

ReWater

Water recycling in Australia

WINTER 08

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On the cover:

Dr Belinda Rawnsley, photo courtesy of SARDI.



Healthy vines

Recycled water saving viticulture

Recycled water is drought-proofing McLaren Vale, keeping it one step ahead of other regions affected by water shortages.

The use of recycled water in the McLaren Vale region has observable benefits by alleviating pressure on naturally available water resources and is up to 40% cheaper per kilolitre than mains water. Environmentally, the amount of wastewater discharged out to sea is reduced which minimises the harmful impact on the marine environment in the Gulf St. Vincent.

Recycled water quality is constantly monitored. Compared to mains water, recycled water tends to have an elevated salt content and nutrient load (Table 1). Nitrogen (N) and phosphorus (P) are higher in recycled water than mains water so additional fertiliser use may not be necessary. There are common concerns that recycled water contains excessive levels of boron, yet there is no evidence of this (Table 1).

Table 1. Comparison of selected quality parameters of recycled and mains water used to irrigate vines in McLaren Vale, South Australia.

Parameter	Unit	Recycled	Mains
pH		7.4	7.4
Boron	mg/L	0.23	0.33
Calcium	mg/L	42	41
Chloride	mg/L	270	138
Potassium	mg/L	25	7
Sodium	mg/L	190	88
Total Nitrogen	mg/L	20	0.3
Total Phosphorous	mg/L	8	0.08
Total Dissolved Solids (TDS)	mg/L	807	373
E. coli	/100ml	18	0

Source: Christies Beach Wastewater Treatment Plant and Myponga system, SA Water 2006.

The use of recycled water has many obvious benefits and ongoing research, led by Dr Michael McCarthy (SARDI), has shown that there is no difference in yield or wine quality between vines irrigated with recycled or mains water. This research has shown that irrigation with recycled water does not cause nutrient imbalance and does not impede yield. Recycled water appears to provide a good source of plant available nutrients that can reduce grower fertiliser costs.

Dr Belinda Rawnsley has also conducted research on the effect of recycled water on the soil environment, particularly the level of microbes in the soil and whether soil pathogens pose a problem.

Extensive soil sampling was conducted over three seasons (2004-2007) under drip-irrigated vines (cv. Shiraz, own-rooted) at a commercial vineyard in McLaren Vale. The site was specifically set up to assess recycled and mains irrigation water. Soil samples were analysed to determine the influence of water quality on root distribution, soil microbial activity and fungal pathogens.

Root distribution was not affected by irrigation water quality. There was no difference in the distribution of roots through the soil profile down to 40 cm. The majority of roots under drip-irrigation were located at 10-20 cm.

Recycled water has a higher level of total dissolved solids (TDS) and higher nutrient levels compared to mains water as shown in Table 1. For this reason, it was suggested that recycled water may contribute microbes to the soil but it was unknown if these were beneficial or pathogenic (disease-causing) organisms. Soil microbes are essential components in promoting plant growth, nutrient

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About ReWater

This newsletter, ReWater, has been designed to make information relevant to recycled/recycled water use in horticulture more accessible to horticulturalists (growers/farmers), the water industry and other interested people. It is part of the service provided by the Australian Coordinator for Recycled Water Use in Horticulture, funded by Horticulture Australia.

Back issues and instructions for subscribing to receive ReWater electronically on a quarterly can be accessed at www.recycledwater.com.au/rewater

Your Feedback and Contributions

We would appreciate your feedback and suggestions for contributions. Please email rewater@arris.com.au or contact us on 03 9421 1701.

www.recycledwater.com.au



Know-how for Horticulture™

The delivery of research and development outcomes from this project to the horticultural industry is made possible by the Commonwealth Government's 50% investment in all Horticulture Australia's research and development initiatives.

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New Zealand's Mangawhai beach resort

NZ's \$53M Mangawhai EcoCare recycled water scheme

Providing recycled water for dairy pasture, protecting the environment and supporting sustainable community infrastructure.

In January this year Earth Tech commenced construction of the NZ\$53 million Mangawhai EcoCare Wastewater Scheme in New Zealand.

A Karakia, a customary New Zealand blessing, and an official ground-breaking celebration was held to recognise the significance of this major community infrastructure project

Earth Tech designed the complete wastewater scheme for Mangawhai Township, a popular beach resort located in a sensitive estuary and marine environment 1.5 hours north of Auckland. They are also responsible for the construction, commissioning and operation of the scheme for up to 10 years on behalf of the Kaipara District Council. The scope of operations includes collection, pumping, treatment and management of all wastewater and biosolids. The EcoCare Scheme is scheduled for completion in July 2009.

The major elements of the Mangawhai EcoCare Wastewater Scheme include:

- 21 kilometres of sewers
- 15 pumping stations
- 6 kilometres of rising main
- a small footprint wastewater treatment plant
- an 11 kilometres recycled water transfer pipeline
- a recycled water storage dam and an irrigation system

Peter Everist, Earth Tech's Group General Manager, explained that the project involved a two-year period of intensive planning and community consultation to obtain resource consents required under the New Zealand Resource Management Act.

"The EcoCare Scheme plays a vital role in maintaining and sustaining the long-term environmental and economic health of Mangawhai," Everist said. "This is a very sensitive coastal environment and it was important for Earth Tech to work with the Council and community to ensure the success of the project."

Kaipara District Council Mayor Neil Tiller said finalising the deal is the culmination of many years of planning and consultation with the community to align objectives and outcomes for the project including maintaining the affordability for the community.

"This is an exciting example of a Council, community and the private sector working together to solve public health and environmental issues in a small community," Tiller explained. "One of the most exciting aspects is the use of recycled water to irrigate pastures. The quality of the recycled water is so high it is fit for the purpose of growing pastures for dairy cows to graze.

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Wine from recycled water saving viticulture

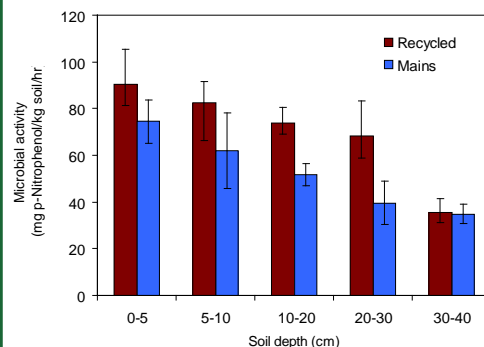


Figure 1. Microbial activity in soil directly around the roots under vines irrigated by recycled and mains water, McLaren Vale, March 2007.

availability and soil structure; and a good sign of soil health is high microbial activity. Bacteria and fungi secrete enzymes associated with nutrient cycling in soils. Measuring these enzymes indicates the amount of microbial activity taking place.

