



# Quality recycled water for the Werribee Plains

Salt-reduction strategy

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## MESSAGE FROM THE DEPUTY PREMIER AND MINISTER FOR WATER

Recycling and alternative water supplies are an integral part of the Government's *Our Water Our Future* action plan.

Increasing the use of alternative water supplies such as recycled water can improve the reliability of our water supplies, 'free up' water for the environment and for growth and reduce the discharge of treated effluent into bays and the ocean.

Melbourne Water's \$124 million upgrade to the Western Treatment Plant is opening up new opportunities for using recycled water in the west of Melbourne and is a key driver of the Vision for Werribee Plains.

Water recycling in the west is constrained by relatively high salt levels in the sewage entering the treatment plant. Until now this has not needed special attention.

The *Our Water Our Future* White Paper committed Government to the development of a salinity-reduction strategy for the Western Treatment Plant this year.

The strategy, which delivers on this commitment and the *Vision for Werribee Plains – the next step: Action Plan 2004*, sets out a clear plan to significantly reduce salt in recycled water from the Western Treatment Plant. This will ensure a sustainable supply of 'fit-for-purpose' water to the Werribee Irrigation District and potentially other recycled water projects in the region.

Through the strategy, Melbourne Water and City West Water will work co-operatively with industry and the community to reduce salt that enters the sewerage system from industrial and domestic sources.

The Government has committed \$1 million in 2004-05 through the Victorian Water Trust for Water Smart industry demonstration projects aimed at reducing salt in trade waste.

It will provide new opportunities for using recycled water and enhance Victoria's reputation as a leader in sustainable water management and water recycling technologies.

A handwritten signature in black ink that reads "John Thwaites". The signature is written in a cursive, flowing style.

**John Thwaites**  
Minister for Water



## THE SALT-REDUCTION STRATEGY

### Objective

- Reduce salt levels in effluent produced at the Western Treatment Plant by more than 40 per cent by 2009 to enable significantly increased water recycling west of Melbourne

### How the objective will be met

At-source initiatives will deliver a significant proportion of the required salt reductions. Cleaner industry production processes in trade waste managed by City West Water aim to deliver about one-quarter of the overall salt reduction target. Further reductions are expected from Yarra Valley Water trade waste customers and conversion of consumers to low-salt domestic detergents. On-site treatment (desalination) at the Western Treatment Plant can deliver the remaining reduction necessary to meet the salinity target. A thorough assessment will be completed to identify the appropriate design and technology of the desalination plant and ensure it is economically and socially justified.

### Key elements

Melbourne Water and City West Water are working with industry, government and other water authorities to:

- Further develop cleaner industry production processes to use water more efficiently, replace drinking water with recycled water and reduce salinity at its source;
- Reduce water use and salt discharges from industry through research and development projects;
- Introduce Water Smart demonstration projects to showcase water-saving and salt-reduction initiatives;
- Reduce the salt content of laundry products and assess possibilities for a detergent product-labelling and consumer education scheme;
- Dilute recycled water with river water to manage salinity in irrigation water used by growers in the Werribee Irrigation District while other options are investigated;
- Prepare an economic, social and environmental assessment of a desalination plant at the Western Treatment Plant by the end of 2005 aimed at operation by 2009 at latest; and
- Review progress on all actions by December 2005 and update the strategy as necessary to ensure the actions are on schedule to meet salinity reduction targets by 2009.



## MEETING DEMAND FOR WATER IN A DRY REGION

During the past eight years, Victoria has been hit by one of the most prolonged droughts in its history. This drought has forced us to look at how we use water.

There are many competing demands for water in the Werribee Plains region, which extends from the Maribyrnong River, west to Geelong and north to Bacchus Marsh and Sunbury. These demands are becoming more difficult to meet as population increases. A lack of water is a constraint on growth in the region.

The major water sources in the Werribee Plains are drinking water drawn mainly from the eastern side of Melbourne (for business and urban use) and water extracted directly from rivers and groundwater (for agriculture and limited urban use following treatment).

Rivers in the region are stressed because of these water extractions. A significant increase in the use of groundwater in late 2003 also contributed to reduced security of this vital resource.

