

# Urban Water Security Research Alliance

Leading water research and knowledge in South East Queensland

Newsletter Issue 1

March 2010

## A message from the director

The new year has got off to a busy start and we are delighted to welcome you to UWSRA's first newsletter, which will be published quarterly.

We are also pleased to welcome Dr Sharon Biermann as our new program manager. Sharon has already demonstrated she will be able to get up to speed quickly on urban water research issues and the Alliance research program. I am positive she will make an enormous contribution to UWSRA.

In mid-January, at the invitation of Austrade, I attended the annual G'Day USA, an event that showcases the best of Australia to the US.

I was a member of the urban issues panel at the water sustainability and management forum and participated in the Australia-US water workshop, as well as attending an energy forum. While in the US, I also visited key researchers and water authorities in San Francisco, Denver and Las Vegas to discuss their work and possible linkages with Alliance research.

Overall, it was a very useful trip and our US counterparts were particularly interested in the research the Alliance is doing in water quality, demand management and residential water end use research.

Back in Brisbane, we held the first Board meeting for 2010 in February and the major focus of our discussion was the strategic direction for the Alliance over the next two years, which was advanced on 17–18 March at our strategic planning workshop, where we invited key stakeholders to participate in setting the strategic direction of the Alliance's research over the next two years.

We can now set about revising project plans to reflect current and emerging issues and make sure the program is consistent with the strategic direction of the new SEQ Water Strategy.

In terms of our research projects, the large majority of projects are tracking really well to deliver on milestones and we are seeing a range of results and products emerge. Any projects that have slipped a little in delivery of milestones are closing the gap and none are in danger of not delivering against approved milestones.

— Donald Begbie



## MEET THE RESEARCHER

Dr Simon Toze is a microbiologist currently leading two research projects, including one for UWSRA, with a combined value of more than A\$6 million. In this article, he shares his thoughts about his research and its contribution to solving Australia's water issues. *Full story page 3.*



## BOARD NEWS

The first Board meeting of the year was held on 23 February and discussion centred around the need for strategic planning for the next two years.

The Board joined with the Research Advisory Committee and key stakeholders at a special meeting in Brisbane on 17 and 18 March to identify the direction for 2010–2012.

Last year the Board officially welcomed two new State Government representatives: the Executive Director of the Queensland Water Commission, Mr Dan Spiller, and Executive Director of Environment and Resource Sciences with DERM, Dr Christine Williams. The next meeting will be held on 18 May.



# Hospitals not major contributor to sewage emissions

The contribution of hospitals to pharmaceutical residue loads in wastewater may not be as significant as suspected, according to results from a UWSRA study.

Dr Christoph Ort has been leading a project through the Advanced Water Management Centre at The University of Queensland to determine what fraction of pharmaceutical residues in wastewater originates from hospitals.

Dr Ort said while the case study results were only applicable for 59 substances investigated in Caboolture, they were important markers for future directions for treating hospital wastewater.

He said there had been increasing interest by the general community in hospital wastewater in the past decade, with some experts calling for its treatment at the source before being discharged into the wider water treatment system.

“We found that of the 59 substances investigated, 29 could not be detected above their limit of analytical



quantification. For 28 of the 30 quantifiable compounds, more than 85% of the residue loads did not originate from the hospital,” Dr Ort said. “Seventeen substances registered below 5%, 11 were between 5% and 15%, and only two substances — trimethoprim (18%) and roxithromycin (56%) — exceeded the 15% contribution. The remaining 29 substances did not register above their limit of quantification.”

Dr Ort said that experimental results matched well with predictions from other national and international research, and that in the next phase of the research his team would conduct desktop audits to “find out if there are other hospitals in SEQ or

other compounds which are expected to contribute a higher percentage of pharmaceutical residues to a sewage treatment plant”.

He said the next stage of the research was significant as it would help identify the most effective and economically feasible treatment methods for various substances — and possibly identify problem pharmaceuticals.

“If we saw that one substance could not be eliminated in any of the treatment steps or only at very high cost when treating a large volume of water and we see the hospital is a major source, we could do something at reduced cost to treat the small fraction of the wastewater at the source,” he said. “If we find the hospital is not a major source, then the question is what is the source of the pharmaceutical and how can its dispersal be limited by alternative methods of disposal. Our results so far show that assuming you were to treat all hospital wastewater, you may have solved only part of the problem.”

