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NEWSLETTER OF THE HYDROLOGICAL SOCIETY OF SOUTH AUSTRALIA

A MARINERS' GUIDE TO FLOODPLAIN MANAGEMENT

Haydn Betts

Imagine yourself as the captain of a fleet of ships. You have sturdy vessels, valuable cargo and are prepared to sail in all waters in search of a profitable lifestyle. However your crews are a bit inexperienced, don't always know what to do or where to get information, and you have a dodgy insurance broker who might accept only some of your risk. How successful your journeys depend on whether or not it's your turn to experience the wrath of the elements. By the way, there are potential leaks in one or more of the hulls and the last time you looked, some of your cargo containers have substances which when mixed with seawater could spoil or form a toxic brew. Also, your ships' owner says he can't afford bigger ships and wants you to carry any cargo, in any sea,

in a particular ship and crew.

Now let's add some underwater ledges (legal edges) to the scenario with clients keen to recover any losses which ever way they can and the sharks are forever circling. Also, there are self servers that would love to see an unfortunate captain before a coroner or a judicial review. These are all to be avoided.

Now swap your nautical cap for that of a modern floodplain manager. The circumstances are analogous in that the public is generally unaware of flood risk and is unlikely to know how to prepare for a flood. Developers and authorities are aware that risk is present but may not perceive the need for more stringent precautions. I've

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PREMIER RANN MEDIA RELEASE ON FUTURE DIRECTIONS IN WATER SECURITY SEPTEMBER 11, 2007

Premier Mike Rann says it is likely that both a desalination plant and a doubling of our water storage capacity in the Mt Lofty ranges will be built to guarantee South Australia's long-term water security.

He said the Government's Desalination Working Group had been investigating both a 50 gegalitre desalination plant for Adelaide and an expansion of the Mt Bold Reservoir over the past six months.

"Based on interim reports of the Group, the Government's preference is to build both which could amount to an investment of more than \$2.5 billion.

"Cabinet hopes to have sign-off in November this year after considering the final report of the Desalination Working Group, due in October.

"Its final cost will depend on where it is located, how the brine that it will produce is dispersed, where the brine is dispersed, and from where the energy to power it is drawn.

"Given the high cost of stainless steel and the high demand for desalination infrastructure across the globe, the cost of building a desalination plant quickly would be at a premium.

"The best estimates before us at present for 50 gegalitre desalination plant and associated engineering works could cost in excess of \$1.4 billion – about five times more than the cost estimated by the Leader of the Opposition. It would supply about 25 per cent of Adelaide's annual water supply.

"We intend to conduct comprehensive studies into the movement of currents around the Gulf, so that engineers can know where best to disperse the plant's large concentrations of brine which, before it is mixed and diffused with sea water, is highly toxic.

"The Desalination Working Group is considering the optimal size of a plant for Adelaide, whether it can be built in modules, what the environmental implications are and where it could be built.

"Wherever the desalination plant is located – whether it is at Pelican Point, near Port Stanvac, or further south along the coast – a pipeline to carry the plant's waste brine will have to be laid beneath the seabed out into the waters of the gulf where the currents are best suited to quickly disperse it.

"While the fresh water produced by the plant will connect directly into our mains water supply, at

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IT'S SO GOOD IT'S BEEN BOTTLED

Helen Beringen

Communications, Water for a Healthy Country Flagship & CSIRO Land and Water

Stormwater previously left to flow down drains has been bottled and even drunk by Australia's Prime Minister to demonstrate the innovation possible in our urban water resources. The bottling aimed to demonstrate the intended outcome of the Aquifer Storage Transfer and Recovery (ASTR) project, an unique concept which involves CSIRO, United Water, the City of Salisbury, SA Water and the SA Department of Water, Land and Biodiversity Conservation.

Researchers from CSIRO Land and Water and Water for a Healthy Country Flagship collected and bottled the water from an Aquifer Storage and Recovery scheme in the City of

Salisbury, in what is the first urban stormwater to be bottled as drinking water.

Prime Minister John Howard and Environment and Water Resources Minister Malcolm Turnbull were amongst the first to drink the water at the 17th meeting of the Prime Minister's

Science, Engineering and Innovation Council in Canberra in June, 2007. The water began as reed bed-treated urban stormwater from Salisbury, and was stored in a limestone aquifer for 12 months before recovery. The extended aquifer storage time was a direct result of the 2006 drought. The recovered water at the time of bottling contained 93 per cent stormwater from 2005 and seven per cent brackish native groundwater, estimated to be 10,000 years old. It was rigorously tested and met all drinking water criteria.

