Australasian Hydrographer

June 2014

Gauging Snowy River environmental water releases.
(Photograph courtesy of Mic Clayton).

AUSTRALIAN HYDROGRAPHERS ASSOCIATION

AHA

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FRANK DAVIES

Editor's Introduction

Yes, it has been quite some time since the last AHA journal. I had hoped that by this stage someone would have taken the opportunity to carry on the editor's role so that I could assist with the handover. Although I am still an employee of the WA Department of Water, I have been on long-term leave since last July. But this will soon end along with my working life as a hydrographer. As I suggested in the request for journal contributions, my thoughts are drifting quickly from hydrography to those typical "retiree" matters such as home maintenance, travel, and a little bit of golf thrown in. Well, perhaps more than just a little bit of golf. So, without any hydrographic interaction, it is becoming increasingly difficult to edit the journal content. If you are tempted to take on this position, be assured that I will be available to help you transition in.

In this issue we have two personal hydrographic profiles. These AHA members also happen to be part of the convening committee for this year's AHA conference. We intend to provide these member profiles as a regular journal feature, introducing you to a range of people in the industry. If you would like to have someone profiled, please forward your suggestion. I hope, like me, that you find them interesting.

Preparations for the AHA conference consume a lot of time for the convenors as well as the AHA Committee, with some members represented on both. Apart from this, some of the AHA Committee have had personal matters to deal with; Bill Steen has recently had a hip replacement; Krystal Hoult had a change of employment in January, and Grant Robinson retired last July. Despite this additional load, the committee continues to address a range of issues, some of which are alluded to in the Chairman's address.

This journal also has an update on hydrographic qualifications, an insight into the AHA ratings training course, a story on some "hands-on" hydrography in WA, a request for a home for an instrumentation museum collection, a bit of Chinese hydrography, a suggestion for a new standard for hydrographic work in sewers, and a chance hydrographic holidaying encounter.

Thank you to all journal contributors.

BILL STEEN

Chairman's Address

Over the past seven years the Association has been pondering what will happen after the boom of the financial injection of money into the hydrographic industry. Well in one respect we don't have to question this anymore as it's a reality; the bubble has burst.

Many state lead water agencies have been feeling the pressure for the past 5 or 6 years whilst others have literally just kept their heads above water, no pun intended. But the reality is that the industry is now facing a catastrophic downturn, and you the members will know firsthand the headaches that the restructuring, staff redundancies, and budget restraints are causing.

What is the impact? I think many of the senior hydrographers would remember similar times in the 1980s. From my recollection the 80s saw approximately 40%+ of the Queensland network closed, entire monitoring regions in Western Australia were closed, then experienced record flooding but no data collected! The Northern Territory also closed over 100+ gauging stations and reduced staff numbers. And, these are just a few memories.

But the 1980s didn't just see staff redundancies or network closures; we also witnessed the demise of the Australian Water Resources Council (AWRC). For those unfamiliar with the AWRC it was formed back in 1964 to administer the Water Research Fund from the Menzies Commonwealth Government. This research program was aimed at improving the efficiency of water management in Australia by complementing research already being undertaken by other agencies.

In 1964, in response to a perceived lack of water resources data in all States, the Commonwealth Government instituted, through the AWRC, the National Water Resources Assessment Program. The original aim was to expand the stream gauging network in Australia and increase the level of groundwater knowledge. In 1976, the collection of water quality data was added to the program.

One of the ongoing benefits of the AWRC was the birth of the AHA, evolving out of the technical group meetings related to activities of the AWRC. Hydrographers were involved in the AWRC technical committees on data collection and instrumentation (just to name a couple) and many shared the common belief that collecting the best quality water data enabled the production of high quality water information which would then feed into informed decisions for Australia's water resources.

But all good things must come to an end, and in the 1980s the government at the time dismantled the AWRC and by 1987 all AWRC commonwealth funding had ceased.

Sound familiar!

It is now 27 years later and most of us would say "so what has changed". We have just experienced the Water Act 2007 and the Modernisation and Extension of Hydrologic Monitoring Systems Program administered by the Bureau of Meteorology.

One of the first initiatives was the formation of the Jurisdictional Reference Group on Water Information (JRGWI). JRGWI is the primary vehicle for coordinating the Bureau's water information activities with those of the States and Territories. Comprising representatives from the lead water agencies in each jurisdiction, the Reference Group provides a forum for members to articulate water information priorities and provide feedback to the Bureau on its various water information products and services.

Then followed the funding from the Modernisation and Extension program, which was invaluable. In line with the funding, was the formation of the Water Information Standards Business Forum (WISBF). Similar in ways to the AWRC, WISBF, chaired by the Bureau, provided an avenue for the water industry to coordinate and foster the development of water information standards and guidelines in Australia.

The AHA was heavily represented on WISBF and this forum produced some great outcomes including the national endorsement of industry guidelines on; Hydrometric monitoring guidelines, Hydrographic training, and ADCP guidelines, to name a few. There are several guidelines still under construction such as groundwater monitoring and water quality metadata.

However all good stories have a twist.

Due to the current financial environment the Bureau has been forced to no longer provide the Secretariat work to administer WISBF. The Bureau can however assist with the maintenance, review and publication of existing guidelines but cannot provide the staff and resources to continue the WISBF. JRGWI however is still operating.

So where does that leave us – people at the coal face that rely on the guidelines to ensure the information we collect is "fit for purpose" and the ongoing need to develop, maintain and review guidelines as needed.

To me personally this is a huge blow to the industry. JRGWI and WISBF, for the first time since AWRC, brought the industry together. Agencies were now communicating and working together more openly with common goals being set and achieved. It was refreshing to see the communication and collaboration these two forums provided.

So now the industry faces another major hurdle, the amount of work and potential ongoing activities to ensure the current and future guidelines are addressed the industry needs to ensure the continuation of WISBF.

At this early stage the AHA is putting its hand up to do whatever we can do within the restraints of the AHA to continue the work of WISBF, however we will need agency support both in kind and financially. The AHA committee will now consider the options and keep members informed and would welcome your feedback and ideas on how the AHA should address this need.

We look forward to the support your agency or company can offer the AHA in regards to ensuring the ongoing success of WISBF.

