

Australasian Hydrographer

August 2026



AUSTRALIAN
HYDROGRAPHERS
ASSOCIATION

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Acknowledgement of Country

The AHA acknowledges the Australian Aboriginal and Torres Strait Islander peoples of this nation. We acknowledge the traditional custodians of the lands on which our association is located and where we conduct our business. We pay our respects to ancestors and Elders past, present and emerging. The AHA is committed to honouring Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to the land, waters and seas and their rich contribution to society.

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From the Editor-In-Chief Zac Ward



Welcome to the back-half of 2026 and to some, the nearing end of the 2026 Winter rains. Our AHA President Arran has given a fantastic update below on the state of Australia's meteorological diversity and also the great policy/training works our AHA Hydrographers have a big part to play with.

In this edition we have one of our more regular contributors Mic Clayton outlining the fantastic networking/technical experience the NZHS Technical Workshop affords whilst also discussing some thought-provoking detail around the development of Alpha relationships with Gauging Stations. Two articles... an impressive lift from an ever-impressive Hydrographer.

Thanks again for never shying away from writing a piece for the Australasian Hydrographer and maybe its time for the newer crop of AHA Hydrographers to follow-suit and try their hand at some technical reporting & observations. I'm sure there are some A-Class science communicators out there!

Also, September is closing in, so don't forget to sign up now for the biennial AHA Technical Workshop in Victor Harbour. I'm sure it'll be jam-packed full of hands-on hydrography and I can't wait to hear from Matt & the Team about its success.

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Cheers,

Zac



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From the President Arran Corbett



As we move toward spring, the national water picture once again resists any simple description. Australia recorded its tenth-wettest financial year on record in 2025–26, with rainfall 27% above the long-term average. Northern Australia experienced its 7th wettest wet season, while widespread flooding affected large parts of Northern and Central Australia during March and significant river rises continued in parts of Victoria during July.

At the same time, below-average streamflow persisted across many southern monitoring sites, including parts of South-West Western Australia and inland areas of New South Wales and Southern Queensland. Nationally, above-average streamflow was recorded at approximately 27 per cent of reporting sites, while 28 per cent remained below average. Total surface-water storage finished the financial year at around 65% of capacity—almost unchanged from the previous year.

These figures highlight something hydrographers understand particularly well: national rainfall totals rarely tell the whole story. The location, timing, intensity and duration of rainfall—and the condition and response of individual catchments—matter just as much. Australia can experience major flooding, saturated northern catchments and persistent southern water stress during the same reporting period.

This variability reinforces the importance of maintaining reliable, resilient and nationally consistent monitoring networks and makes the Bureau of Meteorology's Flood Warning Infrastructure Network program especially relevant to our profession. The FWIN program represents a \$236 million, 10 year national investment in acquiring, remediating and standardising priority flood-warning infrastructure. Its objectives include clearer ownership and maintenance arrangements, improved reliability, nationally consistent standards, stronger quality control and better access to flood data.

We are now beginning to see practical examples of that investment. On the Barron River at Cairns Airport, the Bureau has installed its first FWIN water-level radar after the previous station was damaged during Cyclone Jasper. The installation restored real-time river level reporting and provided an opportunity to trial a non-contact technology that may be more resilient to debris, sediment movement and direct flood damage.

Alongside the physical network upgrades, the Bureau is also changing how flood data is delivered. Support for the legacy 'Enviromon' platform is being withdrawn, and a five-minute rain and river level data feed is scheduled to become available to registered Flood Data Service users from October. This follows concern from councils and emergency-management users about retaining access to sufficiently timely information.

These changes are about far more than equipment replacement. They raise important questions about network design, technology selection, communications resilience, data latency, calibration, quality assurance, ongoing maintenance and the professional capability required to support the network over its full operating life. Those are areas in which AHA members have considerable experience and should have a meaningful voice.

There are equally significant changes occurring in national water information and regulation.

New water-market reporting arrangements have commenced, with government agencies and other designated organisations now required to report certain Murray–Darling Basin water-market decisions. Broader reporting obligations will commence in July 2027 under the Water Markets Data Standards 2026, supported by the Bureau’s Water Data Hub. The policy objective is improved transparency and confidence in water markets. Achieving that objective will depend on more than new legislation and data portals. It will require clearly defined information, reliable measurement, consistent metadata, effective quality controls and people who understand how the underlying data were produced.

The 2026 Murray–Darling Basin Plan Review is also underway, while the Productivity Commission is conducting its latest National Water Reform inquiry. Both processes are considering how Australia’s water management arrangements need to evolve in response to climate variability, environmental decline, population growth, changing demand and increasing pressure on water services.

At the same time, Australia’s reformed federal environmental laws are moving into operation. The National Environmental Protection Agency commenced on 1st July, the first National Environmental Standards were made in August, and the remaining reforms are due to commence by December.

Whatever final form these changes take, stronger environmental regulation and greater transparency will inevitably require stronger evidence. Streamflow, groundwater, water-quality and ecological monitoring data must be demonstrably reliable, traceable and fit for purpose. Monitoring

programs cannot be treated as an afterthought once policy decisions, licence conditions or environmental approvals have already been made.

This brings us back to national standards and professional capability.

The National Industry Guidelines for Hydrometric Monitoring remain an important foundation for consistent practice across jurisdictions. After a period of limited activity, the Water Monitoring Standardisation Technical Committee—WaMSTeC—is now active again under the chairmanship of AHA Training Manager Matt Pilkington. Several existing guidelines are due for review, while a number of new guidelines are also progressing, with two understood to be approaching release. This renewed activity is both timely and welcome. Technology, communications, data management and monitoring practices continue to evolve, and the national guidelines must evolve with them if they are to remain practical, relevant and widely adopted.



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Matt's appointment also provides a valuable link between WaMSTeC, AHA's training and certification programs, and the practitioners who apply these guidelines in the field. On behalf of the Association, I congratulate Matt on taking on the role and encourage members to engage with the review process as opportunities arise. The quality of these documents ultimately depends on the experience and practical input of the hydrographers who use them.

Similarly, the Jurisdictional Reference Group on Water Information has historically provided the primary forum through which the Bureau and the lead water agencies of the states and territories coordinate national water-information priorities. AHA should strengthen its engagement with both the Bureau and the jurisdictional agencies so that the operational experience of field practitioners is properly represented as these national programs progress.

There is an important role here for the AHA. We should not be commenting on every policy debate, but we should be consistent and unequivocal on matters that affect the integrity of water information and the capability of the people who produce it. Our position should be that monitoring networks are essential national infrastructure; that data quality begins in the field; that new technology must be supported by sound standards, competent people and sustainable maintenance; and that investment in assets without corresponding investment in workforce capability will not deliver the outcomes governments and communities expect.

