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Aqua Australis

NEWSLETTER OF THE HYDROLOGICAL SOCIETY OF SOUTH AUSTRALIA

SHEPHERDING WATER: UNREGULATED WATER ALLOCATION AND MANAGEMENT

Mike Young & Jim McColl

In regulated water supply systems like the River Murray, when you want to use some of a seasonal allocation made to your entitlement, you order it. In the meantime, the balance of the water allocated to you is stored for you in one or more large dams.

In unregulated water supply systems, however, there are no large dams and access to water is reliant on capturing water as it flows past your place and storing it in your own dam. In addition to river flow, significant amounts of water can sometimes be obtained by capturing overland flows, especially in extremely episodic systems like those found in Australia's Darling River system.

Apart from a few licences to take water from waterholes or weirs, when the flow rate is low no-one is allowed to take water. As the flow rate increases and defined flow-rate thresholds are passed at a defined point, progressively more and more licence holders are allowed to extract water from the river and/or allowed to harvest overland flows.

To prevent over-harvesting, flow-rate threshold announcements are usually made on a daily basis and, for each threshold, entitlements specify a maximum daily volume that may be diverted or taken while the river flows above that rate. In some systems, maximum storage volume limits are set.

The resultant management regime can be extremely complicated. In Queensland's Lower Balonne system, for example, most entitlements or licences, as they are often called, contain two or three flow-rate thresholds. Larger licences may contain more than 20 flow-rate thresholds.

As a general rule and given the rate at which new technologies and new markets have emerged, there is no logical reason to assume that the current assignment of these opportunities to take water from an unregulated system is optimal. Thus in most systems, there is a case for allowing people to trade their licence from one location to another.

In unregulated systems and when the flow is episodic, how can trading be facilitated? If one wanted to reduce the take of water from one part of the system or 'shepherd' water to the end of the system, what administrative arrangements would need to be in place? What is the best way to deal with the effects of shifts to a drier climatic regime and/or preference for environmental outcomes?

When setting up an unregulated entitlement and trading system, careful consideration must be given to the likely impacts of each trade on downstream wetlands, downstream entitlement holders and the interests of landholders whose animals graze on floodplains that have traditionally been wetted by overland flows.

The interests of towns may also need to be taken into account. In some New South Wales systems, for example, river managers are required to take into account both the flow rate at a defined point and the amount of water in the Menindee Lakes, from where Broken Hill's water supply is drawn.

To fulfil these downstream requirements and obligations, managers need to be able to time announcements in a way that enables water to be shepherded past licence holders otherwise entitled to take this water.

If, however, a river system is divided into a number of reaches and each entitlement is defined by the flow rate at the top of the reach, the maximum amount that one licence holder can take within the reach is not changed by the actions of all other entitlement holders in the reach. Under such a regime, and with appropriate adjustment to account for downstream interests, within-reach trading is possible. But to trade from one reach to another, it

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SHEPHERDING WATER: UNREGULATED WATER ALLOCATION AND MANAGEMENT

Mike Young & Jim McColl

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has to be possible to raise or lower the flow rate at which the announcements are made.

In most unregulated systems, especially those that spread out over large areas, transmission losses can be high. This means that whenever an entitlement is traded, the main factors that determine how much water can be taken, like the maximum pumping rate may need to be adjusted. In most systems, computer models have been developed and used to estimate the changes that are likely to occur and make an appropriate adjustment to the maximum pumping rate. In practice, however, such models are far from perfect. In the short-term, the easiest way around this problem is to set a conservative exchange rate.

An alternative approach is to allow tagged trading. Under a tagged trading regime, the purchased entitlement retains all of its characteristics at its original location. The amount that can be taken at the new location is then adjusted periodically to take account of changes in conditions at the original location and knowledge about the behaviour of the system. Tagged trading systems are designed to protect the long-term interests of third parties. They do this by assigning the exchange rate risk to the buyer.

We think that the development of a tagged trading system for unregulated system management has merit, especially when the volumes involved are so large that they may change the pattern of water flow across the landscape. Tagged trading in unregulated systems has particular merit when river managers are uncertain about the impact of a trade on the direction of water flow across a landscape. With further development and improvement of modelling, eventually normal transfer of a purchased entitlement to another location should be possible.