AHA 2014 Conference

Natalie Noakes, Conference Convenors Chair and
Grant Robinson, AHA Publicity Officer

In 2014, New South Wales is proud to be hosting the 17th Australian Hydrographers Association (AHA) biennial Conference at ANZ Stadium on 28 - 31 October.

The theme for the 2014 conference is "Hydrography from the ground up". There will be three major sessions during the conference:

1. Hydrography underground: Groundwater, Soil Moisture, Coal-Seam Gas, etc.
2. Hydrography above ground: From the mountains to the sea and everything in-between
3. Breaking ground in hydrography: The new and emerging areas of hydrography.

The overall theme was chosen to allow exploration of the depth and breadth of all aspects of the water industry and the involvement of the Hydrographic profession in the monitoring and management of natural resources.

Keynote speakers in 2014 include:
Dr Greg Allen, Manager of Corporate Strategy from Sydney Water,
Dr Peter Cook from Flinders University on groundwater interaction with rivers, and
Anthony Baxter from Google on new methods of data visualisation.

The AHA conference draws over 200 participants from every major water agency in Australia whilst also attracting international keynote speakers and participants for a welcome evening, two day conference and a one day field trip.

The Platinum sponsor for this conference is the Bureau of Meteorology, supported by many other high profile organisations including Kisters, Campbell Scientific, Hydrological Services Pty Ltd, Unidata and UVS. Over 20 major exhibitors representing both national and international companies support the conference with trade booths displaying a range of hydrometric instruments, software and services.

A highlight of AHA 2014 will be the field trip; a cruise starting near the venue, travelling down Parramatta River into Sydney Harbour and a visit to Fort Denison (the oldest continuous tidal gauge in Australia) and Sydney Institute of Marine Science at Chowder Bay near Mosman.

Registration will open soon and you are encouraged to book accommodation at the same time to avoid missing out on staying near the event venue.

AHA Training and Qualifications Update

Paul Langshaw
AHA National Training Coordinator

AHA training has had another successful year, providing face to face delivery of the Hydrography Basics Skill Set and the Develop and Maintain Ratings (NWP510A) course. This has resulted in over 300 students gaining the Skill Set qualification over the past five years and by end of June, in excess of 65 students will have gained the Ratings qualification.

As well as delivering training, the AHA and BoM set up a Technical Reference Group (TRG) to operate under the terms of the BoM Guidelines for Training. This TRG consisted of members from most states and territories and from both public and private sectors.

Over the past year, the TRG activities have been concentrated on working with the National Skills Council (Government Skills Australia – GSA) to "streamline" or review the National Water Industry Training Package (NWP) specific to Hydrography.

GSA selected Hydrography to lead the way in this project as it believed that through the AHA's Certification and Training programs it was best structured to be successfully "streamlined".

GSA has now completed the "streamlining" project of the entire NWP and is preparing the new version for endorsement. GSA expects this process to take around nine months.

The main outcomes that affect Hydrography are:
- The Hydrography Basics Skill Set to be recognised and included in the NWP
- A defined pathway of qualifications for hydrographers i.e.
    - Cert III
    - Cert IV
    - Cert V (diploma)

Until the new version of NWP is endorsed, the current Diploma continues to be the recognised qualification for Hydrographers.

In the near future, the AHA will be offering the Diploma course through Canberra Institute of Technology (CIT).

I will be providing more information on this after June this year.

The AHA continues to offer face to face delivery of accredited courses in:
- Hydrography Basics (4.5 days)
- Develop and Maintain Ratings NWP510A (2.5 days)
- Apply Principles of Hydraulics to Pipe & Cannel Flow NWP508A (2.5 days)

The NSW Office of Water has embraced the "Ratings" face to face course by enrolling most of its staff.

To highlight the success of this course Richard Hillhouse has written the following article.

On another note, you may also be interested in this recent WIN news article on some of the training that we have been conducting http://www.aha.net.au/news/hydrographic-basics-on-tv/

Face-to-Face AHA Ratings Training

Richard Hillhouse
NSW Office of Water

The need for ratings training

The Stage-Discharge relationship is arguably the core business of hydrographers. Most of the tasks we undertake – gaugings, surveys, collecting level data – eventually feed in to a rating curve to produce the item that our clients want; flow data. Consequently, a poor rating will undermine all our good work or a good rating will add significant value to the data we collect in the field.

The dynamic nature of stream flows, together with the variety of inputs needed to produce a rating, can make rating development seem complex and daunting. Similarly, it can be difficult for hydrographers to develop expertise and confidence from purely theoretical instruction.

In response to this, and with encouragement from industry, the AHA developed a ratings training course that is delivered to small groups, face-to-face, over two and a half days. This allows participants to develop competence and confidence using real scenarios, interaction with colleagues, personal attention from trainers and lots of opportunity for practice.

Three courses have been delivered in Sydney so far, training more than 45 hydrographers from the BOM, NSW Office of Water and commercial operators. A fourth course is scheduled for the middle of June.

What does the course cover?

The objective of the training is NOT to simply tell participants about ratings. Instead, it aims to provide a solid understanding of the theories and principles that underpin rating curve development and management. Then, building on this foundational knowledge, it strives to leave participants feeling confident to choose and use a variety of methods to create, maintain and extrapolate ratings.

Some of the content covered includes control and channel characteristics, survey requirements, error detection, creating ratings, changing ratings and extending ratings. Practical exercises are conducted throughout the course, culminating in the completion of real scenarios on the final day that leave participants ready to apply their knowledge and skills in their own workplace.

What have the participants said?

“Overall the course was good - informative, easy learning, open forum, comfortable format.”

“I got a lot from the AHA Ratings course. I enjoyed the course from start to finish (yes, I enjoyed it!). There were parts that were completely new to me and parts that refreshed prior knowledge. The format worked very well: a nice combination of theory with working practice anecdotes and examples, working through to guided practicals. All aspects of the course were very relevant to our work and provided a nice networking opportunity that should be refreshed on a regular basis.”

“I have completed both the diploma and the face to face training and while the diploma unit was good I got more out of the face to face training as it set the training for the level of the participants and therefore we could go into a lot more relevant information. By focussing on the relevant information the group was more interested in the material and learnt a lot more from it. An example of the differences is that the diploma covered the normal operations for hydrographic staff in developing ratings whereas the face to face expanded more into the theory behind rating extensions and the like.”