These themes will be central to our Technical Workshop and Field Regatta in the Victor Harbor and Coorong region this September. The practical exchange of knowledge between experienced hydrographers, early-career practitioners, government agencies, researchers and equipment suppliers remains one of the great strengths of AHA.

Although I will not be able to attend this year, I encourage members to use the workshop not only to develop their technical skills, but also to discuss the direction of our profession. What are the emerging gaps in our national guidelines? Where are new technologies improving our work, and where are they introducing new risks? Are monitoring networks being adequately resourced? Do our training and certification pathways reflect the capabilities that will be required over the next decade?

These are conversations AHA is well placed to lead.

Finally, I would like to acknowledge the hydrographers who have again worked through difficult and sometimes dangerous flood, drought and severe-weather conditions over the past year. The national statistics may appear contradictory, but they reflect the diverse operating reality our members encounter every day. Your work provides the evidence on which warnings are issued, water is allocated, environmental outcomes are assessed and long-term decisions are made. As Australia's water-information and regulatory systems continue to evolve, that work—and the professional standards that support it—will only become more important.

Stay safe in the field, and I hope everyone attending the Technical Workshop and Field Regatta has an enjoyable and productive event.

Best regards,

Arran Corbett

President, Australian Hydrographers Association

Shanty Town Shenanigans – A Summary Report of the NZHS Technical Workshop 2026

Mic Clayton (FAHA, CPH) – Snowy Hydro Limited, Cooma, NSW

Shanty Town, on the West Coast of the South Island between Greymouth and Hokitika, was the 2026 centre of the universe for the New Zealand Hydrological Society (NZHS) Technical Workshop. Held in late March the NZHS, in conjunction with West Coast Regional Council (WCRC), hosted around 170 participants – the largest number of attendees to date for an NZHS Technical Workshop.

The theme for the workshop was *“Back to Basics: Core Principles for a New Era”*

The workshop ran over three days and included a choice of a field regatta or a data workshop in the middle of the event. Networking opportunities were available each night with the final evening culminating with a dinner and award ceremony.

Keynote speakers included topics presented by representatives from:

- The University of North Carolina (Critical Assessment of SWOT’s Ability to Capture Complex Braided River Dynamics)
- Korea Institute of Hydrological Survey (Application of Image Based Grain Size Analysis for Improving Sediment Data Reliability)
- United States Hydrological Survey (Image Velocimetry Tools (IVy))

Other international presenters ranged from around the globe including University of Ottawa (Canada), National University of Cordoba (Argentina), Sommer Messtechnik (Austria), as well as AHA representation through Matt Pilkington (Qld Hydro) and Logan Cameron (Qld Department of Local Government, Water and Volunteers) who were recipients of travel awards from the 2025 AHA Conference in Launceston.

