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Newsletter of the Australian Chapter  
International Association of Hydrogeologists

**July to September 2013**  
**Volume 29, No. 3**



On the cover: Welcome to country ceremony at the commencement of the 40<sup>th</sup> Congress of the International Association of Hydrogeologists in Perth, Australia.

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## International Association of Hydrogeologists Australian National Chapter

The International Association of Hydrogeologists is a professional association for those within disciplines related to groundwater, its occurrence, utilisation, testing and management. IAH is a scientific and educational organisation that is truly international, and was established to foster closer ties, cooperation and information exchange related to the study of groundwater. IAH is non-government and non-profit and has over 4000 members internationally from around 120 countries. The Association is affiliated with the International Union of Geological Sciences (IUGS), and was founded during the 20th International Geological Congress in 1956. By its statutes the IAH is an association of individuals and corporate members, and not a federation of national committees. National groups do, however, organise local meetings and other activities. A proportion of the national committee membership goes to the local organisation to support these activities, the remainder to the international body. The country of the international secretariat is changed every several years. The IAH publishes Hydrogeology Journal, various workshop and conference proceedings and an international newsletter.

The main objectives of the IAH are to promote international and national cooperation between involved scientists and engineers; sponsor international and national technical/management meetings and symposia on hydrogeology; publish hydrogeological reports, papers and maps; establish investigation commissions and working groups to report on special topics; encourage the international application of relevant approaches and techniques for the benefit of the hydrological and human environment.

Our national chapter was founded in 1983 and is one of the most active. Activities tend to be organised locally within each state and territory, but national activities also occur. Each state body has its own meetings, usually monthly. Conferences are held in Australia around every two to three years, and seminars on a more frequent basis. This national Newsletter is published quarterly.

Membership Requirements: IAH will accept as individual members anyone directly or indirectly engaged in study or research on, or management of water in its various forms related to hydrogeology, if sponsored by two members in good standing. Companies and research organisations can apply for corporate membership. The current membership categories and annual subscriptions for 2009 (see [www.iah.org.au](http://www.iah.org.au)) are:

- |                         |                           |
|-------------------------|---------------------------|
| ▪ Member                | \$140                     |
| ▪ Online member         | \$120                     |
| ▪ Student               | \$75 (full time students) |
| ▪ Online Student Member | \$55                      |
| ▪ Corporate member      | \$790                     |
| ▪ Partial sponsor       | \$155                     |
| ▪ Full sponsor          | \$190                     |
| ▪ Retired               | \$75                      |

Membership of this professional association is tax deductible in Australia, and individual members are entitled to use 'MIAH' (Member of the International Association of Hydrogeologists) after their name.

## **FROM THE PRESIDENT**

### **Perverse Forces Driving Bad Groundwater Management Decisions in Australia**

Throughout Australia important groundwater management decisions are being made virtually every day on a broad range of issues – mining approvals, groundwater licensing decisions, coal seam gas regulations and so on. These decisions fundamentally shape the nature and availability of groundwater and strongly influence the sustainability of our groundwater resources. Frequently I have become aware of a broad range of perverse and frequently opposing forces operating to create bad groundwater management decisions in parts of Australia.

Let me explain. I see many hydrogeologists who know that from a science perspective a particular outcome is virtually certain, however from the point of view of their employer (this definitely includes government) and at times self-interest, the opposite is proposed and this is what often occurs. For example groundwater licensing is all about the tyranny of the small decision: How much additional impact will this small new license actually make? The answer is a small impact, but where do we draw the line and say enough is enough?

Consider surface water-groundwater interaction. When this came to the fore as a serious process to be considered about 10 years ago, many hydrogeologists openly opposed it because they said that this would mean an end to all new groundwater licences in Australia and hence the end to employment of hydrogeologists.

Political interference in groundwater management decisions is rife in some parts of Australia, and we hydrogeologists accept this as just part of the culture. New water ministers want to make an impression with their electorate!

So is there a solution? The fundamental problem when the science outcome is relatively clear but from the employers perspective the opposite is proposed, calls for a strong and well educated regulatory and compliance system (with real teeth, not false teeth). But as the outcomes of many decisions will not be clear until after we are dead, this also calls for a culture shift where intergenerational equity is seen as a fundamental principal to be adopted by our profession.

#### **40<sup>th</sup> IAH Congress in Perth**

I could not let this newsletter pass without saying how great it was to meet many of you in Perth. It was a fantastic event. A big thank you to the local organising committee for a fantastic effort. I especially want to thank Jeff Turner and Ryan Vogwill for a stupendous effort.

Richard Evans  
President, IAH Australia

## IAH 2013 CONGRESS

# International Association of Hydrogeologists- 2013 Perth Congress “Solving the Groundwater Challenges of the 21st Century”

IAH Australia hosted the 40<sup>th</sup> International Congress in Perth, Western Australia from 15<sup>th</sup> to 20<sup>th</sup> September 2013. Due to the high level of interest, the Congress was organised in six parallel technical sessions and poster session. In addition to some 400 attendees from Australia, the Congress attracted 300 international participants from 47 countries, which was a great effort in the current difficult economic climate. Six Congress short courses were organised prior to the start of the Congress and one Symposium after the Congress.



*Plenary Session by Sue Murphy, CEO Water Corporation*

remediation and nuclear waste management, mining, research, contamination, managed aquifer recharge, and uncertainty in modelling. In addition, 2013 Darcy Lecturer Prof David Rudolph presented two lectures on water quality impacts from agricultural land use practices and challenges with vulnerability of public supply wells.

The opening of the Congress and Welcome to Country was followed by two plenary sessions: Sue Murphy, CEO Water Corporation, discussed Perth’s drought-proof water supply, followed by Prof Craig Simmons, Director of the National Centre for Groundwater Research and Training at Flinders University who discussed groundwater being a challenge from different viewpoints and in the spirit of the Congress theme. Over the course of the week, many other plenary speakers – Prof Wolfgang Kinzelbach, Prof Stephen Foster, Dr Peter Cook, Geoff Beale, Prof John Doherty, Dr Chunmiao Zheng and Dr Peter Dillon - discussed challenges in groundwater resource management from different perspectives such as

A few statistics on the Congress attendance:

- Total number of participants: 717
- Number of IAH members: 538
- Number of oral presentations: 462
- Number of poster presentations: 141
- Number of students: 85

A mid-Congress break comprising six different tours was organised with local IAH members volunteering as tour guides. The topics of the tours were: adapting Perth's water supply to a drying climate, managing groundwater allocations, managed aquifer recharge innovations in the Perth Basin, Gnangara mound wetlands and climate change, Perth basin geothermal and groundwater resources, and contaminated sites of Swan Valley. Some of the excursion highlights were visiting the geothermal bores in the eastern Perth suburbs that extract groundwater from the Yarragadee aquifer at around 45°C, lunch beside Lake Joondalup and discussing managed aquifer recharge at a Swan Valley Winery.



*Dr Jeffrey Turner, Chair of the Conference Organising Committee*

Many international and national professionals (too numerous to mention here) delivered keynote speeches and chaired technical sessions. A diverse range of technical themes were explored, including: groundwater quality and hydrogeochemistry, managing groundwater resources, surface water – groundwater interaction, climate and groundwater and advances in tools and techniques,

agriculture and paleochannels and karst systems. Other conference streams focused on the practical application of groundwater services, including: resource investigation and management, mining, oil and gas, pollution prevention, geothermal development, tunnelling, climate change research and others.

The great success of the Congress would not have been possible without a monumental effort consisting of countless volunteer hours from the IAH 2013 Organising Committee (Chair and Congress Convener, and scientific program co –chairs and committee members), and support from national and state IAH committees across the country. A special thank you from the IAH community goes to Dr Ryan Vogwill, Congress Convener, and Dr Jeff Turner, Chair of the Conference Organising Committee, whose leadership and tireless efforts were unsurpassed in making this Congress a reality.



*Dr Ryan Vogwill, Congress Convener*

The 41<sup>st</sup> IAH congress is to be held in Marrakesh, Morocco between 15<sup>th</sup> to 19<sup>th</sup> September 2014. Abstracts close on 15 March 2014.



*Congress Dinner at Fraser's State Reception Venue*

# **IAH AUSTRALIA ANNUAL GENERAL MEETING**

## **MINUTES OF ANNUAL GENERAL MEETING**

Held at the 40<sup>th</sup> IAH Congress, Perth, WA on 17 September 2013

### **Quorum:**

A show of hands indicated that a quorum exceeding twenty financial members was present.