"I went into the course with very limited ratings experience and was worried about keeping up with the content that more senior hydrographers may have wanted. I found that the classroom / face to face course was very beneficial as the room contained all levels of experience, and not only did we get the trainers input we also got a lot of input from the trainees. Whenever anyone was having difficulties, the trainers would stay on subject until we understood. I left the course with far more confidence in working on ratings, especially on the subject of theoretical ratings, and the reasoning and validations for changing ratings."

*"It was a good opportunity to not only learn more about rating processes but also to chat with other Hydrographers to get an understanding of different situations/sites that others are maintaining. It was good to learn (again) about different methods to determine high stage extensions using the Area*Velocity, Steven's and Manning's methods. I was shown Manning's years ago by my old boss, but as the years have passed and the lack of using it, it was like learning it all again. With the install of new sites in recent years, it will be good to use this training to produce these high stage theoretical ratings."*

Want to know more?

Successful participants receive a nationally recognised Statement of Attainment for *"NWP510A – Develop and Maintain Ratings"*, one of the Units of Competency required for completion of *NWP50107 – Diploma of Water Operations*. For more information about the AHA Ratings course, see the AHA website or email training [at] aha.net.au

Participants and trainers from the first AHA Ratings course, June 2013

Goodbye Steadmans, Hello Meedo Pool

Phil Correll and Mighel Chivilo
Department of Water WA

The Wooramel River is located just over 120 km south of Carnarvon on the west coast of WA and feeds into Shark Bay. 703002 Steadmans is a secondary gauging station on the Wooramel, opened in 1993 and situated on the North West Coastal Highway. The primary station for the Wooramel is 703001 Meedo Pool, roughly 90 km upstream. This was opened in 1973 but mothballed in 2002 as part of an overall network reduction. It was most likely chosen for closure over Steadmans due to access issues in the wet. It has long been recognised that Steadmans was ineffective for flood warning purposes for highway closures and that flow data from the site was poor. In high flows the main channel is overtopped and overflow occurs in shallow braided channels in a floodplain 10 km wide; impossible to gauge and difficult to model. Meedo provides both early flood warning and high flows are contained within the main channel allowing a reasonable rating to be developed. A 2013 rating review revealed that the purpose of Steadmans was to provide data to support a proposed horticultural development in the area which never eventuated. Having served its purpose, Steadmans' fate was sealed and Meedo Pool was to be reinstated.

We had been very lucky to have Simon Pinnington in Carnarvon for 12 months, and we wanted to complete the re-opening of Meedo before he left for the cooler climes of home in the South West. Simon was within a relatively easy drive of Meedo to make a full investigation of what was required to get it up and running again, and to order all the required instrumentation and hardware.

On site investigations and reference to the history file revealed that the upstream slope station was the more suitable site as it was situated upstream of a sealed concrete/rock road crossing. This gave a stable CTF/low flow control and allowed the orifice to be raised above the unstable sand bed with associated siltation issues typical of north west WA rivers; issues that were evident at the original downstream site. Fortunately, both stations had been run simultaneously through enough flow events for a stage to stage relationship to be developed to allow a historical rating curve data to be applied to the new site. Reinstatement of the upstream site involved installing a complete new 50+ metre bubble line with galvanized conduit, pluviometer and new instrumentation in the existing shed.

This was a challenging, interesting, and fun task for four intrepid hydrographers, with two nights sleeping under the stars thrown in. That is, it would have been fun if we had been there in July. But due to supply delays and staff leave commitments, the Mid-West Gascoyne crew didn't arrive on site at Meedo until early December. So tasks like carting around bags of concrete, digging trenches and wiring up equipment in an un-ventilated shed were completed in 40+ degree temperatures with the company of legions of flies, which was not ideal. But we did not complain (much) and after three days including travel, Meedo was back on the system and reporting to Hydstra. Luckily, the job went extremely smoothly, because the consensus after day three was *"We are not spending another night in this hell hole."*

Instrument shelter and pluviometer

Installing the bubble line

It's not often the opportunity comes up to re-open or install a new gauging station in our region, so we were very happy for the chance to work at Meedo Pool. And we were extremely satisfied to see river flows and rainfall reporting from the station to the internet and Hydstra, and eternally grateful for Simon's decision to come and help us out for a year.

AHA Member Profile - John Hayes

Describe your current role?

I like to think of myself as a HydroInformaticist. My areas of expertise range widely but generally have a connecting water/natural resources data and computing theme. Hence the HydroInformaticist tag from hydro – "from Ancient Greek (*hudōr*, "water")" and informatics – "the interactions of natural and artificial systems which store, process, access, and communicate information and…. the interaction between humans and information systems".

I am currently the Manager of the Water Information Systems Unit for the NSW Office of Water (NOW). My small team and I manage all the water data software (five major database applications) and hardware systems (some 27 servers, 50 Terabytes of storage and two major communications systems) for NOW. The system handles over 1,300,000 data points a day (and growing) and we make this data available through three web sites, three mobile web sites and two apps. As well, we publish two data DVDs and operate an SMS system and a web service. The team also works closely with field hydrographers, external data suppliers and all the data clients both internal and external, so we are fairly busy.

What hydrographic or other qualifications - relevant to your role - do you have?

I'm a firm believer that not only qualifications but experience is crucial for a successful hydrographic career.

My qualifications include an Honours Civil Engineering degree from UNSW, a Masters degree in Engineering Science majoring in Hydrology, and another Masters degree in Commerce majoring in Information Systems also from UNSW (Oh, the beauty of being old enough to have had free university education).

As for experience, my first job was in a Hydrology Unit of the then NSW Water Resources Commission. I worked there for 10 years as a data user undertaking a range of hydrologic and hydraulic analysis and modelling jobs. For another decade or so I was in the data processing/management area, initially as the project manager for the installation of the original Hydsys system on a Fujitsu mainframe computer. Then, after several years in the Hydrometric TQM/QA area looking at the full range of hydrometric field and office activities, I returned to the data and application system support area where I have remained as a data/system manager in various guises ever since.

What are your major achievements?