## Research guides greenhouse solution

Greater research is needed to gain a better understanding of uncertainties about diffuse emissions from reservoirs and wastewater systems, according to CSIRO Environmental Scientist Murray Hall.

Mr Hall has been leading a team of scientists in studying energy and greenhouse gas emissions in South East Queensland, as part of a UWSRA project.

“Greenhouse gas emissions will rise faster than growth in population and more than double for water and wastewater services over the coming decades,” he said.

Mr Hall said new sources of water supply such as rainwater tanks, recycled water and desalination, currently had greater energy intensity than traditional sources.

In addition, there was little information available about diffuse emissions from reservoirs and wastewater systems — potentially the largest sources of greenhouse gas emissions for the sector.

“Traditionally estimates of greenhouse gas emissions for the water and wastewater sector have focused on energy use for centralised water and wastewater services,” Mr Hall said.

“Our research illustrates that diffuse emissions are potentially one of the largest sources of greenhouse gas emissions for the sector.”

Mr Hall said more research needed to be done to get a better understanding of the uncertainties for the upper range of emissions.

“These uncertainties are still very large,” he said. “But these large uncertainties also present large opportunities for mitigation by managing the system to the best result.”

Mr Hall said an example for improving performance was for the 800,000 new rainwater tanks that are planned for installation over the next 50 years. Guidance for energy efficient installation could save large amounts of energy over time.



“Our research has a long-term perspective to define the sustainability challenge and to support planning in South East Queensland over the coming decades,” he said.

“The results provide a starting point for setting targets for improved performance as well as understanding potential opportunities for mitigation and liabilities under new greenhouse regulation.

Monitoring of reservoir emissions is currently underway to reduce uncertainty and determine the benefits of mitigation. The results will be available in June 2010.

## Water facts

1. Stormwater run-off in SEQ amounts to around 870GL per annum, which is 420GL more than the drinking water used in the region each year.
2. It is estimated that 300GL of water is lost from SEQ dams and reservoirs through evaporation each year, and a further 40GL is lost from leakage.
3. Non-membrane water treatment technologies can remove 95% of micropollutants in recycled water, without producing a saline waste stream.
4. Studies of three wastewater treatment plants in SEQ have shown they are able to reduce between 99 and 99.9% of microorganisms linked to intestinal bacteria.
5. South East Queenslanders use 33% of their water in the shower, according to average daily end use water consumption studies.

## Meet the researcher

### Simon Toze

Principal Research Scientist  
CSIRO Land and Water



Dr Simon Toze is a microbiologist currently leading two research projects with a combined value of more than A\$6 million: one with UWSRA on the health and ecological impacts of purified recycled water; and the other on managed aquifer recharge, funded by the West Australian Water Foundation, Water Corporation and CSIRO. Dr Toze has published more than 50 refereed journal papers and is an adjunct senior lecturer at UQ, and adjunct lecturer at the University of Western Australia and Murdoch University. He has participated on various working groups for the new Australian Water Reuse Guidelines.

**Q. How have you come to have an interest in water research?**

A. In my undergraduate degree at UQ I majored in microbiology and was particularly interested in the environmental aspects. It was the 1980s and just before the use of molecular techniques, so it was very labour intensive just to identify a few microorganisms. I did my honours on bacteria in drinking water and went on to do a PhD in Legionella. I was one of the first and few people in the world to look at Legionella from an environmental perspective, not just a health perspective. Then I went to the US, to the University of Illinois, and worked on wastewater treatment. In 1994, I came back to join CSIRO.

**Q. In 2001, you were part of the team that won the inaugural UNESCO International Water Prize for Innovation in Water Resources Management in Arid and Semi-Arid Areas — what was the prize for?**

A. That was one of our first projects on managed aquifer recharge, a process where we intentionally put water back into aquifers and use that as a form of storage. We were able to show that we can use the aquifer as an active treatment barrier to improve the quality of the water.

**Q. How will your research into PRW contribute to solving Australia's national water problems?**

A. By recycling water for both potable and non-potable purposes, we could have a major influence on the impact of drought. If we can bring up to a third of our water back into the system from the water we're currently throwing away, that's going to be a huge bonus for the Australian population as a whole.