Microbial activity in the soil was higher with irrigation of recycled water than mains water (Figure 1). Higher microbial activity enhances the transfer of nutrients to the vine. There was an obvious decline in microbial activity with soil depth, showing microbes were more active in the upper soil horizon.

Soils and roots were assessed for fungi to determine if recycled water promoted pathogens in the soil. Pythium, Cylindrocarpon and Fusarium were the major fungi isolated. There were no significant differences between recycled water and mains water grown vines. For both irrigation water treatments roots appeared healthy and vines did not display disease symptoms.

Recycled water is proving to be a viable alternate source of water for irrigation and has the potential for widespread adoption with the expansion and development of wastewater treatment facilities. Using wastewater ensures consistent grape production in regions that would otherwise have inadequate water supply.

If drought conditions persist, recycled water may play a major factor in survival of the industry. However, there are limited volumes of wastewater available and many competing demands for it. ●

Source: Dr Belinda Rawnsley, Senior Research Officer, South Australian Research & Development Institute.

For more information contact Belinda on: rawnsley.belinda@saugov.sa.gov.au

Acknowledgements: The author would like to thank Dr Michael McCarthy, Robin Coles, Drs Kerry Porter, Kirsty Neaylon and Belinda Stummer, and staff at the Fosters Wine Company for access and provision of samples from the McLaren Vale vineyard. The Grape and Wine Research and Development Corporation (GWRDC) are gratefully acknowledged for funding this research through investment by Australia's grapegrowers and winemakers with matching funds by the Federal Government.

NZ's \$53M Mangawhai EcoCare recycled water scheme

The EcoCare Scheme will also protect our estuary and harbour for future generations so that residents and visitors alike can continue to enjoy our beautiful environment and recreational activities."

Jack McKerchar, Chief Executive Kaipara District Council, said that the Mangawhai EcoCare Scheme was not only essential to protect the environment but was also a model of how to deliver sustainable community infrastructure.

"We are delivering the EcoCare Scheme under a partnership arrangement with Earth Tech, who will build the sewage treatment plant and pipeline infrastructure, operate it under a long-term contract and, importantly, warrant its performance."

"The model that we have developed for Mangawhai is one that could work for other communities in New Zealand who are also facing rapid development and environmental issues," Mr McKerchar said. ●

Source: Leif Ericson, Communication, Earth Tech
leif.ericson@earthtech.com.au



High quality recycled water provides pastures for grazing dairy cows



GOOD READS and website links

Risk management for water and wastewater utilities.

Simon Pollard, IWA title. Covers basic probability and statistics, process risk and reliability analysis, assessing risk beyond the unit process boundary, regulating water utility risks, business risk management and managing opportunity & reputational risk. Cost \$172 plus p&h.
bookshop@awa.asn.au

Reverse osmosis and nanofiltration (m46)

An excellent primer which explains the principles behind membrane filtration and the operation of reverse osmosis systems commonly used in desalination and water recycling projects. Quote AWA membership number for special cost \$99 plus p & h.
bookshop@awa.asn.au

Metcalf & Eddy 4th edition: wastewater engineering: treatment and reuse.

An excellent and comprehensive text and reference for aspiring and fully qualified engineers covering conventional technologies and processes, the latest developments and applications in one title. Special hardcover price \$165 plus p.& h.
bookshop@awa.asn.au

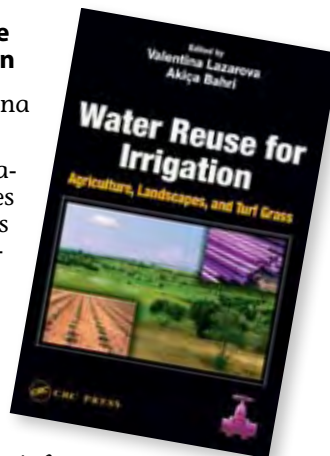
AWWA Publication: Membrane treatment for drinking water and reuse applications.

A compendium of peer reviewed papers. A huge hardcopy book (668pp) with top quality scientific and technical research, case problems and their resolution. The majority come from American specialty conferences. Costs \$246 plus p. & h.
bookshop@awa.asn.au

Water Reuse for Irrigation

By: Valentina Lazarova

This compilation provides guidelines that facilitate the successful planning and operation of water reuse projects. Offering the information, analysis, and proven experience for agricultural and landscape irrigation, it bridges the gap between fundamental science and relatively uncharted areas of economic, institutional, and liability issues. It delivers a synthesis



of information recently emerging in both science and in the practice of irrigation with reclaimed water. The book compiles guidelines, recommendations, and codes of best practices from around the world for all types of recycled water uses, and it examines recent concerns about adverse effects on plants, groundwater, and public health. Hardcover published in 2004, costs \$207 + p&h.
www.booktopia.com.au

ERA: Water and Wastewater Statistics

The Economic Regulation Authority (ERA) has released its Water and Wastewater Statistics for 2006/07. For full report see: www.era.wa.gov.au
ERA's media release (27 March 2008)

Long-Term Effects of Landscape Irrigation Using Household Graywater

The report contains a detailed literature review and synthesis of the current state of the knowledge on graywater reuse for landscape irrigation at the household level. It identifies information gaps for future research on the long-term use of graywater for irrigation of residential landscapes, particularly as it relates to human health, landscape plants, and/or the environment.
<http://www.werf.org>

Drip or sprinkler irrigation?

Maximising return from limited water resources through efficient irrigation.

With the current limitations to water availability; one way to make available recycled water go further is the adoption of efficient irrigation techniques to maximise return from this limited water resource. It could also help manage the increasing salinity of recycled water by applying less salts, but ensuring adequate leaching of salts when required.

There is limited data available to vegetable growers to assist with making independent, informed decisions about how or if drip irrigation will improve water use efficiency (\$/ML) and its impact on day to day management of the vegetable farming operation. Drip irrigation has been assessed for several other commodities (eg cane, tomatoes, grapes, onion, avocados). In some cases, these reports have indicated:

- improvements in yield and quality of product;
- better management of soils (salinity and nutrients);
- improved economic returns in the mid term;
- improved water use/efficiency;
- lower pumping costs; and
- more efficient use of labour across the whole farming operation.

These claims are varied depending on the crop grown and management methods used.

Research was undertaken at Werribee South (Victoria) to improve our understanding of any benefits from drip irrigation in the lettuce production systems. Lettuce is one of the most salt sensitive vegetables produced. Hence, if the benefits reported from drip irrigation in other crops are also shown in lettuce production systems, there may be sufficient economic, agronomic and environmental benefits for lettuce growers (and possible other vegetable crops) to encourage a change in irrigation systems.