The ASTR demonstration project will involve about 200,000 m³ of urban stormwater being harvested each year via the same reed bed and injected into an aquifer to improve quality before recovery from separate wells at drinking water standards.

In the ASTR project, four 160 - 180 metre deep wells are used to inject reed bed treated stormwater into the aquifer, and another two wells are used to recover the water after it has travelled 50 metres through the aquifer.

The research focuses on water quality improvements of harvested, injected and recovered stormwater. This includes studies on the attenuation of pathogens and organics, physical and biogeochemical processes and the development and implementation of a Hazard Analysis and Critical Control Points (HACCP) approach to provide water quality assurance over the long term. The approach is consistent with current Australian Drinking Water potable water guidelines.

CSIRO research leader Dr Peter Dillon says the project was developed to show potable and non-potable supplies can be achieved from stormwater currently allowed to flow to the sea. If methods demonstrated at ASTR are successful, it will enable the concept to be replicated elsewhere, including overseas, he says. "The bottled water clearly shows the potential for this water to go into mains supplies," he says. "Further research is required to validate this and build confidence in this approach."

Collaboration amongst partners from research institutes, local, state and federal government departments and private industry has progressed the project from an idea to the current demonstration trial.

Dr Rudi Regel, ASTR Project Manager from United Water, says the ASTR demonstration trial is one



KERRY LEVETT (CSIRO) BOTTLING RECHARGE WATER AT HICKINBOTHAM WINE CENTRE, URRBRAE.

of eight case study sites for the international Reclaim Water project, funded by the European Union and involving 19 partners from western and eastern Europe, Israel, China, Mexico, South Africa and Singapore.

"Involvement in the Reclaim Water project is not only advancing science, but also providing CSIRO and ASTR project partners the chance to showcase their expertise, build new relationships and develop future research projects," he says.

For more information see: www.csiro.au/WaterReuseCapability, www.uwi.com.au/rd/ASTR/ and www.reclaim-water.org



DR DECLAN PAGE (CSIRO) TASTE-TESTING



THE FINISHED PRODUCT

A MARINERS' GUIDE TO FLOODPLAIN MANAGEMENT

Haydn Betts, Senior Water Resources Engineer, KBR, Adelaide

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seen instances of low lying buildings containing goods that must be kept dry, caravan parks and suburbs located on flood-labile land, aged care facilities to which access would be lost in a flood, and a major SES facility that would require a boat to access the upper level.

So, how do we as floodplain managers survive every time we journey up to the next flood season, regardless of our 'ship', 'cargo', 'seas' and weather?

We have adopted the concept of freeboard (the allowance between the design flood level and floor level of a building) but need to check if the allowance is sufficient. "Freeboard" had its origins in ship-building and is defined as the distance between the waterline and the upper deck level measured at the lowest point where water can enter the boat. The amount of freeboard required depends upon the sea conditions, the size of the vessel and the value of the cargo. Drainage and flood engineers have almost universally adopted this concept and the usual 300 mm allowance provides a margin for error in the calculation of peak flood heights; for wind and wave effects, and errors in rainfall measurement.

We could examine our 300 mm freeboard to see whether it is sufficient for development platforms constructed to the 100 year ARI flood level. One approach is to apply a factor of safety of, say, two to our risk. With this approach we would need to ensure that our floor levels are above the 200 year ARI flood level, or 300 mm above the 100 year ARI flood level whichever is higher. Depending on the uncertainty regarding information, seasonal conditions or the variability of channel maintenance we can increase the amount of freeboard. In some valleys, or heavily vegetated waterways, the freeboard set in planning schemes can be 0.5 m to 1.0 m in Australia, or 2.0 m or more for overseas flood levees.

We can ask for a bigger boat if the weather doesn't look good, or if some of our passengers need special care, or if the cargo is valuable or potentially nasty. It might be possible to increase flood storage, or set higher development standards for vulnerable communities or assets such as telephone exchanges, hospitals, places of refuge, and emergency services.

We can choose the cargo that would not be affected by water or have the owner use another ship to take their cargo. In floodplain terms that would mean assigning hazardous materials to land that would not be affected, or less likely to be affected, by flooding.

We can educate our communities and potential buyers about the risks they face, what they can do to minimize their potential losses, and 'lifeboat' procedures.

