

Perth's Wastewater System

Protecting our Health and our Environment

Wastewater systems around the world operate to protect public health and the environment. The introduction of reticulated wastewater systems is one of the major advances in public health over recent centuries.

Here in Western Australia, our reticulated wastewater pipe system takes wastewater away from households, commercial businesses and industry for treatment to an environmentally acceptable standard before it is either reused, or safely discharged back to the environment.

The reticulated wastewater system replaces basic septic tank systems, which allow a high level of nutrient-rich liquid to find its way into our precious groundwater. Not only can this seriously affect human health, it can also have a serious impact on bird and fish life by contributing to the growth of algae in waterways and wetlands.

Perth's wastewater system is large and complex, collecting more than 300 million litres of wastewater – the equivalent capacity of 210 Olympic-sized swimming pools – every day. It operates almost incident-free, which compares well with similar Australian and international wastewater systems operating at best practice levels. In fact, 99.99 per cent of Perth's wastewater is conveyed, without overflows.

Regrettably, wastewater overflows caused by events beyond the Water Corporation's control do



Although wastewater overflows have no long-term impact on our rivers, Perth's wastewater system is continuously enhanced to protect our waterways and maintain their amenity for recreational use.

sometimes occur (eg - extended power failures, tree roots), so all wastewater systems are designed with overflow points – which include rivers and wetlands – to protect public health.

Wastewater systems rely mainly on gravity to transport the flow, making it necessary to locate collection points, such as pumping stations and pressure mains, low in the landscape – often near waterways.

Due to Perth's flat landscape, more than 100 riverside pumping stations are required along the Swan and Canning rivers. However, the Water Corporation carefully manages the wastewater system to maintain the highest level of protection for our State's treasured waterways.

Independent studies show that while undesirable, the small number and low volume of wastewater overflows have minimal short-term and no long-term environmental impact on our waterways.

“ In recognising the economic, social and environmental importance of these waterways, the Water Corporation has set an aspirational target of zero overflows into the Swan and Canning rivers from our wastewater conveyance systems. ”

Algal blooms in the Swan-Canning River system are caused by the high levels of nutrients, including phosphorus, nitrogen and organic carbon, deposited in run-off from their large catchment areas. Occasional wastewater overflows contribute just a small fraction of the nitrogen and phosphorus levels already in the river.

While research shows that wastewater overflows have no long-term impact on our rivers, the Corporation continues to enhance Perth's wastewater system to improve the health of our waterways and maintain their amenity for recreational use.

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Sophisticated equipment monitors system performance, which is benchmarked against peer utilities' performance both in Australia and internationally. In addition, asset inspections, remedial work and process reviews are regularly undertaken.

The Water Corporation is investing more than \$100 million over a five-year period to reduce the risk of wastewater conveyance system overflows in sensitive areas around Perth, focusing initially on assets near our river system.

This commitment is part of our state-wide, \$230 million, 15-year Overflow Risk Management program that officially began in 2004.



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Protecting the environment and enhancing Perth's waterways

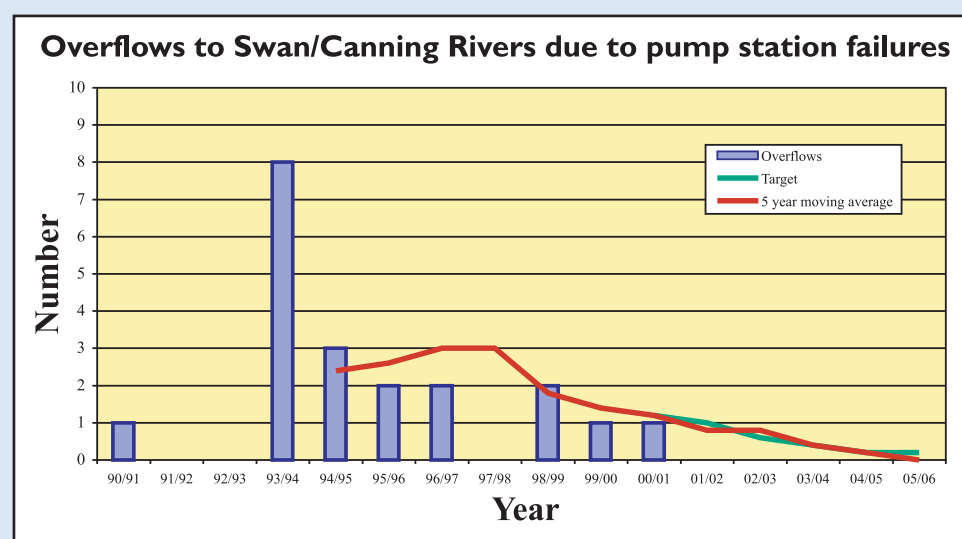
To reduce the amount of treated wastewater released into the natural environment while relieving pressure on our precious drinking water supplies, the Water Corporation is increasingly using treated wastewater for irrigation and industry.

