Australasian Hydrographer

November 2011

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AUSTRALIAN HYDROGRAPHERS ASSOCIATION

AHA

Australian Hydrographers Association
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Material Submitted

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Contents

FRANK DAVIES

Editor's Introduction

I'd like to take this opportunity in my first as journal editor to explain my position. The AHA committee has failed to attract a candidate for the position of publicist in recent years. Grant Robinson is now managing the website and I now complement him as the journal editor, the two of us equating somewhat to the role of publicist.
Our positions are voluntary and thus non-voting on AHA matters. Hydrography has been my life career and I felt a duty when I put my hand up for the role. However, if another member wishes to take on the publicist position, then I would have no qualms in passing on the batten. There is no doubt that playing a role in the AHA committee opens up your vision and also provides opportunities.

In the meantime it is my desire to take the content of the journal closer to the "coal face". Article style should not necessarily be highly developed, and perhaps more at an ideas and discussion level. I'm also happy to work with you to develop content. And a little bit of hydrographic humour will be most appreciated. If you have further ideas on possible content, then please let me know. The bottom line is that all members should feel capable of, and encouraged to make contributions to the journal, and hydrography as a whole, without having to prepare a formal document.

Hydrographic equipment and processes have certainly changed over time, but to me the rate of change over the past 25 years has seemed exponential. Or is that simply a reflection of the fact that I'm getting older? Electronic technology is the underlining theme of that change. At the forefront of recent times, and also the focus of several articles in this issue of the journal, is the ADCP. Glenn McDermott makes some suggestions about the application of the ADCP, whilst Mark Randall and Daniel Wagenaar explore some of their benefits.

I look forward to hearing what everyone is up to in the next journal in March 2012. But don't wait until then. Have your say now.

GRANT ROBINSON

AHA Website

The committee is keen to make the AHA website a useful resource as the public face of the AHA.
Amongst the recent changes you'll find a listing of the AHA committee and key volunteers with their photos on the contacts page (http://www.aha.net.au/contact/). We have also managed to track down electronic copies of most issues of Australasian Hydrographer back to 2001 and these are now available for review (http://www.aha.net.au/resources/journal/). However, it is likely we are missing some issues.

If you can help, please contact me: webmaster [at] aha (dot) net (dot) au.

BILL STEEN

Chairman's Address

A lot has happened since our last journal. As you can see Frank Davies has volunteered to take on the role as journal editor and with the input of several contributors has produced an issue that all members will find informative. We are also undergoing a major web site rework with Grant Robinson putting up his hand to apply his webmaster skills to help the AHA. The association wishes to thank Frank and Grant for helping us to fill a void that we have struggled with for several years.

We also have a new AHA secretary, Krystal Hoult, who with the transitional help from Michael Whiting is coming to grips with the duties of the secretary. This is a mammoth task and we welcome Krystal's enthusiasm to the committee and thank Michael for helping in the transition. The committee itself also changed with the inclusion of Simon Cruickshank who is the Senior Manager Water Monitoring for NRETAS Northern Territory and Paul Sheahan, Manager Water Data, Bureau of Meteorology. I'm sure many of you know both Simon and Paul and their industry experience and insight will be an asset to the AHA committee.

At the August AGM the accounts presented by Max Hayes showed that AHA revenue has expanded significantly to cover training and certification. This reflects the development of the association into a more professional body supporting the water industry. Our organization operates with a voluntary committee, so as we mature it is becoming increasingly necessary to outsource many of our services.

In the journal Paul Langshaw updates us on the current status of both training and certification. Behind the scenes Paul has put in many hours to get to where the Association is in terms of the number of students trained in the Hydrographic course and also the status of the new Diploma course.

Also in the journal you will see a short note on the 2012 AHA Conference. There has been a lot of ground work undertaken to find a suitable venue in Melbourne that caters for our technical and trade show requirements whilst meeting our limited budget. The final choice of a venue was Moonee Ponds Race Course facilities. This was chosen over many other venues because it is located conveniently between the airport and the city plus has a range of accommodation and catering within a close proximity of the venue.

It has been amazing that within approximately 24 hours of advertising the sponsorship packages they sold out, showing the trade support for the Hydrographic industry. The AHA wishes to thank all the companies who are supporting us. Without this support we would not be in a position to continue with such conferences.

The dates of the conference will be between 21-23 August 2012.

The theme is being sorted out by the conference conveners. One of the ideas that is being discussed is to have three or four themes / workshop sessions. The conveners hope to announce this shortly and a conference update bulletin will be distributed shortly.

We look forward to seeing as many Hydrographers as possible attending the 2012 AHA Melbourne Conference.

PAUL LANGSHAW

AHA Training Update

Hello from the training desk.

Since the last AHA journal a lot has happened on the training and qualification front. In the main, I believe there has been significant positive progress in the delivery/availability of course(s) and qualification recognition.

The following are just some of the developments that have occurred over the last year:

Dec 2010:	*Diploma Water Operations (Hydrography) gains national accreditation*
July 2011 onwards:	*OTEN commence offering the first of the Units of Competency of the Diploma by distance learning*
November 2011:	*AHA launches its Certification program*
By Dec 2011:	*Almost 200 students will have successfully completed the AHA Hydrography – Basics course*

I have previously explained the background to the development of the Diploma was by way of a Hydrography Technical Reference Group working with Government Skills Australia (a national skills council). This group developed eight units of competency to be included in the Diploma. Unfortunately GSA only submitted five of those units for national endorsement. The result of this action was that three units that the industry believed were vital to provide a complete and comprehensive course were omitted. This was seen by AHA and industry as depriving students of essential learning material.

It was due to these omissions, along with the delays in the Diploma course gaining national endorsement (18 months) that the AHA provided the five day, face-to-face course that covered the content of the omitted units and provided organisations and staff with a comprehensive, intense technical course, whilst waiting for the delivery of the Diploma.