My major achievement would be the development and extension of the various water data collection and management systems within NOW to be where we are today with one of the largest data collection, archival and dissemination systems in Australia. With the assistance of many of my colleagues in NOW and other agencies I've also been instrumental in the development and implementation of many important components and tools in the Hydstra software suite. Recent major achievements would include the developments of Hydstra Web and Mobile components and most recently the development of NOW's IOS and Android Real Time Data apps.

Where has hydrography taken you in the world?

I have been fortunate enough to have had opportunities to work overseas for short and extended periods in several countries. These include Cambodia, Indonesia, Malaysia (Sarawak), Mauritius, Sri Lanka, UK and Vietnam, where I undertook various water monitoring, and water data management and dissemination and project management roles. It's interesting to see that the issues that we face are so similar around the world; it's just that we are at different stages on the hydrographic path.

How did your career related to hydrography commence?

It started at University. I've always had an affinity for water and I was a fan of the course on Numerical Approximations or "near enough is good enough" as it was known. This is where there was no exact answer to a problem but you iteratively built on previous answers to get closer to the truth. So of the various options open to a civil engineer I was most attracted to the idea that there is still a degree of this "art" in the water industry in general and in hydrology and hydrography in particular. I liked the idea that experience, skill and knowledge could still play an important part in generating answers and solutions.

Was there anyone who had a major influence on your career?

An old manager and my current boss have both influenced my career significantly. I have been encouraged by their willingness to listen to my ideas and, generally, to support them as well. I have also learnt from their different approaches to management, the need for looking outside of my silo, and considering the "bigger" picture.

What has been the most memorable experience in your career?

Because I'm largely a desk jockey, most of my memorable career experiences relate to my work overseas where I have had more opportunity to get out into the field. Some examples include my time in the peat swamps of Sarawak on tributaries of the Rajang or where, in combination with my travels, my career has enabled me to see, boat on, swim in and measure, most parts of the Mekong River from its origins in Tibet Plateau, through the gorge country in China, then as it starts to widen in Laos and Thailand past the Great lake in Cambodia (Ton Le Sap) and finally to the delta in Vietnam.

What makes hydrography interesting?

There are a number of elements to this. I've always liked water and activities on water from paddling, to body surfing, to white water rafting. I think that the job that I have is important and that the data side of the hydrography profession is undervalued (which I'm trying to change). I also like the idea that hydrography is not black and white (Is it …50 Shades of Blue perhaps?). While there is science and computers in hydrography today and it is possible to have lots of decimal points, there is still a real need to be able to apply your knowledge and experience to select the best way of getting the most correct answer.

What do you do when you are not at work?

To run a RealTime data capture and delivery system means being on call 24/7. To some extent that means that I'm always at work, although this really only comes into play during flood events. As for the rest of the time my young daughter, and her sporting and scholastic activities, seems to keep me fairly busy and there's always something to be done around the house (not that they necessarily get done). I'm also a member of Ryde SES and get a chance to get away from the desk and climb a roof or cut down a tree every so often.

Where do you see hydrography in 50 years?

We are already seeing the move away from the traditional approach to hydrography that is associated with resource determination to the real-time world associated with resource operation and management. However I don't believe that we've seen the full impacts of this on the profession yet. I've also been reading about the march of robotics and technology and its possible impact on many areas of the workforce in the future. I'm hopeful that the art of hydrography can be retained and along with it, the acknowledgment of the value of a person's skills and experience acquired over time and that we will still be able to get our feet wet even 50 years in the future.

AHA Member Profile - Tony Polchleb

Describe your current role?

I am currently Manager of Hydrometric Services' Instrumentation and Special Projects group at Sydney Water where I manage multidisciplinary teams and specialists with diverse skills providing hydrometric, bathymetric, scientific, environmental measurement, instrūmentation, technical audit and related services to Sydney Water stakeholders and external clients.

What hydrographic or other qualifications - relevant to your role - do you have?

I completed the Hydrography Certificate in 1975; Business of Management UniNSW; Rogen Australia Project Management, Frontline Management and other various training over the years.

What are your major achievements?

I have actively contributed to the development of the nationally accepted series of ten *National Industry Guidelines for Hydrometric Monitoring* and more recently the National Training Package for Hydrographers working closely with water agencies across Australia and with Government Skills Australia. Whilst I have enjoyed the development and implementation of new and improved technologies over the years, I am more excited about the guaranteed future of the hydrographic industry with new and emerging technologies and the high calibre and qualifications of our newly trained generation 'Y' hydrographers.

Where has hydrography taken you in the world?

I have worked in remote area and urban catchments, managing hydrometric operations and special projects in Sydney Catchment Area, Melbourne, Newcastle, Lismore, Gold Coast, New Zealand and Fiji whilst working in Sydney Water and in its commercial trading arm, Australian Water Technologies Pty Ltd.

How did your career related to hydrography commence?

I started in the Water Board in Sydney as an Assistant Hydrographer. With additional studies, I progressed through various roles to Hydrographer, Senior Hydrographer, Project Manager and Manager. I now have over 40 years of experience in all facets of the hydrographic industry.

Was there anyone who had a major influence on your career?

I was trained and mentored by Alex Miller. Others that had a major influence on my career were those early hydrographers, many of whom came from overseas to work on the Snowy Mountains Scheme and trained in hydrography by Snowy Mountains Engineering Corporation (the "Snowy Course") namely Jurgis Janavicius, Milos Stefanek, Alex Vesic, Alex Smallwood and Les Asmus.

What has been the most memorable experience in your career?

There are too many to highlight only one. Some highlights include working on the Upper Nepean River water quantity and quality studies in developing urban catchments in the 1980s; the Sydney Special Environment Programs in the Hawkesbury Nepean Basin in the 1990s with $1M funding in six months for new and improved river, water quality and rainfall gauging stations, many in remote helicopter-access only wilderness areas of NSW; the introduction of wireless,

boat and current meter gauging methods gauging the full hydrograph and peak flood of 9,800 m^3/s or 840,000 ML/d in a 140 metre wide flooded river, eight metres deep on the Nepean River Penrith in 1990; gauging the Warragamba Gorge, downstream of the Dam; implementation of a Quality Assurance system in 1994; the introduction and implementation of new generation data loggers with FTP push telemetry in the early 2000s; managing the bathymetric silt profile, water quality and velocity surveys of many lakes, dams, ponds and rivers including the Yarra, Patterson and Maribyrnong Rivers in Melbourne, 300 kilometres Hawkesbury-Nepean River System, Lake Burragorang, Chichester Dam, Prospect Reservoir, Parramatta River, Lane Cove River, Sydney Harbour, Georges River, Cooks River and Botany Bay.