In the metropolitan area, the Corporation's \$28 million Kwinana Water Reclamation Plant (KWRP) is helping to achieve the Western Australian Government's State Water Strategy target of recycling 20 per cent of wastewater across Western Australia by 2020, while expanding Perth's water use options and protecting our coastal waters.

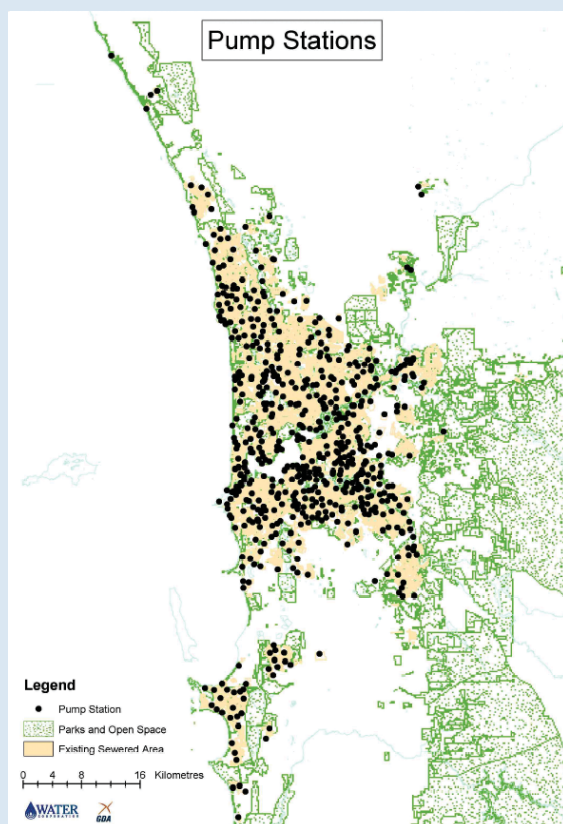
The Corporation is also doing its bit to protect the health of our river system through its support of the Swan River Trust and its State Government-funded Swan-Canning Cleanup Program. In addition, the Corporation's own initiatives include the Infill Sewerage, Riverwise and Wastewater Overflow Risk Management programs.

Since the Western Australian Government and the Corporation launched the Infill Sewerage Program in 1994 to reduce the number of septic tanks and their associated health and environmental risks, an estimated 600 tonnes of nitrogen and 150 tonnes of phosphorus a year have been diverted from the shallow groundwater aquifer to the wastewater system. These nutrient loads are of similar magnitude to the annual catchment nutrient loads entering the Swan-Canning river system.

Proactive works on wastewater assets near or across rivers and sensitive wetlands were the immediate focus of the Water Corporation's \$230 million – 15-year Wastewater Overflow Risk Management Program that began in 2004.



The \$15-million Riverwise Program has resulted in a decrease from an average of six to less than one overflow a year from riverside wastewater pumping stations



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Already, the \$15-million Riverwise Program has resulted in a decrease from an average of six to less than one overflow a year from riverside wastewater pumping stations since the program was completed in 2000. Through the program, more than 100 wastewater pumping stations close to the Swan-Canning river system have been upgraded, comprising increased emergency overflow storage capacity to a minimum of three hours; installation of a more sophisticated monitoring system; alarm system improvements; the installation of additional emergency power generators at the major wastewater pumping stations; and improvements to incident response procedures.

Building on the successful Riverwise initiative, in 2004 we began a \$230 million, 15-year Wastewater Overflow Risk Management Program to further reduce the likelihood of overflows from all wastewater assets across the State.