When one moves the pumping or diversion point upstream, the interests of other pumpers, landholders who benefit from grazing floodplains and the environment need to be taken into account. If you want to give 100 per cent protection to the floodplain and grazing interests, then only allow trading downstream! But remember that, the further water is traded downstream, the greater are the losses.

Imagine what would need to happen if a Queensland entitlement was purchased with the view to increasing river flow in South Australia. To effectively shepherd any water to South Australia, every announcement threshold and every monitoring point along the way would need to be changed, but changed only for each shepherding circumstance. Possible, but development of such a system would require a considerable degree of co-ordination and communication among river managers and jurisdictions. Some refinement of interstate water sharing agreements may be necessary.

Without a shepherding arrangement that allows announcement threshold variation, a decision to increase river flow in downstream states by purchasing a Queensland entitlement to may be a questionable investment. CSIRO estimates that when there is a maximum flow at the St. George weir in Queensland's Condamine Balonne System, one megalitre of water will deliver only 0.18 megalitres to the Murray Mouth.

The last question to consider is the effect of adverse climate shift on the health of an unregulated river system. If there is an adverse shift to a drier climatic regime, then one would expect a reduction in the total flow and in the number of high flow events. In most unregulated systems, however, entitlement holders get access to a larger proportion of the volume of low flow events and to a smaller proportion of high flow events, with most of the environmental water coming from high flow events.

If it gets drier, however, under current entitlement conditions the amount that may be taken during low flow events will remain the same. This means that the environment may lose out. If one was concerned about this happening, then a possible solution would be to define flow-rate thresholds as a function of a long-run moving average (adjusted for any lag effect) so that the impact of the emergence of a shift to a drier regime on the health of an unregulated system is minimised. Note also that if there is a shift to drier climatic regime, all downstream users will get fewer opportunities to harvest water.

As we write this, the Murray Darling Basin Authority is starting work on a new Plan for the Basin that will need to address these issues. Amongst other things, this will require the development of ways to raise and lower announcement thresholds on an event by event basis. If this were done, then river managers would be able to shepherd water through several reaches. They should also be able to manage the effects of adverse climatic shifts on downstream users and the environment.

If the intent is to find ways to shepherd water over long distances, and if required, to move it through different jurisdictions, then considerable refinement of existing interstate water sharing agreements may be necessary.

STORMWATER STUDY BEGINS AT ADELAIDE AIRPORT

The State Government and Adelaide Airport Limited will partner in a $60,000 feasibility study to investigate the potential of harvesting and storing stormwater at the airport site.

Minister for Water Security Karlene Maywald says SA Water and Adelaide Airport Limited have signed a Memorandum of Understanding and will each contribute $30,000 towards the study, to be complete in April 2009.

"The feasibility study will investigate stormwater treatment options and aquifer storage capacity at the Adelaide Airport," she said.

Adelaide Airport Limited Managing Director Phil Baker says investigations into the possibility of an ASR project at Adelaide Airport are still in the early stages.

"We have the twin possibility of managing a significant parcel of land and the opportunity to capture and harvest stormwater from the Keswick-Brownhill Creek and possibly the Sturt River," Mr Baker said.

"We didn't wish to embark on this investigation on our own because such water initiatives are not our core business, so we welcome the opportunity to work with the State Government through SA Water to investigate the feasibility of this project."

Minister Maywald says the joint SA Water and Adelaide Airport study is the first of many planned studies with the intention to have stormwater used for parks, gardens and industry use.

"The Stormwater Management Authority is undertaking an urban study to identify potential new sites for major stormwater capture and storage," she said.

"The study at Adelaide Airport will help form part of the overall findings and is another example of government and private enterprise working together to find ways to reduce reliance on existing water supplies."

Findings from the urban feasibility study are expected to be available by July 2009.

ADELAIDEAQUA PREFERRED BIDDER FOR DESAL PROJECT

A multi-national consortium, AdelaideAqua has been named as the preferred bidder for construction of Adelaide's new $1.37 billion desalination plant to be built at Port Stanvac.