What makes hydrography interesting?

It generally requires a huge variety of skills and different technologies all combined and used in challenging conditions and varied locations.

What do you do when you are not at work?

I like spending time on renovating and home improvements in between the odd days of fishing in Botany Bay, long walks, researching or reading on the web, photographing unusual weather events and taking short holidays to other locations within Australia.

Where do you see hydrography in 50 years?

Hydrographers 50 years down the track will probably use the new Google Tactile Sensory System (GTSS) which will allow users to operate many more sites and still enjoy the 'field trip' by swiftly 'pseudo flying' to their job whilst enjoying the scenery along the way. They will be able to visually inspect and 'feel' local site conditions at close range, verify multiple parameter measurements, initiate maintenance activities, view and record three dimensional images of local observations, immediately verify all historical and real time data streaming using carefully controlled, computerised, robotic and sensory systems ... *all without actually leaving home.*

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The Bureau will release more new products and updates throughout 2014. Subscribe to our email updates at **http://bom.is/enviro-news** to stay informed.

Hydrographic Memorabilia Home Required

John Cameron
Department of Environment and Primary Industries, Victoria

Hydrological monitoring is undergoing rapid evolution worldwide. The last decade has delivered a paradigm shift in environmental monitoring technologies, standards and best practises. None more so than here in Australia.

Between 2008 and 2011 the Bureau of Meteorology's Modernisation and Extension of Hydrologic Systems Program provided the impetus for Victoria to replace and upgrade much of its antiquated analogue water monitoring instrumentation. Consequently, a large number of analogue instruments representing early hydrographic practises within Australia were collected. Most are chart recorders but there is also a small number of level sensing devices etc. in the collection. Many of these instruments will disappear from the hydrographic landscape forever unless a deliberate effort is made to preserve them.

Whilst they provide tangible and nostalgic memories for an individual, they might be better appreciated in a public exhibition of some kind.

The instruments are in original condition and include:

Leupold and Stevens A35 QAC recorder
Leupold and Stevens A71 QAC recorder
Hydrologic Services Aus1 QAC recorder

Leupold and Stevens A35 Water level recorder (Weight driven)
Leupold and Stevens A35 Water level recorder (Battery driven)
Leupold and Stevens A71 Water level recorder (Spring driven)
Hydrologic Services Aus1 Water level recorder (Spring driven)
Leupold and Stevens F Type Water level recorder (Spring driven)
Bristol drum chart recorder (Spring Driven)

Hydrologic Services DP15 (early version)
Hydrologic Services DP20
Stacom Monometer Servo

Rimco gas heated tilting bucket rain gauge
Hydrologic Services HS1 rain gauge

Stevens Telemark (1965) older style
Stevens Telemark (1976)

Barker Current meter
Digital Planimeter
Stereoscopic map reader
Stevens Quartz multi-speed timer
Sundry components and parts for the above items.

As I will shortly be moving interstate I would appreciate any (polite) suggestions about a permanent location for these items.

I can be contacted on 0458 391 907 or at john.cameron03 [at] gmail.com

A Hydrographer on the Yangtze

Martin Doyle
Tasman District Council, NZ

This article describes some observations and experiences while on a visit to the Yangtze River in China. In 2009, Mike Lysaght had asked if we could host some Hydrologists from the Bureau of Hydrology, Changjiang Water Resources Commission, and at the end of the visit they offered to host someone in return and see how things were done in China. When I found myself in their part of the world two years later, I took up their invitation, with the request that I was able to gauge the Yangzte while I was there.

The Yangtze (known locally as the Changjiang which means the long river) is one of the great rivers of the World. It is the 3rd longest, starting in Tibet and ending 6,500 km later on the East China Sea. It may also be the most well used, given the population that lives along it, the reliance on its waters for agriculture, and the extensive shipping that occurs along the bottom reaches (ocean going ships can navigate up the first 1,000 km). It demarcates China north and south, its catchment covers 1/5 of China and holds 1/3 of the population of that country. It has the 3rd greatest mean flow after the Amazon and the Congo, and it is 15 km wide at the mouth, 30 m deep, and the flow reaches around 100,000 cumecs.

I was headed for Wuhan, an industrial city which straddles the Yangtze some 800 km from the coast, and 400 km below the Three Gorges Dam. Wuhan has a population of 10 million and is the 6th largest city in China. It certainly wasn't a tourist town, and I was lucky that the Bureau provided an interpreter while I was there, as very little English was spoken wherever I went. Due to its location on the Yangtze, Wuhan is a major transportation hub, and perhaps because of that it is one of the oldest and most civilised cities in China. A number of important events in Chinese history occurred there or nearby, and a number of historic buildings exist in the City. Wuhan was the location for the first bridge across the Yangtze, completed in 1957. I found out later that Wuhan was the place where the tea clippers loaded up with tea before they commenced their race back to London, the first ship back commanding the highest price.

The land there is very low lying, and during the 1931 flood I understand that the Yangtze flowed up to 6 m deep through the city for many months. That flood alone accounted for 145,000 lives, followed by a similar loss of lives four years later. Flood prevention was one of the main reasons for the construction of the Three Gorges Dam.

My arrival in Wuhan was marred by a somewhat difficult time obtaining money at the airport (at that stage you couldn't obtain Chinese currency in NZ) and battling a dodgy taxi driver, so I arrived at my hotel in a negative frame of mind. However it all became worthwhile when I opened the curtains to see the Yangtze flowing under the 'Yangtze First Bridge' right outside my window.

The Yangtze at night from my hotel room.