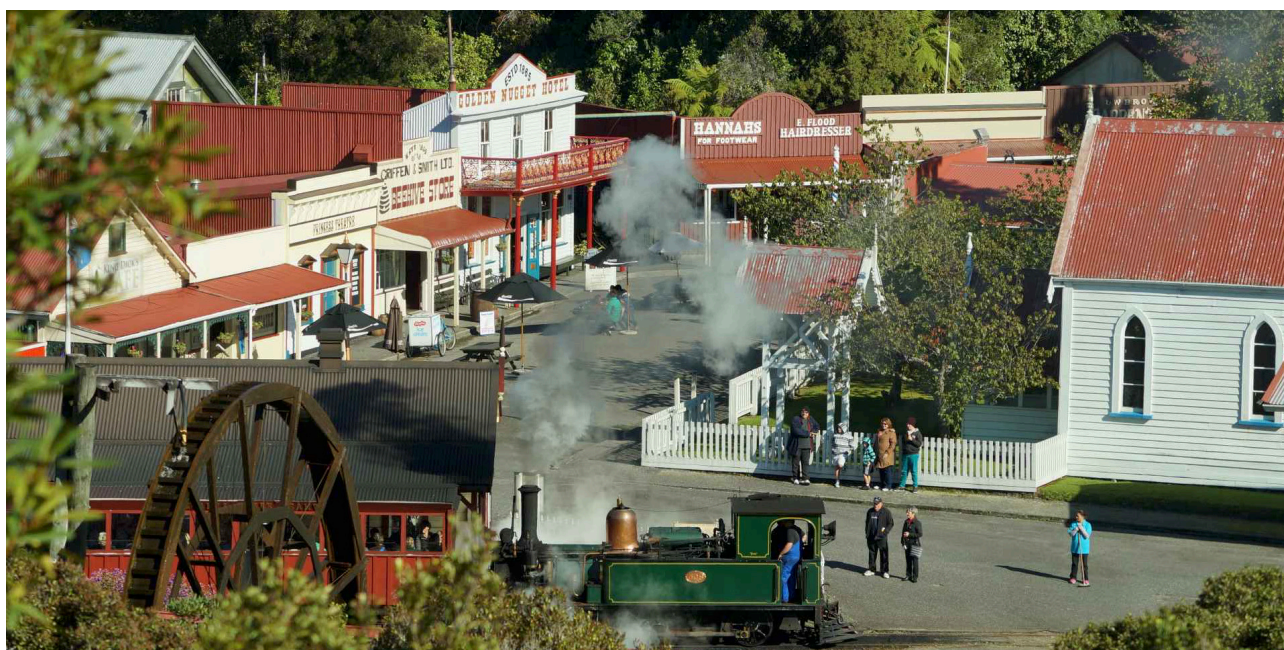


Figure 1 – Shanty Town Heritage Park. Venue for the Workshop

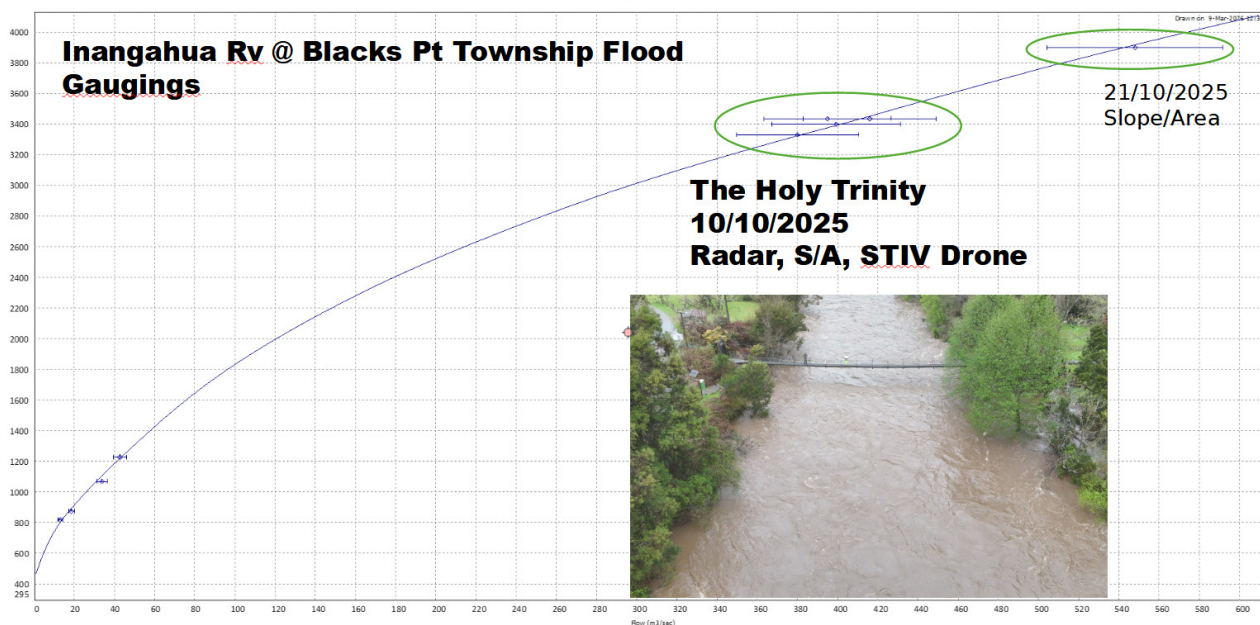


Figure 2 - The Holy Trinity Measurements and the follow-up Slope Area Result with Rating Extensions Completed.
(Source: WCRC Presentation, NZHS Workshop 2026)

Raising Awareness of the Core Principles

The theme was well represented in many presentations, highlighting the roots where a lot of today's computer driven technology and processes have evolved from - The Core Principles that still form the foundation of modern hydrological practices. Presentations from younger presenters illustrated their learning journey into their hydrological careers that drew upon learning from peers and provided opportunities for them to discuss with 'wiser' heads if their journey was meandering appropriately.

For those who were at the AHA Conference in Launceston 2025, you will hopefully remember the co-presentation by Pete and Rueben from WCRC. Presenting on the investigation into extending rating curves into extreme events using a combination of non-contact techniques (the New Era) and slope area techniques (Core Principles). This interfacing of techniques was given the nickname of the Holy Trinity at Shanty Town by Pete.

In October 2025, Rueben and Pete obtained comparative technique measurements simultaneously at Blacks Point during a high flow event using radar, STIV (UAV imagery), and slope area techniques. When the data was finalised this Holy Trinity outcome delivered a flow of around 400 cumecs - nearly ten times more than the previous highest gauging at the site, with the techniques in high agreement.

An even higher event occurred 11 days later than when the WCRC team were previously at the site but following subsequent retrieval of the in situ sensor data following this event, and the confidence obtained during the Holy Trinity event, the rating was extended to 550 cumecs with a discharge measurement that was achieved even though there was no human presence at the time. The data from the slope reach sensors working away continuously through the event - with no overtime rates paid!

Graeme Horrel presented on the importance of validation of data with field observations and the value of chasing high flow events. The example presented was related to the Tengawai River shown during a flood in 1986 (refer Figure 3) The problem presented was a proposal to build a dam some distance upstream from this location and the need to design a spillway capable of passing a 1 in 500 year flood event, BUT the only data available for flood frequency analysis was a downstream flow monitoring site that was installed **primarily as a low flow monitoring site**. High flow events were not considered a function of the site when it was established.

Calculation of the 1 in 500 year flood based on the extended rating curve put the 500 year event at 700 cumecs. Questioning this approach, Graham went back in history to look at what design engineers used when they had little or limited data to design for the big flood events. His review and application

of accepted engineering techniques resulted in a potential spillway design of potentially closer to 480 cumecs, using four comparative methods that have been used by design engineers when limited data is available:

- Flood frequency (1989)
- Regional flood estimation tool for NZ (2016 and 2018)
- Rational method – Original (1851) by Irish Engineer Thomas Mulvaney (latest update Griffiths 2012)
- Technical memorandum 61 (TM61) (MOW 1953) (Metric version 1975)

The four methods yielded similar results with the important message that there are alternatives to test our rating extensions against, but more importantly it highlighted the value of that high discharge measurement if it can be obtained. The potential cost saving for the spillway design in this instance is in the range of \$10-25 million if that high gauging can be obtained to confirm the theoretical design assumptions.

The New Era is seeing the arrival of tools to assist us with achieving results based on actual events as Graeme referenced the importance of Rueben and Pete's work in developing confidence in the emerging technologies and use of established theoretical techniques such as slope area calculations for discharge.

Your high flow gauging, leveraging the knowledge of past techniques and application of evolving approaches, can rightly be labelled that million-dollar gauging!

Other presentations covered included topics such as:

- Mental Health Implications of Hydrological Data in the Agricultural Sector – the importance of clearly explaining hydrological data that can impact on the livelihoods of farmers, and more importantly that the accuracy of the data is robust to support the management, and potentially political decisions that are made around hydrological data.



Figure 3 – 1986 Flood Event, Tengawai River. (Source: Graeme Horrel presentation, NZHS Workshop 2026)



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- Data Sovereignty – in a nutshell if you are permitted to operate a monitoring site for a specific purpose on someone's property, are you entitled make that data available for other purposes without agreement on its intended use from the landowner? What are the implications if data is used by a developer that might adversely impact the property owner that permitted you to monitor on their property in good faith?
- Updates on New Zealand's Environmental Monitoring Standards (NEMs) and NZHS International Relationships with other Organisations
- As well as other high-quality technical presentations covering alpha curve developments, flood warning systems for construction sites through to preserving those old records and processes that can be drawn on in the future to enable the hydrologists of the New Era to be able to enhance their skills and knowledge in the work they are undertaking now.

Flow Measurement Day (Regatta)

An important event at any NZHS Technical Workshop is the Flow Measurement Regatta. The Regatta is a major component of the workshop in the NZHS field expertise development calendar, enabling field personnel to compare and refine their processes against the New Zealand NEMs and their peers.

The Regatta was conducted primarily downstream of the exit of the Hokitika Gorge, near the Granite Creek confluence, with a non-contact measurement (radar) demonstration reach conducted off the suspension bridge over the Hokitika Gorge a little further upstream. Wading sections were also utilised downstream of the deeper Gorge site. Sand fly repellent and sunscreen, or cover up all flesh, were amongst the safety toolbox items for the day.