The consortium of four companies has extensive world-wide desalination experience and strong environmental credentials.

Premier Mike Rann and Minister for Water Security Karlene Maywald announced the preferred bidder for the project at the Port Stanvac site where they tasted the first glass of desalinated water from the recently completed pilot plant.

For the past six months, the pilot plant has been testing reverse osmosis and pre-treatment technology required for the main 50-gigalitre plant.

The companies comprise Spanish firm Acciona Agua, United Utilities, McConnell Dowell and Abigroup Contractors. Together they will design, build, operate and maintain the plant for 20 years, subject to major development approval.

Premier Mike Rann says AdelaideAqua was selected after a competitive and comprehensive evaluation process was undertaken by SA Water - with three short-listed groups.

"After rigorous assessment against hundreds of environmental, technical, financial, legal and social criteria, AdelaideAqua has emerged as the consortia best placed to deliver this critical infrastructure for our State," he said.

"It was crucial we select a preferred bidder as soon as possible to allow detailed design and procurement of long lead items to begin.

"AdelaideAqua will now progress with the detailed design work and procurement of critical long lead items for the works to ensure first water can be delivered in December 2010.

"The plant will provide Adelaide with one-quarter of its annual water use and is a climate-independent source, giving us the insurance we need against future climate variability. It will be powered using sustainable energy sources."

AdelaideAqua's bid includes:

- A pre-treatment process that will provide high levels of reliability, less energy use and reduced need for chemicals.
- A highly efficient reverse osmosis design, which is an Australian benchmark that will mean more efficient use of the seawater extracted, significant energy savings and a smaller plant footprint.
- An innovative diffuser for the saline concentrate that will ensure adequate mixing back into the marine environment and meet the specified Environmental performance criteria

Minister Maywald says the consortium's approach to marine and environmental works required for the project was crucial during negotiations.

"Each of the entities involved in

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A WORD FROM THE CHAIRPERSON

Welcome to the first issue of *Aqua Australis* for 2009! I would like to use this opportunity to welcome Aija Mee and Bob Newman on the HYDSOC Board (they will introduce themselves in more detail below).

This is a good mixture of youth and experience as Aija recently completed her PhD and Bob has been active in water resources management in the state for many years. I would also like to thank the departing members from the Board (Linton Johnston and David Pezzaniti) for their contribution to the Society over the last few years.

We have an ambitious program of activities for 2009. For the next few months, we are preparing one evening presentation on the new Murray-Darling Basin Authority and another on the current state and prospects for the Lower Lakes. The organisation of a half-day seminar on Water-Sensitive Urban Design for later in the year is ongoing and our revamped website will also soon be operational.

We will provide more details about these events soon and I hope to see you at one of them.

Sébastien Lamontagne

MEET THE NEW COMMITTEE MEMBERS

BOB NEWMAN

I am the principal of Catchment Management Consulting Pty Ltd, a sole consulting practice now based in Adelaide. I have 40 years engineering experience, now specializing in Natural Resource Management with a focus on the Murray-Darling Basin and salinity management in particular. I've spent 12 years in the Riverland and 3 years in Canberra. After returning to Adelaide I have reinvigorated my interests in the Hydrological Society SA as an important forum for sustainability of water resources.

AIJA MEE

I am Hydrologist in the Water Division of the Bureau of Meteorology. My work involves providing flood warning services for the Greater Adelaide Region, which includes real-time monitoring of developing flood situations, issuing flood warnings, maintaining and upgrading flood warning services for key flood-prone areas and contributing to public flood awareness programs. This is a far cry from my PhD research, which looked at palaeoenvironmental reconstruction through the analysis of lake sediments from southeastern South Australia. I have always had a keen interest in many aspects of water in the natural and urban environment, particularly those issues related to sustainability and water supply, use and re-use. My involvement with HYDSOC is to me a natural extension of my interests, studies and employment.

ADELAIDEAQUA PREFERRED BIDDER FOR DESAL PROJECT

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AdelaideAqua has demonstrated strong environmental credentials and commitments. The State Government has a strong commitment that we will not compromise the health of the Gulf St Vincent through this project.

