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WATER FRONT

Newsletter of the National Committee on Water Engineering

ENGINEERS AUSTRALIA

In the Pipe NCWE Chairman's Message

Recently a summary of water restrictions across Australia indicated that Sydney was on Stage 3, Melbourne was on Stage 3a, Brisbane was on Stage 5, and Adelaide on Stage 3. In general terms this means only hand held hosing and drip irrigation at restricted times at best and for some capital cities outdoor hoses and sprinklers are banned at all times. Reasons put forward to explain these restrictions across Australia include worst drought on record, climate change, poor water resources planning. There are now major infrastructure projects being planned, designed and built to meet the gap between demand for water and supply. But are these new water sources being planned and designed to meet future challenges, let alone current best practice. The newer water sources are leading to increased technology - wastewater reuse, stormwater reuse, more complicated water development to meet changing climate.

Engineers have been considered to be at the forefront of Australia's water resource management and water supply industry. Many areas of water resource management have argued the need for new ways of thinking. Managing water resources within a total water cycle is by no means a new concept, yet, while frequently present in strategy documents, plans and speeches, its practice remains marginal.

There can be considered to be a growing gap between technical knowledge and water policy and its application. For some years, the engineering profession pressed for acceptance of water sensitive urban design (WSUD) techniques. There are now many examples of successful WSUD applications in new development areas, with much lower water use than conventional approaches. However, the clear advantages demonstrated are not being extended into general application, except in isolated cases.

But have we as water resource engineers kept acquiring and applying new approaches and designs? The current high economic growth (Perth bias) and high demand for engineers, including water engineers may lead to our profession becoming lazy. Where is the need to become innovative when work is so plentiful? I would argue that we all have an obligation to be improving our knowledge, improving our approaches, improving our techniques which lead to better water resource outcomes – improved environment, lower cost, and improved social amenity.

John Ruprecht

Joint India-Australia Workshop on Water Resources Engineering

A joint workshop on Water Resources Engineering was held in Adelaide at the National Wine Centre from February 12 to 15, 2007. The workshop involved academic staff and researchers from the Australian Group of Eight and Associate Universities, the Indian Institute of Technology and the Indian Institute of Science. Aims of the workshop were to increase understanding of the research currently carried out in water resources engineering in both India and Australia, to identify those common areas of interest and to develop draft research proposals for submission for funding.

The workshop was successful with a total of eight research projects were identified during the workshop, these are:

1. To Improve Management and Understanding of Complex Water Systems by Integrating Problem-Specific Knowledge with AI Models
2. Integrated Water Management & Catchments Hydrology Modelling
3. Improved Methods for Irrigated Agriculture
4. An Integrated Approach to Sustainable Urban Water Management
5. Spatial and Temporal Variability of Climate Impacts
6. Experimental Hydraulics Applications
7. Comparative Study of Large Scale River Basin Planning in India and Australia
8. Improved Methods for Pipe Leakage Detection

Another workshop was held in conjunction with Water Down Under 2008 International Conference held in Adelaide, April 15-17, and a further workshop will be held in India in 2009.

AR&R Update Application of Catchment Modelling Systems

One of the fundamental objectives of the upgrade of Australian Rainfall and Runoff (ARR) is the provision of robust advice to users regarding appropriate techniques and methodologies for the prediction of design flows with a desired frequency, or the prediction of flows arising from historical events. Whereas previous editions have focussed on prediction of design floods, the focus of the upgrade to AR&R includes techniques for the prediction of both flood flows and some environmental flows. A further aspect that will be included in the upgrade of AR&R is the consideration of flows throughout a system as well as the traditional consideration of flood flows at a point.

Inclusion of environmental flows and system wide flows has necessitated changes to advice regarding flow prediction through catchment simulation. In addition, the widespread availability of digital computing has resulted in the evolution of new issues in catchment simulation. These issues include

- Consideration of a catchment as a system comprising various models inclusive of a rainfall model (describing the temporal and spatial distribution of rainfall across the catchment), a hydrological model (describing direct runoff generation) and a hydraulic model (translating the runoff through the channel network). Embedded in these models are further models used for the description of particular processes;
- Recognition that software systems are used for the implementation of a particular model and that two alternative software systems may implement the same theoretical model in different manners and therefore produce alternative flow predictions;
- Recognition that a modelling system may not be used always by the same modeller. As the selection of values for the many parameters in a modelling system is a complex and poorly defined task, there is a need to provide guidance not only on the parameter value selection but also on documentation of why values were selected; and
- Provision of advice and guidance on the certainty and uncertainty of flow predictions.