The rated flow on the day was 26 cumecs. 21 measurements were collected on the day and a draft Results Report was delivered to the delegates the following morning, courtesy of some AI generation, though there was still an amount of 'fact checking'



Figure(s) 4 - Images from the Flow Measurement Workshop Day. (Sources: NZHS and S.Walker)



Figure 5 - Black Powder Club Show (Source: M Clayton)

that corrected a number of aspects of this draft report. The report is still being finalised, correcting AI inaccuracies and investigation into data from one gauging cohort sitting higher than the bulk of the results. Generally, the mean of the bulk of the discharge results was 26.17 cumecs, +0.7% off the rated flow.

Australian made Surfbees were again the dominant deployment platform in use on the day, with a smattering of hard-shell hulls present along with an appearance by an Apache4 integrated survey system.

Out of Session Activities

Evening sessions were supported by the NZHS and Envco, at the Montieth's Brewery and Speight's Ale House in Greymouth, with the end of workshop dinner in Shanty Town.

There was time at breaks and lunch to enjoy, not only delightful food fare, but the delights of Shanty Town including steam train rides, explore replica shop fronts from the New Zealand's 'Wild West' and participate actively in the Black Powder Club Show. Here there was a long line of delegates at wanting to have a go at the noise and smoke of single shot historic rifles and pistols.

The next Technical Workshop will be held in the Greater Wellington Region (North Island) and is currently programmed for March 16-18th, 2027. Consider this as a potential professional development activity to include when developing your personal KPI plan for the next financial year!

Technical Note – A Potential Technique for Determination of Streamflow Alpha Relationships using QRevMS

Mic Clayton (FAHA, CPH) – Cooma, NSW

Abstract

Non-contact discharge measurement techniques – surface velocity imagery, velocity radar and timing surface floats – require application of a water surface velocity correction coefficient. This is known as alpha (α) and is used to generate the mean velocity of the water column for the eventual stream discharge computation.

The alpha coefficient (α) is generally described as the ratio of the mean water velocity of the water column (V_m) to the observed water surface velocity (V_s):

$$\alpha = V_m / V_s$$

There is no universal alpha value applicable for all streams, though an alpha of 0.85/0.86 is generally accepted as a starting value for non-contact measurements. This is until an understanding of the actual site alpha can be derived from observations and other techniques.

A variety of techniques for determining a suitable site alpha are summarised in an Envirolink Advice Report, published by NIWA in 2021 titled, '*River discharge from surface velocity measurement. A field guide for selecting alpha*' (Biggs et al). This includes techniques for determining alpha values using features contained in the QRev (USGS) and QRevInt (Genesis HydroTech) software's used for quality assurance and post processing of moving boat ADCP discharge measurements.

The development of QRevMS (Genesis HydroTech) for section by section/stationary ADCP/ADV sensors discharge measurements provides another option for determination of a stream velocity alpha relationship for a site. At time of preparing this article the current release of QRevMS is 1.39 enabling the estimation of section-by-section individual velocity alphas by two options:

- Alpha value derived from the actual measured section of the vertical's velocity profile
- Alpha value derived from the measured section and the '*extrapolated*' components of the velocity profile derived from the QRevMS analysis

If using a version of QRevMS prior to the most recent releases, it is possible to manually estimate the alphas for vertical velocity profiles, but the development of the most recent versions has provided a productivity gain via the excel file output generated by the software.

This technical note describes a process of generating a stream velocity alpha using data generated from QRevMS and illustrates some examples of the derivation of site-specific alpha curves from available discharge measurement datasets.

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Background

The implementation of the alpha estimates from QRevMS borrows on the concept described in Biggs et al where a technique is described for using QRev/ QRevInt (ADCP moving boat post-processing and review software) to determine a velocity alpha:

- Method 1a: Site alpha from extrapolated ADCP velocity data, and
- Method 2b: Alpha from power law profiles

Similar information is contained in the 'Extrap' tab in QRevMS that can be used for determination of

individual velocity profile alphas. (An early concept of this approach is also described in Biggs et al, Section 5.2 – Individual alpha values for each surface velocimetry section. The process was described before the development of QRevMS).

As can be seen in Figures 1 & 2 the appearance of QRevMS 'Extrap' and QRev/QRevInt 'Extrap' tabs are very similar but differ in that each individual velocity profile can be assessed in QRevMS, whereas the tab in QRev/QRevInt is the global agglomeration of all the processed transect pings being used for the computation.