The link to the OTEN website below explains the structure and delivery of the Diploma course along with the Hydrography Skill Set course. The Skill Set is replacing the Hydrography-Basics course. This course provides entry to AHA Certification (see Certification section of this article).

OTEN Water Operations Diploma (Hydrography) NWP07 19049.
(http://www.oten.edu.au/otenweb/1/cils/19049CIL.pdf).

Hydrography - Basics/Hydrography Skill Set

On behalf of the AHA I offer my congratulations to the students that have successfully completed this course. Never before has a course specific to hydrography been delivered nationally, let alone to around 200 students. This course has not only delivered knowledge from experienced hydrographic trainers, but has also provided consistent content to hydrographers nationally.

To our trainers; Mike Lysaght (Hydrological Services), Bobbie Brenton (SWC), Arran Corbett (YSI), James Mancey (DPIPWE), Glen Murphy and Steve Swanbury (HCS), thanks for a great job and your continued availability and support over the last couple of years.

As I mentioned previously, this course covers the three units of competency that were deemed essential by industry but were omitted from the Diploma. It is for this reason that this course is seen as a prerequisite to the Diploma and essential for AHA Certification.

The AHA has recently entered into a "Service Agreement" with OTEN to continue delivery of this course with some subtle changes. Firstly, it will now be referred to as a Skill Set and will therefore provide the student with a Certificate of Attainment. The AHA has negotiated with OTEN that all students that have previously successfully completed the Hydrography-Basics course will be granted the "new" qualification at no further or additional enrolment cost.

To arrange enrolment or organise a Hydrography Skill Set course please contact me:
Email: training [at] aha (dot) net (dot) au or
Phone: 0419 266 299

National Workforce Development Funding (NWDF)

This program is federally funded and, among other industries, includes water related disciplines such as hydrography. The "water" program is managed by GSA. The program has been designed to operate in one year stages over four years.

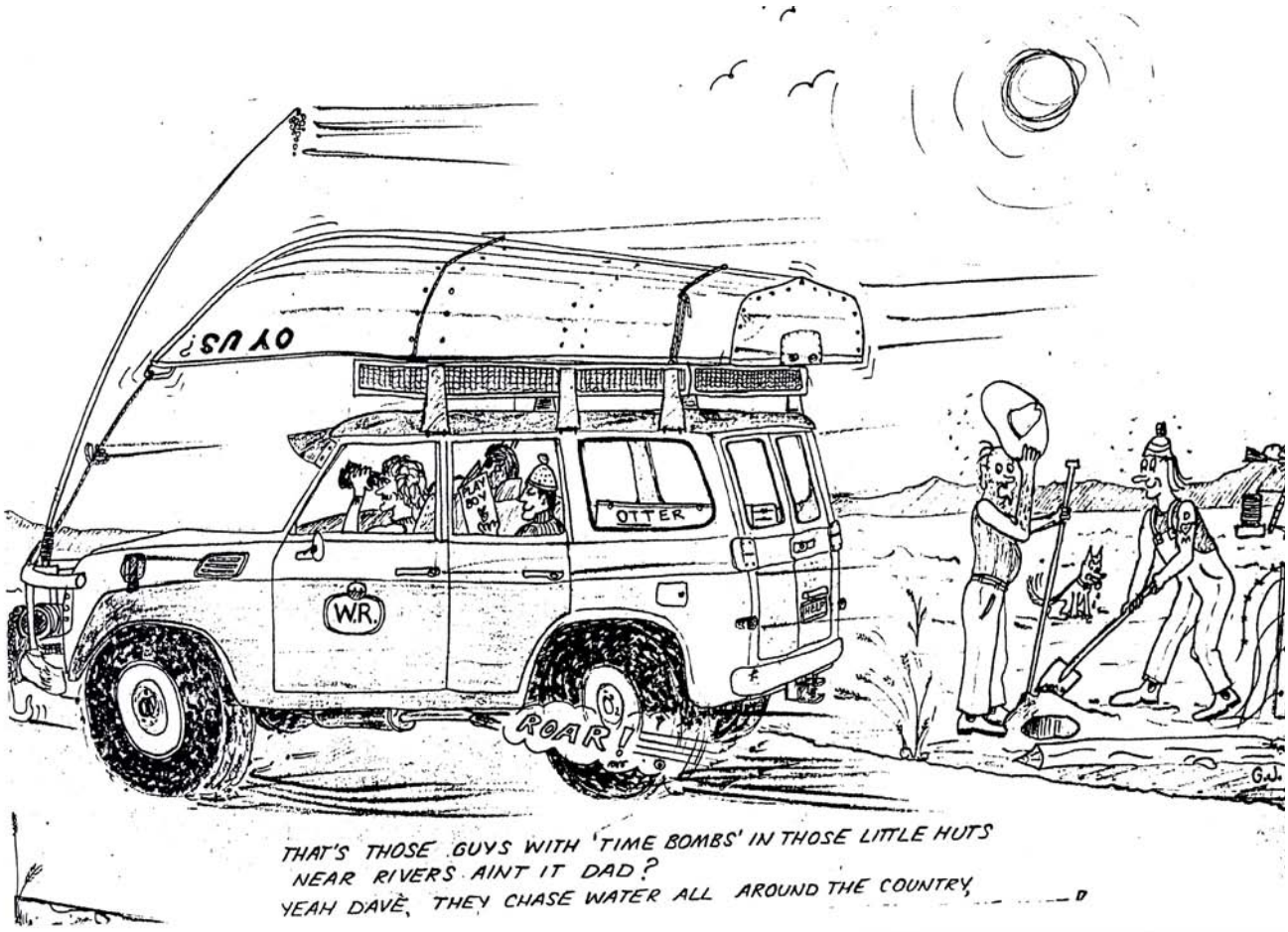
During August this year interested parties (AHA members) approached the AHA to provide a joint application on behalf of industry members to provide funding for the training of hydrographers. After much consultation with the Bureau of Meteorology (BoM), NSW Office of Water (NOW), GSA and other agencies it was unfortunately decided that a comprehensive submission could not be achieved by the deadline for the 2012-13 funding. The AHA will continue to address this issue and hopefully be in a position to apply for the following and subsequent years of funding.

