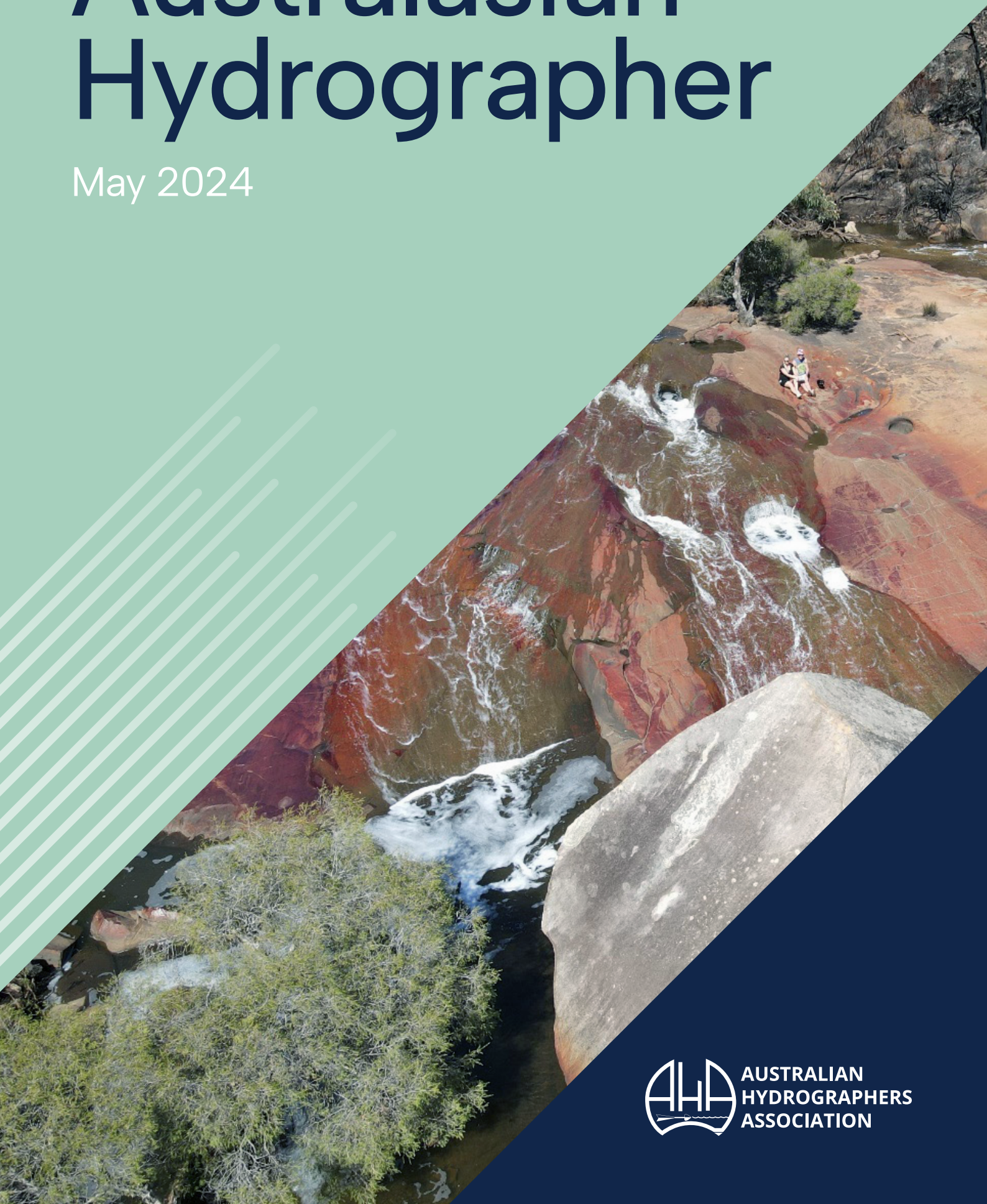
Australasian Hydrographer

May 2024



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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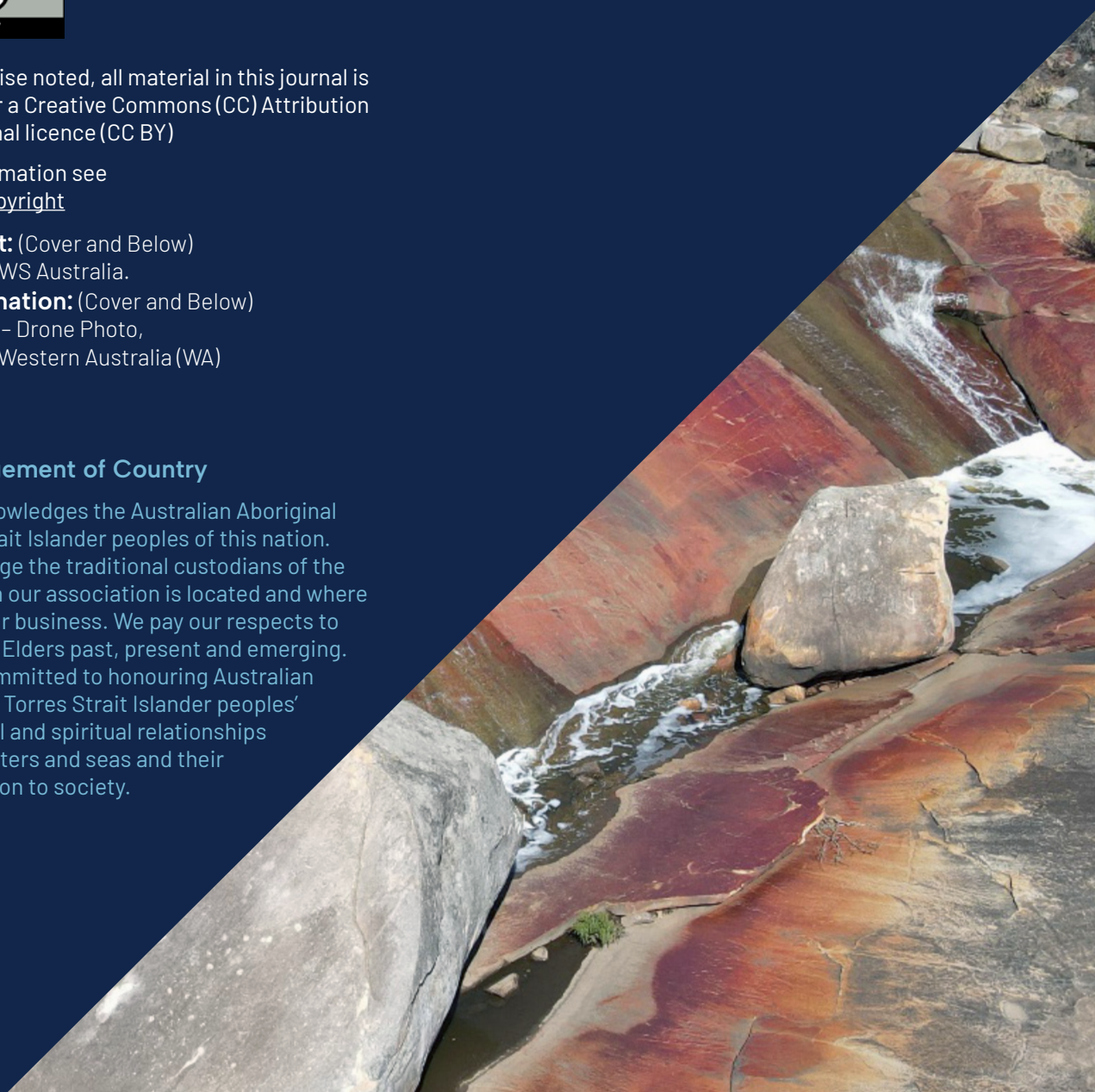

From the Editor-In-Chief

Zac Ward

Hope everyone is enjoying a productive, safe and hydrometrically-filled start to 2024 with a majority of the early-year Public Holidays all but now depleted sadly....With the wet/gauging season nearing completion for some, it is fast approaching that fun flowtime & measurement mania for others in alternative Australian geographies!

At the risk of sounding like a broken record please pay some consideration to submitting AHA articles, photo's, case studies for us to feature in future publications. I can always be called upon to help with any material submissions, profiles and really do love the chance to talk and hear from other hydrographers across Australia/New Zealand and what you are all up to.