### **Welcome:**

The Chairperson for the Annual General Meeting (AGM), IAH Australia President Richard Evans, opened the meeting at 6.10pm.

### **Minutes of Previous AGM:**

The minutes of the 2012 AGM of the incorporated association were confirmed as an accurate representation of the meeting; proposer: Bradley Von Blomestein, seconder: Steve Barnett.

### **Treasurer's Report:**

Ron Colman presented a statement of the Association's financial position (to be attached).

### **Election of Officers:**

The Secretary read out the names of candidates for the executive positions received from the Secretary, as follows

President – Rick Evans  
Vice President – Chris McAuley  
Secretary- Lange Jorstad  
Treasurer- Ron Colman

There being no more than one candidate for each position, the candidates were declared duly elected.

### **President's Report and IAH Australia Vision:**

The Chairperson addressed a range of IAH matters:

- the vision for IAH Australia, including: improved member engagement, growing membership and member retention, strategic links to associated organisations and the voice of groundwater in Australia.

- Thanked the IAH Congress convener, Dr Ryan Vogwill, and the Chairperson of the Organising Committee, Dr Jeffrey Turner, for their efforts in delivering a successful Congress.
- Thanked Fiona Adamson for her assistance with IAH membership and website.

### **State Committee Updates:**

Representatives of the state committees provided brief updates on IAH activity in each state during 2013.

### **Champion Updates:**

Membership champion William Milne-Home and education champion Chris McAuley provided brief updates of their initiatives in 2013.

### **Other business:**

Annual IAH meeting: Peter Jolly (NT) tabled the notion of IAH hosting an annual conference in Australia, with several possible themes identified. It was resolved to discuss the matter in further detail during subsequent meetings of the IAH National Committee.

Membership website and database maintenance – Kyle Horner (ACT) tabled concerns regarding ongoing technical difficulties with the web-based membership facility experienced following the website update in 2013 (sentiments common to other state branches). Inability to join or renew IAH membership through the website had resulted in significant angst amongst some membership, and a general reduction in financial member numbers relative to the previous year. It was resolved to discuss the issue in further detail during an extraordinary meeting to be convened during the lunch break on Thursday, 19 September.

All AGM matters having been addressed, the meeting was closed by the Chairperson at 7pm.

L Jorstad  
Secretary, IAH Australia

17 September 2013

IAH National Committee Finances for the period 26/11/2102 to 17/09/2013

Summary report presented by R. Colman

Term Deposit as of 26/11/12	\$41,797.16
Cheque Account as of 26/11/12	\$56,525.13
<b>Total Cash Balance as of 26/11/12</b>	<b>\$98,322.29</b>

Term Deposit as of 17/09/13 (matures 19/12/13)	\$43,270.77
Cheque Account as of 26/11/12	\$201,546.54
<b>Total Cash Balance as of 26/11/12</b>	<b>\$244,817.31</b>

**Membership Income 2013:** **\$60,834**

**Other Income:**

- AusIMM AGC 2012 Surplus \$53,474

**Major Expenses:**

- AusAid support for Congress attendees: \$24,720
- State Capitation ~\$10,000
- UK IAH Head Office subscription ~\$45,000

**Total Liabilities** ~\$79,720.00

**Total Assets** **\$165,097.31**

## FEATURE ARTICLES

*In this newsletter we introduce an important debate regarding the Australian Groundwater Modelling Guidelines, with two differing opinions presented by eminent Australian hydrogeologists. In addition to debating the merits and shortcomings of our national modelling guidelines, the authors hope to start a much needed conversation about the lofty expectations of numerical models to inform important groundwater management decisions. We would be interested to hear your own views on the subject – if you would like to share your thoughts, please send an e-mail to the IAH Australia Secretary ([ljorstad@golder.com.au](mailto:ljorstad@golder.com.au)) and we will feature your feedback in the next edition of the newsletter.*

### ***Australian Groundwater Modelling Guidelines – Well-Intentioned but Slightly Misguided***

***By John Doherty, Watermark Numerical Computing, NCGRT (Flinders University)***

The “calibrated model” – the cornerstone of model-based decision making - rests on two pillars. Both of these are featured in Bayes equation, which is the quintessential mathematical description of what can be expected of a model. The first pillar is comprised of expert geological knowledge. This is a stochastic concept, for a geologist cannot know all of the nuances of subsurface geology; nor can he/she assign hydraulic properties to the subsurface beneath all points within a study area.

The second pillar on which the “calibrated model” rests is the calibration process itself. Actually “calibration” is the wrong word to describe what “history-matching” (as it is referred to in the petroleum industry) can achieve. Basic mathematics shows that history-matching can lower the uncertainties of some model predictions while leaving the uncertainties of other predictions virtually unaltered. This is an outcome of the inherent nonuniqueness of the inverse problem through which parameters are inferred from an (often limited) measurement dataset.

Like expert knowledge, predictions made by a calibrated model are probabilistic quantities. As such, they will almost certainly be wrong. A model is therefore not “bad” if it makes a wrong prediction. A model is “bad” if the right prediction is not included within the uncertainty interval that it calculates for that prediction.

It follows from the probabilistic nature of model predictions that it may not be possible to infer that a certain thing will happen if a particular management strategy is adopted. However it also follows from the probabilistic nature of model predictions that it may be possible to say with a high degree of confidence that a certain thing will NOT happen. Fortunately, more often than not, this is exactly what the decision-making process requires, for the goal of most environmental management is to prevent the occurrence of events that are unacceptable from a financial and/or environmental point of view.

The Australian Groundwater Modelling Guidelines introduce a “model confidence level classification”. It is not clear from the Guidelines just what the model builder and/or model user should have “confidence” in. However a reading of the

Guidelines suggests that it is confidence in model predictive accuracy. If so, such a classification scheme is lacking in conceptual and mathematical support, for it contravenes legitimate expectations of the modelling process as expressed above. In any case, presumably the uncertainties associated with a model's predictions can be quantified as a routine part of model usage; the model's "confidence classification" thus becomes redundant.

If a model is simple rather than complex then the "man-made uncertainty" incurred by its simplicity must be included in its predictive uncertainty assessment. This guarantees that predictive uncertainty is overstated and that confidence intervals associated with predictions of interest are thus conservative. Regardless of the adopted modelling strategy however, an event that is deemed unlikely by a model must in fact be unlikely. It is this, and not predictive accuracy, in which decision-makers must have confidence. It is the assurance that a so-called type II statistical error is not incurred that any set of modelling guideline should address. (In the modelling context, a type II statistical error occurs when the hypothesis that a certain event can occur is rejected, when in fact the likelihood of its occurrence is very real.)

The Australian Groundwater Modelling Guidelines creates a paradox where none should exist. A modeller may go to great lengths to incorporate all available expert knowledge into his/her model, and then calibrate it using the best available technology. He/she may then undertake calibration-constrained uncertainty analysis, and thereby demonstrate that model predictions of interest are highly uncertain. At the same time, through careful construction and calibration of the model he/she may have reduced predictive uncertainty intervals to such an extent that certain unwanted events can be ascribed a low probability of occurrence. Such a model is obviously of high quality and of high utility. But what "model confidence classification" should be ascribed to such a model? It is unclear, for the classification system to which Australian modellers are, to an ever-increasing extent required to apply to their models, is not aligned with the requirements of model-based decision-making.

In my opinion, a paradigm shift is needed in the way that our industry uses models to assist the making of decisions of local and national significance. I have briefly touched on one of the ways in which I think our concepts and practice must change. Sadly, by insisting that modellers classify their models according to a scheme that does not address the real criterion for failure of a modelling enterprise (namely failure to recognize that a not-unlikely event is in fact not-unlikely), the Australian Groundwater Modelling Guidelines hinders rather than assists our industry to make this much-needed paradigm shift.

John Doherty

## ***In Defence of the National Groundwater Modelling Guidelines***

***By Richard Evans and Brian Barnett, Sinclair Knight Merz***

Our thanks and congratulations go to John Doherty, on his spirited attack of the Australian Groundwater Modelling Guidelines in his closing Plenary Talk at the IAH Congress in Perth. For those of you not present, we will attempt to summarise his objections to the guidelines, and in fact his objections to modelling guidelines in general.

John argues that the Guidelines will be used as a standard or legal instrument that defines the manner in which groundwater modelling must be undertaken. Innovative approaches will be challenged as being unsupported by or counter to the Guidelines. His concern is that many environmental regulators and model developers (those parties who commission groundwater modelling investigations) will (and do) specify that modelling approaches or models in general must conform to the Groundwater Modelling Guidelines.