Many thanks to Natasha Herron (BoM) and Ray Boyton (NOW) for their valuable input.

AHA Certification

After an extended period of development, along with a few false starts, I am pleased to announce that the AHA is now taking applications for Certification. Please read the information document on the AHA website http://www.aha.net.au/education/aha-certification/ and, if interested, please complete the application form.

It is mandatory that your application form is accompanied by copies of qualifications and proof of years of experience relevant to the level of Certification you are applying for. If you have successfully completed the Hydrography-Basics course then you have qualified for AHA Certification at "Cadet" level at no cost. If you believe your qualifications and experience entitles you to a higher level of Certification, please provide documentation and an application form.



Cartoon by Greg Jones, Technical Officer.
Department for Water, Mount Gambier, SA.

Exposure Time Exposed

Glenn McDermott
Greenspan

The subject of this text is point velocity gauging accuracy versus exposure time of the velocity measuring device at the point. AS3778 gives the following guideline as to this relationship for rotating current meter devices.

Table E.3 - Percentage uncertainties in point velocity measurements

Velocity m/s	Point in vertical							
	0,2D, 0,4D or 0,6D				0,8D or 0,9D			
	Exposure time min							
	0,5	1	2	3	0,5	1	2	3
0,050	50	40	30	20	80	60	50	40
0,100	27	22	16	13	33	27	20	17
0,200	15	12	9	7	17	14	10	8
0,300	10	7	6	5	10	7	6	5
0,400	8	6	6	5	8	6	6	5
0,500	8	6	6	4	8	6	6	4
1,000	7	6	6	4	7	6	6	4
over 1,000	7	6	5	4	7	6	5	4

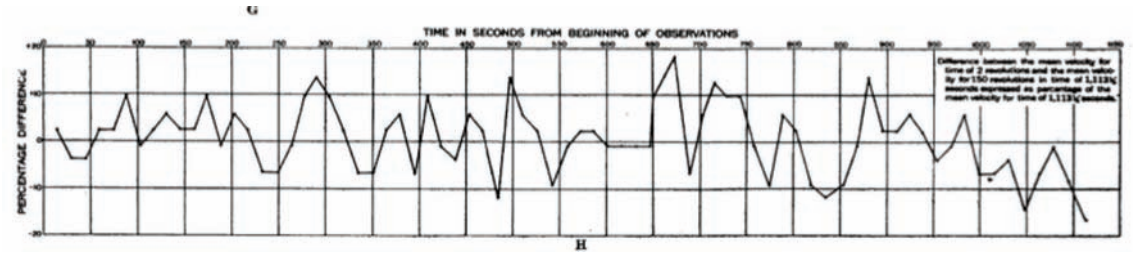
This table has a long history, and is the result of extensive research and field and laboratory tests with a large range of current meters (including electromagnetic point meters), over a large range of river types and depths, in UK, US, Russia, etc.

The main reason that a longer exposure time gives better accuracy (lower uncertainty) is due to better averaging of turbulence effects. There are two distinct types of eddies causing these turbulence effects; short period short radius eddies, and, long period long radius eddies.

> The most important point to note here is that the turbulence effects are a characteristic of open channel flow hydraulics, and are independent of the type of velocity meter being considered.

This table is independent of whether it is an Ott type horizontal axis meter, or a Price type vertical axis meter. It is this author's professional opinion that the table also applies equally to acoustic Doppler velocity meters and electromagnetic point velocity meters, for the reason stated in the text box above.

One particular 1941 hydraulics laboratory study done for USGS is of interest on this topic. This study was based on measurements taken in a smooth concrete box channel 4m wide with flow depths up to 0.5m to compare the accuracy of vertical axis versus horizontal axis current meters. What is more interesting about this study however is the long exposure times that meters were held at various points; up to 19 minutes. A typical result from this study in the straight smooth concrete channel shows how variable the point velocity actually is, even in this "ideal" smooth channel, as shown in the graph below, which is typical of the results found by USGS.



The variability in point velocity due to turbulence can be seen above to be generally within ±10%. Each point in the graph is the ratio of the point velocity over two revolutions of the current meter divided by the overall average velocity over 150 revolutions (i.e. for the whole 1,113 second exposure time. These results would have been no surprise to fellow researchers O'Brien and Hickox who explained that:

> In most of the problems in the motion of air and water the flow is turbulent in the sense that there occur erratic variations in direction and velocity…..Direct measurements of these fluctuations show that they do not exhibit a regular period.

Later researchers (e.g. Hall and Johnston 1967) argued against the fluctuations being totally random in nature, and attempted to prove there was some relation between one fluctuation and the next. This "argument" has never been resolved, so for practical purposes the fluctuations are interpreted as random in nature. Hall and Johnston did imply that the instantaneous point velocity fluctuations measured with current meters (as in the graph above) may actually be larger than measured, due to the meter's limitation or lag in responding to rapid velocity fluctuations.

One interesting aspect for consideration here is regarding the use of ADCPs for discharge gauging observations. These observations are equally subject to velocity fluctuations due to short and long period eddies.

> ADCP consideration: The "stationary method" will give more accurate measurement results than the "moving boat" method as the "stationary method" allows the user to choose the exposure time per vertical, and to better average turbulence effects and in effect to choose the accuracy of the vertical velocity measured. The accuracy of the "moving boat" method is virtually not able to be worked out, as its exposure time per bin is less than 30 seconds (i.e. less than the minimum covered by the ISO and by AS3778).

The above consideration was realised as important by the USGS some 7 years ago, at which time they began to stipulate a preference for the "stationary method" for obtaining accurate ADCP gaugings, for this and other reasons.

Another aspect or reflection is regarding the actual exposure time adopted for current meter gaugings by the two main groups in our industry: government hydrographers tend to adopt longer exposure times, such as guidelines which state "no shorter than 30 seconds", while private company hydrographers tend to adopt shorter exposure times, such as guidelines which state "no longer than 40 seconds". This tendency to adopt a shorter exposure time by private company hydrographers does have loss of accuracy consequences, and should be watched closely by those doing or managing the out-sourcing of such services.