The Victorian Government's vision is to transform the Werribee Plains into an internationally recognised 'green' region revolving around sustainable agriculture, urban development, industry, tourism and environmental management.

Central to the vision is an abundant supply of good quality recycled water from the Western Treatment Plant at Werribee, which will provide an alternative resource to reduce stress on existing water supplies.



## HOW WATER RECYCLING CREATES NEW OPPORTUNITIES

Water recycling is a key part of creating a sustainable water supply for Melbourne – it reduces the discharge of treated effluent to bays and the ocean, and conserves drinking water, which can defer the need to build new dams. Water recycling can also support economic growth.

As a community, we are beginning to realise the opportunities provided by recycled water. We no longer regard treated effluent as a waste product; it is a valuable resource.

Water recycling schemes have been developed using treated effluent from Melbourne Water's Eastern and Western Treatment Plants for agriculture, horticulture and vineyards, and to irrigate golf courses and sporting fields. Recycled water is also being used for garden watering and toilet flushing using dual-pipe systems in residential subdivisions.

In Melbourne's west, water recycling schemes include the Werribee Irrigation District for vegetable growers; the Werribee Tourist Precinct including the Werribee Zoo, Werribee Mansion, Werribee Park Golf Course and the National Equestrian Centre; West Werribee residential area and the Werribee Technology Precinct.

Most of the water recycled from the Western Treatment Plant is used to irrigate pasture for a significant grazing business at the site.

In 2003/04, some 11.5 per cent of the total discharge from the Eastern and Western Treatment Plants was recycled – well on the way to meeting the Victorian Government's target of 20 per cent by 2010.

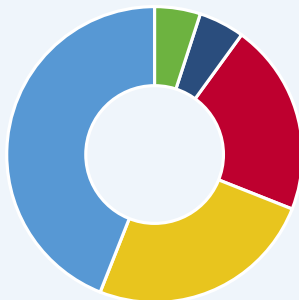
A \$124 million upgrade of the Western Treatment Plant – the most significant since the plant was established more than 100 years ago – is ensuring that all sewage is treated to an improved standard. This is creating opportunities for water recycling both on and off the Western Treatment Plant site.

However, a significant impediment to water recycling west of Melbourne is the relatively high salt content of sewage flowing to the Western Treatment Plant.

High salt levels in sewage reduce the quality of recycled water, which reduces the opportunities to use the water, especially in agriculture and dual-pipe systems in urban developments. High salt levels in water can negatively impact on pipes and other infrastructure. Over time, irrigation with higher salinity water can lead to a build up of salt levels in the soil, impacting on soil structure and vegetation. Managing salt levels ensures recycled water can be used sustainably over the long-term.



### Sources of salt in sewage flowing to the Western Treatment Plant



- 44% Trade waste discharges (industrial/commercial)
- 25% Domestic discharges (residential/commercial)
- 21% Other sources
- 5% Sewer infiltration
- 5% Wet weather inflows

### WHERE THE SALT COMES FROM

Almost half the salt in sewage that flows to the Western Treatment Plant comes from industry located to the west of Melbourne, and about one-quarter comes from households.

Salt in its various forms is widely used in manufacturing processes – from cleaning in the food industry to neutralising industrial effluent in other manufacturing businesses to meet trade waste standards.

Many manufacturers produce salt as a by-product of their operations, and others such as tanneries use pure sodium chloride, which is also an ingredient in many detergent and soap products.

### TACKLING THE SALT PROBLEM

The salt problem is a result of historic development of industry west of Melbourne and practices in industry and households that have been in place for many years.

It is a shared problem and one that needs a shared solution. Everyone contributes to salinity in our sewage, and everyone has a role to play in reducing it.

The typical salinity level of sewage flowing to the Western Treatment Plant is 1050 milligrams per litre total dissolved solids (or 1800 EC). Investigations have shown that the most appropriate and sustainable uses of recycled water require a salinity level of 550 milligrams per litre total dissolved solids (or 1000 EC).

This figure, which exceeds the Government's recommendation of a 40 per cent reduction, has been adopted as the target for the salt-reduction strategy.