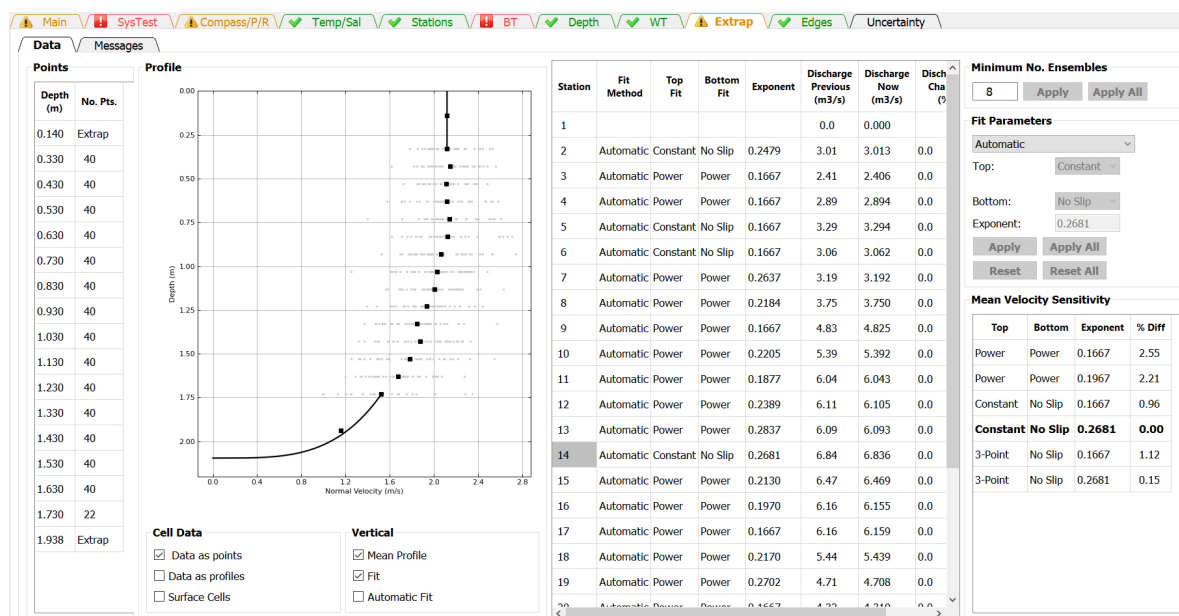


Figure 1 - QRevMS 'Extrap' Tab

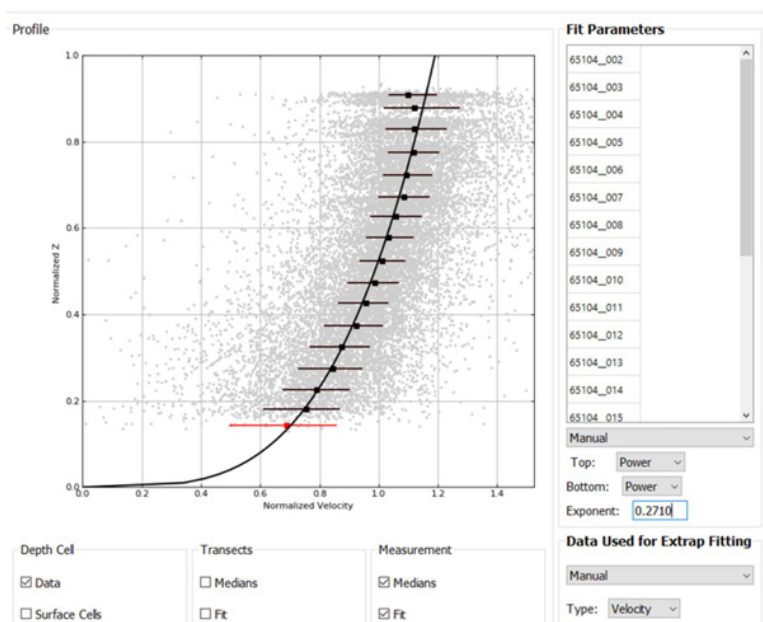


Figure 2 - QRev/QRevInt 'Extrap' Tab example (Source: Biggs et al, 2021)

Process to Generate Alpha Estimation Outputs from QRevMS

- Generate QRevMS readable files exported from ADCP/ADV software
- Open exported file from ADCP software in QRevMS
- Undertake quality assurance and assessment of discharge measurement via the QRevMS workflow process as per organisational requirements or other valid quality processes
- Save the QRevMS project. Amongst the outputs an .xlsx file is generated. This is the file that contains the estimated alpha value for each vertical using the two options, measured cells only and the extrapolated estimates for the verticals derived by QRevMS.

The last two columns in the generated .xlsx file contain the calculated alpha estimates for each profiled vertical. In QRevMS V1.39 the alpha estimations are contained in columns BR and BS.

Table 1 presents an example of the output for each vertical where a valid measurement is available.

Using the Alpha Estimations Generated by QRevMS

The alpha computations presented in Table 1 were derived from a stream monitoring section with relatively 'clean' edge flows (refer Figure 3). In this instance it would be appropriate to develop a single alpha value for this flowrate/gauge height for use in the development of an alpha relationship for this site.

In the example presented here the single alpha could be the mean of all the alphas generated, given the consistent channel characteristics and resultant clean edges. The outcome of this approach would be single alphas (rounded to 3 decimal places) as follows:

- Mean all Alpha Measured = 0.889
- Mean all Alpha Extrapolated = 0.851

The choice of which alpha to utilise for analysis/measurement processes will also depend on site conditions especially any wind shear effects on the water surface velocity interface. Ideally utilisation of a discharge measurement not impacted by wind for alpha determination is preferable, especially for slower moving streams.

Station Number	Location	Alpha Measured	Alpha Extrapolated
1	49		
2	50	0.898519221	0.898519221
3	51	0.905356463	0.846000153
4	52.5	0.936850638	0.857118368
5	54	0.918136662	0.825689552
6	55.5	0.901381493	0.857118368
7	57	0.888809761	0.826901796
8	58.5	0.890061576	0.80354981
9	60	0.889169596	0.811028034
10	61.5	0.884299087	0.823019376
11	63	0.8919295	0.835016007
12	64.5	0.858554981	0.815761402
13	66	0.877756726	0.846630348
14	67.5	0.837927163	0.837927163
15	69	0.850572087	0.80626432
16	70.5	0.841749317	0.841749317
17	72	0.855745888	0.855745888
18	73.5	0.88950586	0.824904424
19	75	0.905120817	0.857118368
20	76.5	0.899247085	0.855449752
21	78	0.901827643	0.857118368
22	79.5	0.889220234	0.845269584
23	81	0.88673373	0.830417467
24	82.5	0.854134539	0.822067656
25	84	0.849912784	0.849912784
26	85	0.934536827	0.934536827
27	86	0.890165304	0.854711554
28	87	0.907989612	0.907989612
29	88	0.951606527	0.951606527
30	89	0.904413788	0.904413788
31	90.2999		

Table 1 - Example of Alpha Estimations for Individual Velocity Profiles Generated to an .xlsx. Output File by QRevMS. (Note: This example 'hides' the intervening columns D to Column BQ)