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On a final note regarding New Zealand, this months publication features a great write-up from a regular contributor (Mic Clayton) on the recently held New Zealand Hydrological Society's Technical Workshop in Queenstown. I'm sure everyone who attended found it extremely illuminating and worthwhile and I look forward to possible other articles trickling through from the event. Keep a lookout for your fellow hydrographers at the years upcoming Workshops & Conferences.

Cheers,

Zac Ward CPH

From the President

Arran Corbett

Dear Members,

Warm greetings to you all in this edition of the Australian Hydrographers Association (AHA) quarterly journal. As we explore the latest happenings in our field, I'm excited to share some updates and initiatives that we're thrilled about.

First off, a big congratulations to the New Zealand Hydrological Society (NZHS) for another successful technical workshop held this April in Queenstown, NZ. We're proud to have had our AHA prize winner, Jaymee Woods, represent us at the event. Keep an eye out for Jaymee's insights on her experience at the conference.

Looking ahead, mark your calendars for the upcoming AHA training week in Darwin this September. It's going to be an enriching event, featuring a Water Quality Community of Practice meeting and a field day covering practical aspects of groundwater, surface water, and water quality. Huge thanks to the subcommittee for their hard work in putting this together. And to our corporate partners, consider this your invitation to explore sponsorship opportunities and collaborate with us.

In our ongoing commitment to support our members, we're actively collaborating with the New South Wales Department of Planning, Industry and Environment (DPIE) to enhance the awareness and capability of our Certified Practicing Hydrographers (CPHs). This collaboration aims to equip you with the skills needed to seize paid opportunities in Non-Urban Metering and Flood Plain Harvesting sign off. Stay tuned for more information, including task datasheets and webinars.

I want to take a moment to thank each of you for your continued support and dedication. Your feedback is invaluable, so please keep it coming. Let us know how we can better serve you.

Here's to pushing the boundaries of hydrography together, fostering innovation every step of the way.

Best regards,

Arran

*(*AHA President, Arran Corbett, is an employee of Ninox)*

Water Quality – Community of Practice

Tara Matthews – Environmental Product Manager (Thermo Fisher Scientific)

Dr Ryan Turner – Science Leader, Reef Catchments Science Partnership (University of Queensland)

Overview

The Australian Hydrographers Association (AHA) are excited to be endorsing the formation of a National Water Quality Community of Practice (WQ CoP) lead by Dr Ryan Turner, Science Leader at the Reef Catchments Science Partnership at the University of Queensland and Tara Matthews, Environmental Product Manager across Australia and New Zealand from Thermo Fisher Scientific.

With a Steering Committee formed, the team consists of industry leaders in this space including Malcolm Robinson from WaterNSW, Michael Whiting from Department of Water and Environmental Regulation and Ben Ferguson from Department of Environmental Science. The team are meeting weekly and the anticipation and energy from our extended community is a positive and engaged response.

Dr. Turner is currently the Science Leader of the Reef Catchments Science Partnership at the University of Queensland (a partnership with the Department of Environment and Science). Ryan was previously the Principal Scientist for Water Quality and Investigations in the Department of Environment and Science and held an Adjunct Associate Professor role at Queensland University of Technology in the Managing for Resilient Landscapes, Institute for Future Environments.

For 12 years Ryan managed multi-million dollar water quality monitoring programs assessing the impacts of sediment, nutrient and pesticides loads in numerous catchments along the Queensland coast discharging to the Great Barrier Reef and Moreton Bay. Ryan has been on several steering committees and technical advisory panels, such as the Great Barrier Reef Foundations Technical Advisory Panel.

He has published extensively (>60 papers and reports) and led several Queensland Government – Academic collaborative research projects. Ryan previously supervised analytical chemistry and microbiology laboratories in the private and public sector. Ryan has developed numerous methodology and standard operating procedures for analytical and monitoring techniques (water quality, sediments and soils). Ryan's passion for the future of water security is what keeps him going.

Dr Turner said

> ***"every year millions of dollars are spent across Australia monitoring water quality and with the advancements in real-time monitoring, the data is coming in thick and fast. We need to be on our front foot in ensuring the quality of data is fit for purpose, so knowledge created from the data and the decisions made are appropriate and not misleading due to poor quality data".***

Dr Turner want's the water quality community of practice to share monitoring experiences amongst each other and discuss how to improve outcomes from using real-time water quality monitoring equipment.

Dr Turner also said

> ***"the long-term objective of the water quality community of practice is to begin to develop a national framework for real-time water quality monitoring. Where we address aspects like, field deployment, quality assurance and quality control, in field maintenances (preventative and breakdown) and calibration procedures, data processing; data anomaly detection, and data gap filling procedures for missing data",***

and ultimately have nationally accredited training, this is a big and complicated space, and we need the experience and knowledge from everyone in the water quality monitoring industry to get involved.

Working alongside Ryan, Tara Matthews is the Senior Australian and New Zealand Environmental Product Manager at Thermo Fisher Scientific and manages industry leading environmental suppliers including US based manufacturers In-Situ Environmental and QED Environmental.

Tara is a scientist and passionate environmental advocate with over 12 years' industry experience and has proudly supported innovation within the environmental monitoring and regulatory space, working closely with environmental suppliers, key industry bodies and industry experts to explore, test and implement new products, technologies and methodologies for groundwater, surface water and coastal monitoring applications.

Tara has worked across Australia and New Zealand supporting customers in natural resource and regulatory bodies, local government, environmental integration companies, environmental consultancies, academia and research institutions, and global mining companies and is well renowned in the industry for her expertise, passion, and professionalism.

> ***"Having been a member of the Australian Hydrographers Association for many years I am humbled and excited by this opportunity to engage with the broader community by bringing diverse skill sets together and to be a part of bringing critical data assets together and Australia working together collectively".***

Arran Corbett, President of AHA and executive sponsor is thrilled with the initiative with the ultimate vision a place of standardisation across the industry and an industry-first forum for information exchange and unification across Australia.

> ***"Arran extends his heartfelt thanks to Ryan, Tara and the team and is excited to see where this initiative takes the industry".***

The Community of Practice are looking to hold their first virtual meeting in the early weeks of October with Keynote Speakers to be announced.

For further information on the National Water Quality Community of Practice, feel free to contact Tara directly at tara.matthews@thermofisher.com

Improving Adaptive Management in the Face of an Uncertain Water Future

Presentation from the AHA Conference 2023.
Jacquie Bellhouse – Senior Hydrologist (Water Corporation)

Who Are We and Where We're Going

Our Purpose is to manage water service sustainably to make WA a great place to live and invest.

Our Vision is for our people, our communities and our state to thrive.

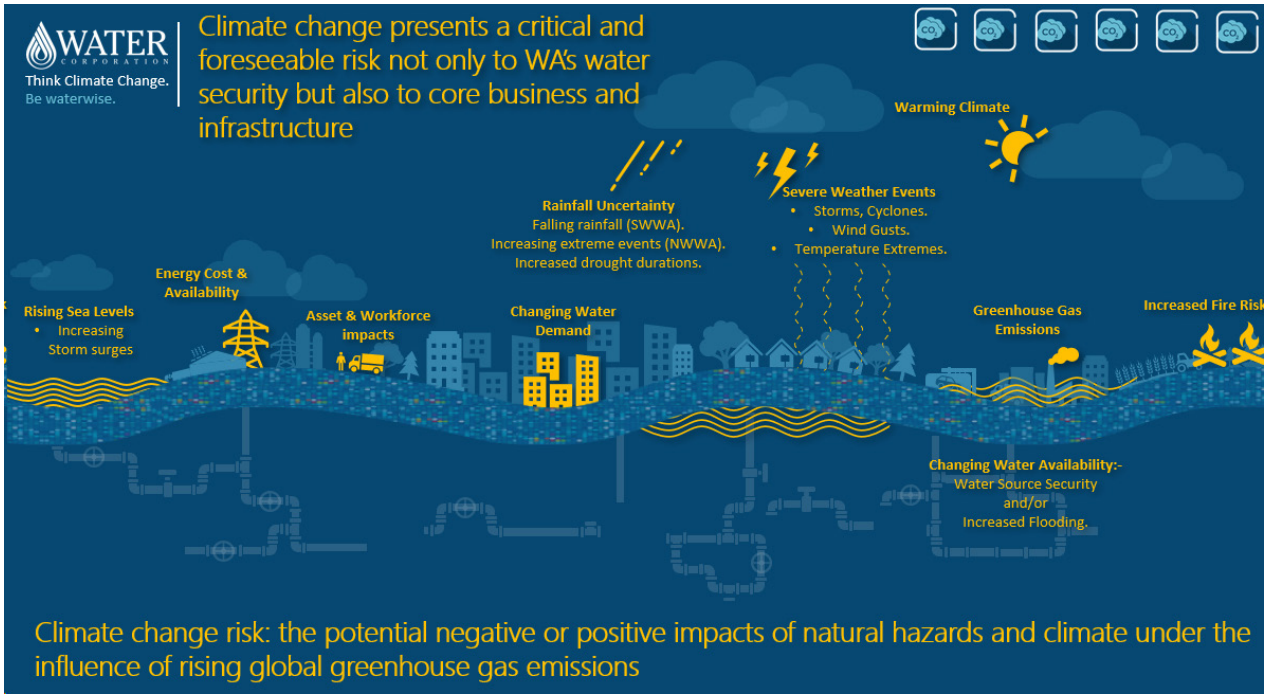
Our water services span 2.6 million square kilometres