"Acciona Agua has won numerous awards for its desalination work, while Abigroup, McConnell Dowell and United Utilities have won numerous awards for environmental and engineering excellence in a range of construction projects.

"The companies involved in the AdelaideAqua consortium have significant experience in constructing and operating desalination plants around the world, in particular in the application of leading edge reverse osmosis technology.

"We have said from the start we do not want to compromise the environment and we are confident the approach proposed by AdelaideAqua will ensure we have a plant designed, built and operated with maximum environmental efficiency.

"The AdelaideAqua team includes environmental specialists, and comprehensive environmental management plans will be in place throughout each phase of the project to ensure our stringent compliance requirements are met.

"I congratulate AdelaideAqua, SA Water and the project's specialist advisers for undertaking these negotiations with the highest levels of probity and professionalism, particularly under such tight timelines.

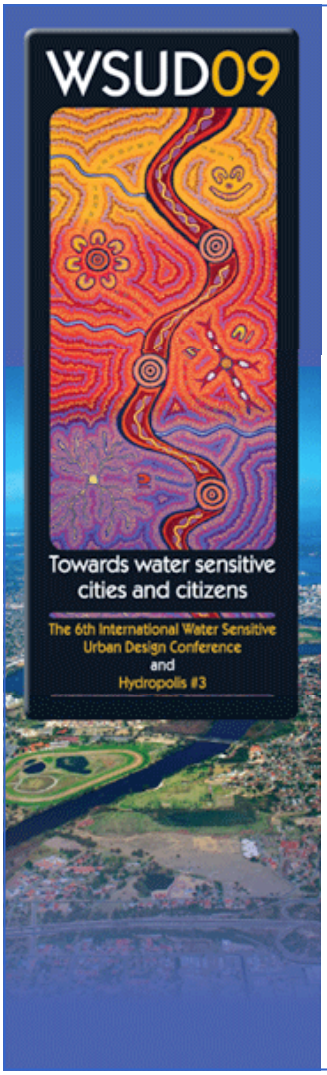
UPCOMING EVENTS

Water In A Changing Climate
Progress In Land-Atmosphere Interactions and Energy/Water Cycle Research

The Sixth International Scientific Conference on the Global Energy and Water Cycle
and
The Second Integrated Land Ecosystem-Atmosphere Study (iLEAPS) Science Conference

are being held in conjunction in Melbourne, Australia on 24-28 August 2009. The two conferences will hold joint sessions with keynote talks and three common sessions, including invited oral presentations and oral and poster presentations.

This conference will provide an exciting platform in which to present and discuss the latest scientific developments in the area of water, energy, and biogeochemical cycles.
http://www.gewex.org/2009Conf/2009_gewex_ileaps_announce1.pdf



The 6th International Water Sensitive Urban Design Conference and Hydropolis #3
5–8 May 2009 · Parmelia Hilton, 14 Mill Street, Perth, Western Australia

This conference will explore 'the state of the art' and transition pathways for the future through papers on implementation and case studies, leading edge research and the policy and regulatory environment needed to facilitate a shift toward Water Sensitive Cities and Settlements.

Some of these interactions of water and the urban environment interrelated 'lenses' include:

- Water and urban planning and design—macro to micro.
- Water and the urban landscape: aesthetics; public art and 'a sense of place'.
- Culture, attitudes and values as they relate to water in the urban setting .
- Assessment techniques for WSUD and integrated urban water management.
- Developments in science, engineering, technology and management systems.
- Governance and political dimensions of our decision making as it relates to water and urban planning and management.

http://www.keynotewa.com/wsud09/

The 7th Annual
Australian Water Summit
3–5 June 2009
Hilton Hotel Brisbane

7th Annual Australian Water Summit will deliver best practice presentations and case studies on issues such as:

- National and state policies for continued water reform
- Water infrastructure project developments including dams, desalination, piping and recycling schemes
- Discussion of water pricing and trade initiatives
- The effect of restrictions on planning and project delivery
- Regional viewpoints

http://www.australianwatersummit.com.au/

14th Annual
nationalwater 2009
10 – 14 August 2009
Sofitel, Melbourne
Australia

National Water Australia brings together senior industry professionals across government and the private sector to develop strategies and do business Strategies to improve the economic and environmental performance of the industry and secure the nation's water supply.