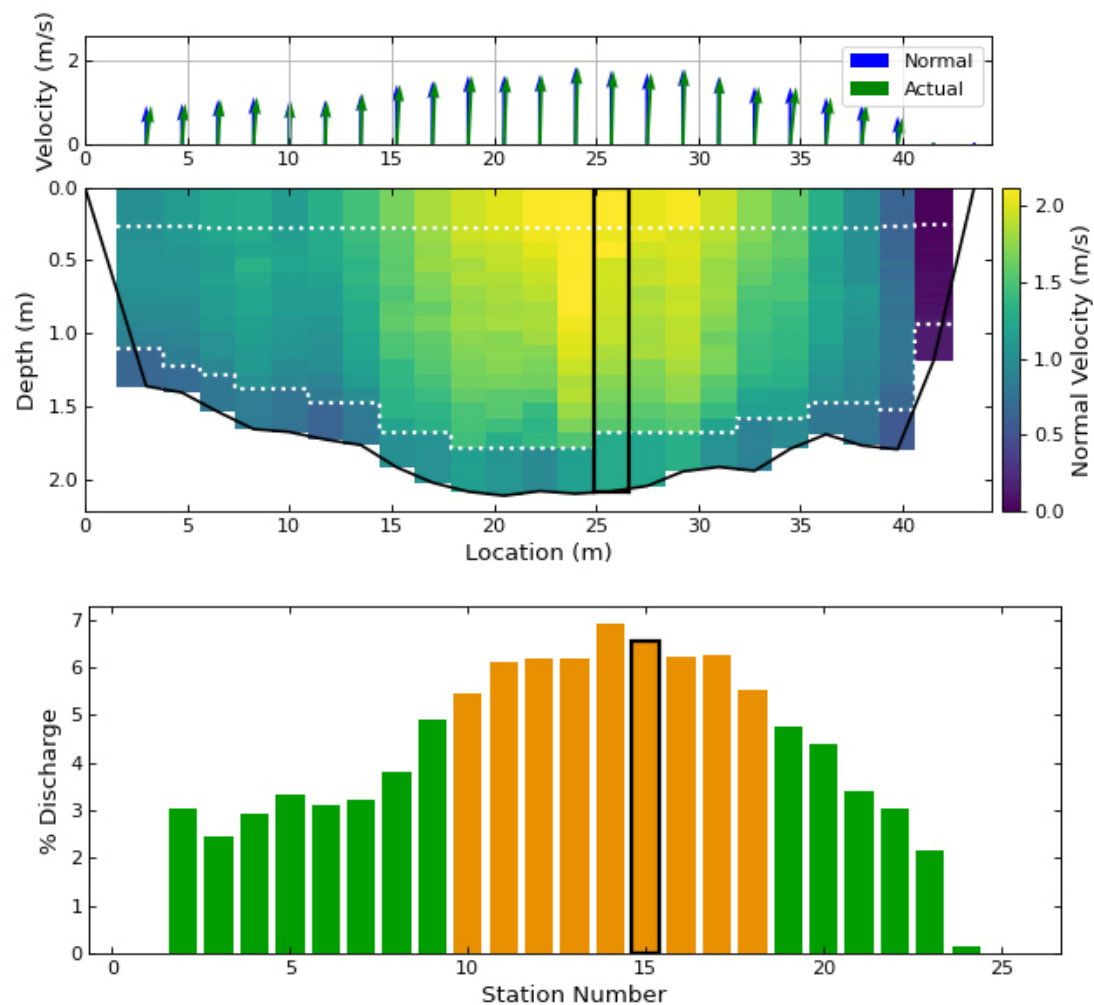


Figure 3 – QRevMS Visualisation of the Stream Section and Velocity Characteristics that Generated the Alpha Estimates in Table 1

Development of an Indicative 'Alpha Curve' for a Site.

Using the technique described above it is feasible to develop an alpha relationship for a site from a spread of representative discharge measurements, as alpha may not necessarily be a fixed value for a site through the range of discharge measurements available for assessment.

Considering an alpha estimation for a range of flows provides the hydrological technician with a visualisation of potential alpha behaviour in the known flow ranges with potential to assist in extrapolating alpha relationships beyond the 'highest gauging' on a rating table – an area where non-contact discharge measurement techniques provide the tools to undertake measurements when flow conditions such as extreme velocities and turbulence can create significant challenges for safe and effective discharge measurements using current meters and ADCP's.

Essential requirements of the discharge measurements used in the development of an indicative alpha curve for a site are:

- The same discharge measurement cross section
- Minimal wind effects – especially at lower velocity flow conditions.

Utilising a range of suitable discharge measurements, a table/plot of alpha values against the representative gauge height or discharge can then be developed.

Using a range of discharge measurements from the example site discussed in the previous section, the following Alpha Vs Discharge relationship was developed for the site. (Conversely a related stream gauge/alpha relationship can be visualised). Figures 4 and 5.



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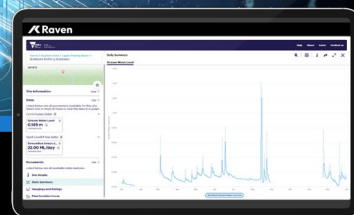
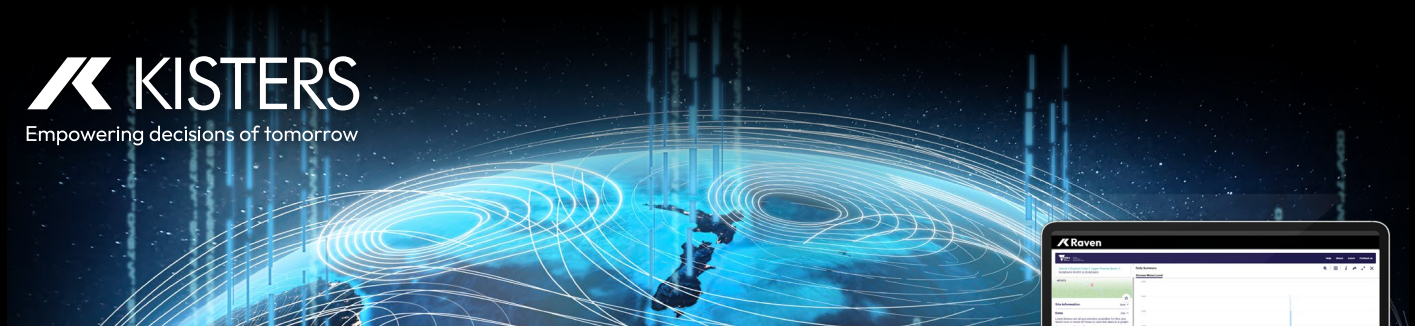
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In this site example a range of flows from 10-105 cumecs were utilised to develop the following visualisations. Given the general closeness/alignment of the two alpha estimation outputs for

this site, a single mean of the two outputs for each discharge measurement was used to generate the varying stage/flow plots against alpha presented in Figures 4 and 5.