In the 21/22 FY we supplied 388 billion litres of water

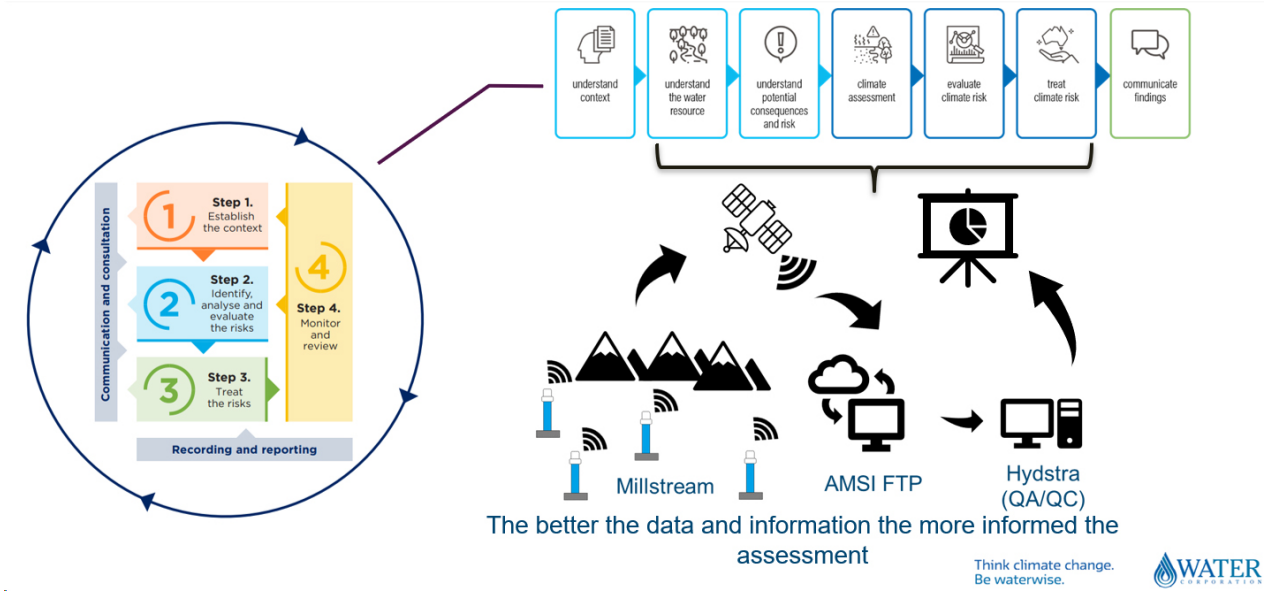
We manage $46 billion (replacement value) of assets

We service a wide customer base, with 1,167,415 properties connected to water

Six goals to drive us forward



Climate Risk Assessment & Management



CASE STUDY

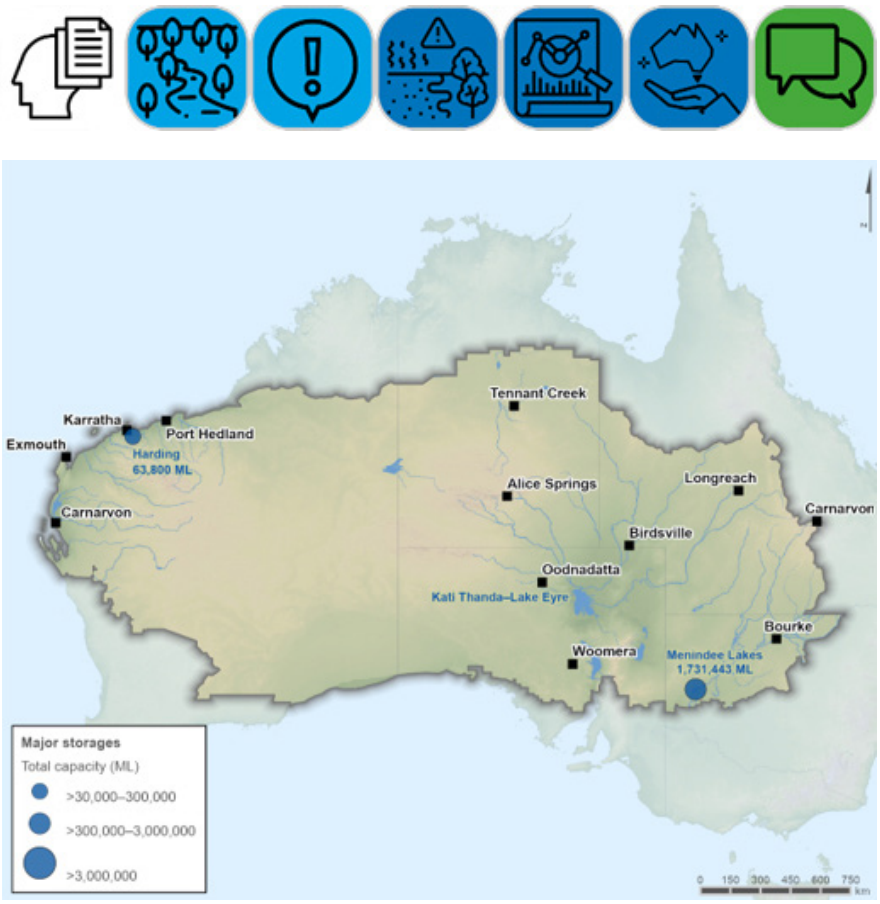
West Pilbara Water Supply Scheme

Context

Question: What risk does climate change present to West Pilbara Water Supply Scheme in the North-West of Western Australia.

Infrastructure: Harding Dam, Millstream Borefield.

Stakeholders: Domestic and Industrial customers, Traditional Owners, Regulators, Resource Sector.



Harding Dam (Primary Source)

- 15 GL/a (Gigalitres per Annum) Licence
- Rainfall Runoff dependent
- Dependant on Tropical Lows & Cyclones
- Upper Harding River (>26GL over wet season – 1,069 km2 catchment)
- Historic reliability strongly influenced by duration between recharge events
- Evaporative loss (Averages 16 GL pa from Lake Poongkaliyarra)