The authorship team currently is working through these issues with the aim of providing robust advice on catchment simulation suitable for the prediction of both flood flows and some environmental flows.

Users of AR&R interested in the upgrade are invited to visit the AR&R web site www.arr.org.au

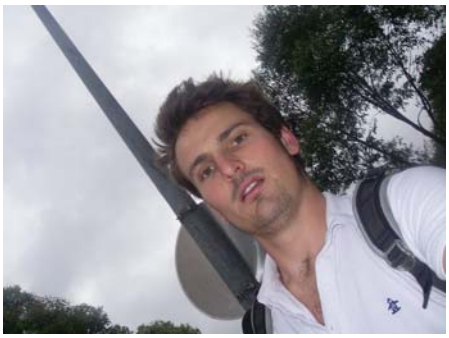
By James Ball

NCWE 2007 Student Scholarships

The National Committee on Water Engineering of Engineers Australia has created a Student Scholarship award to encourage young engineers to become members of Engineers Australia and to pursue a career in water engineering.

The award includes registration at a NCWE sponsored conference and up to $1000 for travel and accommodation associated with attending the conference. The award will also include a certificate that will be presented during the conference. Up to three Scholarships will be offered annually to final year engineering students.

Jai Allison was one of last years scholarship winners and attended the Launceston conference last year. He said:



"Attending the 30th Hydrology and water resource symposium was a significant experience for me as a recently graduated environmental engineering student. Although I had an existing job to go to and was focussed on enjoying the hard earned free time that I could afford having completed uni, the opportunity to see what was going on in the water industry and network on a national scale was appealing. My expectations were exceeded; the level of understanding and insight that can be gained from attending a conference like this is remarkable. The range of specific 'cutting edge' research areas and number of 'top' consultants all give you the ability to recognise the future of your career. Packing this into 4 days, with site visits, the chance to check out the host city and great functions all combine for a really rewarding experience, and with the available scholarship it is very accessible and highly recommended."

Students who wish to find out more information should contact Martin Lambert by email mlambert@civeng.adelaide.edu.au.

Emeritus Professor Frank Henderson

Emeritus Professor Frank Henderson, born in New Zealand in 1921, passed away last year in New South Wales. A highly respected open channel hydraulics expert and water resources engineer, Prof. Henderson had many outstanding achievements.

As a graduate of the University of Canterbury (1943) in the middle of war, Frank began his engineering career with D.S.I.R. in Wellington where he worked on radio development (predominately designing radar aerials). After one year of service in Wellington, Frank was moved to Auckland where he worked under Tom Leech, the head of the Auckland Engineering School. It was here that his hydraulic engineering career began.

After spending the summer of 1949 at M.I.T. for a Foreign Student Summer Projects programme, Frank returned to Wellington to the D.S.I.R. and helped in the design and construction of various hydro-electric schemes for the Ministry of Works.

In 1951 Frank began work at the University of Canterbury as a Senior Lecturer in civil engineering and a hydraulics specialist. During the first year that he held this position he worked closely with V.L. Streeter, a leading hydraulician, and was later invited to spend a year working under his supervision at the University of Michigan, USA. Amongst the projects he worked on there was a computation project on the University's computer. The experience led Frank to lobby for a computer at the University of Canterbury on his return.

Not only did Frank organise the first computer to be introduced into the university, he also played a large role in the laboratory setup for the engineers at that time. As the school moved locations, Frank set about acquiring all the necessary facilities for a professional laboratory. All this was done on top of writing his highly regarded book on open channel flow that he decided could not wait any longer.

By 1964 Prof Henderson had been promoted to Professor, and soon after became the head of the Department of Civil Engineering in Newcastle, Australia. He contributed much to the knowledge and practice of hydraulic engineering and his work is acknowledged by the Henderson Oration award. Established as The Hydraulics Oration in 1989, the Award was renamed The Henderson Oration in 1998 in recognition of Professor Frank Henderson's contribution. Professor Henderson's book "Open Channel Hydraulics" is used as a standard reference in almost all engineering schools in Australia and many others throughout the world.