I was picked up the next morning by my principal host, Mr Han from the Bureau of Hydrology, along with Amanda who was my interpreter for the visit. My hosts were all senior staff, but they had a technical background and this appeared to be their interest. Our first visit was down to the banks of the river where we boarded a vessel the shape and size of a coastal naval patrol craft which was dedicated to measuring the flow at that section of river. This boat was fitted with a Rio Grande ADCP and the extent of its travel was a weekly gauging sortie across and back from where it was moored. In NZ we would carry out this same task with a boat 4 – 6 m in length, and we certainly wouldn't have a cook on board! Mr Han told me they had been using an ADCP for 20 years now, and back in the day there was a lot of development work with ADCPs done on the Yangtze, as it has its own set of measurement problems with drifting sediments.

During my gauging our ship cruised across a section 1.6 km wide, with depths up to 15 m, and velocities of around 2 m/s. DGPS was essential due to the moving bed, and some vegetation (rushes) on one side. The skipper had to carefully judge the course of several large ships which passed close by, but no evasive action was required. The flow was 35,000 cumecs, and the two transects were within 0.03%. They told me they only ever do two transects, and they are always within 0.3%. Being on the boat broke down any cultural barriers very quickly, and we exchanged information about boats and gaugings as would any two Hydrographers at (say) an AHA conference. The gauging ranked up there in career highlights, and I had a big grin on my face the whole time.

After the gauging we visited the first 'modern' water level recorder on the Yangtze, the Han Kou station which was opened in 1865. This was one of 2,000 hydrological stations in the catchment. The Bureau has 2,200 staff to operate these stations.

I was also lucky to visit the flood warning centre for the Yangtze. During the flood season (May – August) there are three Hydrologists and six Meteorologists working at any one time on flood warning, with the centre manned 24/7. They use Unit Hydrographs and Muskingum routing for flood prediction at Wuhan, and Mike Nam and Mike 11 above the dam. At important water level sites they can forecast one day ahead to within 50 mm. Surprisingly, snow was not important in the forecast process, despite the headwaters reaching well into the high country of Tibet. The Meteorologists had access to 80 weather radars in the catchment, there being 150 across all of China.

Boarding the gauging ship on the Yangtze at Wuhan.

The Yangtze below the Three Gorges Dam.

The Bureau was incredibly generous and arranged for a car to take me to the Three Gorges Dam. This was a drive of some four to five hours and an overnight stay. The dam is well known, some would say notorious. It is the World's largest hydroelectric power station (18,200 MW). It is 2.3 km across, 185 m high, has a lock capable of passing large ships, and a hydraulic ship lift is being built at present to supplement this. The dam itself drowned 600 km of gorge, including 13 cites and 140 towns, which required 1.2 million people to be moved from their homes. Of interest to us, it also drowned one of the earliest hydrometric stations in the world. The Baiheliang, literally the White Crane Ridge, displayed some of the world's oldest hydrological inscriptions, recording 1,200 years of changes in the water level of the Yangtze. The stone fish figures and rare inscriptions recorded water-level changes, harvests, positions and titles from the Tang Dynasty (618-907) onwards. I have read that the inscriptions were of importance to predict the water level changes to be expected for the Three Gorges Dam construction.

Downstream of the dam we visited another office of the Bureau of Hydrology. Here 25 staff looked after 22 stations measuring water level and rainfall, and a further two stations measuring flow. The Huang Ling Miao flow station was nearby on a section of river 500 m wide and 70 m deep. This was gauged every two days by both ADCP and current meter. I believe there was a backwater effect from a downstream tributary which required the frequent gauging. The highest gauging carried out by current meter at this site was 63,000 cumecs. The station utilised a horizontal ADCP which looked across 200 m of the 500 m channel, presumably to help monitor the backwater effect and maintain a rating curve.

Further downstream next morning I took a walk along the river bank, and observed people swimming across the Yangtze (around 1.5 km wide) with little regard for the ships passing by. This habit was started by Mao Tse Tung.

I finished my trip with one last feast. I came away with a clear impression that despite the differences in scale and culture, the Yangtze hydrologists hold the same enthusiasm for their work, suffer the same problems and sought the same results as we do. I am thankful to the Bureau of Hydrology for taking time to show me around and feeding me so many delicious meals, in particular Amanda and Mr Han. I should also thank Mike Lysaght who started the process and gave me advice before I went. I would thoroughly recommend visits like this to any Hydrographer.

The Huang Ling Miao flow station below the Three Gorges Dam.

Amanda and Mr Han were excellent hosts

The need for a National Standard on Sewer Gauging

Glenn McDermott
Principal Consultant, Enviromon P/L

Many hydrographers have worked or do work in sewer gauging. The field gaugings are used to calibrate in-situ depth and velocity sensors, similar to river gauging stations. The two main uses of the sewer flow data is to report flow volumes discharged to receiving waters to environmental authorities, as part of environmental licences, and to calibrate computer models of the sewer system which are then used to identify improvement works for capital expenditure. The investment in sewer gauging by system owners is in the scale of $ millions per year, but in the scale of $100s millions per year in capital works for flow reduction projects (based on sewer flows used in model calibrations).

Sewer flow gauging methods and equipment have developed from river gauging methods and equipment, but don't quite fit into the present river gauging standard (AS3778) scope. For example:

- Exposure time per point velocity reading (in sewer gauging) is limited to 10 seconds to avoid "ragging up" of the current meter, whereas AS3778 advocates an exposure time of no shorter than 30 seconds (but preferably longer), with the following measurement uncertainty consequences:
    - At very slow velocities (such as 0.05 m/s):
        - ±50% for a 30 second exposure time, but;
        - ±56% for a 10 second exposure limit (as for sewer gauging)
    - At mid-range velocities (such as 0.5 m/s):
        - ±8.0% for a 30 second exposure time, but;
        - ±8.7% for a 10 second exposure limit (as for sewer gauging)

- On the subject of exposure time, the new (2001) AS3778 does also advocate a shorter time (10 seconds) for the kind of electromagnetic point velocity meters used in sewer gauging, which is likely in recognition of what the sewer gauging industry does, but should be noted as having the above measurement uncertainty consequences, also noting that:
    - In the period from 1930 to 1960 much of the theory behind AS3778 was derived from analysis of many field gaugings and laboratory studies
    - For example the study by USGS's Mr. Pierce (1941) in their hydraulics laboratory using a 4 m wide concrete flume with steady flow conditions, showed that even in steady flow, using a pitot tube velocity sensor at many points in the cross section, gentle but continuous velocity pulsing was observed at each point (due to eddies which could not be seen with the naked eye) requiring ~3 minutes to define a proper average point velocity, which is why longer exposure times are advocated (not due to current meter type)