CASE STUDY – West Pilbara Water Supply Scheme

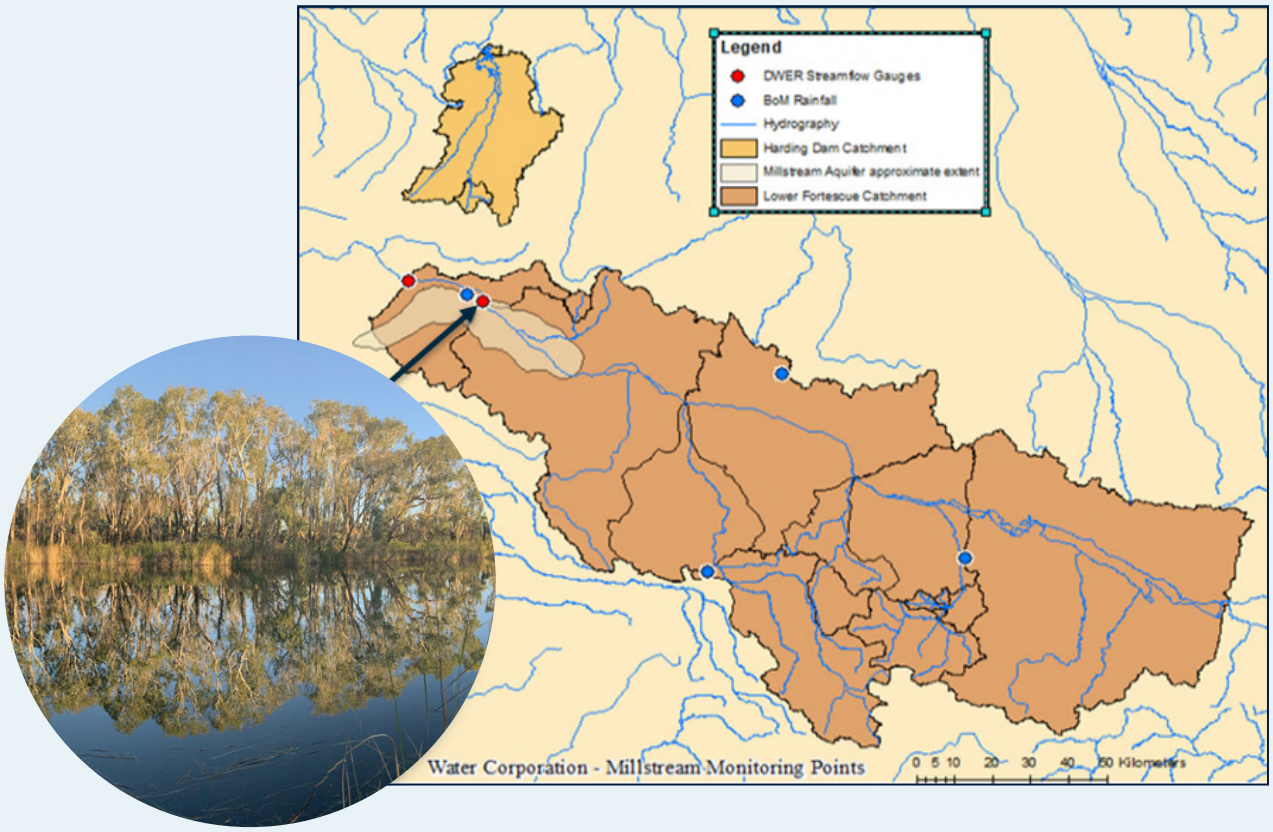
" Use of surface water is prioritised over the use of groundwater sources (due to their supporting high environmental values).

Reliability of the dam has large influence on the reliability of the Groundwater sources "

CASE STUDY – West Pilbara Water Supply Scheme

Millstream Aquifer

- Rainfall and Rainfall Runoff dependent
- Dependant on Tropical Lows & Cyclones
- Fortescue River (>43GL over wet season - 14,630 km2 catchment)
- Direct Rainfall (> 250mm / month)
- Historic reliability strongly influenced by duration between recharge events
- Losses via Spring Discharge and Evapotranspiration

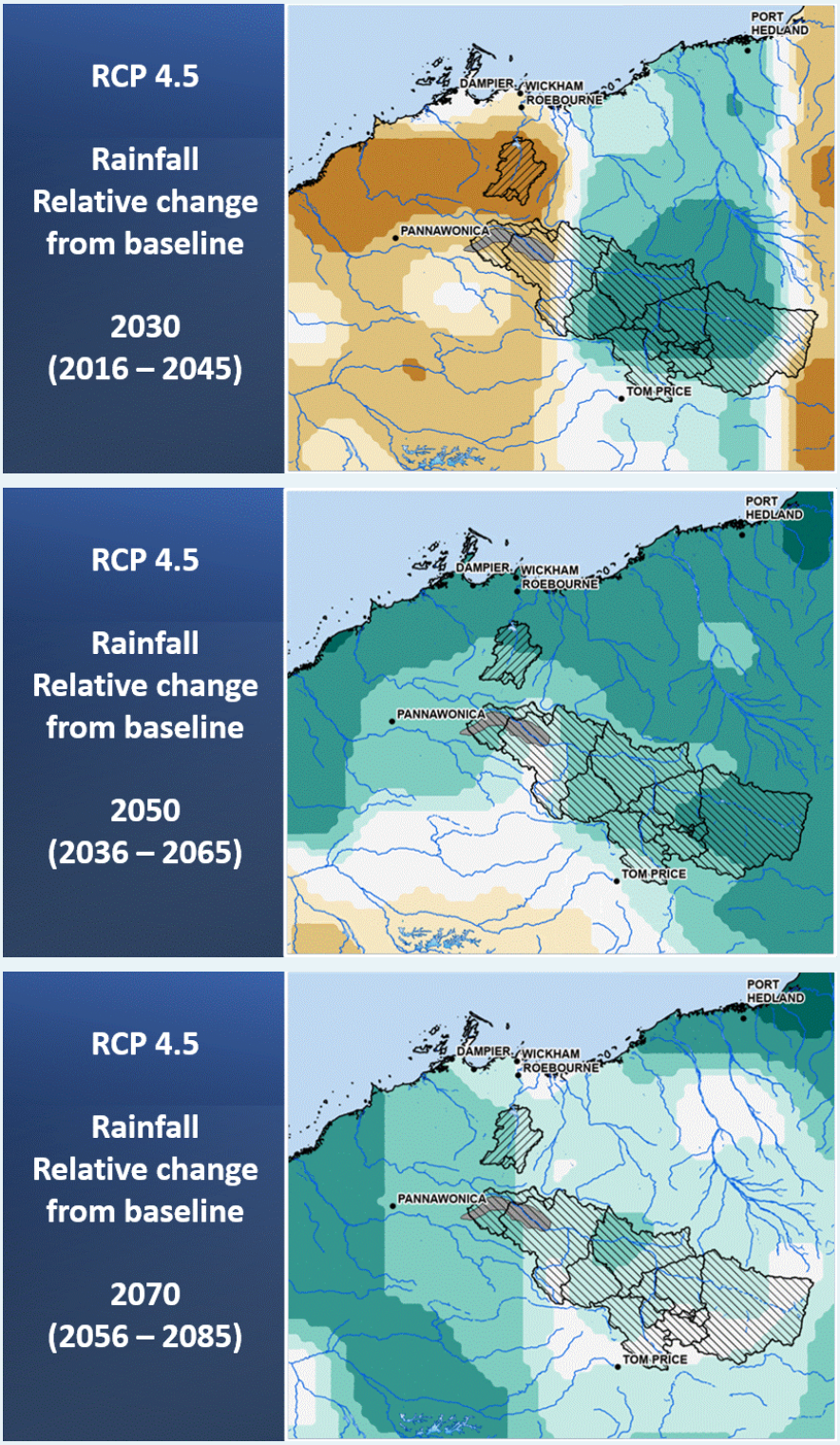


Potential Climate Risks

Projections indicate the key risks to ongoing reliability include:

- More hot days and warm spells (**very high confidence**) with substantial increase in:
  - Temperature reached on hot days (**very high confidence**)
  - Frequency of hot days (**very high confidence**)
  - Duration of warm spells (**very high confidence**)
  - Strong **influence on future liveability & demand**
- Frequency of tropical cyclones may decrease – **Strong influence on future recharge**
- Time spent in drought is projected, with **medium confidence**, to increase over the course of the century
- Overall changes to rainfall possible but unclear (**natural variability dominates**)

CASE STUDY – West Pilbara Water Supply Scheme



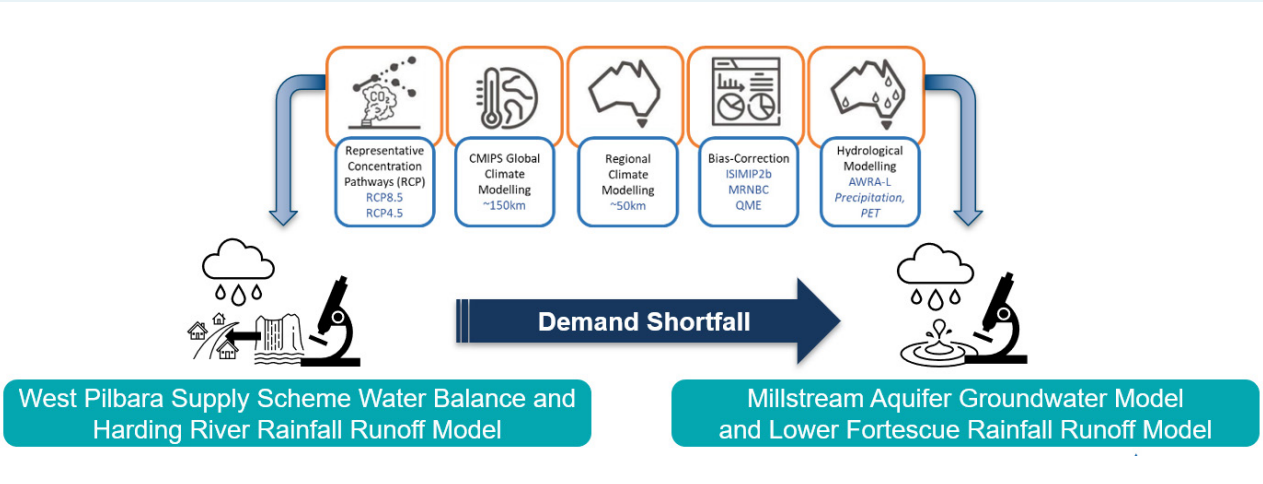
Insitu flow measurement practice procedures covering:

- Common requirements
- Ultrasonic clamp-on measurement devices
- End of pipe HVQ multi-beam sensors
- Thin plate V-notch weir box

CASE STUDY – West Pilbara Water Supply Scheme

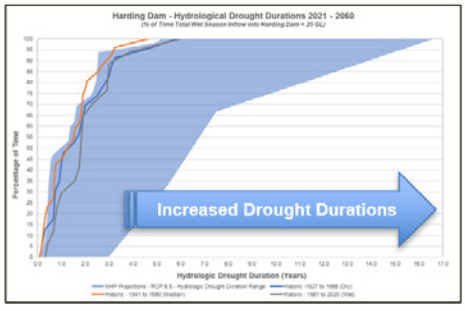
Climate Assessment

Project the future potential risk to West Pilbara Scheme, under the future projected demand and a range of climate narratives in order help inform the implementation of risk mitigation actions (including adjustments to monitoring).

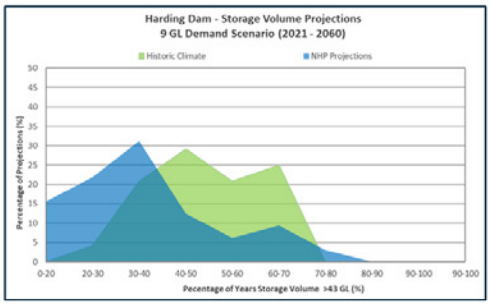


Climate Assessment: Harding Dam

Assessment of water resource response to projections indicates increased rates of evaporative loss and significant drought durations not previously observed will influence ongoing reliability.



Assessment:
High Risk
of significant decline in the capacity (to met demand).



" Climate Change Australia outlook is for deceases in winter (dry season) rainfall but is unclear in regards to changes in the summer (Wet Season) rain.

We are looking at increased extreme events but the magnitude can't be projected with confidence "

CASE STUDY – West Pilbara Water Supply Scheme

Climate Assessment: Millstream Aquifer

Some projections, but not all, indicate a possible decline in borefield's capacity to meet demand:

Projected reliability

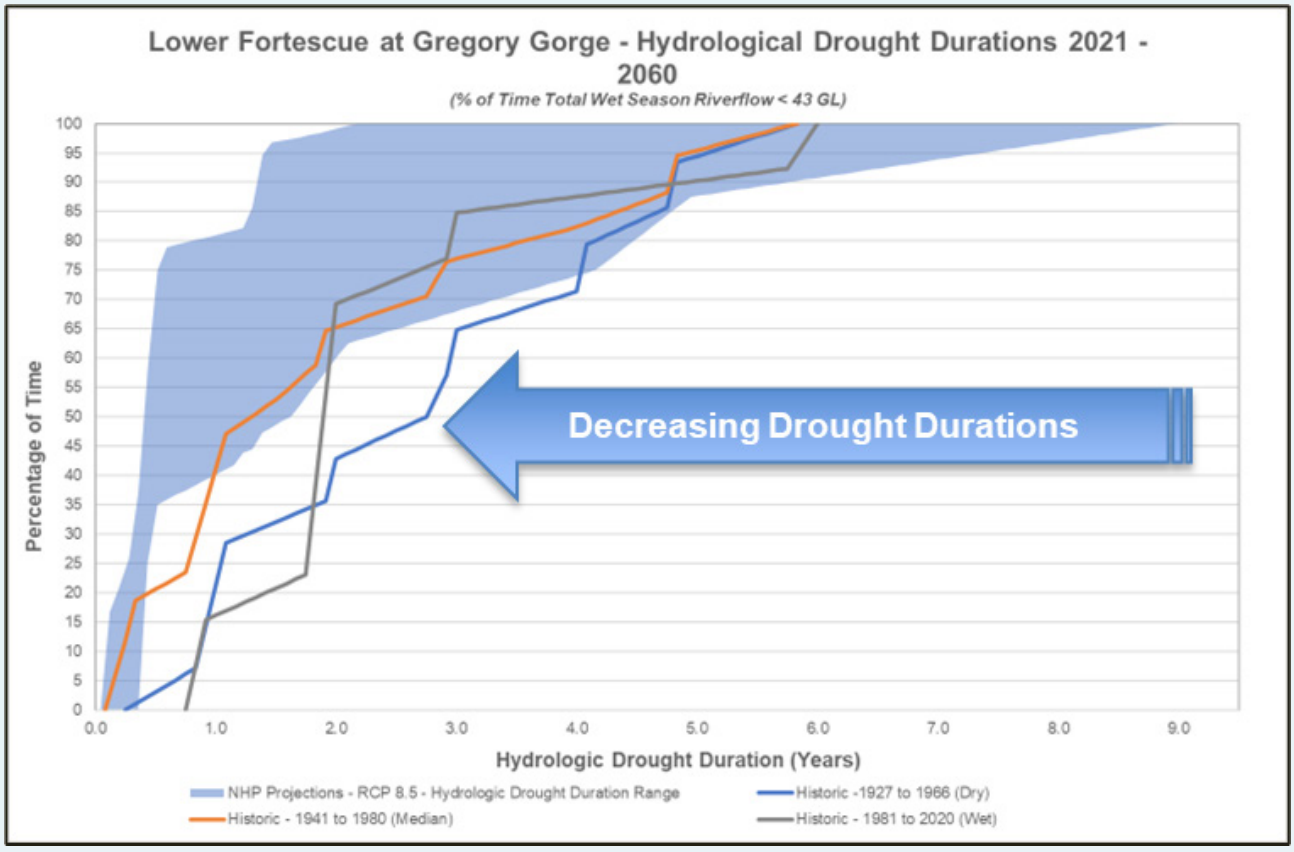
- Optimistic Projections 100%
- Moderate projections 97 - 100%
- Conservative (driest) projections 75 - 80%

Majority scenarios indicate decreases in hydrological droughts.

- Historic drought durations between 1 - 6 years (90% less than 5 years)
- By 2060, conservative projections indicate durations between 0 - 9 years (87% less than 5 years)

Assessment:

- Direct Risk from Climate Change is unclear
- High Risk of significant decline in the capacity (to meet demand) if Harding Dam fails



" Reliability is based on current licensing conditions "

CASE STUDY – West Pilbara Water Supply Scheme

Assessed Risk and Consequence

When Harding Dam is unavailable, water is sourced from the Millstream Aquifer.

- Aquifer is of major environmental, cultural and social importance.
- In addition to supplying drinking water, sustains significant pools, wetlands and vegetation not seen anywhere else in world.
- Significant regulatory controls in place to protect its values.

High consequence if supply is restricted from both Harding and Millstream

Treat the Risk

Adaptation

Climate resilient source

(Desalination $$$, Significant Environmental Approvals, Need to source Green Energy).

Due to the cost and lead time for Desalination.

Manage the Risk at Millstream

Millstream Aquifer may not be exposed to the same level of risk as Harding Dam (13 x contributing catchment).

Can we minimise/delay the cost of desalination by implementing improved monitoring and management at Millstream (using IoT devices?).