In a prolonged period of drought, the water industry has become one of the hot topics of political conversation for the past decade. How we utilise the growing scarcity of this natural resource now is critical to providing adequate water services to the nation into the future. National Water Australia 2009 is the nation's largest and leading independent forum for the water industry. In 2008 over 100 senior industry professionals from across government and the private sector came together. In 2009 you'll be armed with strategies to improve the economic and environmental performance of the industry and secure the nation's water supply.

http://www.sciencealert.com.au/viewevents/viewevent.php?url=http://www.terrapinn.com/2009/waterau

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MEDIA WATCH

The South Australian Government is creating 19 marine parks in State waters by 2010

To protect examples of our magnificent marine habitats and species for current and future generations. The outer boundaries of all 19 marine parks were released for a public comment period – open until March 27
http://www.environment.sa.gov.au/marineparks/location/submission.html

Deep-sea channel 'only option' for Lake George

The Lake George Management Committee says a deep-sea channel is its only option to save the lake from going completely dry.
http://www.abc.net.au/news/stories/2009/03/12/2513891.htm

Any extra water must reach Lower Lakes

Premier Mike Rann says he is delighted that the Federal Government has discovered extra water in the River Murray system – and he wants a guarantee that all of it will flow into the Lower Lakes.
http://www.ministers.sa.gov.au/news.php?id=4339

Adelaide Desalination Plant

As part of a 4-way water security strategy the Government will be building a seawater desalination plant at Port Stanvac, south of Adelaide, to ensure drinking water is available even in times of drought.
http://www.sawater.com.au/SAWater/WhatsNew/MajorProjects/ADP.htm

Draft Environmental Impact Statement for Pomanda Island temporary weir

The draft Environmental Impact Statement on the proposed temporary weir near Pomanda Island is available for comment. The document can be downloaded at the address below. Written submissions are due by Thursday 9 April 2009.
http://www.environment.sa.gov.au/cllmm/eis.html

CleanTech: Mixing it up to harness water's power

Anyone who's considered the power requirements for a seawater desalination plant knows it takes a lot of energy to get salt out of water. A lesser-known fact is that energy is actually produced when freshwater mixes with the salty ocean.
http://www.environmentalmanagementnews.net/storyview.asp?storyid=980443

Draft regulations to enhance the Water Charge rules for the Murray-Darling Basin

The Australian Government is developing the Water Amendment Regulations 2009 under sections 4(1) and 91(1)(d) of the Water Act 2007. These regulations aim to enhance the coverage of the water charge rules in the Murray-Darling Basin. The proposed regulations deal with the definition of a bulk water charge and the list of regulated water charges. Submissions on the draft regulations should be provided by 27 March 2009.
http://www.environment.gov.au/water/action/amend-regulations-2009.html

Sea water proposal

In November 2008, the Murray-Darling Basin Ministerial Council agreed on a management strategy to prevent acidification in the Lower Lakes. This included agreement to lodge a referral to the Australian Government to introduce sea water into the Lower Lakes if water levels continue to decline and there are no other options to prevent acidification.
http://www.environment.sa.gov.au/cllmm/seawater-incursion.html

Securing a long term future for the Coorong, Lower Lakes and Murray Mouth region

At the end of last year the South Australian Department for Environment and Heritage was given responsibility for developing a long-term plan for the management of the Coorong Lower Lakes and Murray Mouth region - one of five Wetlands of International Importance in South Australia as designated under the Ramsar Convention.
http://www.environment.sa.gov.au/cllmm/index.html

The World Water Day Challenge

On 22 March 2009, WaterAid's Water Challenge asks Australians to show their support for the basic right of all to have access to clean water by limiting their water usage for a day. By taking the Challenge and matching your use with that of a family in Africa or Asia, you'll help us work for the increased funding needed for safe water and water sanitation programs around the world.
http://www.wateraid.org/australia/about_us/newsroom/7535.asp