Spray irrigation (solid set impact sprinkler) was compared against two drip irrigation systems, one with 30 cm spacing between dripper lines and the other with 40 cm spacing.

Findings

Water use:

This summer's crop was subject to great heat stress and strong winds. Yet, there was no significant difference in marketable portions of the crops between spray and drip (30cm spacing). For the 40cm spaced drippers the number of marketable lettuces was 10% lower compared to

spray and 30cm spacing (most likely due to insufficient water; ie crop was water stressed).

Overhead sprinklers were shown to be inefficient because of low uniformity of water distribution in strong winds and sprinklers having to be run longer to water the driest areas of the crop. Spray irrigation also watered between beds and the sprinkler line, where drip was more targeted and did not water outside of the growing area. (This equates to approximately 25% less area being watered by the drip systems). Drip irrigation was more efficient, especially with the use of soil moisture sensors. Trials with both 30cm and 40cm dripper spacings consumed less than half the water used by the spray system (Figure 1).

Soil nitrate concentrations:

Post harvest soil samples indicated that plant available soil nitrate concentrations of spray irrigated crops were approximately half that of 30cm spacing drip irrigated approach (Figure 2). This could be due to excessive leaching with spray irrigation or inefficient application of N (lost through volatilisation or denitrification) of N with spray irrigation. Difference in average total N applied was \pm 3% of the average (275 kg N/ha) for drip and 30cm spray treatments, and 20% less for the drip 40 cm spacing treatment.

Salinity management:

Salinity was also lower in spray and 30cm spacing drip irrigation systems suggesting higher leaching compared with the 40cm spacing drip irrigation system (Figure 3). Spray treatments also applied significantly more salts as a result of greater water volumes being applied. Irrigation water salinity for all treatments averaged an electrical conductivity of 2.2



Field day participants at Werribee evaluate trial

dS/m (1500 mg/L TDS) for the trial.

These data indicate that with good drip irrigation management similar lettuce crops can be grown and soil salinity managed. There may also be benefits with more efficient use of fertilisers using drip irrigation.

Future work

A full economic analysis of crop yield, water & fertiliser use, operational costs and the labour needed for the different irrigation methods is currently underway. The ultimate aim of the research is to provide growers with scientifically sound data that will provide sufficient information to make sound economic, agronomic and environmental choices to obtain the maximum economic return for a ML of water. ●

Source: Daryl Stevens, Principal Scientist, Arris P/L, Victoria. For more information phone: (t) 03 9421 1701 (m) 0418 802 621

Acknowledgement: This project is part of the outcome from the Australian Coordinator for Recycled Water use in Horticulture (ACRWH - Project no. HG06170), funded through Horticulture Australia Limited (HAL - www.horticulture.com.au). Outcomes from this project to the horticultural industry are made possible by the Commonwealth Government's 50% investment in all HAL's research and development initiatives.

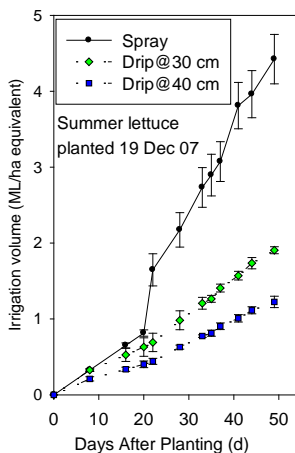


Figure 1: Water use for lettuce grown with 3 irrigation systems.

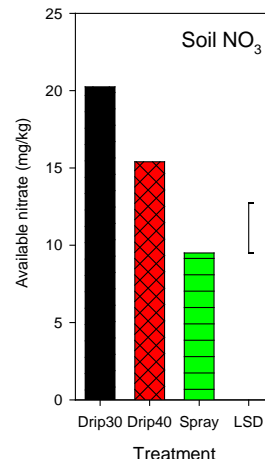


Figure 2 Available soil nitrate post harvest (LSD – least significant difference)

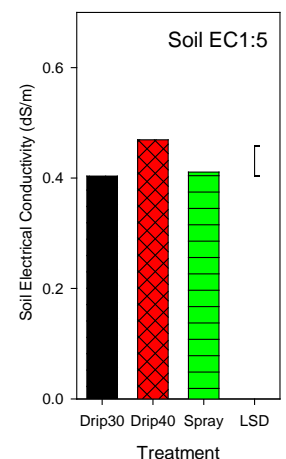


Figure 3: Soil electrical conductivity post harvest (LSD – least significant difference)

Canberra International Airport – leaders in recycled water management

An international leader in water management; educating others in how to better use our precious water resources.

Canberra International Airport is an international leader in water management and has lead a dedicated campaign to not only reduce water use across the Airport, but to also educate other water users across the ACT and Australia in how to better use precious water resources.

Their aim is to progressively reduce water use to an absolute minimum across the Airport – whether that is in their own use of water or the use of water by airport operators and tenants. Already they have far exceeded the highest of hurdles, and far exceed any current water standards or requirements.

All of Canberra International Airport's operations are consistent with Stage 4 water restrictions.

Taking a multi-targeted approach

The airport has taken a multi-targeted approach to water use minimisation by addressing all issues of water management. This approach includes:

- Water Recycling: Over 100,000 litres of water are recycled every day
- No use of ACTEW water on any lawns: recycled, rainwater and non-potable bore water are used across the Airport.
- Sub-surface watering in some newer landscaping: Lawns and garden beds are watered from underground to eliminate evaporation.
- Ban on use of ACTEW water for dust suppression: using instead non-potable water sources.
- Recycled water in Caltex car wash: to minimise water use.

Canberra International Airport was the first to introduce a large scale commercial water recycling system in the ACT, and the first Airport to do so in Australia. The system was launched on 10 May 2007 and comprises of two major recycling plants which recycle 100,000 litres of water every day, equivalent to recycling two Olympic sized swimming pools every day.

An Australian first

Canberra International Airport's water recycling system takes sewer (or 'black') water and converts it to clean drinkable water, which is then used in toilets, cooling towers and in irrigation (while the water is drinkable, it is not used for drinking or showering).

A three stage recycling process

The water is recycled using a three stage process:

Stage 1 - Biological treatment: biological agents are added to the sewer and air is then bubbled through the biologically treated sewerage. This breaks down sewerage so that it can then be treated further.

Stage 2 - Ultrafiltration: where the liquid is then passed through a thin self-cleaning membrane. Particles in the membrane one-one hundredth the thickness of a human hair allow only clean pure water to pass through. The water that comes through the membrane is so clean that it is drinkable.

Stage 3 - UV Lamp: as a further step, the clean water is then passed under a UV lamp. This provides a further layer of protection.

This process is shown below in Figure 1.