This strategy, developed by Melbourne Water and City West Water following detailed investigations, will tackle the salt problem through a combination of at-source and end-of-pipe initiatives. Industry cleaner production processes and trade waste initiatives, along with converting consumers to low-salt domestic detergents, will deliver a significant proportion of the reduction. A desalination plant at the Western Treatment Plant can deliver the rest of the reduction once a thorough assessment has been completed to identify the appropriate design and technology and ensure it is economically and socially justified.

Salt levels will be progressively reduced between now and 2009 to meet the required target.

Implementation of the strategy will play an important role in delivering on the *Our Water Our Future* White Paper and achieving the Government's Vision for Werribee Plains, benefiting existing and new users of recycled water from the Western Treatment Plant.

Achieving the salt-reduction target will provide 'fit-for-purpose' recycled water for vegetable growers in the Werribee Irrigation District.



## WHY MOST HEAVY INDUSTRY IS LOCATED IN MELBOURNE'S WEST

Initially, industry in Melbourne chose locations near ports and railways as well as waterways west of the city centre to enable transport of goods. Industry growth after the Second World War gravitated to the west where bulk sewage treatment was available.

In the early days of Melbourne, land on the western plains was cheap, and factories soon lined the Saltwater River (later the Maribyrnong).

The Victorian Government encouraged industrial development in the western suburbs by offering cheap leases on Crown land, and Footscray Council also encouraged industry to relocate from sites near the Yarra to the Saltwater River. Escalating inner-city land values continued this pattern, and Footscray became known as the Birmingham of the south.

The 1920s manufacturing boom led to a new wave of industrial growth and as road transport became dominant, vast tracts of land on the western plains were set aside for manufacturing.

The Melbourne Metropolitan Planning Scheme 1954 recognised the historic uses of land in the west for particular industries and acknowledged the need of some industries for special effluent disposal facilities, and to be located near the main outfall sewer.

Traditionally, contaminants in trade waste generated by heavy industry were treated cost effectively at the Western Treatment Plant but salt was not removed from the waste streams discharged to Port Phillip Bay.

However, with the increasing demand for higher quality recycled water, salt is now regarded as a detrimental component of trade waste. Industry and Government are working together to tackle the salinity problem, with the aim of increasing water recycling to conserve drinking water and create opportunities for economic growth.



## REDUCING SALT AT ITS SOURCE

### Industry cleaner production processes

City West Water, in conjunction with EPA Victoria, is working with industry on cleaner production processes that include better and more efficient water use, increasing recycled water use where possible to substitute drinking water, and reducing the salt discharged by industry to increase the potential for water recycling.

City West Water and Melbourne Water have determined that by 2009 cleaner industry production processes in trade waste managed by City West Water can deliver about one-quarter of the overall salt-reduction target.

There is also an opportunity to reduce salinity at source through Yarra Valley Water trade waste customers. City West Water is collaborating with Yarra Valley Water to pursue this opportunity.

City West Water has identified the highest salt dischargers among its customers and is working on site-specific and industry sector improvement projects.

Resource management plans are being developed to reduce pollutants and minimise waste streams before disposal to sewer, and assess impacts on product quality and production costs.

This involves examining production processes to see if some of the salt by-products could be recycled, or whether the use of some chemicals could be discontinued or replaced by products with a lower salt content.

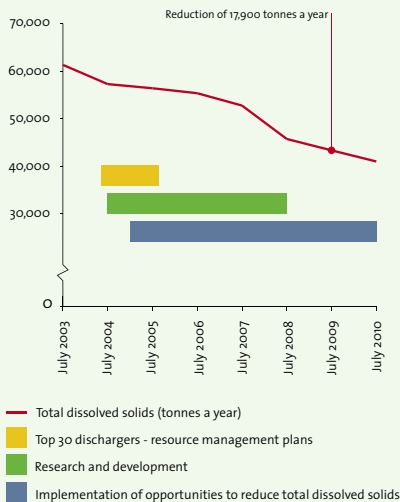
Consideration will be given to changing the cost structure for sewage treatment services, based on pollution load as well as sewage volume. The proposed pollutant sewage charging structure aims to provide industry and government with incentives for efficient investment and reflect the cost of treating salt in sewage.