He contends that in many instances the primary purpose of a groundwater model is to demonstrate which modelling scenarios are implausible and impossible. His concern is that the guidelines do not address this matter.

His other concerns are that Guidelines will further encourage poorly trained and inexperienced modellers as a “cheap” option. He laments that the groundwater modelling profession is falling behind the more lucrative oil and gas reservoir modelling industry because it has become the domain of monkeys being paid peanuts for important work. Finally John criticised the Model Confidence Level Classification as providing an assessment of how well the model has been constructed and calibrated and is not necessarily relevant as to how well the model is able to address the specific requirements of the modelling or project objectives.

We would like to present an alternative view.

The Guidelines are very clearly “guidelines”, in the sense that they are not intended to be standards and certainly not intended to be mandated into law. The likelihood that some organisations will treat them as law and also some courts may choose to treat them as law is not an argument against the guidelines. The fact that many documents are misused is not an argument for not having the document.

There are few, if any, specifications of things that “have to be” included or “must be done”. Indeed one might argue that stipulating a model be developed in accordance with the Guidelines is meaningless as the Guidelines do not mandate anything. A more practical interpretation of “modelling in accordance with the Guidelines” might be that the general process (as summarised in Figure 1-2 of the Guidelines) should be followed. In other words Modelling Objectives should be made clear; a conceptualisation should be developed; a model should be designed and constructed to best represent the conceptualisation and to meet the specific requirements of the modelling objectives; the model is calibrated if necessary; it is used to provide predictive outcomes that address the

requirements of the modelling objectives; model uncertainty should be addressed and a report prepared. This is the basic framework promoted by the Guidelines and modelling in accordance with the Guidelines should be interpreted as following such a process, or providing justification for deviation from the process.

The serious question of poor modelling due to poorly trained and inexperienced modellers is surely a question of professional accreditation, inadequate budgets in the groundwater industry, unrealistic client expectations and so on. To blame the Guidelines for almost all the problems in the groundwater industry is going too far. Yes, there are many appalling models which are being undertaken by poorly trained and inexperienced modellers. But one of the aims of the Guidelines is to play a part in addressing this serious problem by providing regulators and model developers with a benchmark of best industry practice that can be used to identify minimum requirements for modelling and to assist them to judge if a satisfactory model has been produced.

The Guidelines recognises John's argument that a model will never provide a true representation of reality and that the art of modelling requires careful consideration on how to quantify and present limitations and uncertainties in model outcomes.

With this issue in mind the Guidelines introduce the concept of a Model Confidence Level Classification which is aimed at providing an indication as to the level of confidence that can be assigned to a model prediction. The concept has been proposed as a replacement for the Complexity ranking included in the MDBC Guidelines of 2000 and hence to avoid the incorrect inference that a complex model is in some way superior to a less complex one. It has also been introduced to help placate the environmental regulators who insist on using a simple quantitative indicator of how "good" a model is. Until the publication of the Guidelines the standard test of a model's value (in Australia) was simply whether it passed a scaled RMS error criterion of 5%. Experienced modellers realise that such criteria alone are meaningless and in many cases counter-productive. The Confidence Level Classification addresses a number of model features (calibration statistics being just one), all of which can influence the reliability of a model estimation. Most of the criteria used to assess confidence are simply common sense. For example we should recognise that as the length of any prediction increases so does the uncertainty of that prediction; if a model has been calibrated with a certain level of groundwater extraction within the calibration period then it is more likely to provide a reliable estimate when a similar level of pumping is included in the prediction; if the model is required to predict groundwater flux then a calibration to measured fluxes is desirable.

John argues that models are often best used from a hypothesis rejection point of view rather than the hypothesis acceptance point of view. In other words model are often most suited for understanding what is not likely to happen rather than finding an optimum solution to a problem. We heartily agree and note that there is nothing in the Guidelines that suggests such an approach is inappropriate. We point out that the common way to test such hypotheses is to create predictive scenarios designed to test the proposition. Indeed the Guidelines suggest that these scenarios should be developed in a way that meets the modelling

objectives and answers the problem at hand. The Confidence Level Classification, rather than undermining the process, provides an indication as to the confidence with which the model can be used in predictive mode and hence the confidence with which the rejection of the hypothesis can be made.

John seems to imply that the Confidence Level Classification is in some way incompatible with the use of a model to identify events that are unlikely to occur. In reality however, whenever a model is used – whether to prove that an outcome is likely or to prove that it is not likely – it is used in a predictive manner where the model is required to estimate groundwater behaviour outside the range of what has occurred in the past. When assessing these outcomes it is useful to understand the relative confidence of the estimate and we contend the Confidence Level Classification is a valid and sensible means of addressing this issue.

While we agree that a model can often be used effectively to identify those outcomes that are unlikely to occur in future we do not go so far as to suggest that this is the only valid use for groundwater models. There are many instances when models have been and should be used to help illustrate outcomes that are likely to occur. In this regard we wish to reassure the industry that many of us in the groundwater modelling profession understand the real world problems faced by those commissioning models. For example we appreciate that our miners are not particularly interested in a model telling them how much water they don't need to pump to dewater their mine. In advising them how much water they may need to pump we also need to indicate how confident we are in this estimation.

Rick Evans and Brian Barnett

## FROM THE BRANCHES

### NORTHERN TERRITORY

#### IAH NORTHERN TERRITORY BRANCH

2013 Committee:

Chair	Steven Tickell	(Dept. Land Resource Mgt.)
Vice-Chair	Peter Jolly	(Jolly Consulting)
Secretary	Bill Howcroft	(URS)
Treasurer	Alan Puhlovich	(Golder Associates)
Southern Region Rep.	John Wischusen	(Dept. Land Resource Mgt.)
Northern Region Rep.	Chris McHunter	(URS)
Public Officer	Steven Tickell	(Dept. Land Resource Mgt.)

#### ***Recent Events***

##### **AGM**

The Annual General Meeting was held on Monday, 4 November from 5:00 – 6:00 pm at the office of Golder Associates, Level 2, Paspalis Centrepoint, 48-50 Smith Street, Darwin CBD. Peter Jolly gave a talk entitled “Rainfall and recharge variability”

##### **Field Trip**

A field trip was held on October 6th to Acacia area. It coincided with the Solar Car Challenge so we all watched the front runners zoom past. The main features of the trip were a spectacular sinkhole and a spring (with associated rainforest), both related to a dolomite layer in the Proterozoic Whites Formation. We inspected quartz reefs associated with the Giants Reef Fault and looked over some WWII archaeology, including an army water supply borehole.



Headworks of a WWII drilled in 1942 by the army, Photo: Steven Tickell



Large fig tree growing in sinkhole, Photo: Alison Worsnop



Rainbow fish and pond skater in spring, Photo: Alison Worsnop

## NEW SOUTH WALES

### IAH NEW SOUTH WALES BRANCH

#### 2013 Committee:

Chair	Katarina David	(CDM Smith)
Presentations Secretary and External Communications	Graham Hawkes	(AECOM)
Treasurer	Sara Mehrabi	(UTS)
Secretary	John Fennel	(RPS)
Sponsorship Champion	Mark Peterson	(ANSTO)
Meeting Facilitator and Internal Communications	Ellen Kwantes	(Parsons Brinkerhoff)
Awards Secretary	Dr Anna Grieve	(Xstrata Copper)
Newsletter Champion	Dr Ben Rotter	(Coffey)
Web Champion	Doug Anderson	(Water Research Laboratory, UNSW)
International Sponsorship Champion	Dr Jay Punthakey	(Ecoseal)
University Liaison and National Member Champion	Dr Bill Milne-Home	(UTS)
Members Champion	Andrew McCallum	(Office of the NSW Chief Scientist and Engineer)
National Secretary	Dr Lange Jorstad	(Golder Associates)
International Vice President - Australasia	Dr Wendy Timms	(UNSW)

### ***Local News***

Our regular branch meetings continue to be held at the office of Parsons Brinckerhoff (PB) located in the Sydney CBD. Thank you to PB for supplying the convenient central venue, first class facilities, and food and drinks. Thank you also to AECOM for hosting this year's Darcy Lecture in their central Sydney CBD office and providing food and drinks.