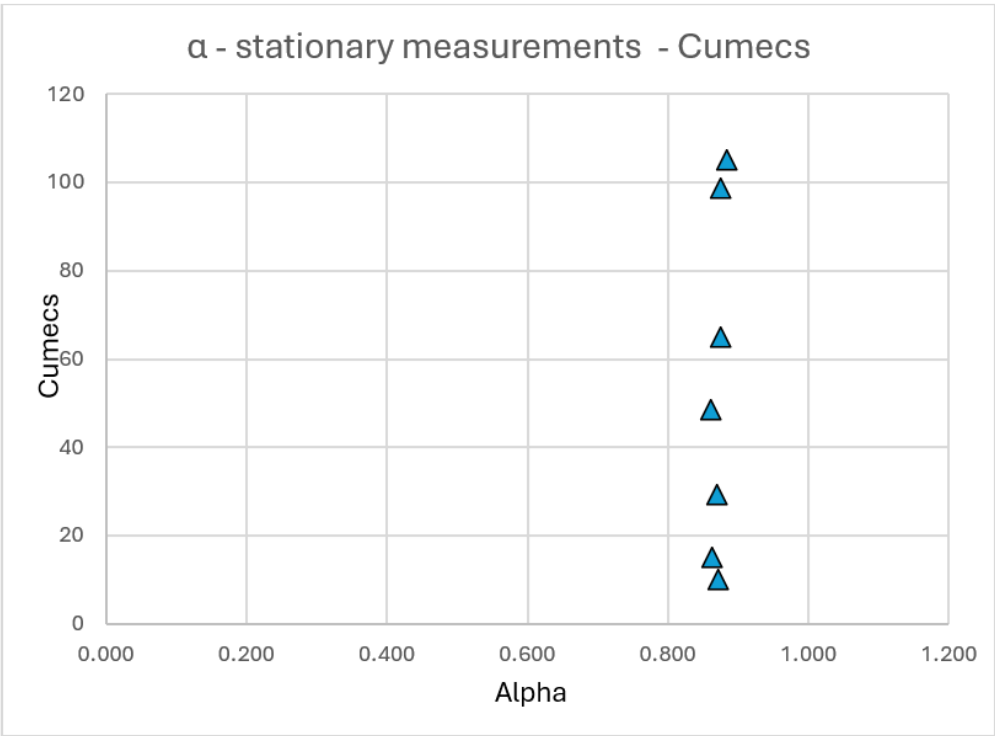


Figure 4 – Example of Alpha Relationship Visualisation against Discharge

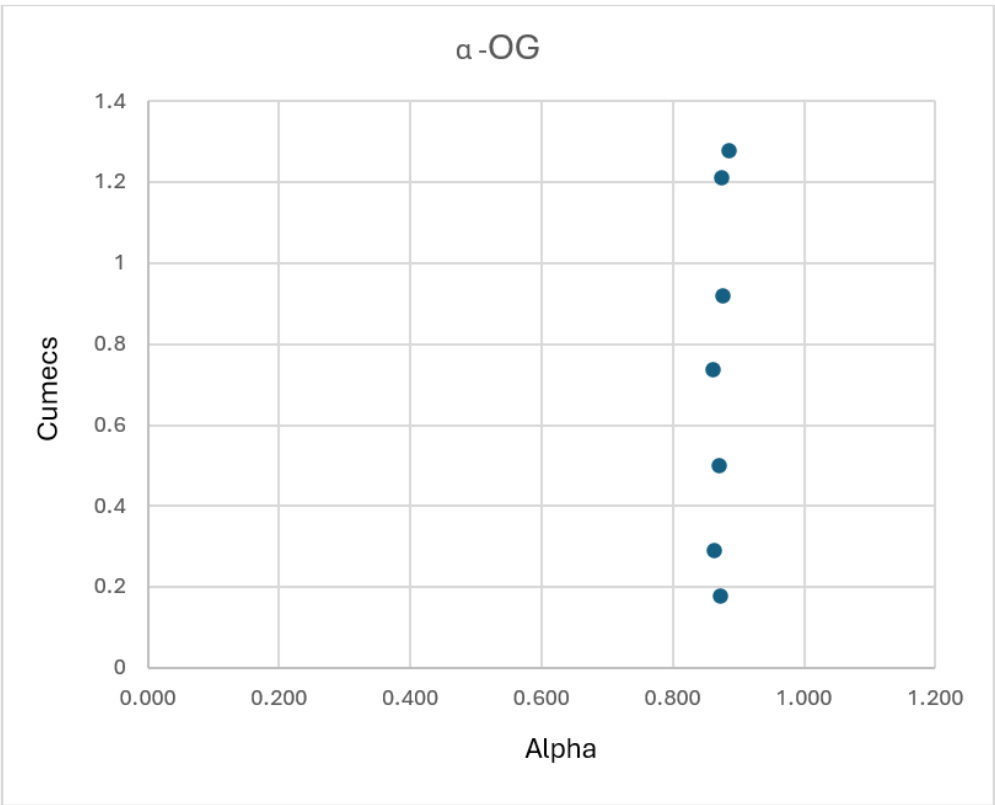


Figure 5 – Example of Alpha Relationship Visualisation against Reference Gauge Height

Commentary

The example presented in this technical note is primarily a demonstration of what information and techniques could be used for the development of an understanding of stream alpha for a stream gauging site using the statistical analysis tools of QRevMS, with the specific aim to produce an estimated alpha range for non-contact discharge measurements.

Existing ADCP/ADV discharge measurements, once processed through QRevMS provide you with the alpha estimates that will assist in the development of the required alpha estimates.

The alpha/ reference gauge height relationship could feasibly be a 'rating table' in your hydrometric data management system to apply to non-contact surface velocity observations be they imagery, point velocity radar or even the float and stopwatch techniques, a technique most recently re – endorsed as an applicable surface velocity discharge measurement technique in the most recent release of ISO748 (2021)

A note regarding the example presented here though:

The alpha relationship derived for this example site presents an even distribution of alpha through a wide range of flow conditions. This is by virtue of the cross section and flow conditions being a result of:

- human management of the channel shape at the site and downstream channel control conditions,
- all flows presented in this technical note were maintained in the primary channel and
- the section shape is approaching the ideal trapezoidal shape (as prized in many gauging situations)

In other words, the site provides a suitable environment for developing an initial appreciation of the potential to develop an alpha relationship.

Irregular bed shapes, overbank flows when the main channel capacity is exceeded, and downstream controlling conditions are some of the flow conditions that would have an impact on the definition of the alpha relationships through the analysis of velocity verticals using QRevMS smartware.

There is probably an advantage in using stationary ADCP measurements when main channel capacity is exceeded as using a moving boat approach might result in unusual analysis result of a global alpha via Biggs et al Method 1 using QRev/QrevINT softwares.

If it is not possible to undertake stationary measurement techniques when main channel exceedance occurs then a combination approach of moving boat for the main channel and stationary method for the overbank flows might be considered, if safe to do so.

QRevMS provides a tool that better standardises the analysis of velocity data collected by the primary ADCP systems in use. It is widely accepted that algorithms used for processing acoustic doppler measurements varies between manufacturers, hence the initial development of QRev by USGS to standardise the processing of raw ADCP data from the different manufacturers of ADCP systems has been important.

To Round Out

The ongoing development and refinement of QRev (USGS) has been progressed via the International Hydrometry Group, IHG, (internationalhydrometrygroup.org) with enhancements added, through the knowledge and assistance of Genesis HydroTech (genesishydrotech.com/home) and funding from a variety of international water agencies (primarily Europe and Canada), to develop QRevINT for moving boat ADCP measurements.

In recent years a working group within the IHG has progressed and funded the birth of QRevMS for stationary ADCP measurements. Recent developments in this space have included ability to utilise FlowTracker 2, Nivu Flow Stick and Ott MFPro data files.