## Diary Dates for 2010

**18 May, 17 August & 23 November**  
Board meetings

**28–29 September**  
UWSRA Annual Science Forum

**16 November**  
Research Advisory Committee meeting

### Conference highlight:

**26–28 May**  
Aus Water Future – National Water Recycling and Reuse Technology 2010, Melbourne.

## Publications

For a list of UWSRA publications including journal articles, reports, conference papers and annual reports, visit: <http://www.urbanwateralliance.org.au/publications>

# Advanced treatment processes key to clean water

Preliminary findings from the Enhanced Treatment project indicate that non-membrane processes may be a viable alternative to the current micro-filtration and reverse osmosis technologies, which are energy-intensive and produce a waste stream.

The University of Queensland's Dr Julien Reungoat is leading the project, which has been investigating the effectiveness of each step in a treatment train at the South Caboolture Water Reclamation Plant in removing trace chemical contaminants and reducing the effects observed with bioassays.

The six-stage treatment train includes:

1. denitrification;
2. pre-ozonation;
3. coagulation/flocculation/dissolved air flotation and filtration (DAFF);
4. main ozonation;
5. activated carbon filtration; and
6. final ozonation for disinfection.

Dr Reungoat said results showed 50 of the 54 micropollutants quantified in the influent water were removed to below their limit of quantification (LOQ), representing over 90% reduction in the concentration of pharmaceutical and other compounds. Moreover, effects observed with bioassays were reduced to blank levels. He said the three key processes responsible for the plant's performance were coagulation/flocculation/DAFF, main ozonation and activated carbon filtration.

"While the effectiveness of these processes varied from one compound or bioassay to another, the combination of the three was almost totally responsible for the overall observed performances," he said.

Dr Reungoat said the concentrations of the target compounds were several orders of magnitude below the guideline values from the Australian Guidelines for Water Recycling — Augmentation of Drinking Water Supplies. However,



he cautioned that before this combination of processes could be recommended for indirect potable reuse, overall risk management strategies of the treatment train needed to be considered – and this work was being investigated in other projects and groups.

Dr Reungoat said the project team was now gathering national data to compare results, before gathering overseas data.

"We now have the capacity to use the method we were using through Queensland Health laboratories to measure concentrations of micropollutants in the lab here at the Advanced Water Management Centre," he said.

"This gives us the freedom to adapt the methods and add compounds to the list that we couldn't previously."

For a detailed summary, see:

Reungoat J., Macova M., Escher B.I., Carswell S., Mueller J.F., and Keller J. (2009) Removal of micropollutants and reduction of biological activity in a full scale reclamation plant using ozonation and activated carbon filtration. *Water Research*, in press. (available online) <http://www.urbanwateralliance.org.au/publications.html>

Macova, M., Escher, B.I., Reungoat, J., Carswell, S., Lee, C.K., Keller, J. and Mueller, J.F. (2009) Monitoring the Biological Activity of Micropollutants during Advanced Wastewater Treatment with Ozonation and Activated Carbon Filtration. *Water Research*, in Press (available online). <http://www.urbanwateralliance.org.au/publications.html>

## UWSRA welcomes new program manager

The Alliance's new Program Manager, Dr Sharon Biermann, commenced her role on 4 January, joining UWSRA from the Council for Scientific



Photo courtesy CSIR

and Industrial Research (CSIR) in Pretoria, South Africa, where she was Competence Area Manager of Planning Support Systems in the Built Environment Unit.

Dr Biermann is a geographer who has more than 25 years experience including a decade with the Metropolitan Planning Department of Johannesburg City Council, and 15 years with CSIR. She is widely published on issues of housing, spatial analysis and organisation, urban development and sustainability, and infrastructure and planning.

Dr Biermann said she joined UWSRA because it offered her the ideal opportunity to expand her knowledge base in terms of a new country context, a new field and new people.

"I am excited as I get to slowly understand the Australian research and government contexts, grapple with the priorities in urban water security research and meet the many gifted people who are undertaking research and ultimately applying the research in water strategy, policy and management," she said.

"I am also enjoying the productive, quiet and intimate office environment of the Alliance headquarters in Brisbane and getting to know and appreciate Don Begbie and Sharon Wakem — a refreshing change from the challenges of managing 30 scientists in South Africa.

"I feel incredibly honoured to be able to experience, learn from and hopefully contribute to, your world."

Dr Biermann is joined in Australia by her husband, Johan, a town planner who is working with the Department of Infrastructure and Planning in Rural Futures, and their two daughters Chanelle, 10, and Laraya, 9.