After the treatment, the water is then used, along with rainwater captured off roofs, in toilets, cooling towers and externally. This means that the only use for ACTEW water supplies is for drinking and showering.

The recycling process is shown in Figure 2 below.

Canberra Airports' leadership in water management has been held up as a model for others, and has been praised by a number of groups, including ACTEW and the Green Building Council of Australia. ●

Source: www.canberraairport.com.au



Figure 1: Water recycling filtration process.

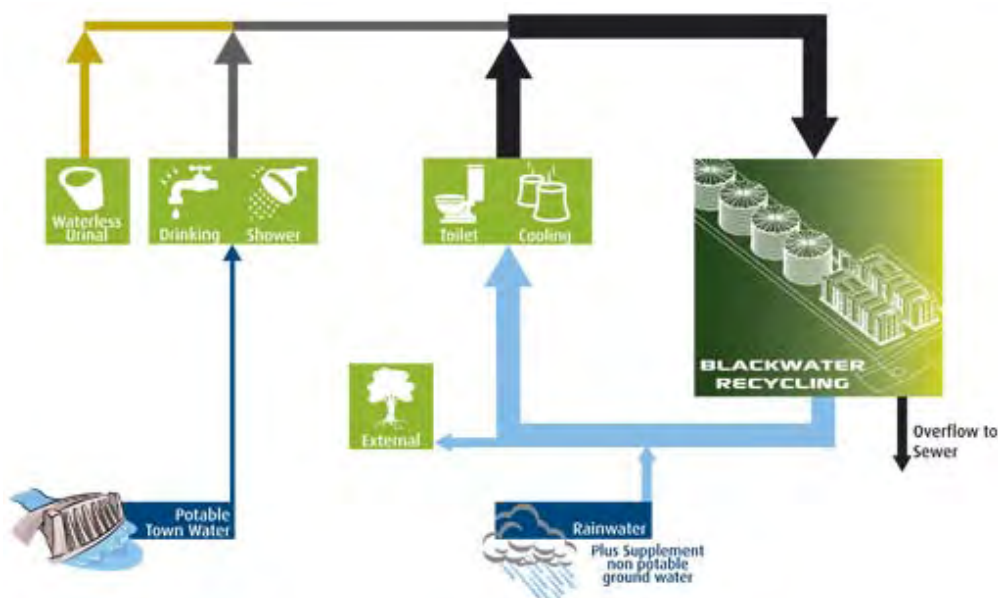


Figure 2: Water recycling - closing the loop.



The Davis family gets a trial run on the purple pipe network that will deliver quality recycled water.

Getting water wise on the Gold Coast

It might come as a surprise for many that part of the Gold Coast is leading the way in planning for environmental sustainability, especially with the use of water. And it's leading the way with a far-sighted strategy that introduces, on a large scale, the concept of water sensitive urban design.

It will also bring into play an advanced dual-reticulation system which delivers potable water and recycled water treated to Class A plus which is the highest quality of recycled water for non-drinking purposes in Queensland, having been filtered and disinfected through two different treatment plants.

Water experts predict that this system will eventually reduce the use of drinking water in new homes by up to 84 per cent. It will make a significant impact on the total water consumption habits of Gold Coast residents since the new water strategy is focused on burgeoning Greenfield development sites at the northern end of the Gold Coast.

At the moment, every resident of every new home in the Pimpama-Coomera region of the Gold Coast is embarking on a learning curve, not only on how to turn on to a dual water network, but also in experiencing a lifestyle that makes them, their homes and their neighbourhood become more environmentally friendly.

And the spin-off is that everybody becomes happier, they have a better environment, a closer connection with nature and a personal input in helping to save the planet and some of its species - including the human kind perhaps.

Presently, the population of the Pimpama-Coomera area is about 20,000 and expected to top 120,000 by 2055. Indeed,

it is the Gold Coast's fastest growing region and designed within the guidelines of the Pimpama Coomera Waterfuture Master Plan - a Gold Coast City Council inspired and award-winning project that is intended to ensure sustainable development.

The first impression is how well landscaped the neighbourhoods' open spaces are - indeed that there are open spaces - where vegetation in places has replaced the usual bleak concrete kerbs and guttering.

While each new home and business in this region is plumbed with two totally separate water networks - the traditional one for drinking water and the easily identifiable purple one for high-grade recycled water - residents will have to wait until early next year before the system is thoroughly checked and comes fully on stream.

It means, that at the moment, potable water is coming through the purple network of mains, meters, pipes, taps and hoses and that home owners will have to remember which tap to turn come early 2009. The handles of taps are removable, rendering them childproof when necessary

The Pimpama Recycled Water Treatment Plant will soon be completed and then undergo a long testing period. This is a secondary treatment plant that processes treated water from the adjoining Pimpama Wastewater Treatment Plant to a higher quality. Also, two large reservoirs are being constructed to hold a head of supply for both drinking and recycled water.

Stage 1 of the plant will convert up to nine million litres of wastewater into

Class A plus recycled water each day. Another benefit of the dual reticulation system is that home owners will have two separate meters, making it easier to track water consumption and to make appropriate savings where necessary.

The Waterfuture Masterplan also includes installation of plumbed in rainwater tanks on all new homes to supply cold water for the laundry and an optional external tap. Another environmental bonus comes with the wastewater system which is designed to limit stormwater infiltration and so reduce, in turn, the amount of greenhouse gas emissions due to less wastewater requiring treatment.

The council has also upgraded its wastewater pipes, creating 'smart sewers' which are made of new advanced materials and designed to reduce the amount of stormwater and groundwater entering the wastewater system. In all, it's a win, win, win water system that has been developed uniquely through a Gold Coast community-based advisory committee with input from industry associations, developers, residents associations, council, government departments and not least, environmental groups that included Gecko (Gold Coast and Hinterland Environment Council), a sister organisation to Sunshine Coast Environment Council.

And to further demonstrate that recycled water Class A plus is a really cool item, Queensland fire fighters have given it the nod as being safe for firefighting. ●

Source: Brian Rickards, April 5, 2008
www.econews.org.au



The Beijing Olympic Forest Park utilising recycled water

Water recycling meeting Olympic demand

Beijing will be treating 90% of the 2.78 million kilolitres (KL) of waste water produced every day in the Olympic city and recycling half of it.

Nowadays, when people walk along Beijing roadsides, they may seldom guess that public fountains, sprinklers, gardens and greenbelts all make use of recycled water.

China advocates energy-saving and discharge reduction policies. Many wastewater disposal factories in various cities have set up wastewater reclamation systems. To cope with the 2008 Olympic Games Beijing municipal authorities are exploring new ways to increase city usage of recycled water.