- Number of verticals recommended as a minimum in AS3778 is 20, whereas in sewer gauging (and in the gauging of small creeks) usually only one is possible in pipes 300 mm and smaller, but maybe as high as three verticals in pipes larger than 1 m, but up to five verticals in the large 3 m or more wide trunk sewers, with the following measurement uncertainty consequences:
    - ± 5% if 20 verticals are used
    - ± 15% if 5 verticals are used
    - ± 20% if 3 verticals (i.e. by extrapolating from the table in AS3778)
    - ± 50% if 1 vertical (i.e. by extrapolating from the table in AS3778)

The accuracy consequences of blindly applying the uncertainty due to number of verticals means that most sewer pipe (and small creek) gaugings based on one vertical, have an apparent flow rate measurement uncertainty of at least ±50%.

This of course looks ridiculous when you consider that the sewer gaugings are used to check calibrate the in-situ depth and velocity sensor (which itself has a flow rate measurement uncertainty of ~ ± 10%.), and to decide on a calibration factor to apply to its sensed velocity.

The implications of this potential high uncertainty threatens to undermine the validity of the whole sewer gauging approach in the eyes of system owners, who spend $100's millions per annum on capital works based on models based on flow gauges calibrated using these methods. For example when a "before" versus "after" remedial works study is done, to prove the effectiveness of the works, the amount of flow reduction achieved falls well within the measurement uncertainty of the before and after gauges, defeating the purpose of effectiveness evaluation.

Experienced sewer gauging practitioners, however, are confident that the uncertainty of a one vertical sewer gauging in a small sewer is more like ± 10% (not ± 50%) in practice. One of their reasons for saying this can be explained with the following logic:

- In a typical river gauging with 20 verticals and three points per vertical using a standard current meter (0.12 m blade diameter, making 0.0113 m^2 coverage per point), in a 20 m wide and 2.5 m deep cross section, the percentage of area covered by the 60 points works out to be **1.35%**.
- In a typical small pipe sewer gauging with one vertical (and one point per vertical) using a pygmy meter (0.03 m blade diameter, making 0.000707 m^3 coverage per point), in a 300 mm pipe running half full, the percentage of area covered by the one point is **2.0%**.

So, what at first glance seemed a big difference in gauging coverage turns out to be the opposite way around, with the single point pygmy meter in a small sewer actually covering relatively more of the wetted cross section area than in the 20 vertical standard meter gauging in a 20 m wide river section.

The same comment equally applies to small creek gauging in river gauging work.

Before a new standard can be written there is a need to "prove" the gut-feeling of experienced practitioners, by a mixture of research at approved hydraulics labs, and field proving of results. The key areas are envisaged to be:

- Hydraulics lab research, for a range of pipe sizes and slopes and flow rates, for sewer gauging improvement:
    - Define the accuracy of single point current meter gauging (i.e. using both mechanical and electromagnetic types) versus the laboratory reference meter flow rate
    - Take repeat measurements at different point exposure times to define the influence of exposure time on the resultant comparison accuracy
    - Modify a clamp-on transit time meter to be used upside down (on the water surface) to measure centreline vertical velocity, and define its accuracy versus the laboratory reference meter, to see if this might be the better technology to carry forward for this purpose (noting that it can be held for as long an exposure time as necessary as it will be unaffected by ragging up)

- For in-situ flow meter measurement uncertainty reduction, by testing if adding more velocity sensors improves the accuracy:
    - Test if adding more sensors interferes with the first sensor signal reception (and each other)
    - Experiment to identify the best arrangement for additional sensors (e.g. at 8 o'clock and 6 o'clock and 4 o'clock, etc.)
    - To appreciate the potential of this "accuracy improvement" for before vs after sewer flow studies, the single site flow measurement uncertainty would reduce as below:
        - ± 10% using one Doppler velocity sensor, as now
        - ± 7.1% using two Doppler velocity sensors
        - ± 5.8% using three Doppler velocity sensors, and
        - ± 5.0% using four Doppler velocity sensors

The article concludes here, with the hope that it will educate about the gauging dilemmas in the sewer gauging industry, stimulate discussion, and hopefully garner support for the improvement research and subsequently writing either a new sewer gauging standard or a new part to AS3778.

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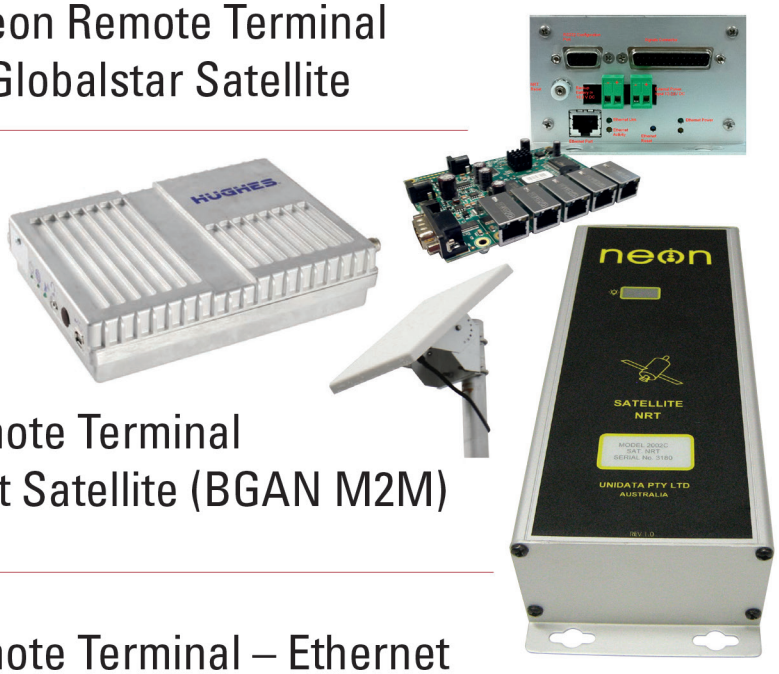