The component of overall discharge measurement uncertainty due to point velocity uncertainty is virtually negligible compared with the number of verticals. The table below illustrates how exposure time really is only a small component of the overall uncertainty of discharge observation. This however should not be used as a reason to avoid or defer improvements in this area.

The table below shows indicative ±% discharge measurement uncertainties achievable for stated gauging combinations.

No. of verticals	Exposure time per point (mins)	
	0,5	3
5	±16.3%	±15.8%
25	±4.9%	±4.6%

ADCP Standards

ADCP standards developed by Queensland's Department of Environment and Resource Management using funds from the Bureau of Meteorology, have been published on the Bureau's website at http://www.bom.gov.au/water/standards/projects/

The standard includes three parts and a field sheet:

- Boat Mounted Acoustic Doppler Current Profiler Standard
- Acoustic Doppler Velocity Meter Standard
- Point Acoustic Doppler Velocity Meter Standard
- Acoustic Doppler Current Profiler Gauging Field Sheet

The Bureau of Meteorology will run a 'Standards Workshop' in major capital cities, in the April/May 2012. These will follow further modifications of the ADCP Standard and the NSW Hydrometric Standards, by their related Technical Reference Groups. The Workshops will facilitate a broader consultation and awareness-raising function in relation to these standards, as a means to identify further work needed, including final refinements, further support or training, and work to address any other impediments to adoption.

For further information, contact Kate Roberts (k.roberts [at] bom (dot) gov (dot) au).

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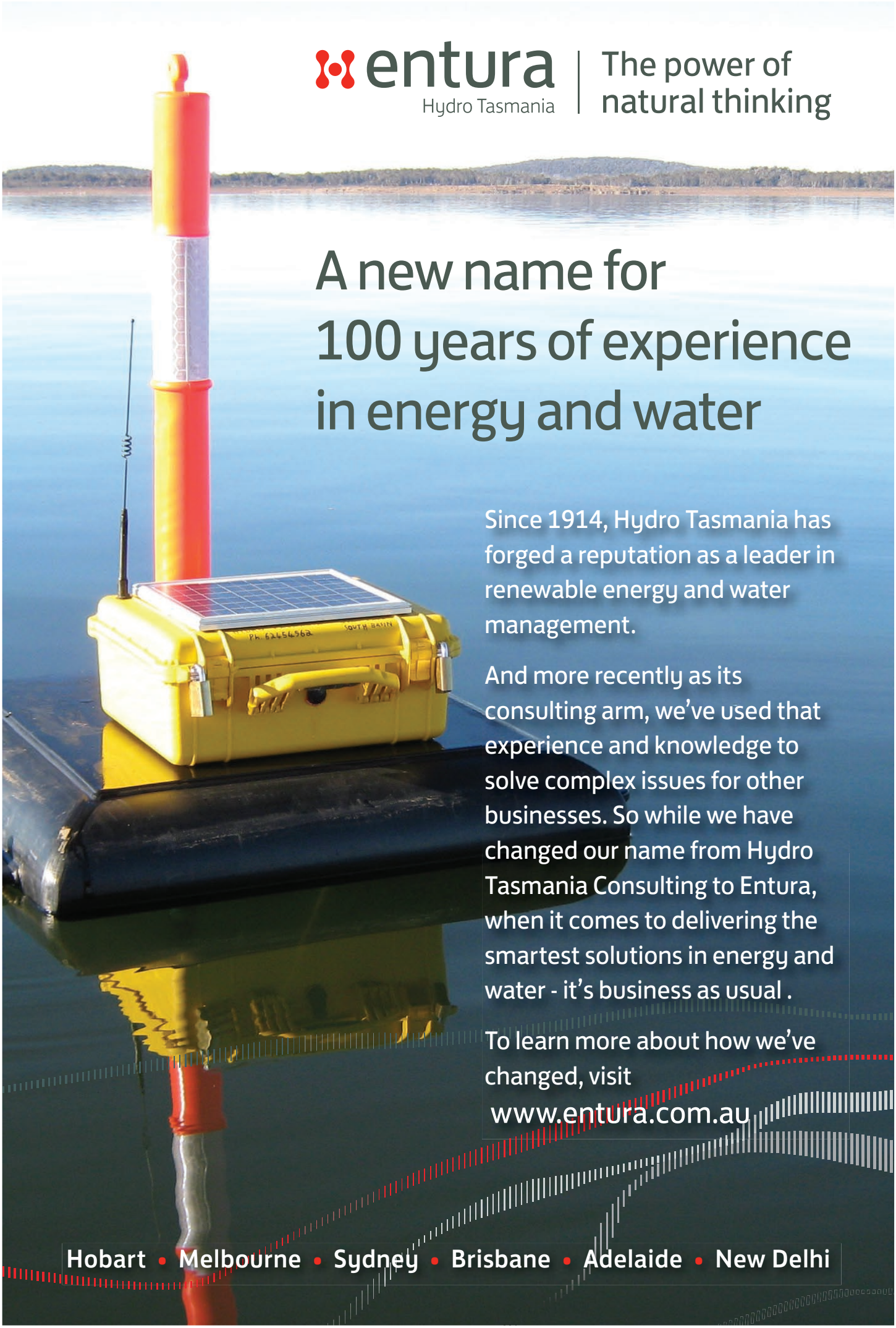
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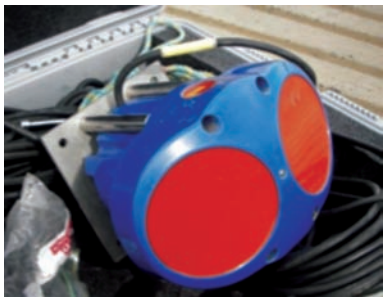
Horizontal ADCP

The Use of Historical Gaugings to Develop an Index Velocity Rating

Mark Randall, Project Officer; and
Vince Manley, Supervising Hydrographer, Water Monitoring
Department of Environment and Resource Management, Qld

Introduction

Horizontal acoustic doppler profilers (HADCP), if mounted correctly, are an effective tool for measuring channel discharge. The HADCP must be installed perpendicular to the flow at a stage height that allows it to measure the mean channel velocity. In addition the HADCP records water temperature and stage which via an internal, user entered index velocity equation, will allow the HADCP to output real time discharge values.