Life in the Field

Personal historical account and reflection – Alex Springall

Hydrographic and Installations Teams, when in the field, were paid a travelling allowance (TA). This rose from \$5.40 to \$6.60 per day in 1967, which doesn't sound much, but at that time, bed & breakfast accommodation at a country pub was around \$2.50-\$3.00 per night, and less if you were staying for any decent length of time. A good meal at a cafe cost about \$1.30. Because we were receiving this per diem, rather than the much lower camping allowance paid to river improvements gangs and others, we were supposed to stay in "appropriate accommodation". In view of the passing of the statute of limitations, I can now reveal that sometimes, we didn't. This meant that as well as our official cargo, the vehicles also carried tents, camp stretchers and a large tucker box. We often camped at the "River Bank Hotel" at the first station to be gauged the next morning. It is rumoured, though I never saw it myself, that one of the Armidale utes was fitted with sleeping accommodation. Usually, it was possible to camp close enough to town to walk or take a short drive to the pub, but several hydrographers were retired alcoholics, who preferred to camp well away from temptation. If the assistant wanted a drink, it often meant a long walk.

We didn't always camp. Many country hotels were very reasonably priced, and even after buying a meal at a cafe, there was some of our TA left. Sometimes gauge readers had accommodation we could use. But some hydrographers really liked to save every cent they could and camped almost every night. On arrival at the camp site, the hydrographer would usually complete the day's paperwork and computations, while the assistant would prepare the camp and get dinner ready. The menu varied according to the taste of the hydrographer and the culinary skills of the assistant. With Len, dinner was always deep-fried potato chips and barbecued sausages. Lionel had a number of tasty recipes and allowed the assistant to use his imagination. Pat liked steak and three veg, but if we'd picked up lambs

fry, kidneys or heart and were staying at Jemalong Weir, we had gourmet breakfasts. Rex liked cafe or pub meals, even if we were camping.

Most hydrographers carried one or two Primus or small gas stoves so they could cook even in fire ban periods. After his assistant had peeled the vegetables and put them in the billy to cook, one hydrographer's practice was to drive to the pub, with the billy on the gas stove in the back of the ute, under the tonneau cover, while the veggies cooked to a mushy mess. Once, he and his assistant were on about their fifth beer when a local walked nonchalantly into the bar to inform them that their vehicle was on fire.

"Once, he and his assistant were on about their fifth beer when a local walked nonchalantly into the bar to inform them that their vehicle was on fire."

TA was paid for each day we were in the field, including weekends, but we didn't work at weekends unless there were floods, when either overtime or leave in-lieu would be paid. This meant that sometimes the team would be stuck in a 'one-horse town' with nothing to do but drink. Many hydrographers and their assistants would use their TA to pay for a return train ticket to their base, or take a private car with them. After finishing work on Friday, the Commission vehicle would be left somewhere secure and the team would travel to their home, returning to work on Sunday night or early Monday morning. While this was, strictly speaking 'against the rules' it was known about by the hierarchy. They generally turned a blind eye, but it was noted in the "little black book" for use when necessary.

In one country district many of the hydrographers, assistants and the District Engineer lived in Commission houses in the same street.

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At weekends, the engineer would pointedly “not see” any hydrographers he encountered.

Not wanting to spoil a good thing, hydrographers were usually very careful not to use work vehicles to return to their base illegally. However, in one case, Dave (the boss) received a call from the police, advising that a work vehicle appeared to have been abandoned at a forestry camp just out of town. It seems that the hydrographer had left the work vehicle there and been collected in his private car by his wife. In another case, the assistant told Dennis (the hydrographer) that he would stay in Warren for the weekend, while Dennis caught the train back to Sydney. As Dennis relaxed in the train approaching Dubbo, he looked out the window to see his vehicle, assistant at the wheel, heading rapidly towards Sydney. One Armidale crew, speeding home unofficially for the weekend, came up behind the DHE. When he realised who they were, the DHE slowed down progressively. Reluctantly, the hydrographic team had to take themselves off expenses for the weekend.

In the field, we weren't tethered to the 9am to 5pm routine of the office. Some hydrographers liked to start early, while others preferred a late start. We often worked longer hours in the field, sometimes just to get the work done, sometimes to give ourselves an early knock-off on Friday. Some hydrographers and assistants liked to start and finish early and play a game of golf after work.

One thing everyone avoided was completing their itinerary early, as this would mean losing a day or more's TA. On one three-week itinerary with Lionel, we didn't encounter one flowing river. We painted recorder shelters, carried out annual inspections of stations, completed any maintenance that we could find to do and filled in as much time as we could justify. Nonetheless, by the Wednesday of our last week it was clear that we would have to return a day early. Lionel phoned our District Engineer from Hill End to deliver the news, but was informed that we were needed at Warren, in the north-west of the state. The Minister had approved a release of 20,000 acre feet of water from Burrendong Dam,



Macquarie Marshes

and we, with several other hydrographic teams, were to measure the flows as they passed through the many channels of the Macquarie Marshes. This finished up taking five weeks, in a part of the state that I had never seen before. The days were long and hot, but the work was interesting, with the Project Engineer (Max Shaw) putting our data together each night and scheduling the next day's work. Sometimes we would be gauging large flood runners, and other times we would be measuring flows at tiny trickles. The arrival of the water stirred up the animals, both native and feral, in the marshes, with plenty of snakes, birds, especially galahs and emus, and feral pigs. We moved around a lot, staying at either Warren or Carinda. The Carinda Hotel had only recently been built, and we stayed there when in the area. As well as supplying breakfast and dinner, the publican also packed lunches for us in an Esky, usually cold meats and salads, which were an improvement on the sandwiches we would normally have eaten. In Warren, we stayed in the Commission quarters at Warren Weir and ate huge dinners at one of the cafes in town.

Coming, as it did, just before Christmas, this trip made a welcome bonus to our bank accounts. We'd had eight straight weeks in the field on TA and most of us hadn't needed to touch our pay. We'd also been able to save quite a bit of our TA. Santa was very generous that year.

Life wasn't always so pleasant. Sometimes we were wading in rivers when there was still ice on the puddles. We worked in cold winds and pouring rain, and sometimes in snow. Even though we had good equipment, nothing could make these conditions pleasant. At the other extreme, sitting in a small aluminium boat in +40°C heat while the current meter barely seemed to move and the bush flies tried to get into your mouth, nose, eyes, ears and any other orifice was pretty uncomfortable, and occasionally during floods there would be long days of hard work, gauging from bridges or boats when we were cold and hungry. Usually though, the work was enjoyable, and there was a sense of satisfaction at the end of the day.



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