A small excerpt from the inaugural Henderson Oration written by Frank in 1998:

"To do a competent professional job you must have all the necessary facilities, from computers to basic laboratory equipment. And the search for those facilities has taken up a great deal of my time; For example, in 1960 the Canterbury Engineering School moved out to a completely new building on the Ham Road site (familiar to all who have seen the film "Heavenly Creatures") where everything had to be built up from scratch. And all the many jobs this entailed had to be done while I was still deeply preoccupied with what I conceived to be my real job. For instance, there was the bug that had bitten me when I was at Michigan: the idea of writing a book on open channel flow. This came to a head when I gave one of my first lectures in 1961: the one that dealt with the basics of resistance in open channel flow. I had sorted out all the issues to my complete satisfaction and I had a place for them in the proposed book, viz. Chapter 4. The lecture went well, and when I got back to my study I said two things to myself: (1) it had been a good lecture, if I did so say so myself; (2) it was a great pity I couldn't start writing the book "Open Channel Flow" right away, at Chapter 4 if need be. But that of course was impossible because I had so much else to do; my desk was piled high with umpteen kinds of rubbish relating to all these other jobs. Suddenly I thought: to hell with all of it. I cleared a space for some sheets of paper and started writing – Chapter 4. In that first day I wrote twenty quarto-sized pages of manuscript, and that was a firm unequivocal start on the book. Gradually I completed Chapters 1 to 5 over the next year, and did the preparatory work for Chapters 6 to 11, which I managed to complete in 1964. When the book was finally completed and published in 1966,I should have been able to settle down and relax, at least for a while. But at the beginning of 1964 I had been promoted to Professor, which led to some complications."

ARQ Reflection Infiltration Systems, Chapter 11

The link between "Australian Runoff Quality" (Engineers Australia, 2005) and the guiding principles of water-sensitive urban design (WSUD) is clearly stated in Chapter 4 of the document as "…an integrated approach combining quantity and quality management measures across the range of scale in an urban environment"

It is not surprising, perhaps, given the title of the publication, that runoff quality considerations dominate succeeding chapters – protection of receiving waters, GPTs, hydrocarbon management, vegetated swales, etc – however, runoff quantity figures strongly in Chapter 11 – "Infiltration Systems". In this chapter dimensioning of infiltration devices to meet the requirements of flood management is given equal consideration with corresponding dimensioning to achieve pollution control objectives. In the many circumstances the total design objectives includes both. Where two devices or system "sizes" emerge – the most likely outcome – Chapter 11 advises: "carry out the alternative design procedures in any case where both are important, and select the larger".

Many "WSUD application" projects constructed across Australia – retention basins, streetscape swales, bio-retention systems in car parks, etc – have been designed as "pollution only" installations. In these systems the quantity element in the total design process has been ignored. There are, undoubtedly, cases which do fall into the "pollution only" category, but they are rare, for example marina developments; sub-divisions discharging directly into lakes, large rivers or estuaries; urban sub-areas draining to subterranean limestone caverns.

It is most important that WSUD measures, where they are applied in typical, urbanising catchments, take full account of flood management. Failure to do this will lead, inevitably, to loss of natural waterways and drainage paths as these are replaced, progressively, by 'hard' stormwater infrastructures, augmented and enlarged as further development occurs. The cost burden, alone, apart from the environmental damage of this poor practice, should drive this process.

Chapter 11 sets out principles enabling practitioners to design stormwater management systems that achieve the joint objectives of pollution control and flood management. The pollution control section in the chapter involves the use of hydrological effectiveness curves to determine the annual average performance of retention/infiltration systems. Sets of performance curves have been developed for each of the Australian capital cities, derived from 'continuous simulation' modelling using local historical rainfall data. The essence of flood management is on-site retention of stormwater to achieve equality of runoff volume – before and after development – in the catchment-wide (design) storm of critical duration. The primary benefit of this approach is its ability to retain – without augmentation and indefinitely - existing, competently performing drainage lines, both 'natural' and man-made. This outcome is in sharp contrast with systems resulting from use of 'detention' techniques, widely used in Australia, which are focussed on equality – before and after development – of flood runoff peak flow.

Comment by authors John R Argue and David Pezzaniti

Water Security A Draft Position Paper prepared by the National Committee on Water Engineering

Water systems are highly vulnerable utilities and if not adequately or effectively protected, can enable saboteurs, vandals, etc, the opportunity to create havoc and cause large amounts of financial loss, public mistrust and a reduced level of confidence in service delivery.

Since the terrorist events in the USA and elsewhere, concerns about the potential for deliberate attacks on major public infrastructure, including water supply systems have increased.