The program concentrated initially on environmentally sensitive areas around Perth, with particular focus on assets near the river system. Works completed to date include reviews of incident response plans for all wastewater pipeline river crossings; condition checks of riverside pipelines and their early warning systems; and installation of extra by-pass arrangements to further improve response times in the event of a wastewater overflow.

The program's emergency power backup arrangements have proved successful. In May 2005, during a storm that severely disrupted power supplies, 73 wastewater pumping stations were without electricity for some time. Work crews used the fleet of emergency generators to keep the pump stations running. As a result, there were only two minor overflows. That same month, following a failure of the sewer main in Hordern Street, Victoria Park, an accelerated refurbishment program was implemented for the remaining two per cent of unlined, reinforced concrete sewer mains that are more than 50 years old.

In 2006, the Corporation began a \$530,000-trial involving the construction of trenches filled with various materials, to stop large quantities of nutrients from entering drains flowing into the Swan and Canning rivers. The trial is being conducted at the Mill Street drain, which enters the Canning River at Wilson. If successful, the technology will be applied in other areas where nutrient-enriched groundwater enters waterways.

Effects of overflows on Swan-Canning river system

Independent studies show that, while undesirable, wastewater overflows into the Swan – Canning River system over the last decade have had no long-term environmental impact.

Wastewater comprises 99.97 per cent water (originating from showers, baths and washing machines) and the frequency of wastewater overflows entering the river system is low. Each overflow is, in effect, an isolated incident as the rapid dilution and dispersion of overflows and the low amounts of contaminants that enter the river system on these rare occasions means cumulative effects are unlikely.

Even a large overflow on a single day would contribute only a tiny fraction to the nutrient levels already in the river's water and sediments from the broader catchment. However, as a precautionary measure, the Department of Health may direct that health-warning signs be erected to restrict access to a water body in the vicinity of a wastewater overflow. The Department of Health then tests water samples for bacteriological contamination. The sampling process can take up to two days. Once cleared, the signs are removed from the affected river section and access is re-established.

A nutrient is any material that contributes to the nourishment of organisms. Nitrogen and phosphorus are the most important nutrients needed for the growth of algae and other types of plants. But excessive amounts can cause eutrophication – over enrichment, which in aquatic environments, chokes the vegetation or phytoplankton and may cause algal blooms.

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Sinclair Knight Merz Report for Swan River Trust – 1997



Wastewater is 99.97 per cent water because most of it comes from sinks, showers, baths and washing machines. It's greyish in colour, similar to discoloured water that comes out of the washing machine after use.



Maintaining the amenity of rivers for recreational use is the main impact when occasional overflows occur.

There is no evidence of any link between wastewater overflows and the occasional algal blooms in the Swan Estuary, which can lead to fish kills.

Only 0.002 per cent of the nitrogen load and 0.01 per cent of the phosphorus load in the river system over the past 10 years has come from wastewater overflows. Wastewater overflows also contribute an insignificant amount of toxicants, such as heavy metals, to the river system and slightly reduce the levels of dissolved oxygen in the water, but not enough to harm the organisms that live there.

In March 1994, an independent study was carried out by DA Lord and Associates to determine the impact of the overflow from the Armagh Street wastewater pumping station at Victoria Park in 1994, which resulted in about 500 kilolitres of wastewater entering the Swan River.

The study concluded that the overflow had minor short-term and no harmful long-term environmental impact. Within 48 hours of the overflow, water quality criteria throughout the affected area had been restored. Water quality criteria for the harvesting of shellfish, which are far more stringent than those for swimming, were met within 72 hours of the overflow. The main impacts were the possible risk to health through primary contact if swimming in the immediate area within the first 48 hours and loss of the amenity of the river to the public while bacteriological tests were analysed.

A separate extensive independent study conducted by the Swan River Trust in 1997 also concluded that wastewater overflows had minimal short-term and no long-term environmental impact on the river system.

Since that time, there have been two major incidents where wastewater overflowed into the Swan River – at Guildford in 2003 and Caversham in 2004. Overflows from the Bridge Street wastewater pumping station at Guildford resulted in about 1,480 kilolitres of wastewater entering the river, while the corroded main in Caversham below the river bed caused 2,500 kilolitres of wastewater to overflow into the river. Again, the effect on public health and the environment was minimal, as the overflow was quickly dispersed by river flow and disinfected by sunlight.

