

WATERLINES

ISSUE 2, 2022



MOLINO STEWART

ENVIRONMENT & NATURAL HAZARDS

a WATER TECHNOLOGY company



multi-disciplinary solutions



STEVE CLARK
Managing Director



Welcome to our latest issue of **Waterlines**

Earlier this year, Queensland and New South Wales experienced widespread and, in many cases, extreme flooding. In numerous locations (e.g., Gympie, Lismore, and many parts of the NSW North Coast), this event is now the flood of record. Tragically, the damage and suffering experienced in early March was compounded by further heavy rain, the Lismore levee being overtopped for the second time and significant flooding occurring again in many areas in NSW. The scale of these events, the broader community response, and recovery is still very much playing out.

For now, I'd like to acknowledge the efforts of all those involved.

Molino Stewart joins Water Technology

further strengthening our skills and capability, and broadening our multi-disciplinary approach to project delivery.

A common theme has emerged in this edition of Waterlines of multi-disciplinary approaches and information sharing. This theme is personified in the recent merger of Molino Stewart and Water Technology, which broadens and strengthens the capabilities that we can deliver for our clients. After more than a decade of collaborating on complex issues for water and environmental projects, we have formalised our partnership and will use our complementary skills to address the unique and complex challenges our clients face. Our newly merged business takes a strategic, long-term approach to maintain the health of Australia's water and surrounding environment for current and future generations.

We invite you to read about our staff's recent presentations at national conferences, and educational projects with tertiary and industry-leading national organisations addressing current major flood studies. The high-level technical analysis of these projects using data, multi-disciplinary approaches, and graphical storytelling further demonstrates our expert capabilities and our team's desire to share industry knowledge with the water engineering and environment community.

Please do not hesitate to contact me or any of the Water Technology team at any stage if we can be of assistance.

After collaborating for more than a decade

MOLINO STEWART JOINS WATER TECHNOLOGY

After more than a decade of collaborating on complex issues for water and environmental projects, Water Technology and Molino Stewart have merged to bring a robust body of experience to our clients.

The merged organisation's combined technical expertise spans a range of specialities including ecology, natural hazards, hydrogeology, hydrology, coastal and marine, wastewater, geomorphology, environmental assessment and auditing, stakeholder engagement and community education, and environmental engineering.

Water Technology and Molino Stewart share a deep belief in the ability to use our highly technical capabilities in science, technology and engineering to create real change for communities and the environment.

Our next edition of Waterlines will showcase projects we have worked together on.



We proudly announce that Steven Molino has joined the Board of Water Technology.

"Australia's complex environmental challenges require a comprehensive, multi-disciplinary approach that tackles the problem from all angles. The merged business delivers practical and affordable solutions to manage the impacts of climate change on people, property and the environment." **Steven Molino**

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Integrated Catchment Management

Nature-based solutions investigated and communicated

“ Art meets science ”

Nature-based solutions such as constructed wetlands, water sensitive urban design, and riparian revegetation can play an important role in water quality improvement while providing a range of co-benefits. Taking a systems approach to catchment management starts with identifying the most impactful source of nutrients and sediment. In catchments where point source pollution (e.g. from Sewerage Treatment Plants) is not the leading cause of poor water quality, considering an effective treatment train to intercept or naturally treat land-derived nutrients and sediment is possible.

Water Technology worked with the *City of Gold Coast* and design consultancy, *Relative Creative*, to explore how catchment health and nature-based solutions can be





Managing nutrients in waterways



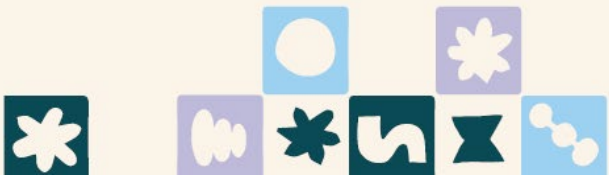
QUEENSLAND ENVIRONMENTAL OFFSETS HIERARCHY:



Queensland State policy outlines a management hierarchy for protecting water quality in relation to recycled water discharge. The Gold Coast follows this hierarchy in avoiding local discharge points.

When considering the health of the catchment as an integrated system, reducing nutrients in the lower reaches of the catchment by avoiding local discharge is only one part of the story. It is important to consider the health of the entire catchment, including areas outside the tidal reach where land runoff may be contributing high nutrient and sediment loads to waterways.

State of Queensland 2019, Point Source Water Quality Offsets Policy



investigated and communicated. Taking a different approach than a standard technical study, this project incorporated a concise and easy to understand visual summary of concepts and initial findings, including a graphically designed communication resource.