We have been taught how to get good weather information, but have we been taught how to determine the implications: how quickly waters can rise, how many people to evacuate, and what sustenance and shelter are required.

Finally, having taken all these precautions, addressed planning and development control mechanisms, undertaken mitigation works and set emergency management measures in place, we need to ask ourselves, have we done enough?

That question must be answered with a resounding NO. There will always be a bigger flood, people are always moving, goods are always shifted and awareness of risks always fades over time. Disasters of whatever form will strike a community sometime and we must consider the ultimate aim of any emergency manager - to build the resilience of the community and the capacity of its social and economic systems, but that is another journey.

GENDER BENDERS IN AUSTRALIAN RIVERINE ENVIRONMENTS

Anu Kumar

Compelling evidence has emerged showing that certain chemicals (e.g. estradiols, nonylphenol, PCBs and some pesticides) commonly known as "endocrine disrupting chemicals (EDCs)" may interfere with the normal functioning of endocrine systems in wildlife.

In wildlife populations, associations have been reported between reproductive and developmental effects and exposure to EDCs. This includes changes in sex, intersex (both male and female reproductive organs), imposex (females with male sex organs), reduced repro-

ductive success, disrupted immune and nervous systems, abnormal behaviour and population declines. However, the risks of EDCs to ecosystem health under Australian conditions are currently unclear. Local environmental conditions often influence the environmental fate of chemicals and therefore it is not always possible to extrapolate data from one country to the other. In addition the Australian fauna is unique.

There is a need for local and reliable scientific data on the fate and bioavailability of known EDCs. It is important to establish a firm scientific foundation

for the management of this issue to support our national water and waste reuse agenda and foster rational decision-making.

Dr Kumar will be speaking at 2nd Australian Symposium on Ecological Risk Assessment and Management of Endocrine Disrupting Chemicals (EDCs), Pharmaceuticals and Personal Care Products (PPCPs) in the Australasian Environment on November 21-22, 2007, CSIRO Discovery Centre, Black Mountain, Canberra.

<http://www.clw.csiro.au/conferences/ourwater/>

UPCOMING EVENTS

WORRY II WASTEWATERS



A Seminar over Two Days

November 7-8, 2007

Crowne Plaza Hotel, Parramatta

Worry Wastewaters II is designed to showcase some of the various treatment methods and technologies developed specifically to address difficulties faced when used wastewater contains high levels of nutrients and/or salt. This wastewater usually exceeds discharge limits imposed by regulatory authorities. Disposal would also represent wasting water which has been a cost of the product process, yet, with some clever technology and re-processing this water could be reused either within the plant or in the facility itself. The treated wastewater could

reduce total water use in the facility thereby saving money. The increasing cost of water, tighter discharge and license conditions and the need to pursue a more environmentally acceptable approach to doing business are major drivers of innovation in Australian business. This Seminar is designed to show how wastewater engineers and innovative scientists are rising to the challenge and opening new opportunities. Case studies and projects with a practical focus will be in evidence on the two days of this Seminar.



Master Class

DBOOT Desalination

An Intensive Class on
Desalination Technologies

Venues: Adelaide 13-14 September 2007
Sydney 17-18 September 2007



The 6th International Symposium on MANAGED AQUIFER RECHARGE, 28 October to 2 November, 2007 near Phoenix, Arizona. Includes 58 speakers from 14 countries including Australia, four workshops, poster sessions and field trip. Please visit the web site for details on program information, hotel accommodation and registration.
www.ismar2007.org/

Phase 1 Recycled Water Guidelines. Melbourne will be hosting the final Seminar of the Phase 1 of the Australian Guidelines for Recycled Water on Wednesday September 26th 2007. <http://www.awa.asn.au/AM/Template.cfm?Section=Home1>

6th Aquifer Storage and Recovery National Workshop, April 2008
Centre for Groundwater Studies is

conducting the 6th ASR National Workshop, 21 - 23 April, 2008 in Melbourne.
<http://www.waterindustry.com.au/>



The Organising Committee of **Water Down Under 2008** invites all professionals with an interest in hydrology, water resources and the environment to join colleagues in Adelaide, South Australia 15-17 April 2008. Pre-Conference workshops are scheduled for 14 April and a number of post-Conference field trips 18 April. Early bird registrations need to be received by 31st December. <http://www.waterdownunder2008.com/welcome.htm>.