Risk reduction strategies can be implemented to improve the security and protection of water supply systems.
This paper presents EA's position on water security related issues, including; Security Management Planning, Assessing Vulnerability, Site Security, E-Security, Drinking Water Security, The Engineer's Role.

Engineers Australia supports the formulation and implementation of security management strategies and plans by all water service providers in Australia.

Engineers Australia demonstrates this support by:

- endorsing the development of security management guidelines for water service providers;
- supporting the implementation of security management plans by water service providers;
- supporting the training of water service provider staff to enhance their ability to manage security issues and potentially hostile situations, and additionally increase their awareness of the potential threats present at a worksite; and
- raising the awareness of members of water security issues and management responses through the release of this position paper.

Call for Papers AJWR

The Australian Journal of Water Resources provides a forum for Australian & International researchers and practitioners to publish high quality articles on issues related to and affecting the hydrology & water resources in Australia. Topics covered range from rainfall & rainfall modelling, climatic variability & change, assessment & management of water resources, catchment hydrology, environmental flows and hydraulics, open channel flow and hydraulic structures. Instructions for prospective authors can be found at:
http://www.engaust.com.au/transactions/pub_info1.asp

PAPERS in Australian Journal of Water Resources, June 2007

Technical papers

Expertise in finding water and exploiting water resources in Australian prehistory
H Bandler

Examining the technical feasibility of using stormwater as an alternative supply source with an existing urban area - a case study
C M Goonrey, P Lechte, S Maheepala, V G Mitchell, B J C Perera

A review of the application of water sensitive urban design (WSUD) to residential development in Australia
AB Barton and JR Argue

Assessment of alternative groundwater management options in sugarcane growing area in the Burdekin Delta, North Queensland
ME Qureshi, K Bajracharya, SE Qureshi and M Kirby

Estimating uncertainty of flow measurement for the in situ calibration of large water meters
EH Johnson

Leak location in pipelines using transient reflections
P J Lee, M Lambert, A R Simpson, J P Vitkovsky, D Misiunas

Paradigm shift in protecting the water environment in NSW
D Raha

Estimating life cycle costs of stormwater treatment measures.
A C Taylor, T D Fletcher.

Comparison of methods to estimate suspended solids loads in urban stormwater
I Brodie, M Porter

A pattern storage model with variance adjustment for multi-site generation of rainfall
W Boughton

Models of stochastic generation of rainfall data for multiple sites - monthly, annual and multiple year assessment
O Droop and W Boughton

Upcoming Events

Water Down Under 2008

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 **15-18 April 2008**.
The proposed Conference themes and sub-themes are:

- Climate, Rainfall and Surface Water Variability
- Hydrological Modelling, Data and Forecasting
- Water Management and Sustainability
- National and International Water Issues and Case Studies
- Groundwater Systems

The Conference will be held at the Adelaide Convention Centre. For more information visit:
http://www.waterdownunder2008.com

10th Annual Water Distribution System Analysis Symposium

Analysis, design and maintenance of municipal water distribution systems are core functions of the civil engineering profession. Vast networks of pipes, pumps, and storage tanks have been designed and built to provide reliable supply of high quality water to millions of consumers around the globe. Safe and adequate water supply is an uppermost priority in the developing world and distribution forms a primary element of achieving the United Nations Millennium Development Goals.
In view of these and other urgent questions, the WDSA series of specialised conferences have played a huge role by providing a forum for engineers, scientists and other professionals to communicate and debate the latest advances in research on the design, operation, and security of water distribution systems. So far there have been eight international WDSA symposia, with the ninth taking place in Tampa, Florida in May 2007. At the 8th WDSA Symposium hosted by the University of Cincinnati in 2006, the WDSA Committee requested Dr. Kobus van Zyl of the University of Johannesburg to organise this event in South Africa in 2008. The 2008 symposium will be the 10th in the WDSA series and the first to be hosted outside of the USA.
http://www.uj.ac.za/wdsa2008/

Links

Sydney Division Water Panel:
http://www.sydneywaterpanel.org.au/

Queensland Division Water Panel:
http://qld.ieaust.org.au/jetspeed/?group=water

West Australian Division Water Panel:
http://www.wa.engineersaustralia.org.au/groups/hydrology.html

Victorian Water Engineering Branch:
http://www.vic.ieaust.org.au/groups/branches08.html

Hydrological Society of South Australia:
http://www.hydsoc.org/