IAH NSW branch provides events that span all stages of a career in hydrogeology. Our Student Night event provides a platform for students, and our Young Professional Award recognises young professionals. For mid to late career hydrogeologists, a platform is provided for technical presentations. Highly experienced professionals join our panel during Elders Night, with esteemed NSW hydrogeologists recognised by the receiving of the Woolley Award at or near retirement.

## ***NSW Sponsors***

IAH NSW gratefully acknowledges the contributions of its sponsors. Details of sponsors can be found on the website at <http://www.iah.org.au/about/new-south-wales/nsw-branch-sponsors>.

Our Gold Sponsors include AECOM, CDM Smith, Coffey, GHD, Hydrosimulations, Parsons Brinkerhoff, RPS Aquaterra, and UNSW.

Our Silver Sponsors include C. M. Jewell & Associates Pty Ltd, EcoSeal, EMM, Environmental Strategies, Frans Kalf and Associates Pty Ltd, NSW EPA, and NSW Office of Water (NOW).

## ***Recent Meetings***

### **June 2013, McEllhiney Lecture**

The 2013 McEllhiney Lecture is presented by Dr John Jansen, a principal and senior hydrogeologist for Cardno ENTRIX who specialises in high-capacity groundwater wells and groundwater resource management.

The 2013 lecture was presented in Sydney on 27 June 2013, and discussed how several different definitions of “sustainability” apply to the management of an aquifer, how these different definitions may affect an organisation’s business, the States’ varying approaches to aquifer management and regulation, and successful management.

The National Ground Water Research and Educational Foundation established the William A. McEllhiney Distinguished Lecture Series in Water Well Technology in 2000, to foster professional excellence in water well technology. The McEllhiney Lecturer is selected annually by a panel of groundwater contractors who ask an outstanding groundwater professional to share their insights and work experiences in the industry.

### **September 2013, 2013 Darcy Lecture – Managing Groundwater Beneath the Agricultural Landscape - Professor David L. Rudolph**

The 2013 Darcy Lecture was presented by Professor David L. Rudolph, a geological engineer in the Department of Earth and Environmental Sciences (and cross-appointed to the Department of Civil and Environmental Engineering) at the University of Waterloo. Professor Rudolph specialises in the areas of regional hydrogeology and groundwater protection and management.

Professor Rudolph’s presentation discussed how the nature of groundwater quality has been impacted from agricultural land-use practices, at both local and regional scales, and specifically focused on nitrate and microbial species as indicators of impact.

Agricultural land use represents the largest nonpoint source threat to groundwater quality on a global scale. As a result of decades of fertilizer application and surface spreading of animal manure, chronic increases in nutrient concentrations

have been documented in both private and municipal groundwater well systems. The occurrence of pathogenic microbes in groundwater supply wells has been associated with agricultural practices at the land surface.

The presentation discussed beneficial management practices (BMPs) designed to reduce the risk of groundwater quality impacts in agricultural environments, and the data available to assess the performance of these BMPs.

The complexities associated with variable mass loading to the water table were explored, considering regional recharge distributions. The role of the vadose zone in controlling subsurface redistribution, and as an archive of past land-use activities, was also considered relative to the legacy of agricultural impacts on groundwater quality. Evaluation of the performance of a decade-long regional-scale field BMP program designed to reduce nutrient loading to the subsurface in the vicinity of an impacted municipal groundwater supply system was presented. The utility of a targeted in situ denitrification approach designed as a remedial strategy to temporarily augment the BMP program in the vicinity of the municipal wells was discussed, as well as the potential influence of extreme climatic variability on the mobility of nutrients and microbial species in agricultural environments.

### **September 2013, IAH Congress, Perth**

The IAH Congress was held in Perth this year. A number of NSW IAH members attended and presented at the Congress.

### **October 2013, Student Night**

The NSW Chapter encourages students to present their work at the annual Student Night. On 15 October 2013, Richard Rosendorff (UNSW) and Michael Short (ANU) presented the results of their work to date:

**Richard Rosendorff**, an Honours student from UNSW, presented on ***Identification of Fractures in the Hawkesbury Sandstone Using Ground-Penetrating Radar.***

Ground-Penetrating Radar (GPR) is a non-invasive geophysical technique that allows for imaging of the shallow sub-surface. There has been a need to understand the alteration of fracture networks caused by long wall mining related subsidence. This is especially apparent in areas where an aquifer overlies the mining panels e.g. the Waratah Rivulet. If the natural local fracture network is altered this may cause a disruption in the surface water – groundwater flow, ultimately leading to a change in local catchment supply. By combining field mapping of fractures, aerial photographs, and GPR data in 3D modelling software it was possible to visualise the fracture networks and detect various sub surface fractures.

**Michael Short**, a PhD student from ANU, delivered his presentation titled ***Where's the plug? 200 years of fluctuating water levels at Lake George.*** Ever since its discovery in the early 19th century, the fluctuating water levels of Lake George, located in the Southern Tablelands, have intrigued locals, tourist

and scientists alike. Many complex and unbelievable theories have been put forward to explain this phenomenon but the truth lies in the fine balance between rainfall, surface runoff and evaporation. This presentation will describe current knowledge of the Lake George Basin hydrological system and the methods that will be used to gain a better understanding of salt accumulation processes within this small endoreic basin.

### **November 2013, Dino Parisotto – Braddon Site Remediation**

Mr Dino Parisotto of environmental and groundwater consultants Earth 2 Water Pty Ltd presented on remediation of the former service station at the Braddon site. The presentation discussed the geology of the site and the soil and groundwater remediation methods adopted.

The November meeting was the last IAH NSW meeting for 2013. A Committee Meeting was held prior to the November meeting presentation.

### ***Upcoming Events***

#### **Australian Earth Sciences Convention 2014**

The Australian Earth Sciences Convention will be hosted by the Australian Geological Society and held in Newcastle between 7 and 10 July 2014 at the Newcastle City Hall. The convention will also include the 39<sup>th</sup> Symposium on Advances in the Study of the Sydney Basin. Within the Environment stream there will be three themes of interest to hydrogeologists including:

1. Hydrogeology, the water within
2. Coal seam gas and groundwater
3. Groundwater quality implications of changes in physical water management.

Abstracts close on 14 March 2014.

## AUSTRALIAN CAPITAL TERRITORY

### IAH AUSTRALIAN CAPITAL TERRITORY BRANCH

#### 2013/2014 Committee

Chair	Lucy Lytton	(Geoscience Australia)
Vice-Chair	Scott Lawson	(Department of the Environment)
Treasurer	Anne Reisz	(Murray-Darling Basin Authority)
Secretary	Scott Cook	(Geoscience Australia)
Events Sub-Committee	Sarah Marshall	(Geoscience Australia)
	Gabby Yates	(Geoscience Australia)
	Scott Lawson	(Department of the Environment)
	Tim Ransley	(Geoscience Australia)
Website and Newsletter	Kyle Horner	(Geoscience Australia)
Membership Champion	Hashim Carey	(Geoscience Australia)
Sponsorship Coordinator	Peter Hyde	(Murray-Darling Basin Authority)

#### ***Local News***

##### **ACT Branch welcomes a second Gold Sponsor**

The IAH ACT Branch has welcomed a second corporate sponsor, URS Corporation, a leading provider of engineering, construction and technical services for public agencies and private sector companies around the world. Thanks to our sponsors' generous contributions, the ACT Branch is helping us provide members and non-members alike with free access to world-class speakers to raise the profile of hydrogeological issues and research in the territory.

##### **IAH ACT Branch welcomes a new committee**

The IAH ACT branch held its first AGM on Tuesday the 15<sup>th</sup> October and selected a committee for 2013/2014. Many of the previous, interim committee re-nominated and were selected. In addition, the branch would like to welcome Scott Lawson, Tim Ransley and Peter Hyde as new committee members. Thanks are also extended to Pauline English, who acted on the committee throughout 2013 as the IAH Congress Champion.

#### ***Recent Meetings***

##### **Presentation on CO<sub>2</sub> and groundwater CO<sub>2</sub>-CRC**

At the conclusion of the AGM on the 15<sup>th</sup> October, the IAH ACT hosted a presentation by Dr Kyle Horner on carbon sequestration in low-salinity aquifers. His talk outlined some of the geochemical consequences of storing carbon dioxide in deep aquifers, and summarised his current research on the Surat Basin, Queensland.

## **IAH Congress 2013**

*15 - 20 September 2013*

In mid-September, members of the hydrogeological community gathered at the annual IAH Congress. This year the congress was held at the Perth Convention and Exhibition Centre in Western Australia. The presentations ranged in scope from groundwater management and policy; to technical hydrogeological research. The theme of the congress was 'Solving the Groundwater Challenges of the 21<sup>st</sup> Century'.