It's commonly understood that a multi-disciplinary process is best practice, and this project was a great opportunity to facilitate this approach. Art meets science in our project team, working across environmental planning and science, water quality modelling, strategic communication, and graphic

design. The outputs of projects such as this provide robust resources for client use, with technical reporting well suited for business case development, decision-making, and visual aids readily adapted for presentations, print, website, or social media.

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Flooding what can we learn?

In March 2022, Senior Engineer and National Practice Lead for Flooding at Water Technology James Weidmann participated in an online panel discussion facilitated by the Australian Water School. The purpose of the special event was to discuss the recent major flooding event in Queensland and New South Wales, and its implications for flood modelling and planning. Over 2130 people from around the world registered for the free event.

James was called upon to provide his expert opinion on how the February 2022 flooding event affects rainfall IFD (Intensity Frequency Duration) curves, flood frequency analyses, and current major flood studies. He has provided the following summary of his thoughts from the recent discussion.

After the initial major flooding event in February 2022 on the east coast, there was time to digest the data and evaluate the implications of this event on our current flood studies. The heaviest recorded rainfall in South East Queensland and Northern New South Wales was recorded just north of Brisbane, near Mount Warning.

Water Technology is undertaking several major flood studies for catchments across SEQ. The February 2022 event has significant

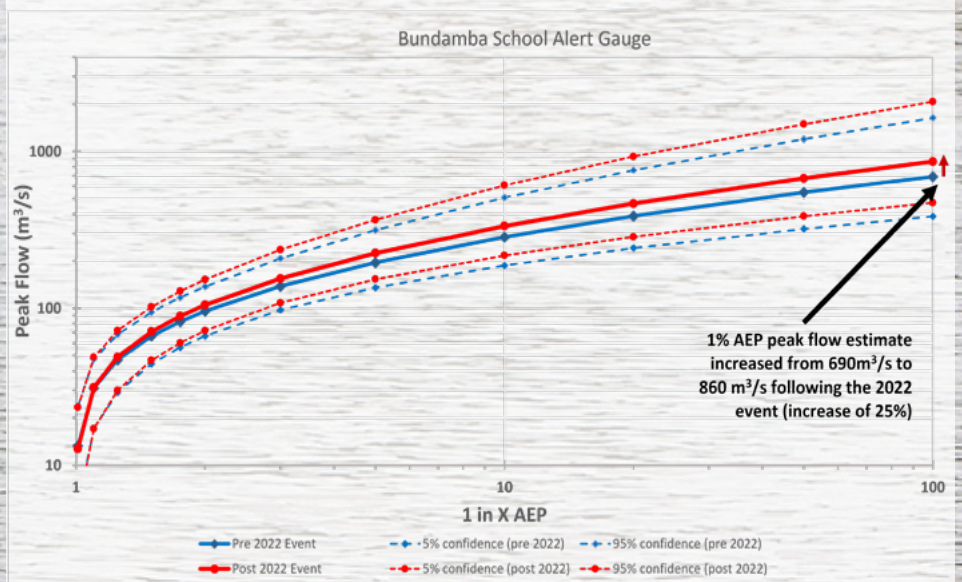
consequences for these studies in terms of the modelling and the eventual outcomes for planning. Naturally, when a major recent flood event is added to the historic data set and included in a flood frequency analysis, estimates for design flood hydrology increase. The chart shows how this event affects a Flood Frequency Analysis (FFA) for a catchment in SEQ with a reliable 26-year gauge record. The peak discharge estimate for the 1% AEP increases by 25%. Using the detailed hydrology model developed for the

catchment, we were unable to match this peak discharge using IFDs which were derived by the local council and enveloped with the Bureau's IFD dataset.

A solution is to factor the IFDs to match the FFA. It is becoming well-known that the Bureau's IFDs sometimes produce low flood estimates, and we regularly factor IFDs to account for the deficit. This is justified in circumstances where adequate data is available, and it is the same basic approach taken to represent increased rainfall intensity



"...implications for planning and minimum design levels"



due to a warmer climate.