CASE STUDY – West Pilbara Water Supply Scheme

Why Go Down the IoT Pathway

Short Term Aim

- Comply with increasing compliance commitments (causing work scheduling issues)
- Reduce/eliminate OSHE risks, reduce carbon footprint.
- Improve our understanding of our Groundwater and Surface Water Schemes

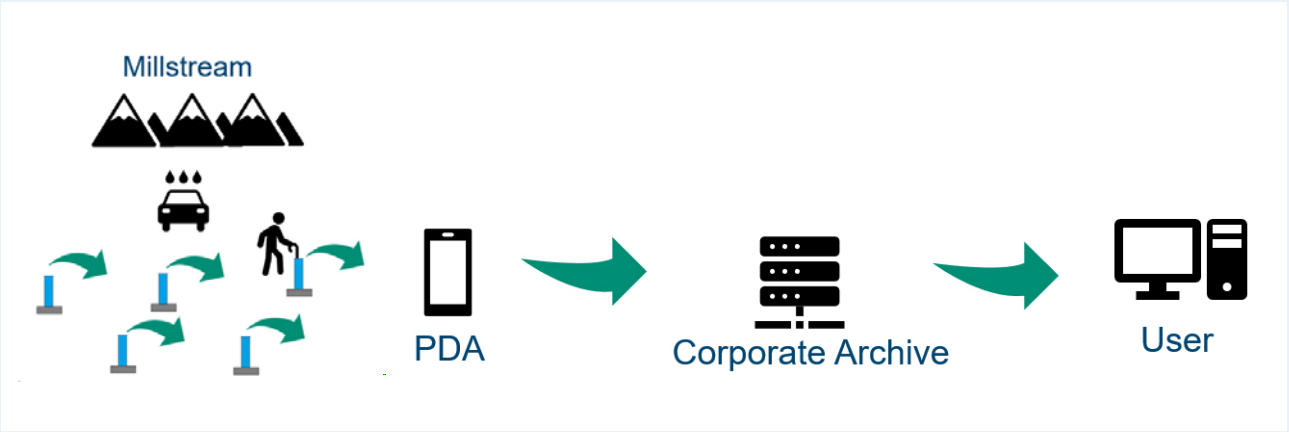
Long Term Aim

- Sustainable monitoring of remote asset performance across WA (aquifers are an asset);
- Respond to increasing competition for limited resources.
- Sustainably respond to increasing regulation.
- Prioritise and stage adaptive responses (to risks such as climate change);
- Continue to protect our states extremely unique environmental, social and cultural values.

CASE STUDY – West Pilbara Water Supply Scheme

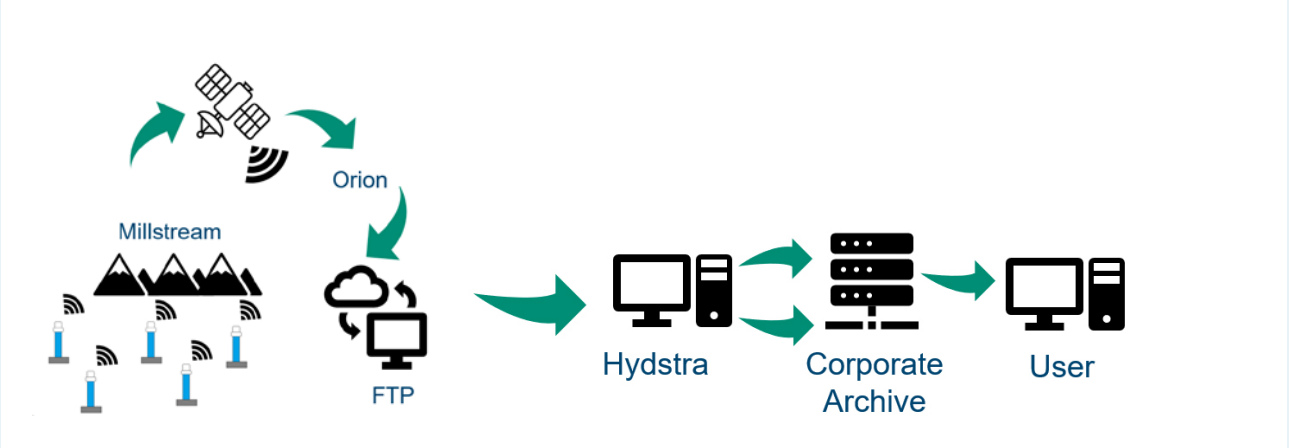
Millstream Current Arrangement

- Discrete – No access to levels between 2 mthly dips.
- Data gaps (e.g. during flooding/sickness)
- Raw data - Very Light QA/QC of data (mainly post collection = some errors)
- Reliance on key staff (labour & support $257/hr x 12hrs x 6 runs = $18,500 pa @ 54 readings pa = ~$342 dollars per reading)
- Long travel Distances => On road cost, OHSE risk + carbon emissions (324 kg pa)
  Average emissions for off road 180g/km* x ~300km = 54 kg CO2 x 6 = ~324 kg per annum.



IoT Trial – Millstream

- Near real time access (daily).
- Record of raw data; plus alarms for triggers.
- QA/QC of instrumentation and data.
- Reduction in travel (Annual site maintenance visit - Operational costs ~ $50,000pa @ 78,840 readings per year = $0.63 per reading, ~ 276 kg pa GHG emissions)
  Flights 1 person Perth to Karratha return = 222.2 kg
  *Driving emissions off road vehicle 180g/km** x ~300km = 54 kg CO2*



CASE STUDY – West Pilbara Water Supply Scheme

Communicate, Monitor and Review

Optimise Monitoring ($)

- Redrill 9 Mean Aquifer Level (MAL) Bores (replacing 50-year-old steel cased bores)
- Equipped with IoT devices (2 monthly discrete level observations => hourly water level and temperature - 12hrly transmission).

Next (at Millstream)...

- 3 primary spring flow points to be equipped with IoT Gauges (2 monthly discrete observations => 5min logged level & flow).

Operationalised Millstream Groundwater Model

- Incorporate near real time data into model to produce short – medium term projections
- inform operational and investment decisions

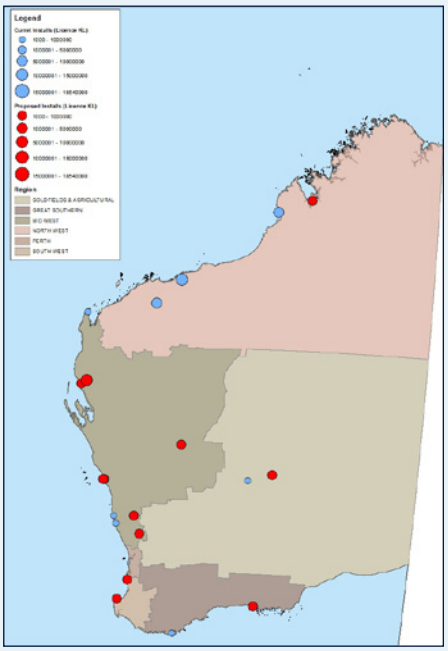
CASE STUDY – West Pilbara Water Supply Scheme

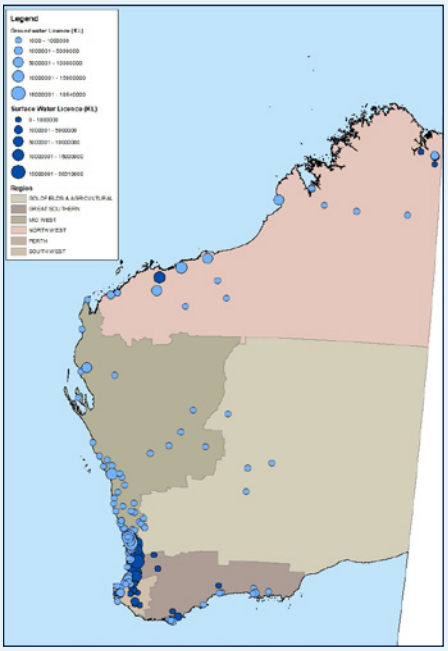
Future Direction

Recent assessment of the risk to supply schemes across the state highlighted:

- 18 water supply schemes of extreme concern (due to insufficient data).
- 21 water supply schemes of high concern (due to insufficient data)
- 22 water supply schemes of moderate concern

Progressive program to install water level and/or conductivity IoT devices on monitoring bores in systems of extreme or high concern.





Long-Term Aim

Broad network of near real time hydrometric monitoring that facilitates the Adaptive Management of our Water Resources under an uncertain climate future.

Aim:
Delay or in some instances eliminate the need for more costly source options (e.g. Desalination) through improved management of what we already have.