## **2013 NGWA Darcy Lecture**

***David L. Rudolph, PhD, PE, Earth and Environmental Sciences / Civil and Environmental Engineering, University of Waterloo, Canada***

*6 September 2013*

The ACT Branch hosted this year's Darcy Lecture in Canberra. Dr. Rudolph presented the talk "Managing Groundwater Beneath the Agricultural Landscape". The talk examined how the nature of groundwater quality has been impacted from agricultural land-use practices, at both local and regional scales, with a specific focus on nitrate and microbial indicator species. The complexities associated with variable mass loading to the water table were explored, as was the role of the vadose zone in controlling subsurface redistribution and as an archive of past land-use activities. The event was held at the National Water Commission offices in Civic.

## **Combined Geo-societies Quiz Night**

***IAH ACT, in combination with ASEG, PESA, AusIMM and the GSA***

*31 July 2013*

A quiz night was held at the Harmonie German Club, Narrabundah. The night was well attended and had a lively, fun (and competitive!) atmosphere. It included geological and non-specific questions, representing the interests of each contributing Geo-society. Chris Harris-Pascal and Millicent Crowe were fantastic hosts, and the tradition of an annual combined Geo-societies hold will hopefully continue into the future.

## **Christmas Party**

***IAH ACT, in combination with the GSA, AusIMM and AMSA***

*10 December 2013*

2013 is the inaugural year that the IAH will be involved in an established tradition of a combined Christmas party. Come along for a drink with friends and stay for the barbeque! The event will be making the most of the balmy summer evenings and is held on Tuesday 10<sup>th</sup> December, at 5pm at Geoscience Australia. There will be free entry to the Christmas Raffle, drawn on the night.

## **VICTORIA**

### **IAH VICTORIA BRANCH**

2013 Committee:

Chair	Alan Wade	(Aquade)
Vice-Chair	Ben Hall	(EarthEon)
Secretary	Anne Northway	(VIC EPA)
Events Committee	Ben Hall Katy Kijek	(Eartheon, EES respectively)
Communications Committee	Tim Robson Malcolm Graham Matt Currell	(Kleinfelder, Bluesphere, RMIT respectively)
IAH National Committee Liaison	Chris McAuley	(DEPI)

### ***Local News and Recent Meetings***

#### **2013 NGWA Darcy Lecture**

***David L. Rudolph, PhD, PE, Earth and Environmental Sciences / Civil and Environmental Engineering, University of Waterloo, Canada***  
*September 2013*

For those not able to attend the IAH Congress in Perth, VIC Branch hosted this year's Darcy Lecture in Melbourne. Dr. Rudolph presented the talk "Managing Groundwater Beneath the Agricultural Landscape". The talk examined how the nature of groundwater quality has been impacted from agricultural land-use practices, at both local and regional scales, with a specific focus on nitrate and microbial indicator species.

#### **IAH 2013 Perth Conference, September 2013**

Many IAH VIC members attended the recent Perth conference, including our VIC Chair who claims to have travelled the furthest – from Melbourne (via Canada, the UK and Italy). The conference was a great opportunity to hear about some of the latest work taking place both around the World and in Australia, for many of us to present our own work, and to network. A significant number of IAH members from Victoria attended the conference, many of them presenting.

Some feedback from members of the VIC committee is that, while there were many interesting presentations, the scheduled presentation times (15 minutes from one to the next) limited the opportunity to present more detail or allow extended questions and discussion.

Time to start saving your Dirhams for IAH Congress 2014 in Morocco.

## **Student Presentations, 8 October 2013**

Three students from three different universities provided an overview of their research projects. The event was kindly hosted by RMIT.

**Sanjeeva Manamperi** (La Trobe University): 'Impacts of episodic flooding on groundwater resources in the Loddon system, Victoria'

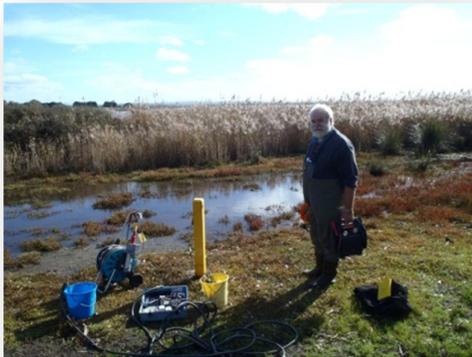
**Nic Unland** (Monash University): 'Tracing the age, origins and hydrodynamics of groundwater surface water exchange'

**Stephen Lee** (RMIT): "Investigating salinity sources and variation throughout flow system changes in Western Port, south-east Australia"

All presentations were very topical, well received and generated plenty of discussion.

## **2013 FIELD TRIP – Lake Connewarre**

IAH VIC has joined forces with AIG to host a field trip to the Lake Connewarre Complex, near Barwon Heads, southeast of Geelong. The event was held on **Saturday 23 November 2013**. Guides on the tour were Dr Peter Dahlhaus (Federation University) and Dr Matt Currell (RMIT).



The trip explored the hydrogeology and geomorphology of the lower Barwon River, through a guided tour of sites along this internationally protected wetland complex. Topics included the geological, geomorphological and hydrological evolution of the area, and how these interact with the groundwater/surface water system, geological hazards, ecosystems and new land development

## **2013 CHRISTMAS PARTY**

The final year presentation and Christmas break-up was held on 10<sup>th</sup> December. Louise Lennon (SKM) delivered a presentation titled: Leading Practice Framework for Coal Seam Gas Development in Australia.

## **2014 PRESENTATIONS, FIELD TRIPS**

Our events committee of Ben Hall and Katy Kijek have been very active in lining up events for next year. The 2014 schedule will include talks on geothermal energy, groundwater and the law, a regional event in Gippsland and scheduled events Darcy, McElhiney and NCGRT Distinguished Lectures.

## WESTERN AUSTRALIA

### IAH WESTERN AUSTRALIA BRANCH

2013 Committee:

Position	Officer	Position	Officer
<b>Chairperson - State Liaison</b>	Grant Bolton	<b>Presenter Coordinator</b>	Geoff Pettifer
<b>Vice – Chairperson</b>	Ian Brandes de Roos	<b>2013 Congress – State Champions</b>	Pauline Amez-Droz Hannah Stokes
<b>Secretary</b>	Mariajose Romero-Segura	<b>Sponsorship Champion</b>	Bradley van Blomestein
<b>Treasurer</b>	Peter de Broekert	<b>Newsletter Champion</b>	Keith Brown
<b>Meetings Secretary</b>	Carl Davies	<b>Newsletter Assistant</b>	Gillian Hurding
<b>Ministerial Liaison</b>	Jed Youngs	<b>Web Champion</b>	Lynn Reid
<b>Education Representative</b>	Ryan Vogwill	<b>Web Assistant</b>	John Enkelmann
<b>Media Liaison</b>	Robin Smith	<b>State Liaison</b>	Philip Commander
<b>Membership Champion</b>	Genevieve Marchand		



The big news item in WA was the successful hosting of the 40<sup>th</sup> International IAH Congress. The congress was held from 15 to 20 September at the Perth Convention Centre with over 700 delegates from around the world in attendance. The technical programme included 425 presentations, themed on showcasing “Solving the Groundwater Challenges of the 21<sup>st</sup> Century”.

Technical sessions including contaminant hydrogeology; groundwater policy; groundwater modelling; geophysics, groundwater dependent ecosystems,

agricultural challenges and climate impacts rounded out a comprehensive technical programme. As well as technical sessions, the congress was well catered for with respect to trade exhibitions, field trips, pre-congress workshops and congress dinner and drinks events.

As you would appreciate, the amount of organisation that went into hosting this event, was significant. To those who were involved in ensuring the success of the Congress, we offer our sincerest gratitude. To our visitors we hope you enjoyed our hospitality and we hope to see you all in Marrakech next year.



## ***Recent Meetings***

### **Models in Mining**

***Keith Brown, Rio Tinto***

*28 August 2013*

Keith's talk "Models in Mining – art and science in modeling" examined the current process of developing models in the context of mining in WA. Keith emphasised the importance of conceptualisation and selecting the most appropriate mathematical solution in the modelling process. He then discussed the conflict of art and science with regard to uncertainty in this process. The talk was well received by a receptive audience.