In addition, the Government will conduct a review of the existing trade waste management framework including an investigation of the regulatory mechanisms that could be used to focus industry attention on waste minimisation and recycling.

### 2005 Action Plan

- With industry, continue developing cleaner production processes including more efficient water uses, substituting recycled water for drinking water and reducing salt discharges
- Produce 30 Resource Management Plans with industries focusing on sustainable ways to implement cleaner production processes
- City West Water and Yarra Valley Water will collaborate to reduce salinity at its source
- Subject to Essential Services Commission approval, introduce a sewage pollutant charging structure with incentives for efficient investment and reflecting the cost of treating salt in sewage

### Working with industry to reduce salt



*Reduction based on 2002/03 salt loads from City West Water trade waste customers. This reduction is equivalent to 49 tonnes a day.*





## Research and development

Research has been commissioned to support industry to reduce salt. For example, industry must meet certain pH limits as part of trade waste agreements. Many businesses need to add chemicals to ensure their trade waste meets these pH limits. These chemicals generate more salt in the system.

An investigation, also involving RMIT University and Melbourne Water, has begun on whether these limits could be adjusted without compromising the structural integrity of sewers and other infrastructure and Occupational Health and Safety standards.

Other research and development projects being undertaken include:

- A process integration study focusing on water and salt reduction at a large beverage manufacturer;
- Investigation of a salt recovery and reuse process in the sheepskin salting industry;
- Salt brine recovery and reuse in the chemical industry; and
- Salt dye bath recovery in the fabric dyeing industry.

### 2005 Action Plan

- Support industry to save water and reduce salt discharges through research and development

## Water Smart industry demonstration projects

Victorian Government funding of \$1 million from the Victorian Water Trust has been allocated to support industry and City West Water develop Water Smart industry demonstration projects that aim to reduce salt and save water in 2004/05.

The projects will demonstrate new approaches that are applicable to other industry users and reduce salt production and demand for water through on-site treatment and recycling.

### 2005 Action Plan

- Accelerate the introduction of Water Smart industry demonstration projects, with the allocation of \$1 million from the Victorian Water Trust to projects to reduce water consumption and salt discharge

## Detergent substitution

Laundry detergents contribute about one-quarter of the salt in domestic sewage and are the major focus for salt reduction in domestic sources.

Generally, liquids have less salt content than powders. The water industry, through the Water Services Association of Australia, is working with detergent manufacturers to reduce the salt content of laundry products.

In addition, the Department of Sustainability and Environment, retail water businesses and the Water Services Association of Australia are assessing possibilities for detergent product labelling to enable consumers to choose detergents with lower salt levels, and for the development of a public education program.

These programs aim to reduce salt loads by 6500 tonnes a year by 2009.

### 2005 Action Plan

- Through the Water Services Association of Australia, work with detergent manufacturers to reduce the salt content of laundry products
- Through the Department of Sustainability and Environment, retail water companies and the Water Services Association of Australia, assess possibilities for a detergent product-labelling and consumer education scheme





## HELPING THE WERRIBEE IRRIGATION DISTRICT PROSPER

More than 100 market gardeners grow vegetables for local, national and export markets in the Werribee Irrigation District, which is the most significant agricultural area in the region with an annual output worth about \$70 million.

A recycled water scheme for the Werribee Irrigation District began in November 2004. Under the scheme, growers will receive up to 8500 million litres of high quality recycled water a year via a pipeline from the Western Treatment Plant..

Benefits of the scheme include 'freeing up' water for the environment, much greater security of supply for irrigators, a sound base for future growth in the area, and reduced discharge to Port Phillip Bay.

Salt levels in the recycled water need to be managed as the scheme is introduced. It is possible to immediately supply water at the salinity target level by blending the recycled water with Werribee River water. However, the volumes that can be supplied are dependent on the salinity of the river water and the amount of water available, both of which can vary.

Until 2009 at the latest, Southern Rural Water will blend recycled water and river water to maximise the amount of recycled water used while maintaining salinity below the normal range currently managed by irrigators.

During this time, Melbourne Water will investigate ways to manage the river catchment to reduce river water salinity and increase the amount of recycled water in the blend.