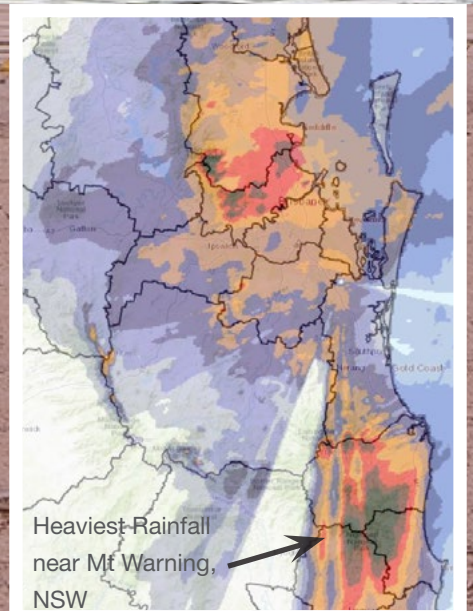
This has implications for planning and minimum design levels. The degree to which IFDs affect water levels can be vastly different between catchments.

In 2020, Water Technology finalised the Mary River Flood study for Gympie Regional Council. We are very proud of the entire study and the advice that was provided to Council during the event in February. Interestingly, we elected to factor the design rainfall IFDs by 13.5% for the study to achieve consistency with the FFA. The detailed

analyses Water Technology specialists undertook suggested that the design rainfall intensities were too low, and this is before the 2022 event which now sits as the second highest water level recorded at Gympie. Our decision was strongly justified at the time, and it certainly looks to be validated now.



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PARADISE DAM

Sediment and Water Quality Assessment and Monitoring



Paradise Dam is located on the Burnett River about 80 km southwest of Bundaberg, within the Great Barrier Reef catchment. The Dam was completed in 2005 and then damaged by the 2011 and 2013 flood events. Detailed investigations into the stability of the dam wall resulted in some concern, and the decision was made to lower the dam wall to reduce the risk of dam failure. Sunwater brought forward a 20-year dam safety review as part of the Paradise Dam Improvement Project. Key components of this review were an assessment of geomorphic condition, water quality, and sediment quality to identify any potential impacts associated with interim spillway lowering.

Water Technology completed a detailed assessment which involved the review, inspection, and interpretation of the current condition and future expectations for areas in the lake and downstream of the Dam. This was achieved through physical inspection of the project area, field data collection, and desktop assessments. Water Technology assessed geomorphic condition, sediment and water quality and potential impacts of lowering the spillway. The final report recommended mitigation options and proposed monitoring to be conducted during the Essential Works and any later operations.

The Dam Improvement Project is a high-profile project with essential safety and operational requirements, and Water Technology worked hard to ensure the work presented was robust. This was comprehensively undertaken by bringing together experts in all relevant fields with detailed consideration at every project stage. The report facilitated the understanding of the values, threats, and impacts necessary for Sunwater to proceed with the effective and sustainable management of Paradise Dam in the geomorphic and water quality contexts.

The report also identified the issue of potential Acid Sulfate Soil in the exposed banks of Paradise Dam due to lowering the dam wall. As such, a detailed Acid Sulfate Sampling investigation was conducted along about 30 km of the Dam ponded perimeter. This was followed by the preparation of an Acid Sulfate Soil Management plan.

Comprehensive soil testing and water quality logging are ongoing as part of a monitoring program.

More information about the dam improvement project is at www.sunwater.com.au/projects/paradise-dam-improvement-project

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Removing Sediment - not as simple as it sounds

Melbourne Water manages and maintains over 500 sediment pond assets, and the list keeps on growing as Melbourne's urban growth area develops and expands. The Healthy Waterways Strategy has set clear goals and long-term targets to protect our waterways and the bays. Sediment ponds play a crucial role in trapping the sediments from urban construction, erosion, and soil disturbance. Such sediments would otherwise fill up our waterways, negatively impacting the health of the downstream ecosystems and habitats.

It is a complex challenge to manage living assets such as sediment ponds and maintain them to work as effectively as possible in reducing sediment loading. It requires a sound asset management system (good data) to understand how assets function, how they can be maintained, how frequently they tend to fill up with sediments, and how we can dispose of the sediments once collected. To prioritise which sediment ponds are to be desilted first, a desktop assessment to identify assets that are likely to require desilting (i.e. assets which have not been desilted in 6 years or more) is undertaken. While this may guide the desilting prioritisation program alongside other influencing factors (i.e. maintenance requirements), Melbourne Water is committed to evaluating onsite the bathymetry and condition status of all their sediment ponds.

The *Water4Good* team is supporting Melbourne Water Asset Management and Work Delivery teams in delivering

a condition assessment and bathymetry of the sediment ponds in 2021/2022. The condition assessment is being completed using Melbourne Water's Survey123 recording and photographing site observations and maintenance/access concerns, or considerations associated with the overall health of the ponds. Such considerations include vegetation/weeds cover, depth compared to the designed/as constructed Normal Water Level, and likely impacts of sediment accumulation. To derive a sediment pond volume for sediment settling and capture, bathymetric surveys are undertaken manually or via a depth sounder mounted on an remotely operated survey vessel.