According to the Beijing Water Authority, Beijing has established four water recycling plants and two water pump stations with 325 kilometers of paved pipelines to date. Currently Beijing can provide 960,000 KL of water on a daily basis, with recycled water reaching 50 percent - the highest rate in China.

Recycled water pours into the Olympic Park

In May 2007, high-quality recycled water from the Beijing Qinghe Water Recycling Treatment Plant poured into the Olympic Park in a steady stream, signifying another breakthrough how recycled water is used. The plant has adopted advanced technologies to process water while simultaneously absorbing mature

skills and experiences from domestic and overseas sectors. The newly processed water resembles clear water.

The water processed by the plant is mainly used to supply the Olympic Park's water needs and will also service Haidian and Chaoyang districts. In this way, Beijing can save 30 million KL of clean water every year.

In the Beijing Olympic Forest Park, recycled water is used as the main source of lake water. The park is also paved with water-channeling bricks, and rainwater collection facilities are installed around the venues in the park. According to the experts, if the park used municipally-supplied water as the main source for its water system, then not a single yuan would be expended on the rainwater collection and treatment facilities, nor would an acre of land be used for those facilities. But then the annual maintenance fee would run as high as 40 million yuan (\$6M AUD).

When they turned to recycled water, they invested more than 30 million yuan (\$4.5M AUD) for the necessary facilities that occupy 3.9 hectares of the land, but it is projected that the maintenance fee will be limited to around 300,000 yuan (\$45,600 AUD) a year.

In fact, water recycling technology has been widely applied at all of Beijing's Olympic venues. Many venues, including the Olympic Green Hockey Field, Olympic Green Archery Field, Olympic Green Tennis Center and a few others, not only use recycled water supplied by wastewater treatment plants, but also have installed their own drainage treatment stations or systems to recycle water and create zero sewage discharge.

In order to promote the usage of recycled water, the Beijing Drainage Group Co. Ltd has developed an intelligent water machine. This machine can automatically provide recycled water for public sanitation, gardens, greenbelts and even car-washing when people use their water cards. In 2006, the machine provided a total of 65,000 KL of water. The price of this reclaimed water is lower than tap water, so it has gained popularity. It is expected that Beijing will produce 60 similar machines in 2008.

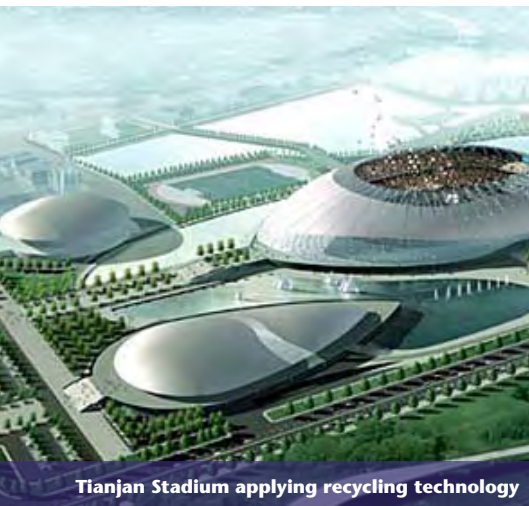
The Beijing Drainage Group Co. Ltd will also invest 1.7 billion yuan (\$258M AUD) to operate nine water recycling plants and construct 500 kilometers of pipelines to adequately fulfill Beijing's needs during the Olympic Games.

Recycled water to irrigate farmland

In November 2006, the farmers in Beijing's Daxing District began to use recycled water.

At the end of 2006, the Nanhongmen irrigation zone initiated an agriculture recycling water project designed to irrigate farmlands of 0.2 million mu (13,333 ha) by 0.3 million KL with recycled water on a

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Tianjin Stadium applying recycling technology

daily basis. The water primarily irrigated wheat and corn, plants for feeding animals, and other gardens and greenbelts.

Water administration challenges

Beijing is a big city with a severe water shortage, with less than 300 KL of water resources per person. Since 1999, Beijing has experienced eight consecutive years of drought weather, with only 450 millimeters of rainfall on average during this time. In light of this situation, Beijing has made great efforts to incorporate scientific development, standardize administrative mechanisms, and unify water protection, management and the utilization process. All of these sectors have made significant progress.

Administering water resources has encountered the problem of division between various departments and between rural and urban areas for a long time. "Those who manage water issues do not regulate watercourses; those who provide water do not care about water pollution." To comprehensively coordinate the entire city's water protection program the city government has organized Water Affair Authority at both the district and city level. The government has set up 114 waterworks stations at different watercourses to supervise comprehensive regulation work, as well as 3,298 farmer's water associations to better manage water affairs. By adopting these measures, the government can holistically administer transporting water, providing water, saving water, draining off water, disposing of wastewater, and utilizing recycled water. ●

Source: China Development Gateway by Sun Wan October 16, 2007 & www.showchina.org

Sustainable water sources, innovations and applications: Study Tour

Increased pressure on our scarce water supplies has prompted a significant focus on the identification and sustainable management of alternative water resources, particularly in the amenity and production horticulture industries.

On the 20th of October this year an Australian study tour group will be heading to United Arab Emirates (Dubai), Israel and Spain to explore a variety of alternative water source technologies, management and applications in urban, industrial and rural contexts. The group will also observe efficient, innovative irrigation technologies supplying water to amenity and production horticulture that maximise water use outcomes and economic returns while minimising environmental impacts.

In addition to this, tour participants will explore world leading new technologies and methodologies to improve sustainability, efficiency and effectiveness in water management and understand how these may apply in Australia. An improved understanding of barriers to adoption of alternative water sources and identification of opportunities for

overcoming these barriers in the amenity and production horticulture industries will also be explored.

Water sources, management and application considerations are underpinned by the philosophy of 'reduce, reuse and recycle' to ensure that options evaluated consider broader sustainability aspects such as energy requirements, raw material use, emissions and ecological impact.

At the time of producing this edition a few study tour places were still available.

For more information about the study tour see www.recycledwater.com.au

To discuss participating in the tour please contact Arris on (03) 9421 1701 or email studytour@arris.com.au

See: www.recycledwater.com.au/studytours for previous tour information.

On this tour participants will:

- Observe and explore a variety of water source options in use by countries who have been managing severe limitations to water supplies for decades. (Examples of sources include: desalination plants, cloud seeding, wastewater treatment plants, sewer mining, groundwater, stormwater, rainwater, industrial wastewater, and greywater).
- Experience irrigation innovations first hand that enable scarce water supplies to provide maximised outcomes.
- Observe and discuss with practitioners technology and innovation that may be appropriate for adoption in Australia to improve water management and application efficiency.
- Improve your understanding of overseas R&D projects and outcomes; and identify opportunities to promote and prioritise appropriate irrigation research in Australia.
- Establish linkages between Australian and international experts, industry members and researchers.
- Explore and identify opportunities to overcome any barriers to the adoption of alternative water source innovations.