RDI 600 kHz Channel Master.

The method of creating an index velocity rating (IVR) was developed over 25 years ago by the United States Geological Survey (USGS). This approach allows the user to compute discharge from water velocities measured by the HADCP through the creation of a regression equation that relates the mean channel velocity to the index velocity. The cross-sectional areas relative to stage are calculated from a detailed channel survey.

As well as being able to output real time discharge data, a further benefit of the HADCP is that it allows discharge measurements to be undertaken at gauging stations that are remote and inaccessible during the monsoonal wet season.

Site

GS112003a looking downstream towards the control.

GS112003a, (North Johnston river at Glen Allyn), was selected due to its inaccessible nature during the wet season, plus the tendency of events to occur during night. The channel is very stable displaying very minimal change over the last 20 years. The control is a man made rock bar which is again very stable. The maximum gauged stage was 3.71m in 1995. The highest recorded stage was 8.12 in 1967.

The HADCP was installed in February 2011, 2 metres out from the right bank at a stage height of 1.565 metres. The HADCP measured velocity, stage, and water temperature every 2 minutes for 30 days.

Results

The HADCP recorded a maximum stage of 5.05m during the 30 day installation period (Figure 1). HADCP recorded stage was within 30mm of that of the Campbell CR1000 and WL3100 installed in the gauging station.

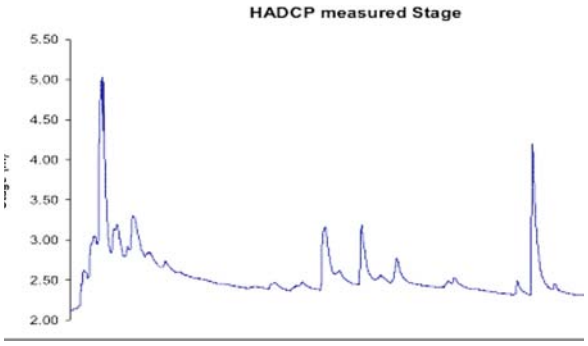


Figure 1 HADCP recorded stage.

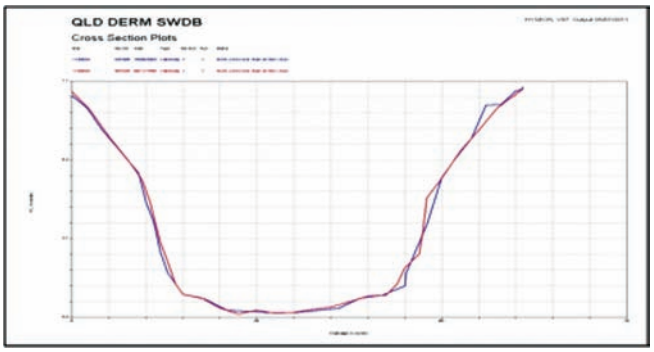


Figure 2 Channel shape changes since 1990.

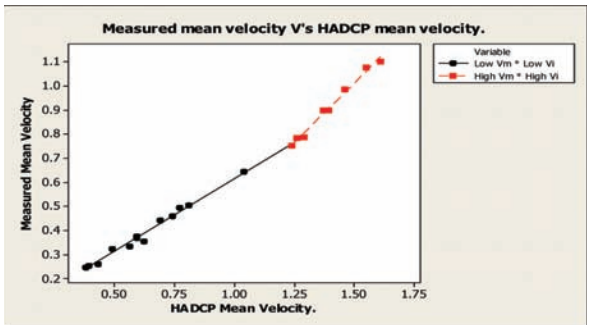


Figure 3 Gauged vs HACP mean velocity.

Due to stability of the channel cross section and control, historical gaugings were used to create the index velocity equation. Analysis of the measured mean velocities (Vm) against the HADCP mean velocities demonstrated the need for two separate equations (Figure 3). The change point between the equations was calculated to be 3.14m stage. At this point the rock bar control becomes ineffectual.

Velocity Regression Analysis

High Vm versus High Vi

The regression equation is

High Veq = -0.469 + 0.987 High Vi

Predictor	Coef	SE Coef	T	P
Constant	-0.46870	0.05994	-7.82	0.000
High Vi	0.98722	0.04275	23.09	0.000

S = 0.0153193
R-Sq = 98.9%
R-Sq(adj) = 98.7%

Low Vm versus Low Vi

The regression equation is

Low Veq = 0.0127 + 0.602 Low Vi

Predictor	Coef	SE Coef	T	P
Constant	0.01274	0.01099	1.16	0.269
Low Vi	0.60157	0.01554	38.71	0.000

S = 0.0136943
R-Sq = 99.2%
R-Sq(adj) = 99.1%

Area versus Stage Regression Analysis

(Using a third order polynomial)

The regression equation is

Area = -13.93 + 26.66 Stage + 1.152 Stage**2 + 0.07941 Stage**3

S = 0.930287
R-Sq = 100%
R-Sq (adj) = 100%

- S is measured in the units of the response variable and represents the standard distance data values fall from the regression line. For a given study the better the equation predicts the response the lower S is.
- R-Sq describes the amount of variation in the observed response values that are explained by the predictor(s).