### **Pit Wall Stability and Foundation Dewatering**

***Alan Brown, Airwell Group***

*16 October 2013*

Alan from Airwell gave a well-received presentation describing the many advantages in mining of Airwell pumps using examples from around Australian.

## ***Upcoming Events***

### **2013 AGM & Student Presentation Night @ the Melbourne Hotel**

*20 November 2013. From 5:30 pm to 8:00 pm*

The Annual General Meeting was enlivened by presentations of student research. Best presentation gets a cash prize! and plenty of opportunity for all to network. The student presentations on the night included the following:

#### **Alexander Salomon – Honours Student Curtin University**

*Distribution and possible sources of high nitrate concentrations in groundwater aquifers used for potable supply in Aboriginal communities, Central Western Australia.*

High levels of naturally occurring nitrate are present in many of the groundwater aquifers which supply potable water to remote Aboriginal communities of the northern Goldfields and southern Pilbara regions. Recent monitoring conducted by the Remote Areas Essential Services Program (RAESP) has indicated that concentrations in some communities far exceed the Australian Drinking Water Guideline (ADWG) health thresholds. Nitrate levels also fluctuate significantly over time, with possible links to climate, making it difficult to plan and implement treatment processes to reduce nitrate concentrations in the potable supply. While nitrate contamination is usually associated with anthropogenic sources, it is suggested that the high concentrations of nitrate in central Western Australia are naturally occurring due to the low population density and highly isolated and pristine nature of these communities. Three potential nitrate sources have been identified, including nitrogen fixation by bacteria on the roots of Acacia species, solubilisation of ammonia rich waste metabolites from termite mounds, and nitrogen in the surrounding geology (in particular evaporite deposits and organic rich sediments). Leaching studies undertaken have demonstrated that, of the three potential source materials, termite mounds in particular may well be capable of producing leachate rich enough in nitrate to potentially affect the groundwater. It is hoped that a new understanding of the probable nitrate source will assist development of bore field management strategies that seek to minimise nitrate levels in potable supply.

#### **Nicholas Wright – Honours Student Curtin**

##### ***Hydrogeology and Hydrochemistry of the Unconfined Aquifer of the Broome Peninsula***

To further the ongoing investigations in to the Lyngbya blooms in Roebuck Bay a hydrogeological and hydrochemical investigation of the Broome Peninsula was completed with significant results. The unconfined aquifer of the Broome Peninsula is made of an 8-12 m thick layer of Pindan Sand underlain by Broome

Sandstone. A multifaceted empirical approach was taken to quantify the hydraulic conductivity of the surficial sediments, which suggested a horizontal hydraulic conductivity of 1.7 m/day for the Pindan Sand. Groundwater levels were typically elevated in the centre of the peninsula and were lowest near the ocean. This confirms previous investigations which indicated that groundwater outflow to the ocean occurs on all sides of the Broome Peninsula, excluding the area to the North East where groundwater inflow from the regional unconfined aquifer occurs. Given that most wastewater disposal sites are south of the centre of the Peninsula, any contamination present will be migrating towards Roebuck Bay.

Nutrient contamination was clearly identified and the associated submarine groundwater discharge (SGD) flux was estimated, including the likely range. In most instances these locations were directly linked to the wastewater treatment facility and wastewater disposal sites located within Broome. The causal relationship between nutrient contamination and Lyngbya blooms has been well established in previous works. The current study indicates that there is significant potential for nutrients from wastewater disposal in Broome to be contributing to Lyngbya blooms in Roebuck Bay via groundwater pathways.

### **John Hemson – Honours Student UWA**

*Interaction between waste fines and groundwater; implication on water quantity and quality of a Channel Iron Deposit aquifer.*

The Rio Tinto (RTIO) Yandicoogina (Yandi) mining operation is located approximately 85km northwest of Newman within the East Pilbara shire, Western Australia. The mining operation consists of extracting profitable ore from the largest Channel Iron Deposit (CID) discovered worldwide. To meet market product specifications, the ore is refined through a beneficiation process, leaving a waste fines product that is stored on site as a slurry composition in purposely built waste fine cells (WFC's) within the mined out CID. The aim of this study is to investigate the effect of storing the waste fines slurry in WFC's on the underlying groundwater quality and quantity, in pit water levels and the dewatering regime; a prerequisite for improved water management on site.

An integrated investigation into aquifer hydraulics and environmental tracers; chloride (Cl-) and stable isotopes (Deuterium ( $\delta^2\text{H}$ ), Oxygen ( $\delta^{18}\text{O}$ )) are used to trace and quantify seepage from WFC2. The water stored within WFC2 has increased Cl- concentrations, enriched  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  signatures in comparison to groundwater within the underlying aquifer. This is a result of the water stored in WFC2 being exposed to a high degree of evaporation. A shallow seepage flow path exists between WFC2 and the down gradient section of the CID as the Cl- concentrations and  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  signatures in the shallow monitoring bores and the down gradient sump approach those within WFC2. From December 2012 onwards; the water abstracted by the down gradient sump is 100% WFC2 seepage. An analytical WFC2 water balance as well as a Cl- and stable isotope mass balance has accurately quantified seepage into the underlying aquifer and the down gradient mining pits. Over time, as the volume of water stored within

WFC2 increases, an elevated hydraulic head and a steeper hydraulic gradient has been created between WFC2, underlying aquifer and the down gradient section of the CID, resulting in greater seepage. Therefore, the seepage from WFC2 has caused elevated in pit water levels, manifested by increased sump pumping rates to maintain dry in pit mining conditions, allowing efficient extraction of the economic ore. Overall, this study has provided essential information to refine the RTIO Yandi water balance, an important requirement in the production of sustainable water management and the formulation of a realistic closure plan.

## **SOUTH AUSTRALIA**

### ***Recent Meetings***

#### **Groundwater modellers forum #2 - Beyond MODFLOW?**

***Jarrah Muller, SKM***

***John Kozuskanich, NCGRT***

***Maria Pool Ramirez, NCGRT***

***4<sup>th</sup> July 2013***

This series is an opportunity for Adelaide's groundwater modellers to come together and discuss a host of issues relevant to consultancies, agencies and researchers.

This forum presented examples of modelling applications using a variety of different modelling software packages. Examples of how a specific application of software has solved a groundwater problem were provided by presenters, with emphasis on why they chose that particular model and what advantages this has offered. About 20 people attended. Presentations included:

- Jarrah Muller, SKM: Modelling open cut pit development in folded banded iron formation (BIF) using FEFLOW
- John Kozuskanich, NCGRT: Discretising a discrete fracture model for simulation of solute transport using analytical models and HydroGeoSphere
- Maria Pool Ramirez, NCGRT: A comparison of deterministic and stochastic approaches for calibrating real region aquifers – Mar del Plata aquifer

Following the three presentations a panel, led by Professor Okke Batelaan (NCGRT), discussed the relative strengths and weaknesses of different modelling approaches and modelling packages, and addressed modelling questions.

## QUEENSLAND

The 2013 QLD IAH committee is made up of new and existing members who include those shown below.

### 2013 Committee:

President	Malcolm Cox	(QUT)
Vice President	Troy Cook	(WorleyParsons)
Secretary/Newsletter/State Liaison	Paul Smith	(Waste Solutions)
Treasurer/Web Champion	Mauricio Taulis	(QUT)
Committee Member	Stephanie Botha	(WorleyParsons)
Committee Member	Time Armstrong	(AGE)
Member Champion	Matthias Raiber	(QUT)

### *President's Message*

Well 2013 has been an interesting year for the IAH; one that seems to directly correspond to the changing economic times we have all been experiencing, at least one way or another. As a result of the economic downturn, and the subsequent movement of many across the sector, we have observed a general decrease in the attendance of our monthly meetings.

On a more positive note, at the beginning of the year the Qld Branch of the IAH was overwhelmed with the interest that external businesses had in becoming an IAH sponsor. We have more than doubled our sponsorship portfolio from previous years, and this has provided us the financial capability to attract national and international experts to present their work to us; including researchers associated with the 2013 William A. McElhiney and 2013 Darcy Lecture Series. We also supported the visiting NCGRT Distinguished Lecturer, and made a good video of Andrew's talk and of note his answers to questions. Moreover, members of the Queensland branch of the IAH have been actively involved in conferences across Australia. Firstly, in September at the 40th IAH Congress held in Perth, with many IAH members from Brisbane and other parts of Queensland. From QUT we had 6 postgrads presenting, as well as myself, plus Matt Raiber presenting work done while at QUT. I was also involved as Co-scientific chair helping with the very interesting task of reviewing and sorting over 400 abstracts. The Perth IAH branch did a terrific job, led by Ryan Vogwill and Jeff Turner. In October Troy Cook and I participated in the Coal Seam Gas (CSG) Water Management Conference in Brisbane, which was a useful update of the CSG industry and regulations.