EVENTS diary dates

Australia

First International Conference on Technologies and Strategic Management of Sustainable Biosystems

6 - 9 July 2008 Perth, WA

The topics discussed in this conference will be under the broad area of reuse and recycle of organic solid and liquid waste for horticulture, agriculture, forestry, land rehabilitation, aquaculture and hydroponics.

The specific topics shall be: Energy from Biosystems, Biosystems for Urban waste treatment and recycling, Organic waste treatment and reuse in biosystems, Wastewater treatment and reuse in biosystems, Constructed wetlands for waste treatment, Nutrient management in waste recycling systems, Health and Environmental issues with biosystems, Community Participation and governance, Education and training, Case studies.

For more information see www.etc.murdoch.edu.au

NEW Master Class: Pre-Treatment For Membrane Applications.

24 - 25 July 2008, Sydney, NSW

Now recognised as an essential step in undertaking water reclamation, desalination and other reverse osmosis processes, this class is in response to AWA member feedback. Speakers: Paul Bertolucci, Tony Fane, Pierre Le-Clech and more in this comprehensive program.

For more information contact Dianne Wiesner on dwiesner@awa.asn.au or see www.awa.asn.au

71st Annual Victorian Water Industry Engineers and Operators Conference

2 - 4 September 2008, Bendigo, Victoria

Discuss the latest in water industry developments and see state-of-the-art technology on display.

For more information see www.wioa.org.au

Advancing Food Safety's 15th Australian HACCP Conference

8 - 12 September 2008, Adelaide, SA

Convened by Advancing Food Safety, the conference will also include a one day Allergen Bureau Conference. Some of the topics covered include:

- Use of recycled water in the produce industry
- Toxicology of heavy metals
- E.coli 0157:H7 in Australia - is it an issue

For more information see www.ferret.com.au

International

IWA Leading Edge Technology Conference - Water and Wastewater Technologies

1 - 4 June 2008, Zurich, Switzerland

This series on water and wastewater highlights the most significant advances in these fields and covers technologies ranging from those just emerging from the laboratory to those just making their way to full commercial applications.

For more information see www.eawag.ch/let2008

AWWA Annual Conference and Exhibition (ACE).

8 - 12 June 2008, Atlanta, Georgia, USA

Conference activities include 14 in-depth workshops, a professional program with 91 sessions, 9 facility tours, and an exhibition of over 500 service providers showcasing the latest products and services for the water industry.

For more information see www.awwa.org/ace08/

International Expo Zaragoza

14 June to 14 September 2008 Zaragoza, Spain

"Water and Sustainable Development" is the theme underpinning this international expo. In addition to a huge variety of activities & exhibitions, the Water Tribune will explore 8 different water themes.

For more information see www.expozaragoza2008.es



IWA 2008 World Water Congress

7 - 12 September 2008, Vienna, Austria

The Congress brings together 3,000 delegates from around the world with the common goal of sustainable water management, with an emphasis on practice and case studies.

For more information see www.iwa2008vienna.org/i8/

23rd Annual Water Reuse Symposium

7 - 10 September 2008, Dallas, Texas USA

Touted as the world's preeminent conference devoted to water reuse and desalination.

For more information see www.watereuse.org



Water Smart Innovations Conference and Expo

8 - 10 October 2008, Las Vegas, Nevada, USA

As the largest conference of its kind in the world, the inaugural WaterSmart Innovations Conference and Exposition will be the premiere venue for showcasing new water-efficiency technology to industry and business from around the globe; building and strengthening effective, interdisciplinary relationships and establishing your company as an international leader in innovative water efficiency technology and services.

For more information see www.watersmartinnovations.com



IWES Water and Wastewater Short Courses

14 - 18 July 2008, Gold Coast, QLD

A variety of courses are available including:

- Water Reuse (2 days)
- Potable Reuse Master class (NEW - 5 days)
- Membrane processes for the Australian Water Industry (3 days)

- Environmental Toxicology and Risk Assessment for Water Reuse (2 days)
- Irrigating with recycled water (2 days)
- Carbon accounting for water and wastewater systems (3 days)
- Principles of wastewater microbiology (2 days)
- Water planning (NEW - 2 days)
- Principles of wastewater treatment (5 days)
- Design of biological and advanced wastewater treatment plants (5 days)

For more information Phone 1800 000 404 or see www.iwes.com.au

National

Australian Guidelines for Water Recycling Phase 2

Two draft guidelines have been released, one focussing on stormwater harvesting and reuse, the other on managed aquifer recharge. Copies of the draft guidelines are now available.

Closing date for submissions is 1 July 2008.

www.epch.gov.au

Abs Reveals Figures on Water Use

The Australian Bureau of Statistics (ABS) has released Water Use on Australian Farms, 2005-06 (13 March 2008), which shows that irrigation of grazing pasture accounted for more than a quarter of the water used on crops and pastures during 2005-06. The report revealed a total of 814,000 hectares of grazing pasture were irrigated, using an average rate of 3.5 megalitres per hectare.

Source: ABS

www.abs.gov.au

Future Focus – Industry Strategic Plan

Future Focus is the horticulture industry's strategic plan, which is being developed to improve the profitability of Australian horticulture. The completed first phase of the project identified areas that require improvement and the industry's opportunities and main drivers. The next phase of Future Focus is to develop action plans in consultation with industry. One of the six strategic areas is 'making effective use of scarce resource, such as water'.

Source: HWI E-news March 08

www.futurefocus.org.au/

\$1.75 Million Skills Investment

The Federal Government will invest \$1.725 million in two new projects to improve skills in Australia's water industry, including \$1.5 million Graduate Course in Water Planning, which will be provided by several universities and \$250,000 National Water Sector Skills Project.

Source: AWA (24/3/08)

www.environment.gov.au

www.nwc.gov.au

Collaboration re Greywater Use

WERF and its partners are collaborating on a long-term study to investigate the potential impacts to plants, soils, and human health from household greywater used in landscape irrigation. Phase 1 of the project, which is now complete, developed a literature review and synthesis report on the current state of the knowledge on greywater reuse for landscape irrigation at the household level. Phase 2,

which is just getting underway, will conduct experimental studies of households using greywater for landscape irrigation.

www.informz.net

See Good Reads page 4

South Australia

Beaches In A Spot of Bother

South Australian Greens MLC Mark Parnell has called for the immediate release of the Adelaide Coastal Waters Study, commissioned by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) which examines the state of Adelaide's beaches. The report, calls for a radical reduction in the amount of nutrients and other materials in wastewater and stormwater dumped off Adelaide's beaches". He noted that a stop must be put to dumping waste water from Bolivar and that it should instead be treated as a resource (recycled water).