GROUNDWATER QUALITY 2007

CSIRO will host the Sixth International IAHS Groundwater Quality Conference (GQ07) in Fremantle, Western Australia, 2-7 December 2007 – the first time a GQ conference has been held in the southern hemisphere.

The GQ conferences are the premier world events for interaction on **Groundwater Quality** issues. They are organised on behalf of the International Association of Hydrological Sciences (IAHS) and held every three years. Previous GQ conferences were held in Estonia (1993), Czech Republic (1995), Germany (1998), United Kingdom (2001) and Canada (2004).

"Securing Groundwater Quality in Urban and Industrial Environments" will be the main theme. The conference aims to bring together industry, regulators, contractors, consultants, planners, researchers and water supply agencies to discuss and address the important issues related to the sustainability, repair and protection of groundwater quality in urban and industrial settings.

The GQ07 Committee received approximately 300 abstracts from 41 countries around the world and has put together an exciting program of Oral and Poster presentations, available online at the web address below. Prominent international researchers will present on current topics of importance – from land-use impacts on groundwater quality and policy controls, to new technologies for groundwater remediation and characterisation, and modelling linked to decision making.

This event promises to be a socially and technically stimulating experience for anyone interested in groundwater issues. It affords a unique opportunity, in a beautiful setting, to hear and interact with the best researchers in the world on groundwater quality issues.

For further information: www.csiro.au/GQ07.
Registration is now open.



<http://www.hydsoc.org>

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PREMIER RANN/MINISTER MAYWALD JOINT MEDIA RELEASE ON POSSIBLE EXPANSION OF MT BOLD RESERVOIR

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times the desalinated water will also need to flow into our filtered water storage facilities.

"For the first time, the northern and southern parts of our water system will also need to be fully integrated – so pipelines will need to be built between our major metropolitan facilities so water can be fed from one system to another.

"Given that a desalination plant's membranes are most cost effective if the plant works around the clock, seven days a week, year round, which means it will draw down an enormous amount of power and so have an ongoing impact on the cost of water.

"A desalination plant would take, I am informed, about up to five years to build and connect to the supply grid.

"Cabinet has also been considering the Mt Bold proposal to expand our storage capacity, estimated to cost in excess of \$850 mil-

lion. Actual costs will depend on the result of geo-technical engineering investigation.

"In years of abundant rain, Adelaide can draw 90 per cent of its water from rain that is captured in our reservoirs in the Mt Lofty Ranges and in an average year, 60 per cent of our water comes from rain in the Mt Lofty catchments.

"Given that water run-off in the Mt Lofty Ranges provides a significant source of Adelaide's water supply in ordinary years, it makes sense to increase our water storage capacity in the hills from one year to two.

"Water pricing will need to reflect this significant investment in infrastructure. As a result, the Government is reviewing its water pricing options.

"The projects outlined today are the only real choices we have before us now to guarantee our water security for the long term and create the confidence we need to drive our State's future prosperity," Mr Rann said.

MEDIA WATCH

Murray river group seeks greater cross-state collaboration: A New South Wales river management group has called for state and federal cooperation to deal with the nation's failing waterways.
<http://www.abc.net.au/news/stories/2007/09/05/2024590.htm?site=water>

Great Artesian Basin bore meeting offers feedback opportunity: Landholders taking part in a program to rehabilitate old bores in the Great Artesian Basin met Federal Government officials yesterday at a workshop in Richmond in north-west Queensland.
<http://www.abc.net.au/news/stories/2007/09/05/2024654.htm?site=water>

SA to start Murray-Darling water saving project: The South Australian Murray-Darling Basin Natural Resource Management Board is conducting a project to identify crop water savings in the Mallee.
<http://www.abc.net.au/news/stories/2007/09/05/2024586.htm?site=water>

Murray outlook still shaky: The Murray-Darling Basin Commission says the outlook for the river system remains grim
<http://www.abc.net.au/news/stories/2007/08/29/2018270.htm?site=water>



Wetlands.edu has 6 courses on offer around Australia between now and Christmas:

1. Managing carp in floodplain wetlands
2. Wetland rehabilitation
3. How to design and implement a wetland monitoring program
4. Multi-stakeholder management planning for wetland sites
5. Wetlands in Individual Property Management Plans
6. Wetland ecology: the fundamentals needed for management

For all of the above the (partial) cost-recovery fees are \$350/head. Go to <http://www.wetlandsedu.org.au/Trainingcalendar.htm> to register