Stage	Area	Gauged flow	Vm	Vi	Veq	Qi	Difference
3.710	104.890	116.468	1.110	1.61	1.120	117.484	1.02
3.620	101.443	110.113	1.085	1.55	1.061	107.615	-2.50
3.550	98.784	98.2	0.994	1.46	0.972	96.020	-2.18
3.400	93.152	84.445	0.907	1.37	0.883	82.271	-2.17
3.340	90.924	82.355	0.906	1.39	0.903	82.098	-0.26
3.190	85.416	67.74	0.793	1.29	0.804	68.694	0.95
3.150	83.962	66.2	0.788	1.26	0.775	65.038	-1.16
3.140	83.599	63.433	0.759	1.24	0.755	63.107	-0.33
2.870	73.950	47.8	0.646	1.04	0.639	47.238	-0.56
2.660	66.631	33.605	0.504	0.81	0.500	33.337	-0.27
2.610	64.912	32.182	0.496	0.77	0.476	30.914	-1.27
2.580	63.885	29.343	0.459	0.74	0.458	29.271	-0.07
2.520	61.840	27.239	0.440	0.69	0.428	26.472	-0.77
2.440	59.133	20.88	0.353	0.62	0.386	22.822	1.94
2.410	58.123	21.852	0.376	0.59	0.368	21.382	-0.47
2.410	58.123	21.332	0.367	0.59	0.368	21.382	0.05
2.380	57.117	19.057	0.334	0.56	0.350	19.981	0.92
2.290	54.116	17.3	0.320	0.49	0.308	16.650	-0.65
2.180	50.486	13.1	0.259	0.43	0.272	13.710	0.61
2.140	49.176	12.353	0.251	0.39	0.247	12.170	-0.18
2.130	48.850	11.944	0.245	0.38	0.241	11.795	-0.15

Area = Calculated from stage/area polynomial equation.
Vm = mean flow calculated from gauged flow divided by area.
Vi = HADCP measured mean velocity.
Veq = Indexed velocity calculated from regresion equation.
Qi = Indexed flow calculated from Veq* Area.

The data above compares the gauged flows from the historical gaugings and the flow calculated from the velocity index equations, (Qi). The differences between the two flows are displayed as a percentage in the difference column.

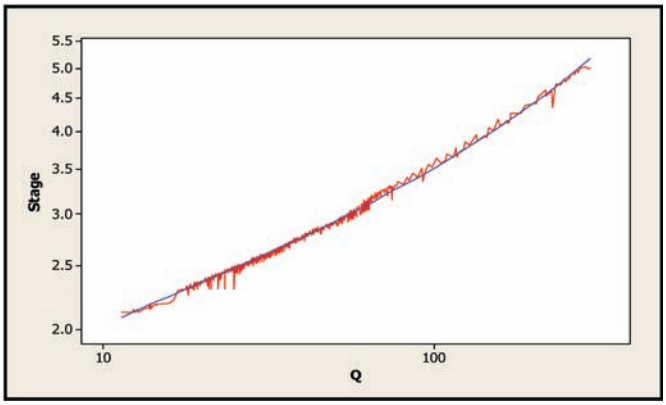


Figure 4 HADCP generated rating curve

Stage (m)	Index Calculated Flow	Theoretical Rated Flow
5	285	320
4.5	217	230
4	142	155

Conclusion

HADCPs are an invaluable tool for measuring velocity data that would otherwise be unobtainable and theorised. The HADCP allows the hydrographer to improve the accuracy of rating curves (Figure 4) and formulate a better understanding of the flow characteristics at a gauging station. Although the sole use of historical gaugings to calibrate an IV rating is not recommended I believe that it is perfectly valid for sites such as GS112003a that have a proven stability. Calibration gaugings undertaken with the HADCP in situ are not always possible for remote and inaccessible gauging stations. Further work will be undertaken at other remote sites that have theoretical ratings as well as establishing HADCPs to output real time discharge data via sat IP and total suspended sediment measurements.

TRDI User Conference From a NT Perspective

Daniel Wagenaar
Department of Natural Resources, Environment, The Arts and Sport

I was fortunate enough to attend the Teledyne RD Instruments (TRDI) Users Conference that was held at the beginning of October 2011 in San Diego, USA. The purpose of the conference was to give users the chance to share their experiences as well as showcasing the work they have done using Acoustic Doppler Technology. The conference was divided into three groups, which consisted of Marine Measurements, Water Resources and Navigation.

Teledyne RD Instruments (TRDI) has a number of offices across the world with their head offices situated in San Diego with a total work force exceeding 200 people. Although TRDI specialises in Water Resources applications their main operations are more orientated towards Marine Measurements and Navigational work.

TRDI was generous enough to supply some pre-conference entertainment and from the photo's my choice was obviously the Mirrimar Air Show. This was the airbase used in the Top Gun movie, however the airbase now a days focuses more on helicopter operations.

The most recent developments that TRDI have done in the Water Resources field are the development of the RiverRay and the upgrading of the StreamPro into a proper ADCP containing a built-in compass and GPS.

The RiverRay has a patented phased array technology with a frequency of 600khz. This design is different from the normal piston array, which is used with the workhorses.

The instrument has a unique auto adaptive set up that adjusts the instrument configuration depending on the flow conditions at that specific location.

The papers presented in the Water Resource group consisted of a wide range of Acoustic Doppler applications. The study focus of Acoustic Doppler technology has definitely shifted from the standard flow measurements to research areas such as sediment transport, velocity mapping and tidal bore properties.

The following points summarise some of the presentations that will have an impact on our operations and standards.

- ADCP measurements to develop loop ratings due to change in energy slope for given stage, off channel storage or unsteady flow conditions. The ability to perform large numbers of gaugings within a relatively short time frame enables us to identify these conditions much more clearly and therefore develop the required rating curves.
- The evaluation of ADCP measurements and ensuring that they conform to the standard operating procedures.
- Post processing of ADCP data to improve the data quality.
- Evaluate acoustic data during the first iteration of post processing. Flow and C.O.V can be used for final check.
- The use of multiple GPS systems or a GPS compass to determine heading, if site conditions make it impractical to use the internal compass.
- Incorporating GPS systems to correct for bed movement effects can introduce a large number of possible errors to your ADCP measurement. The user must be aware of the various factors and the limitations of the type of GPS system used.
- The RiverRay is fitted with a new compass, which is much more sensitive than the previous compass used in the Workhorse instruments. During testing of the RiverRay it was found that the errors made during the calibration of the compass are much more evident than before.