So as 2013 draws to a close, we have much to reflect on to ensure that 2014 is a more successful year for the Qld Branch of the IAH. In closing I would like to thank our commercial sponsors and dedicated IAH members for your continued support. We will be having a final meeting/get together on 11 December and will send the details.

- Mal Cox

### ***Local News***

**Our regular branch meetings** continue to be held at the Queensland University of Technology (QUT) located in the Brisbane CBD. Thank you to QUT for supplying the convenient central venues, notably those for special functions.

**Dr Matthias Raiber** has resigned from the Queensland committee due to current workloads. Matthias completed his tenure as NCGRT Post-Doctoral Research Fellow at QUT, and has now taken a position as research scientist at CSIRO. He continues the collaboration with QUT research projects. Congratulations Matthias.

**Sponsorship.** As members would have heard at our IAH meetings, the QLD Branch is now accepting sponsorship for 2013. The IAH QLD sponsorship is available at a cost of:

- \$250 per year – for company logo promotion on notices of monthly meetings, which has a distribution list of around 165 members.

The advantages for sponsoring IAH QLD is that company logos, of sponsoring organisations, will be placed on promotional materials for monthly technical meetings and other special events, as well as on the IAH QLD website. In addition to the promotional materials, company sponsorships will also go towards recognising the academic achievements of students.

***John Laycock Groundwater Award*** is given by the Queensland Branch of the IAH and is aimed at inspiring final year undergraduate students in hydrogeology and groundwater investigations to consider a career in hydrogeoscience. Currently, the award is given at QUT, which offers a formal undergraduate hydrogeology subject, and John was a Visiting Scholar at QUT for several years after his retirement.

The winner of the award is selected based on the “best all round performance” in the final year subject Groundwater Systems, as selected by the IAH committee. The Award has a cash value of \$500, plus a formal certificate. In December 2012, the 4<sup>th</sup> award was presented to Mr Thomas Ambrose, a QUT double degree student in science and law. This year 2013 will be the 5<sup>th</sup> year, and the award will be presented at the end of year meeting on 11 December.

**Field-day:** In addition to the prescribed distribution of sponsorship funding, and given the recent additional support of the QLD Branch of the IAH by local organisations, we are proposing to organise a day excursion (or similar) to the greater Brisbane area, accompanied by local experts, to gain a better understanding of the geology and hydrogeology of our own neighbourhood.

If you would like to sponsor the QLD Branch of IAH, or would like to learn more of upcoming or proposed events, please send your enquiries to QLD IAH President, Malcolm Cox ([m.cox@qut.edu.au](mailto:m.cox@qut.edu.au)) or any of the committee members.

### ***Summary of Meetings for 2013***



**Tania Kennedy**



***Newcrest Mining***

**Catching the waves of change: responding to the challenge**

**13 February**

Water professionals have a real opportunity to contribute to the future of our community, as water will always have a pivotal role in wealth and health, and as a fundamental matrix for life and biodiversity. How should we position ourselves and what kinds of tools or approaches do we need to take water management forward? We can think of water management with two main counterparts: 1) our internal capacity, the base technical need of understanding of water as a phenomenon, plus knowledge, methods and capacity; and 2) our ability to interact with all stakeholders. The latter point must consider, a) our ability to translate our science to a wide audience: decision makers, stakeholders, peers and community, b) our ability to meet expectations of our audience: their needs and information relevant information. To date, water management has explored our ability and time to understand water systems, and there have been a number of initiatives to advance communication and consistency, but few are industry wide. However, we now observe an increasing expectation from the public for increased transparency and accountability,

and for communication of complex situations in simple terms. As an industry, the question becomes are we understood, and do we meet expectations and needs of our stakeholders?

For a comparison, several decades ago a lack of transparency and ethical concerns in the minerals industry reduced stock market confidence and industry trust. As a proactive response, that industry adopted an industry wide Code as a means to be consistently “understood” in resource and reserve classification and reporting. This achieved a transformational change for the mining industry and is now a benchmark in communication of the level of certainty of both minerals as a resource and as a mineable reserve. Although a radical idea, should we consider the use of consistent framework for presenting water resources, such as a “Water Resource Classification and Reporting Code (WRCRC)”.

This presentation reviews the position of water industry, drivers of change and the role of professionals operating within water management. It presents an example Code framework for water to promote dialogue and development of a view of the option it represents.

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**Kelly-Jane Wallis**



**Parsons  
Brinckerhoff,  
Brisbane**

**Nitrate leaching to the aquifer in Majorca Island (Spain).**

**13 March**

Nitrate contamination of groundwater poses a threat to human and environmental health. The Plioquaternary aquifer of the Inca-SaPobla basin (Majorca Island, Spain) was designated as a Nitrate Vulnerable Zone by the Environmental Council in the year 2000 under the Water Framework Directive. In 2009, the average nitrate concentration of groundwater was in the order of 122 mg l<sup>-1</sup> and reached up to 580 mg l<sup>-1</sup>, exceeding the maximum contaminant level of 50 mg l<sup>-1</sup> permitted by European drinking water standards.

In this investigation, a field scale numerical model was calibrated and validated for water movement and solute concentration and was up scaled to a regional scale within a GIS environment. Spatial databases were incorporated dealing with land use

and management, soil type, irrigation water and meteorological conditions. Watershed simulations were run to show the impacts from different environmental and management option scenarios and the best management practices to reduce groundwater contamination were identified. Nitrogen transport below the root zone was found to be significantly increased by frost prevention irrigation, by as much as 318%.

**Prof. Andrew Boulton**



**Adjunct Professor:  
University of New  
England**

**Deeper meanings? Integrating river ecology and groundwater linkages** - *2013 Distinguished Lecturer Series – National Centre for Groundwater Research and Training (NCGRT)*

**24 April**

Professor Andrew Boulton is an Adjunct Professor at the University of New England and has worked on river and groundwater ecology for over 25 years in Australia, New Zealand, France and the United States. He has co-written two textbooks on freshwater ecology and over 120 peer-reviewed papers, many of which have been heavily cited.

Professor Boulton presented part of his research on the natural and anthropogenic effects caused to the surface water-groundwater system; with particular emphasis on the long-term implications to 'river health' and ecological processes.

**Dr John Jansen**



**Principal  
Hydrogeologist  
Cardno ENTRIX, USA**

**Keeping the Pump Primed: Aquifer Sustainability** - *2013 William A. McElhiney Distinguished Lecture Series in Water Well Technology of the US National Ground Water Research and Educational Foundation (NGWREF)*

**26 June**

Dr John Jansen, a Principal Hydrogeologist at Cardno ENTRIX (USA), author and originator of well-related technologies, works on a wide variety of groundwater projects around the USA, specialising in high-capacity wells and groundwater resource management. Formerly a partner in a Denver-based water rights company and the chief geoscientist for an international drilling company, he has broad experience in well construction and maintenance, as well as water rights issues.

Dr Jansen presented US-based case studies concerning groundwater resources and management. Highlighting the need for “sustainability” of groundwater resources for future use, Dr Jansen emphasised the need for groundwater contractors and scientists to confront the economic and governmental challenges affecting these resources and the need for sound information to support decision-making for regulators and policymakers.

**Prof. David Rudolph**



**University of  
Waterloo, Canada**

**Managing Groundwater Beneath the Agricultural Landscape - 2013 Darcy Lecture Series in Groundwater Science of the US National Ground Water Research and Educational Foundation (NGWREF-NGWA)**

**2 September**

Professor Rudolph is a geological engineer, a professor in the Department of Earth and Environmental Sciences and cross-appointed to the Department of Civil and Environmental Engineering at the University of Waterloo. He specialises and teaches in the areas of regional hydrogeology and groundwater protection and management. His areas of research activity include field investigation and numerical modeling related to groundwater flow and contaminant transport with a focus on regional groundwater flow systems, recharge dynamics, and vadose zone processes.

Professor Rudolph presented some of his work on the potential influence of extreme climatic variability on the mobility of nutrients and microbial species in agricultural environments in relation to aquifer and well vulnerability.