Swan-Canning River system nutrient loads

Approximate nutrient loads in the past ten years from wastewater overflows

- ◆ Nitrogen = 210kg
- ◆ Phosphorus = 45kg

Other Sources

- ◆ Nitrogen about 10,000,000kg
- ◆ Phosphorus about 800,000kg

100 kilolitres of wastewater contains about 6kg of nitrogen and 1.5kg of phosphorus.



When there are faults or emergencies, alarm signals from monitoring equipment installed on Water Corporation assets are relayed to a central monitoring point, which is staffed 24-hours-a-day, seven-days-a-week.

A reliable wastewater system

Perth's reticulated wastewater system comprises about 10,000 kilometres of pipe and over 500 pumping stations, of which more than 100 are located near rivers. The three largest metropolitan wastewater treatment plants at Beenyup, Subiaco and Woodman Point treat approximately 80 per cent of the state's wastewater. At these locations the treated wastewater is reused, or safely discharged into Perth's coastal waters.

Perth's wastewater network is a relatively young system by industry standards, with only two per cent of the sewerage pipes laid before 1930 and nearly 85 per cent since 1970. Sewers have a lifespan of about 80-100 years.

The wastewater system is designed to overflow in a controlled fashion with health protection the prime objective when a major incident, such as an extended total power failure, occurs. This requires redirection of overflows to natural drainage and rivers to minimise environmental impact and protect low-lying houses and buildings.

The system is well maintained and a range of measures are used to provide both reliability and early detection of any faults or problems.

Alarm systems are installed to indicate faults at pumping stations. These alarm signals are relayed to a central monitoring point staffed 24-hours-a-day, seven-days-a-week. The pumping stations have duplicate pumps and associated electrical systems. If the first pump fails, the second pump starts automatically.

A sophisticated monitoring system has been installed at critical pumping stations – such as those close to the river system – to provide more detailed monitoring and allow control from a central location. Research and development is also under way to further improve monitoring of our most critical pressure mains.

Emergency overflow storage capacity is provided in either the sewers leading to the pumping station, or in dedicated storage tanks. Also, emergency backup

power generation is provided at key sites and there is mobile generating capacity to service smaller sites.

Contingency plans are in place for all wastewater pumping stations to ensure a timely response to an overflow.

Operating within the requirements of the *Environmental Protection Act*, the Water Corporation reports to the Department of Environment and Conservation on wastewater overflows to the environment. Other regulatory authorities, including the Department of Health, the Swan River Trust and relevant local government authorities, are also informed immediately.

If needed, the Corporation also conducts incident de-briefs with the relevant authorities after wastewater overflow events and implements any recommended improvements.

The Economic Regulation Authority (ERA) requires regular independent reviews of the Corporation's asset management system and the most recent report found that it had achieved a very high standard, which reflected a culture of continuous improvement.

Everyone's responsibility

The Water Corporation manages only half of the wastewater system in Western Australia – the other half is located on our customers' properties. Therefore, we need your help to be vigilant at the entry points to the wastewater system (eg toilets, sinks and outside gullies).

It is illegal to put inappropriate materials and substances down toilets, sinks and gullies and to connect swimming pool backwash, stormwater pipes and drains to the wastewater system. Children's toys, bathroom rubbish, cooking oils and grease can cause wastewater blockages and overflows.

Wastewater overflows can also harm the environment and be expensive to repair for both the Water Corporation and our customers, particularly if the blockage or overflow is on your property.

Everyone is responsible for ensuring our wastewater system is used properly!

A brochure entitled: 'Our wastewater system – Customer's responsibilities' outlines what you can do around the home to reduce the load on the wastewater system and help protect public health and the environment. It can be viewed at our website: www.watercorporation.com.au



The toilet is not a rubbish bin! To help protect public health and the environment, foreign objects should not enter the wastewater system.

“The Authority was pleased to note that the Corporation has achieved a high rating from ‘good plus’ to ‘excellent’ in its asset management system review.”

(Economic Regulation Authority Chairman, Lyndon Rowe – June 2005.)

For more information:

General enquiries

13 13 85

Website

www.watercorporation.com.au

Wastewater overflows should be reported immediately to **13 13 75** Faults, emergencies and security (24 hours).