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### 2005 Action Plan

- *Through Southern Rural Water, manage the salinity of recycled water delivered to customers in the Werribee Irrigation District to an acceptable level by blending with Werribee River water until 2009 at the latest*
  - *Investigate sources of salinity in the Werribee River to determine if it is possible to reduce saline inflows and optimise blending with recycled water*
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## DESALINATION – A FEASIBLE OPTION

Desalination plants are used when clean water is scarce to help supply communities and industry with the highest quality water. For example, four desalination plants already operate in Western Australia. Two others, including a 130 million litre a day seawater desalination plant for Perth, are committed, and another eight small plants are under consideration.

Desalination is a useful technology to clean treated effluent for water recycling, but desalination plants are expensive, with high operating costs. As the expense of providing water in other ways increases, desalination plants are becoming more viable.

The cost of production depends on the type of technology, maintenance, disposal of the concentrated saltwater or brine by-product, and energy, which can represent more than half the cost of operation.

Most desalination plants in Australia use reverse osmosis, where water is pumped through a membrane, however other technologies are also available.

A desalination plant could be installed at the Western Treatment Plant to achieve the salt-reduction target, provided it is found to be financially and socially justified. Melbourne Water will prepare an economic, social and environmental assessment of a desalination plant, considering the preferred plant design and technology.

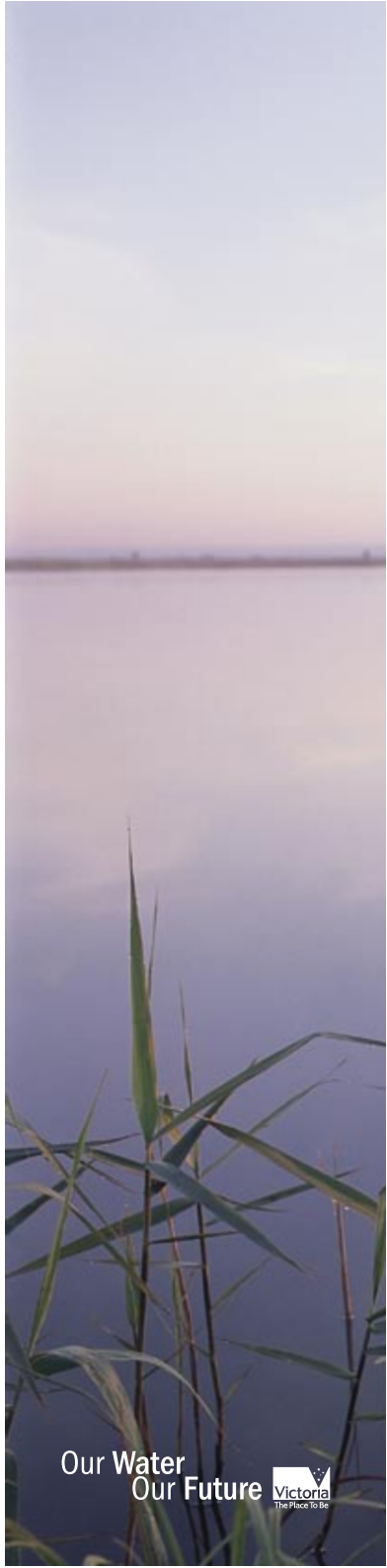
A desalination plant would avoid further blending with river water, 'free up' river water for environmental flows and/or other uses, and maximise the use of recycled water.

Most desalination technologies are sensitive to the characteristics of the feed water. The most appropriate technologies for the Western Treatment Plant will be selected using a demonstration program. This will involve prototype trials including monitoring, consultation and modelling.

It is expected that investigations and trials of all factors affecting the size and cost of a desalination plant will take about one year. If it is determined necessary, a desalination plant could be constructed and operational by 2009.

### 2005 Action Plan

- Prepare an economic, social and environmental assessment of a desalination plant at the Western Treatment Plant by the end of 2005, considering the preferred plant design and technology, and taking account of emerging technologies as well as forecast salinity reductions from other actions and 'fit-for-purpose' salinity levels for water delivered to customers



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