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***Conferences and Meetings***

**IAH 2013. Solving the Groundwater Challenges: 15-20 September  
Perth, Western Australia**

A very successful international conference with around 725 delegates, and well represented by Queenslanders, both as attendees and as presenters of talks and posters. Not surprisingly some of the well-attended sessions were in

the last 2 days and related to sedimentary basins hydrogeology and the relation to resources, including CSG.

The full congress program can be found here:

<http://iahcongress2013.org/program.php>

The comprehensive proceedings contains abstracts of orals and posters.

**Coal Seam Gas (CSG) Water Management: 15-16 October  
Brisbane, Queensland: Stamford Plaza**

This conference was aimed at presenting compliance for CSG water management, understanding the need for, and getting baseline information accurate, and presenting the latest research in CSG water management (e.g. beneficial use). For more information please see the brochure: <http://csg-water.com/wp-content/uploads/sites/17/2013/09/brochure.pdf>

The following lists the presentations held on each day:

***Tuesday 15 October:***

Morning Chair

**Malcolm Cox, QUT –President, International Association of Hydrogeologists (Qld Branch)**

Recent regulatory changes to construction & abandonment of CGS wells and bores in QLD

Dr Bernie Prendergast, *Team Leader Groundwater*,  
Department of Natural Resources and Mines (DNRM) QLD

CSG water legislation and regulation in NSW

Carmen Dwyer, *Special Project Manager –CSG*, NSW EPA

Assessing the benefits of local land-holder monitoring networks

Ross Carruthers,

*Principal Project Officer (Groundwater Investigation and Assessment Team) – CSG Compliance Unit*,

Department of Natural Resources and Mines (DNRM) QLD

Assessing quality of data for CSG water management

Graeme Millar, *Professor*, Queensland University of Technology (QUT)

**Afternoon Chair**

Dr Troy Cook, *Principal Hydrogeologist – ANZ Northern Operations*,  
WorleyParsons

& *Vice President*, International Association of Hydrogeologists (Qld Branch)

Ensuring highest standards of community engagement

Vol Norris, *Lake Eyre Basin Facilitator*, Department of Sustainability,  
Environment, Water, Populations and Communities (DSEWPaC)

Engaging in the community conversation on gas exploration  
Richard Holliday, *Commercial Manager*, Icon Energy

Measuring cumulative impacts for CSG/associated water  
Dr Sue Vink, *Principal Research Fellow*, Centre for Water in the Minerals Industry (CWIMI)

CASE STUDY: Targeted land evaluation for CSG water irrigation development  
Dr Glenn Dale, *Managing Director and Chief Technical Officer*, CSG Water Management

**Wednesday 16 October, 2013**

**Morning Chair:**

Peter Henderson, *Managing Director and CEO*, METGASCO

Exploring beneficial uses of CSG water  
Prof Steven Raine, *Commissioner*, GASFIELDS COMMISSION QUEENSLAND

Exploring emerging policies ensuring the safe management of salt and contaminated water produced through coal seam gas activities  
Paul Pendlebury, *Director – Water Systems*, NSW Office of Water, Department of Primary Industries

Management and assessment of potential surface water contamination  
Prof Heather Chapman, *Program Leader, Health and Environment*, Smart Water Research Centre

Gathering and monitoring data for your project  
Iain Hair, *Principal Hydrogeologist*, Douglas Partners

Exploring three-dimensional geological models to constrain groundwater flow and hydro chemical evolution in the Walloon Coal Measures of the Surat and Clarence-Moreton basins  
Dr Matthias Raiber, *Geologist and Hydrogeologist*, CSIRO Land and Water

Use of hydro-geochemistry and isotope hydrology to assess interactions between bedrock- and alluvial aquifers in the upper Condamine valley, southeast Queensland  
Des Owen, *Research Specialist*, Queensland University of Technology (QUT)

Conducting trials on reinjected water  
Julian Long, *Water Solutions Development Manager*, Origin Energy

Looking at water treatment assets – the past, present and future  
Scott Chalmers, *Regional Manager QLD*, OSMOFLO

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Sydney NSW 2000 Tel: 02 9279 2222, [www.resourcefulevents.com](http://www.resourcefulevents.com)  
Email [info@resourcefulevents.com](mailto:info@resourcefulevents.com)

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## TASMANIA

*No update available in this edition.*

## NATIONAL CONFERENCES AND EVENTS

### ***Australian Earth Sciences Convention 2014***

<http://www.aesc2014.gsa.org.au/>

The Geological Society of Australia invites you to participate in the Australian Earth Sciences Convention 2014 in Newcastle.

AESC 2014 will be held from **7-10 July 2014** in Newcastle, a vibrant port city that is characterised by its working harbour, beautiful surf beaches and proximity to many of Australia's most prestigious wineries. It is the gateway to the Hunter Valley – heart of the Sydney Basin coalfields, centre of power generation for New South Wales, and home of the NSW Institute for Frontier Geoscience, a joint initiative of the University of Newcastle and the NSW Department of Trade and Investment. Combined with the city's focus on energy efficiency via the Federal Government's Smart Grid, Smart City initiative and the CSIRO Energy Centre, Newcastle is an ideal site for our convention – ***Sustainable Australia***.

The convention will be based around the themes of energy, basin geology, geodynamics, resources the environment, the geological record of life, and the role of the Earth Sciences in the community. Dedicated symposia include the 39th Symposium on the Advances in the Study of the Sydney Basin and Comparisons & Contrasts in Circum-Pacific Orogens.

The IAH is supporting this event, and the scientific program includes groundwater-related topics under the Environment and Energy themes. IAH members are strongly encouraged to submit abstracts.

The call for abstracts is open until 14 March 2014. Further details can be found here: <http://www.aesc2014.gsa.org.au/call-for-abstracts/>

### ***Bureau of Meteorology Groundwater Products***

The Bureau of Meteorology produces several national groundwater products, such as the National Groundwater Information System and the Groundwater Dependent Ecosystems Atlas, which are freely available from the [Bureau's website](#).

The Bureau is setting up a groundwater mailing list that will be used to send out occasional emails when new and updated groundwater products are released.

You can register to receive these regular updates by completing this [subscription form](#). Once you have subscribed you can [manage your subscription](#) or [unsubscribe](#) at any time. Please refer to the Bureau's [Privacy Statement](#) on how personal information is managed.

### ***Launch of the TWAP Groundwater Component Website***

The website for the groundwater component of the GEF Transboundary Waters Assessment Programme (TWAP) is now operative. The web site address is:

[www.twap.isarm.org](http://www.twap.isarm.org)

The TWAP project, funded by the Global Environment Facility (GEF) is aimed at conducting a global assessment of the status of five transboundary water systems, namely: transboundary aquifers, lakes/reservoirs, river basins, large marine ecosystems (LMEs), and the open ocean. Small Islands Developing States (SIDS) groundwater systems have also been included in the assessment scope, given their central importance and vulnerability.

UNESCO-IHP has been entrusted with the execution of the groundwater component of TWAP, namely the global assessment of Transboundary Aquifers (TBAs) and SIDS groundwater systems. The assessment will be carried out in close cooperation with a network partners at international, regional and national level.

The website aims to be the main portal of the TWAP Groundwater Component and it is addressed at all those interested in the progress of its implementation as well as those that would like to contribute to it.

### ***Groundwater Scholarship Open to Indigenous Students***

Indigenous students who want to care for their country and community are encouraged to apply for a valuable training scholarship to boost research into South Australia's groundwater resources.

The scholarship is run as a partnership between the South Australian Department of Environment, Water and Natural Resources along with the National Centre for Groundwater Research and Training, and Flinders University. It offers the chance to study a groundwater qualification and receive paid work experience, mentorship and graduate employment.

Potentially worth around \$90,000 over three years, this scholarship offers a unique opportunity for indigenous people to fast track a career in earth science and groundwater research.

For more information or to apply, visit [http://www.environment.sa.gov.au/get-involved/Working\\_at\\_DEWNR/scholarships](http://www.environment.sa.gov.au/get-involved/Working_at_DEWNR/scholarships)

## **IAH PUBLICATIONS**

Discounted IAH publications in the 'International Contributions to Hydrogeology' and the 'Selected Papers' series can be ordered by Australian IAH members directly from Macmillan Publishers Australia in Victoria.

[customer.service@macmillan.com.au](mailto:customer.service@macmillan.com.au) or [orders@macmillan.com.au](mailto:orders@macmillan.com.au)

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[secretariat@iah.org.au](mailto:secretariat@iah.org.au)