Source: Australian Greens

www.sa.greens.org.au

Water Research Centre for Adelaide

The headquarters of SA Water in Adelaide will be the location of a new national water research centre – Water Quality Research Australia – funded by the SA Govt. The centre will continue the work of The Cooperative Research Centre for Water Quality and Treatment. Research areas will include the health and acceptability aspects of drinking water, management of toxic algal bloom, improving drinking water treatment technologies, water recycling and more.

Source: HWI E-news March 08

Grape Expectations

Federal Water Minister Penny Wong has opened a water recycling plant in the Barossa Valley that is expected to save 60 million litres of Murray River water per annum. The plant will recycle waste water from wineries to supply seven Barossa vineyards for reuse in irrigation.

Source: Federal Water Minister's media release (30/4/08)

Victoria

Waratah Bay's New Sewerage Scheme Operational

A \$3.2 million sewerage and wastewater treatment scheme that will service the Waratah Bay township has been opened. The scheme will see approximately 120 local properties and a 130-site caravan park receive new sewerage connections that will replace the "old and inefficient septic tank systems used by locals in the area".

Source: Water Minister's media release (13/1/08)

www.dpc.vic.gov.au

Recycled Water Trials Begin in Melbourne

A one year trial that will involve approximately 100,000 recycled water samples has begun at Melbourne Waters Eastern Treatment Plant. The trial will test the effectiveness of different technologies in the filtration, advanced treatment and disinfection of recycled water. This information will be used in the upgrading of the plant to provide over 100 billion litres of Class A recycled water for non drinking purposes by 2012.

Source: HWI E-news March 08

Recycling Boost for Mornington Peninsula

More than \$21 million will be spent improving recycled water technology through funding of an upgrade of the Borneo Treatment Plant on the Mornington Peninsula. The first stage hopes to produce 1650 million litres a year of Class A recycled water by next year to be used by businesses, golf courses and a school.

The second stage is expected to produce 3200 million litres of water by 2012.

Source: The Age (18/4/08)

www.theage.com.au

Ballarat Reclamation Plant Upgrade Complete

Mr Holding has welcomed the completion of the \$30 million upgrade to the Ballarat North Water Reclamation Plant, stating that the completion of the project "is an important milestone in developing a supply of high quality recycled water for the Ballarat region". Mr Holding advised that the "new plant is scheduled to be producing recycled water above class A standard for the Lake Wendouree Water Supply Project by the end of the year".

Source: Water Minister's media release (10/1/08)

www.dpc.vic.gov.au

Recycling Target Passed

The Age reports that over 22% of Melbourne's waste water is now being recycled, reaching the state government's recycling target of "20% by 2010" two years early. The recycled water was reportedly used by "market gardeners, industry, sporting grounds, nurseries and housing developments" as per new figures for recycled water trials at the Eastern Treatment Plant at Bangholme.

Source: The Age: Melbourne hits water recycling targets (28/2/08)

www.theage.com.au

Funding for New Stormwater and Recycled Water Projects

Minister for Water Tim Holding has announced that \$10 million in grants is to be made available to "businesses, local councils and community groups across Victoria" to implement new stormwater and recycled water projects. The first round of funding under the Stormwater and Urban Recycling Fund would see \$6 million being used to "target large water users to help save billions of litres of drinking water". The first round is open to all non-residential water customers that use more than 10 million litres per year, with a subsequent second round to be "available for businesses, community groups and sporting clubs for smaller, localised projects".

Source: Minister for Water; DSE (13/2/08)
Further information from the Department of Sustainability and Environment (DSE)
www.dse.vic.gov.au/

State Government to Assist Farmers Cope With Change

Agriculture Minister Joe Helper has announced that the state government will fund a new project to assist Victorian farmers in increasing their ability to adapt to climate change. The project would focus on ways that farmers could improve water efficiency, and identify "important gaps in science knowledge so that science investment can be redirected".

Source: Agriculture Minister's media release (27/3/08)
www.dpc.vic.gov.au

Recycled Golf Wins Praise

Plans are in place to use recycled water to irrigate two golf courses and to supply a resort development at 13th Beach Golf Resort in Barwon Heads.

Source: Minister for Water's media release (26/2/08)
www.dpc.vic.gov.au

Water Research at Werribee

The opening of a \$4.6 million Centre for Sustainable Water in Werribee has been announced. The initiative seeks to expand the use of recycled water and develop sustainable water management". The centre will focus on:

- increasing the use of recycled water for non-drinking purposes;
- improving the efficiency of desalination, membrane technologies and other processes that remove total dissolved fluids (TDFs), total suspended solids (TSS) and other biological organisms from waste water; and
- developing cleaner production technologies for surrounding industry trade waste water.

The vision is to create a research centre which focuses on new technology and process development, and seeks to provide the Werribee region with water appropriate for specific industry needs.

Source: Water Minister's media release (19/2/08)
www.dpc.vic.gov.au

\$5 Million for Water Saving and Recycling Projects

\$5 million has been allocated to 26 water saving and water recycling projects across Victoria. Grants have been awarded to businesses, sporting clubs, research centres and other organisations throughout metropolitan and regional Victoria.

www.smartwater.com.au/mainf.asp

Fast Tracking Investigation into Recycled Water Plant

Barwon Water will fast track an investigation into a new multi-million dollar recycled water plant at Black Rock to provide low salinity Class A water. The Class A water will be suitable for outdoor residential use, industry, community recreational facilities and agriculture.

The proposed plant will allow Barwon Water to better its current recycled water target of 25 per cent by 2015.

Source: Geelong Advertiser (21/4/08)

Warning over Desal Plant Costs

Piping recycled sewage to reservoirs in Melbourne's east would be a cheaper and less environmentally damaging solution to the city's water crisis than desalination, the State Government was told two years ago.

Source: The Age, (10/5/08)

Peterborough Sewerage Scheme Complete

Water Minister Tim Holding welcomed the completion of construction on the \$5.45 million Peterborough Sewerage Scheme, stating that "the project would improve public and environmental health in Peterborough and provide recycling opportunities for local industry". The reticulated sewerage system will provide EPA Class B standard recycled wastewater for land irrigation or for producing pasture for the dairy industry.

Source: Water Minister's media release

New South Wales

Price Increase Draft Report Released

The NSW Independent Price Regulator (IPART) has released a draft report proposing price increases for water, sewerage and storm water services provided by Sydney Water, with new prices to apply from 1 July 2008. The typical annual household bill is expected to increase by \$233 in 2011/12. The increases will allow renewed and expanded water mains, reduced leakages, and investment in wastewater infrastructure and recycled water schemes.