The informal meetings with the different TRDI users were very productive and assisted us in resolving some of our operational challenges with Acoustic Doppler instrumentation. It was interesting to see how other users apply Acoustic Doppler instruments in their operations, which gives another perspective in how the instrumentation can be utilised within the hydrographic environment.

The Acoustic Doppler standards that are going to be further developed from the information collated during the conference are the post processing requirements and quantifying of data quality for Acoustic Doppler measurements.

Coming back from the conference I have realised that it would be extremely valuable for Australian Hydrographic operations to establish an Acoustic Doppler Forum (USGS equivalent) that is focused on the application of this technology within our environment. This communication medium would ensure that knowledge and practical application is shared between the different agencies. My suggestion is that the AHA must be used to establish such a forum and to supply the communication link via the AHA web page.

I would like to thank the Department of Natural Resources, Environment, The Arts and Sport and Teledyne RD Instruments for making it possible for me to attend the conference and share the Northern Territory experiences in Acoustic Doppler Technology.

Blowpipe

Greg Yeo
Department of Water, Carnarvon, WA

I recently had to prepare some sites for the installation of Neon IP telemetry. For those with pluvios attached the existing cable between the tipping bucket and logger had to be replaced. Weather watchers might also be aware that the major catchment for my area, the Gascoyne River, experienced the “great flood” in 2010. This resulted in many sites being damaged and / or submerged. Efforts to pull the existing pluvio cables through the conduit were fruitless, with breaks occurring at numerous locations. In the end my assistant, Mick Major, and I decided to start from scratch, hiring a digger to rip up the old cables and gummed up conduit. Poly pipe was substituted for the conduit because it was readily available in horticultural Carnarvon and the lack of joins would make it easier to pull cables through; at least that’s what I thought at the time.

At the first site, Jimba gauging station, we started poking some heavy gauge, monofilament fishing line through the poly pipe to act as the cable pull-through. With the fishing line through it should be a matter of simply tying onto the bight of the cable, pulling it through, nipping the ends, wiring it up, and job done. We found the fishing line to be quite good … for anything up to about 20m. However, the pluvio at Jimba is about 50m away so this turned into a nightmare. As the poly pipe had not yet been buried it was ripped out of its trench, one end dropped down the river bank, whilst the other was held up high in the instrument tower. We tried in vain to feed the high end while the low end was shaken, coaxed and sworn at.
After 20 minutes or so of this we had only made a further five metres or so. It was time for a rethink.
We ended up drilling a hole about half way and grabbed the line using long nosed pliers. This enabled us to pull and feed the line through from midway, eventually getting it out the end with some more shaking, coaxing and cursing.

The next day we tackled Fishy Pool gauging station where the pluvio sits just over 100m away from the instrument tower.

This was going to require a completely different approach. There were rumours floating around about blowing string through with a rag attached to the end. I was highly sceptical of this approach but couldn’t come up with any viable alternatives. In addition, our digger had buried the poly pipe on us the previous day, so no more shaking, coaxing and cursing …
well maybe the latter?

In order to give it the best chance of working, and if only so I could say “I told you it wouldn’t work”,
I fashioned a miniature parachute out of trusty old blue rag (cloth infused paper rag that only comes in one shade of blue). A roll of builder’s string was then attached to the parachute which was then stuffed in one end the poly pipe.

All the rumours suggested using a compressor, which we didn’t have. However, Fishy Pool gauging station operates on nitrogen so I had a couple of E-size cylinders of the stuff sitting around. Finding a spare gas regulator and cutting a short length of bubble line, we set it all up so the builder’s string would feed straight off the spool as we opened the gas up. The bubble line was shoved in behind the parachute and the gas cylinder opened. Not a lot happened at first, until I opened the regulator up all the way, believing the more the merrier to give it every chance of success. The spool began spinning so fast it was in danger of melting. I was gobsmacked; it worked far better than I ever expected. Never again will I be caught swearing at a long piece of plastic!

Fishy Pool – view from pluvio to instrument tower.
(Floodmarks remain from the 15.7m river, estimated 15-20,000 m3/s flood).

“Parachute” attached to string.

String feed nitrogen propulsion system.

Pluvio cable feed setup.

Environmental Hazards

Australia's hydrographers live and work in a diverse range of environmental conditions. The Northern Territorians experience one of those extremes.

An investigation into an erratic trace was made once the wet season high flows had receded sufficiently to inspect the orifice. The picture shows a Hydrological Services gas chamber orifice GC01 (copper) after two years deployment. Close inspection revealed a number of tooth marks!

Photograph by Rodney Hassett, Hydrographer, NT.

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The Commonwealth *Water Act 2007* gives the Bureau of Meteorology responsibility for compiling and delivering water information. This responsibility is carried out through the Improving Water Information Program, a $450 million Australian Government investment.

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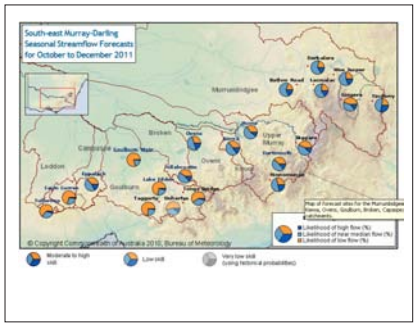
The National Water Account 2010 contains a set of water accounting reports for eight nationally significant water management regions: Adelaide, Canberra, Melbourne, Murray–Darling Basin, Ord, Perth, South East Queensland and Sydney.