Managing Expectations, Quality, Quantity, Resources, Resilience

2024 New Zealand Hydrological Society, Technical Workshop April 9–12 Queenstown, South Island.

Mic Clayton – CPH, FAHA. Cooma, NSW

Overview

The New Zealand Hydrological Society Technical Workshop ran over three and a half days in April, 2024 at Rydges Lakeland Resort with over 140 registered participants and trade representatives in attendance. The theme was set around "Managing Expectations, Quality, Quantity, Resources, Resilience"

On the Monday (8th) prior to the workshop there was also a New Zealand Kisters User Group meeting and the team from Otago Regional Council co-ordinated a catchment run with a small group of visitors who were in town early.

Keynote speakers for the workshop were:

- Amber Jones (USGS), with keynote presentations on automating and streamlining processes in time series data systems around ingestion, QA/QC and availability of water information.
- Jono Conway (NIWA), presenting on the current status of the New Zealand Snow and Ice Network and progress towards quantifying New Zealand's seasonal snow.
- Rob Davies-Colley (NIWA), presenting on the mutual benefits of improving the collaborations between sediment monitoring and water quality monitoring disciplines.

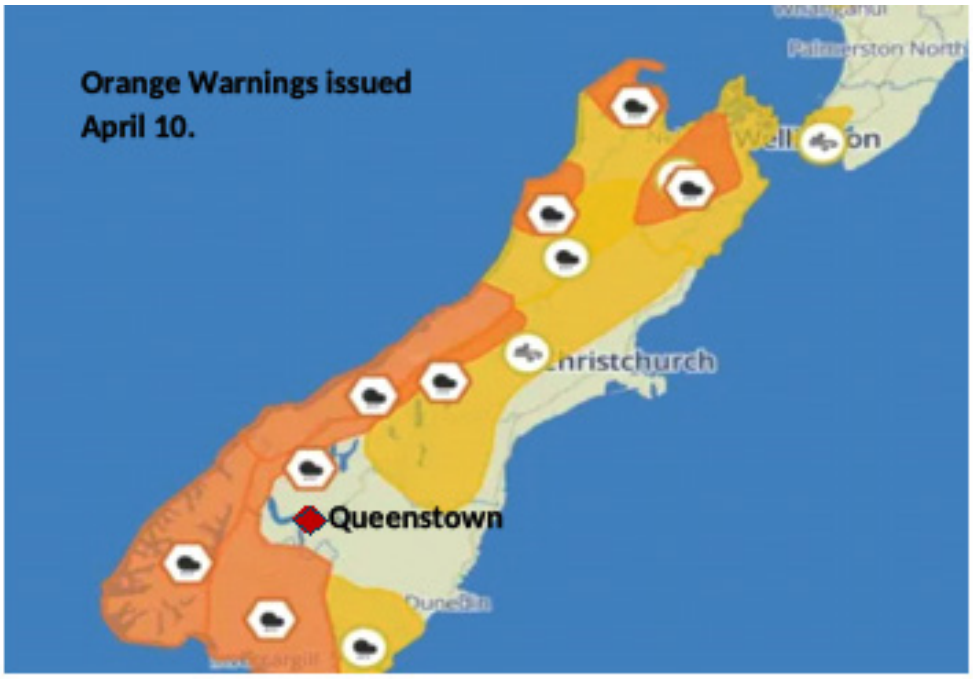
The programme included technical presentations, panel sessions, a data workshop and a flow measurement regatta on the Shotover River, an update on New Zealand's National Environmental Monitoring Standards (including a summary of a recent water quality 'regatta'), and a rapid-fire exhibitor session introducing themselves and their services to participants. Networking events were available each night, supported by some of the exhibitors, and a workshop dinner rounded off the week on the last night of the workshop.

Changing Moods of Queenstown

Queenstown weather through the week was one of many personalities. The Kiwis were aware that some Aussies were in town and had brought a weather system with them which, right on cue, arrived in time for the flow regatta day!

The weekend before the workshop the southeastern seaboard of Australian was hit by a complex trough and east coast moisture feed causing flash flooding throughout the Sydney and Illawarra regions. On the previous Friday predictions were being broadcast that Warragamba Dam, near Sydney, would commence spill on the following Monday but by Saturday morning Warragamba catchments had received in excess of 150mm of rainfall in the previous 24 hours and the dam commenced spilling two days ahead of the earlier predictions!

This weather system headed towards New Zealand, intensifying as it wandered across the Tasman and by Wednesday significant areas of the South Island West Coast were being impacted, with effects spilling into catchments east of the Alps, including the tributaries to Lake Wakatipu where Queenstown is situated.



At the start of the week fine weather and mild temperatures greeted participants, by Wednesday the regatta participants were receiving a good wetting down (while the data workshop gang stayed warm and dry in their workshop venue!), into Thursday southerlies were charging up Lake Wakatipu into Queenstown and by Friday the wild weather had dropped and the surrounding ranges were now topped with snow.

Workshop Content

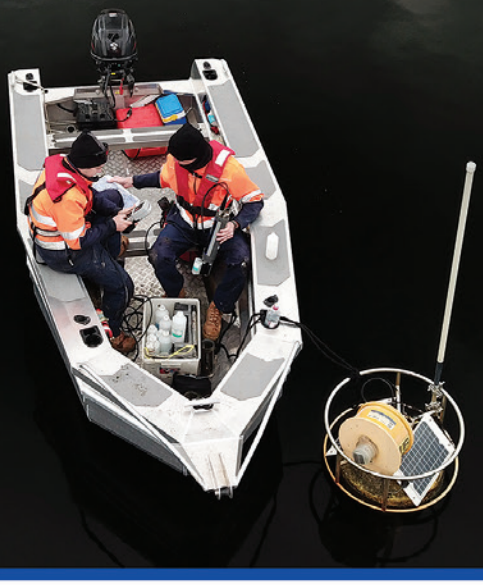
The workshop covered a large range of disciplines and concepts - flow measurement techniques, data management, water quality, groundwater, sediment sampling and national standards, with many presentations overlapping in theme. Topics covered geographical contexts from the snow-covered New Zealand Alps to remote and isolated inhabited atolls of the Northern Cook Islands, and ranged from relaxed discussion on challenges encountered of getting things done, through to more scientific work on sensor performance and data quality. Presentations were limited to 15 minutes and 5 minutes of questions (20 minutes all up).

ORC presented on the challenges of installing and maintaining a profiling water quality buoy on Lake Wakatipu, where they are developing systems to vertically profile the deeper sections of this nearly 400 metre deep lake which includes the buoy mooring systems and protecting the installation from interactions with other lake users. (The bottom of the lake is below sea level in some places!)

West Coat RC showcased there approaches to improving safety to access their sites in wild locations and there was an extremely lively presentation where intergenerational hydrological expertise (a young gun and an old dog) working together to get a result with a great presentation on combining STIV & Slope Area methods to more accurately develop the rating on the Orikaka River in the Buller Gorge.

Throughout all the presentations, experienced hands in the New Zealand hydrological community shared their knowledge with the next generation of New Zealand field hydrologists, while the younger ones were willing to share their learnings, and sometimes mistakes, of their hydrological journeys. What was noticeable throughout the event was the attitude of being a big part of a large hydrological community where ideas are shared, challenged and accepted, all in a trusting collegiate environment.

Jaymee Woods (Western Australia Water Corporation) presented to the Workshop on cultural aspects of water in Western Australia. Jaymee attended and presented as a winner of the AHA young awards from the 2023 AHA conference in Penrith as part of the MOU between the AHA and the NZHS that encourages exchange of activity participation between the two associations.



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right partner.

Hydrographic Careers at ALS

ALS has the biggest contingent of Hydrographers in Australia. We operate many long-term contracts for major Water Authorities as well as a diverse list of Government and private sector clients. If you're after a career in Hydrography while working with a dynamic team, ALS is your destination.