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HIGH LEVEL QUALITY ANALYSIS

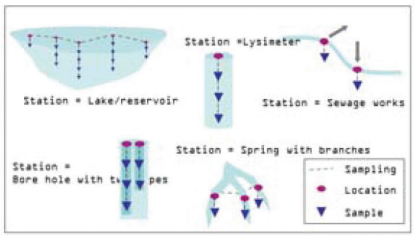
Water Management Tasks

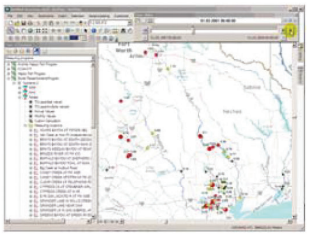
Government agencies and water management companies face complex tasks in the wake of the amended legal conditions. Water quality data on all bodies of water must be collected, managed and evaluated, and both qualitative and quantitative data must be combined in the data analysis to provide a meaningful data set. The actual quality of bodies of water can only be adequately assessed on the basis of this complex data. Finally, the collected data and analysis results must be presentable as graphs in order to present findings to the general public.

Features of The KISTERS Water Quality Module

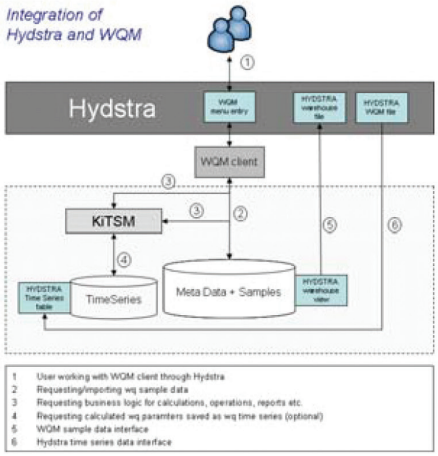
The **KISTERS Water Quality Module (KiWQM)** was added to the KISTERS water management information systems in order to measure up to an integrative approach capable of handling the variety of tasks at hand. The module allows expert users to organise and directly link water quality data and hydrological information (e.g. for load calculations) in a relational database. This has made the combination of qualitative and quantitative data on bodies of water possible.

Data import from Excel and LIMS - Sample data can be imported both automatically and manually. Import comprises not only measured and analytical values, but also verbal descriptions of the sample. Automatic import is carried out through a highly configurable importer. This tool allows the import of files created in spreadsheet programs, the standard format for sample data. An XML interface supports automatic imports of sample data from Laboratory Information Management Systems (LIMS).





Configuring measured data - The module also supports the definition of measurement programs as well as substance and comparison lists, based on which sample data can be evaluated efficiently. Water quality measurement stations are assigned to these measurement programs, which in turn appear in the KISTERS Explorer in display mode. Display mode provides access to the sample data, e.g. all descriptive, measured, or analysed data of a sample at each station. Extensive KISTERS tools are available for evaluations in graph and table format. The Water Quality Module additionally represents the basis for spatial data evaluation, for example through the generation of water quality maps via the KISTERS ArcGIS extension.



Contact KISTERS for further information
Email: support@kisters.com.au
Phone: 02 6154 5200

KISTERS

What are the chances?

Sarah Hesse, Manly Hydraulics Laboratory, NSW
Mark Johnston, Entura, Tasmania

In September 2013 Sarah Hesse and friends Melanie and Amanda decided to climb Mt Kilimanjaro in Tanzania, the highest mountain in Africa at 5895 m, and not very far from the equator.

The trip was planned as a seven day trek starting at around 2200 m in elevation, which is about the same height as Australia's Mt Kosciusko.

It is a 62 km walk to the top over five days, which facilitates altitude acclimatisation, then 38 km over one and a half days back down to the pickup point on the other side of the mountain.

On day three in a camp of around 300 people – there are three porters for every trekker – Sarah had her warm Manly SES volunteer jacket on when a fellow SES volunteer seeing the jacket called over to say "Gooday".

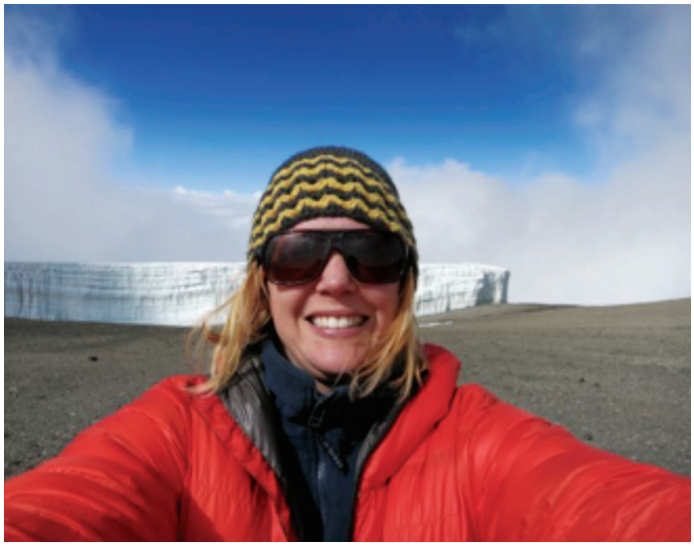
They talked about SES and then got round to work and both mentioned they were in the water industry. The other SES volunteer was Mark Johnston from Tasmania who then thought; Manly — Water Industry.
Mark asked: *"You don't work at Manly Hydraulics Laboratory do you?"*
Sarah replied: *"You're not Hydro Tasmania are you?"*

So it eventuated we had a couple of hydrographers heading to the top of Mt Kilimanjaro. What are the chances of two Australian hydrographers reaching the top of Mt Kilimanjaro on the same day? Rare, you would think.

Sarah and Mark did reach the top on September 19 after leaving camp at midnight for a seven hour, final walk up the last 1200 m to reach the summit for the sunrise. Unfortunately, the weather was not great for the sunrise and at -18 degrees Mark did not hang around long! Sarah arrived a little later to a beautiful day.

Whilst on top of the mountain they did consider popping over to service the weather station on top of the nearby glacier (photo below). However, they could not find a client willing to pay for the helicopter.

Mark and Sarah then caught up again on safari to the Serengeti and the Ngorongoro Crater.



Since this chance meeting Sarah has commenced employment with Cardno as Assistant Business Unit Manager.

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