www.bom.gov.au/water/nwa/2010



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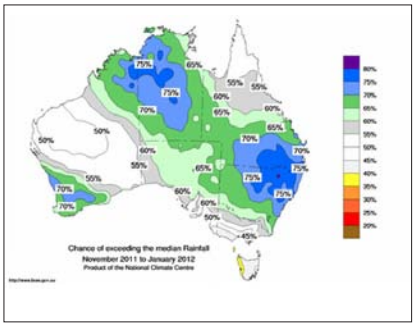
Seasonal Streamflow Forecasts help to improve water management and decision-making for many water managers and users. Forecasts are published each month for the three months ahead.

www.bom.gov.au/water/ssf



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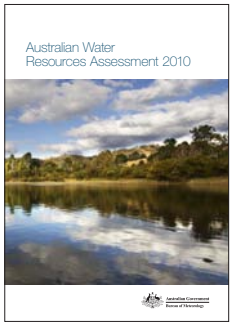
Seasonal rainfall outlooks are general statements about the probability of wetter or drier than average conditions over the forthcoming three-month period.

www.bom.gov.au/climate/ahead



Australian Water Resources Assessment

The Bureau's Australian Water Resources Assessments report on the availability, quality and use of our nation's water resources.

www.bom.gov.au/water/awra/2010

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Upgrading The Network

Frank Davies
Department of Water, Perth, WA

Western Australia's Department of Water monitoring network is presently in the midst of a comprehensive upgrade to Neon internet protocol telemetry using both 3G and LEO satellite networks. Stage one of the rollout is to replace the existing dial-up systems, representing about one third of the network. Providing funding plans are successful, the intention is for all sites to be on telemetry within the next few years. Part justification for the expenditure is to reap efficiency gains such as using the telemetered data instead of the traditional "visit and unload" procedure, as well as earlier detection and repair of site faults.

A secondary focus of the upgrade is to standardise and simplify the equipment. Recent years have seen many changes including the expansion of water quality monitoring, upgrades of data loggers and instruments, increased attention to minimise electrical interference, as well as many versions of the dial-up telemetry hardware.
Not surprisingly, the inside of many instrument shelters have been turned into a spaghetti soup of wires and equipment. Site operators have had to battle with the instrumentation to find space for the field laptop, visit file and test equipment.

The new layouts have all possible instruments secured to a PVC backing board mounted on the shelter wall.
The accompanying picture shows a float well with the data logger, conductivity instrument, Neon telemetry unit and power board all on the PVC board. That leaves just the water level instrument and battery on the table and a much better working environment. Further simplifying the layout there has been a change in strategy to a single solar-powered battery rather than separate battery systems for each instrument. Although the Neon system is capable of recording data from all the instruments, the department has decided to retain the original loggers used in the dial-up system as a further data back-up. These loggers have several more years life expectancy. It is expected they will gradually be withdrawn from service leaving an almost empty instrument shelter!

Completed Neon instrumentation layout.

And the changes haven't been limited to the inside. At many gauging stations the working platforms are elevated. A thorough safety review identified that the platforms and associated ladders did not conform to the Australian Standards. The site featured shows the newly fitted ladder and platform, which uses fibre-reinforced-plastic grating on the landing floor and ladder steps, finial rod to divert lightning strikes, and the solar panel and Neon aerial mounted on a swing-down-pole that will hopefully foil strikes of another kind; vandals. Top it all off with a fresh lick of paint, colour coordinated with the new "wilderness green" platforms and ladders, and the result is very presentable.

The changes have not happened over night. In fact, it has taken many years to pull everything together. And it has involved a number of people in different sections of the department; management to secure the funding, a dedicated asset management group to design and award contracts and arrange fabrication of the infrastructure upgrades, Hydrologic Technology Centre to research, develop, document and train staff in the new instrumentation, and a special effort by operational staff to install everything.

Get a Real Job?

Jobseekers may have noticed this recent advertisement for a 12 month hydrographic position in Western Australia's Pilbara region. It must certainly rank as one of the most entertaining I've read. If you missed it, here it is again.

"Sick of gauging tiny streams? Sick of measuring river level changes in millimetres rather than metres? Is your biggest challenge for the day finding a parking spot near your station so you don't lose the froth off your cappuccino? That's not Hydrography Bazza!

The Department of Water (WA) has on offer a 12 month opportunity to live the hydrographic dream. The job includes bone crunching epic four wheel trips through rugged ancient Pilbara landscapes to visit your remote, isolated gauging stations and you'll need a strong stomach to keep down your camp oven cooked lamb roast whilst roaring up waterfall filled gorges in a jet ranger helicopter to measure another cyclone induced mega-flood.

But don't think we want cowboys with a slap dash attitude to the job. You will need to be a clear, logical thinker that resolves problems on the fly, makes quick, intelligent decisions and has a keen attention to detail. You may need to repair your ADCP before you miss the peak record flow using only the electrical components found within the helicopter that flew you there. MacGyver was actually a Pilbara Hydrographer before making movies.

Based in Karratha you can spend the weekends camping in the internationally recognised Karijini National Park; go fishing or snorkelling in and around the Dampier Archipelago; or just marvel at the scale of the mining operations that are currently driving the economy."

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The span master consists of a manual winch fixed to the operating side post. The winch is manually operated at the desired speed by the operator.

The Span Master is used in conjunction with an ADCP to measure water profile across the river. A 5 kg stabilising weight can be used to stabilise the ADCP in order to keep it from tilting nose up in fast flow or to avoid it from flipping upside down when water current is turbulent.

The manual winch on the operating side is used to drive the ADCP from one side of the river to the other side. The Spanmaster system is suiable for either the 'stationary' or 'moving boat' ADCP gauging methods.

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www.aha.net.au/events/aha-2012-conference/

2012 Conference

The 2012 AHA conference will be held in Melbourne over the period 21-23 August.
Book these dates into your diary and check the available accommodation options.

The conference committee has selected the Moonee Valley Race Course as the venue.

This offers:

- Easy access to the airport
- A large exhibition space
- A large plenary room for the conference
- IT support
- A range of nearby accommodation options

Although all sponsorship packages for the conference have been sold, there are still exhibition booths available to be purchased.
Check the website for details.

The theme of the conference will be announced shortly along with registration papers and conference updates.

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