Source: AWA (31/3/08)
www.ipart.nsw.gov.au

Investing in Recycled Water

Sydney Water is acting now, so by 2015, 70 billion litres of recycled water will be produced each year, about 12 per cent of the water supply. A new \$250 million recycled water plant at St Marys will substitute up to 18 billion litres of drinking water currently being released each year from Warragamba Dam into the Hawkesbury-Nepean River with highly treated recycled water. A further nine billion litres of recycled water will be progressively provided to homes in line with urban development.

A new \$100 million recycled water plant will initially provide up to 4.3 billion litres of recycled water to industrial customers in Rosehill, Camellia and Smithfield from 2011. Work to expand the largest industrial recycling scheme at Wollongong and the largest residential recycling scheme at Rouse Hill is also underway.

Source: Sydney Water media release (27/3/08)

www.sydneywater.com.au

Ashfield Recycling Pipeline Finished Ahead of Schedule

Sydney Water has announced that a "24-kilometre, \$130 million pipeline between Liverpool and Ashfield for recycled water has been completed three months ahead of schedule and on budget". According to Sydney Water, the pipeline will initially be used as a sewer to allow for maintenance work on the North Georges River Submain, however, from 2010 the pipeline will "transport 6.8 billion litres of recycled water a year to industries in the Camellia and Smithfield areas and homes in the Sydney Olympic Park Authority area".

Source: Sydney Water via Lawlex Newsfeed
Sydney Water's media release (21/2/08)
www.sydneywater.com.au

Sewer Mining Agreement Announced

Sydney Water and Kogarah Council have signed a sewer mining agreement, a process which “involves tapping into a sewer main and extracting wastewater, which is then treated and re-used for purposes such as irrigation”. Sydney Water’s managing director Kerry Schott explained that the project “will see 125 million litres of wastewater recycled each year and used for irrigation at Beverly Park Golf Course and all parks in Kogarah”.

Source: Sydney Water via Lawlex Newsfeed
Sydney Water’s media release (12/2/08)
www.sydneywater.com.au

10 Year Recycled Water Agreement Signed

Kiama Golf Club south of Sydney has signed a new ten year recycled water agreement with Sydney Water to use 100 million litres of recycled water per year.

Source: AWA
www.sydneywater.com.au

Australian Capital Territory

Greywater Hose Handout

In a bid to curb the use of drinking water on gardens, the state government has announced that it plans to distribute 10,000 free greywater diversion hoses to ACT residents. Whilst stocks last, ACT residents can pick up their free hose from any ACT Magnet Mart Home Warehouse. The state government has provided interested parties with greywater use guidelines and information on frequently asked questions on the topic.

ACT Government’s media release (22/2/08)
Source: ACT Government via Lawlex Newsfeed
www.thinkwater.act.gov.au

Queensland

Key Milestone Reached

The Western Corridor Recycled Water Pipeline, part of Queensland’s \$9 billion, 450 km South East Queensland Water Grid has reached a key milestone with completion of 225 km in length (more than 23,000 individual pipes and more than 5000 pipe fittings).

Source: AWA
www.qwc.qld.gov.au

Draft Water Strategy Announced

The Queensland Water Commission has announced a draft South East Queensland Water Strategy, sets out a new approach to regional water planning to meet the region’s water supply needs for the next 50 years. The Strategy outlines permanent resident-usage targets, busi-

ness practice and climate resilient water supplies including purified recycled water and desalination schemes.

Source: AWA
www.qwc.qld.gov.au

Cloud Seeding Research Project gets Underway

An innovative scientific project aimed at increasing rainfall throughout south-east Queensland catchments by injecting clouds with rainmaking particles has commenced. This project is funded through the Queensland Government who is investing \$7.6 million over 4 years in the project. Results of the project will determine whether cloud seeding is suitable for SE Queensland.

Source: HWI E-news March 08
www.climatechange.qld.gov.au

Tasmania

AWA Comment on Water and Sewerage

The Australian Water Association (AWA) has submitted its response to the Ministerial Water and Sewerage Taskforce’s Future Regulation of the Tasmanian Water and Sewerage Sector - Part B which aims to bring about a greater integration of the key elements of the planning, policy and regulatory framework.

Source: AWA
www.awa.asn.au

Model For Water and Sewerage Reform Approved

The Tasmanian Cabinet has approved reforms to the delivery of water and sewerage services in the state. Under the reforms, water and sewerage services will be delivered by three regional corporations, with councils retaining the ongoing ownership of the service. Two pieces of legislation are required, with the new business possibly beginning operations early next year if the legislation is approved.

Source: HWI E-news March 08

Water Funding Announced

Tasmanian premier, Paul Lenno, has announced \$80 million in funding to help drought proof the state. This combined with the \$140 million provided by the commonwealth for Tasmanian water projects has meant \$220 million is available for strategic irrigation investment. Five projects will receive a share of the funding including a series of pipelines and dams in the midlands, North East, Central Highlands, Mersey Forth Region and the Meander Valley.

Source: HWI E-news March 08

Budget Delivers on Water for Tasmania

Senator Penny Wong said supporting sustainable irrigation projects through an investment of up to \$140 million will help grow the Tasmanian economy and increase employment in regional areas. The government will provide \$12 million for the Huon Valley water scheme to improve water quality for households and help secure around 200 jobs in the local aquaculture industry. A further \$10.5 million will be provided to support water recycling and reuse in irrigation in South Eastern Tasmania, with the added benefit of reducing wastewater discharge into the Derwent River system.

Source: Minister for Climate Change and Water media release (13/5/08)

Western Australia

Northampton Pipeline Opened

Minister for Water Resources John Kobelke has officially opened a 44km pipeline between Geraldton and Northampton that will supply approximately 1,500 Northampton homes. Mr Kobelke advised that the new pipeline will secure the regions water supply and allow the implementation of “a two-day sprinkler roster, removing the town’s one-day-a-week-system”.

Source: Minister for Water Resources via Lawlex Newsfeed

OASIS Treatment Systems Accredited

Oasis Greywater Treatment Systems has been accredited in SA and WA for use of greywater in above ground irrigation. The accreditation in WA represents a first for the state which so far has only permitted below ground greywater irrigation.

AWA (3/3/08)

International

Water Works in China

Premier John Brumby has been reviewing business opportunities for Victorian companies in China, with over \$300 million in water and waste management, water technologies and environmental engineering projects on offer.

Premier’s media release (20/2/08)
Source: Premier via Lawlex Newsfeed
www.dpc.vic.gov.au