What ALS offers

- A safety-first approach
- The largest employer of Hydrographers in Australia offering room for advancement in varied career paths across the following groups: field hydrology, international projects, data management, instrumentation, and systems in 16 office locations across Australia allowing for voluntary relocation and Management opportunities
- Industry approved Enterprise Agreement with guaranteed annual salary increments and above market pay rates
- Sponsored certification and membership of the Australian Hydrographic Association and free enrolment for the AHA Diploma Water Industry Operations (Hydrometric Monitoring)
- Strong R&D Focus allowing for exposure to technological advancements including Photogrammetry/STIV, remote control boats, acoustic dopplers, iPhone app and sonar
- Field work encompassing working above the snow line, 4WD'ing in isolated areas, kayaking on rivers, hiking, working from boats, and operating drones
- Providing awareness in the education system through work experience placements and internships

If you are keen for a challenge while working alongside the best staff in the industry in a very dynamic company, contact us via email **hydrographics@alsglobal.com**

Flow Monitoring Regatta

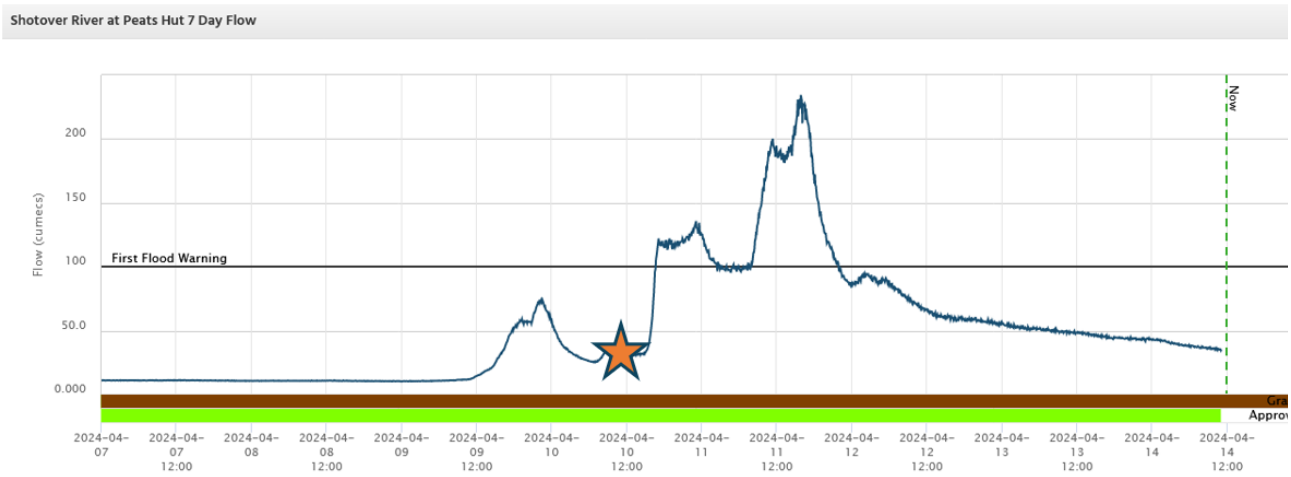
The flow monitoring regatta was undertaken on a section of the Shotover River at Tucker Beach Reserve, sandwiched between the boundaries of two Jet Boat operators!

The team from Otago Regional Council (ORC) co-ordinated the regatta, liaised with the Department of Conservation for use of the reserve, and kept the safety reminders flowing through to everyone, including ensuring the two jet boat operators were aware of our activities occurring in the neutral zone between their areas of operations.

Unfortunately, the ORC team couldn't control the rain, but ensured warm bagels, jam donuts and hot drinks from a local food van operator to keep participants warm on the inside at least!

Regatta Site Layout

Welcome Munchies & Hot Drinks



Flows from Peats Hut site. Star is Regatta Day. Peats Hut is some way upstream of Queenstown, flows at the regatta site had additional catchment pickup than indicated in this graph.

A portable endless line was set up for tethered flow measurements. Many participating teams operated Unmanned Surface Vehicles (USVs) including a good representation of Surfbee systems from Australia.

Portable A -Frame for tethered deployment (top right) with Surfbee in distance. (At the start of the day the tent was away from the water's edge, by days end the river had joined the teams inside the tent)

Surfbee also provided use of an accessory to attach to the Flow Seeker platform, basically a raft assembly that the Surfbee platform nestles in and is designed to improve the Surfbee ability to operate effectively in more turbulent surface conditions.

Participants undertook measurements covering moving boat, stationary, dilution and STIV techniques and recorded the results in a central system for an assessment piece on the last day of the workshop.

Participants reviewed and submitted outcomes based on their operational procedures and deployment techniques. With STIV, drones could not be flown due to the proximity of the Queenstown Airport air space, so Mark Randall undertook measurements with a beta version of HydroSTIV portable.

Moving bed conditions were experienced by everyone due to a slowly rising flow rate through the day creating mobility of fine silt as streams in the catchment rose. Most teams persevered with moving boat techniques (tethered and USV) but one team switched to stationary technique when difficulties were being experienced with obtaining loop correction data. In the summary session for the regatta on the last day of the workshop this team was judged to have achieved the best result for the regatta!

Surfbee platform being nestled inside the Surfbee raft.

Pre-Cursor Field Trip with ORC

On the Monday before the workshop, a small group of participants were hosted on a field trip to various monitoring sites around the Lake Wakatipu region. Here, a USV was put through its paces on the Dart River appreciating the positive impact that the use of these systems have had on achieving more safe, efficient and cost effective flow measurements. Further exploration of challenges with getting data out of remote sites at the Rees River site, undertaking some field verification checks at sites to confirm remote data system outputs and as the day wound up reviewing a recently upgraded water quality monitoring site at Mill Creek (near Arrowtown) that feeds water to Lake Hayes, where past catchment practices have degraded the Lake Hayes ecosystem and the monitoring is assisting in providing information to assist with rehabilitating this lake ecosystem.

The Dart River site (also known as the location where you can view Isengard of LOR fame) is currently dealing with a recently variable bed location effect. This followed a decision by regulators to permit local jetboat operators to undertake removal of rock bars in the river to enable them to extend their area of tourist operations in low river flows. The resultant hydraulic changes further downstream have seen the stream bed path now become highly variable where a reasonably stable stream path existed prior to these instream works, and this has added measurement challenges at the site due to the currently increased variable stream morphology.

The Rees River site (at Invincible) is a confined steep reach before the river opens up onto the plains at the upstream end of Lake Wakatipu. Dissolved oxygen and water temperature are also recorded at this site.

Water resources are a significant contributor to the economy of the Queenstown region, particularly with regards to the intense tourism operations that rely on the water resources in the region

Data monitored by Otago regional Council (and other sites operated by NIWA) from the sites around Lake Wakatipu area contribute to informing authorities, businesses, and individuals on:

- Water resource baseline data
- Water quality entering the system
- Flood warning advice
- Operational data for tourist operators operating on the water ways in the Queenstown region

Dart River USV deployment. (The river braids, offering site selection challenges. The gauging station is located just to the right of the bridge – system solar panel is visible)

In conclusion, I wish to extend my personal appreciation and thanks to the organising committee, and the Otago Regional Council Hydrology team who created a great NZHS Technical Workshop. The support of the trade and exhibitors for this event is also acknowledged as their support greatly improved the ability of the organisers to create a quality event and enabled great networking opportunities for all.

It was great to see everyone actively participate throughout the week, even when the weather conditions began turning against us at the flow Regatta! A great indicator of the willingness of everyone to learn things, share knowledge and have a quality professional development experience.

Well done everyone!

Rees River at Invincible orifice and DO sensor placement. (Nice clear water on the day)

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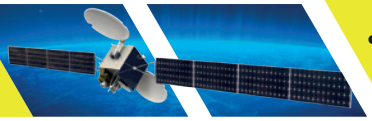

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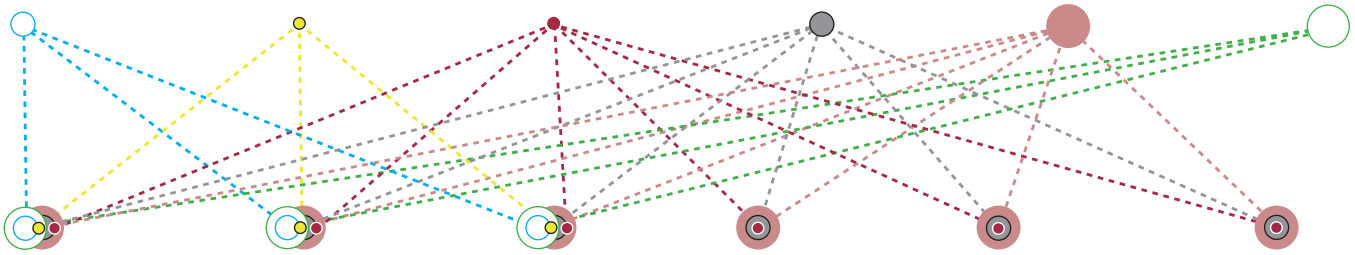

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