The bulk of Melbourne Water sediment ponds will be inspected using the Survey123 condition assessment form and a functional volume estimated to inform upcoming and future desilting programs.

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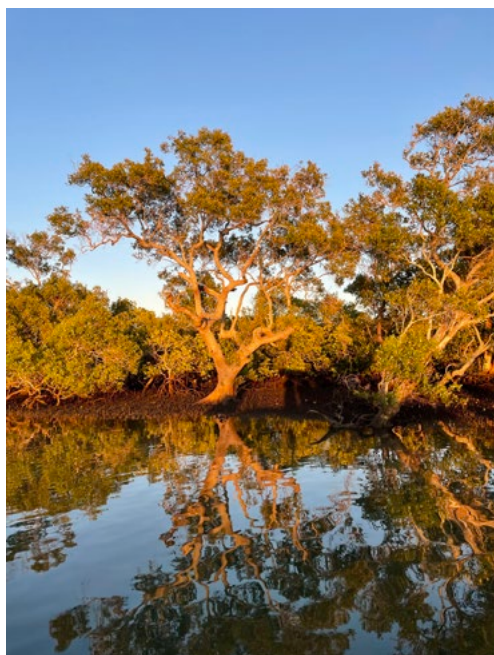


HEALTHY WATERWAYS

Water Quality Modelling

Healthy Land and Water help people understand the values and condition of South East Queensland's environment so we can ensure the sustainable use of our natural environment long into the future. A healthy environment also supports a vibrant economy, strong livelihoods, great lifestyles, and the happiness and well-being of the community.

Since 2000, Healthy Land and Water has delivered one of Australia's most comprehensive freshwater, estuarine, and marine monitoring programs. The Ecosystem Health Monitoring Program (EHMP) provides a regional assessment



of the health of each of South East Queensland's major catchments, river estuaries, and Moreton Bay zones. The data collected is used to calculate annual Report Card grades.

In addition to the EHMP data collection, Healthy Land and Water coordinates an ongoing numerical modelling effort involving catchment and receiving environment water quality modelling. Water Technology has undertaken the receiving water quality modelling for the last five years and has assisted in the processing and delivery of the Report Card grades during this time. Over this time, the models have been progressively improving as experience within the modelling community develops, additional data is incorporated into the models, and advances in relevant software are made. Water Technology continues to remain ahead of the curve in providing complex water quality modelling solutions.

The results of the Report Card grades are then used to assess the progress toward the five key objectives for the SEQ waterways:

- Restore and maintain key habitats (i.e. riparian vegetation)
- Reduce pollutant loads (sediment and nutrients) entering waterways



- Improve and maintain water quality
- Restore and maintain key ecosystem processes
- Restore and maintain resilient and healthy aquatic communities (i.e. fish populations).

As part of Healthy Land and Water, there are many organisations, community groups and individuals working to protect and restore waterways, and Water Technology is proud to be able to contribute in a meaningful way.

The 2021 Report Card can be accessed via the link below.

www.reportcard.hlw.org.au



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Playing in sand... *to demonstrate fluvial processes using physical models*

In collaboration with **Hydrobiology** and **Southern Cross University**, Dr Michael Cheetham has produced a series of educational videos using physical models and flume experiments to demonstrate key geomorphic processes in the **Fluvial System**.

These sandpit collaborations are an aid to understanding multiple processes and influences, including:

- sediment transport;
- river diversion;
- hydraulic jumps,
- meander development and migration; and
- pipe culverts.

More videos are being produced. If you have a fluvial process you'd like to learn more about or would like to see a physical model developed, then reach out to Mick – *he's always ready to play in the sand.*

Go to the [Water Technology YouTube page for the playlist.](#)



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*working together logically and creatively
to develop innovative solutions*



Leigh Smith

Principal Environmental Scientist

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Seen here in one of his preferred natural habitats, Leigh has recently joined Water Technology, bringing to the team a breadth of expertise in waterway, stormwater, and natural asset management. He has complementary skills in leadership, program and project development and implementation, mentoring and coaching, stakeholder engagement and collaboration; all supported by a renowned sense of humour.

Always curious and with a thirst for learning, Leigh has most recently been studying a Grad Certificate in Spatial Science at the University of Newcastle, NSW. Focusing on coastal remote sensing, sea level rise impact assessment, and coastal wetland vegetation cover mapping and time series change, Leigh is in the process of submitting a paper to the Australian Geographer journal based on his innovative work.

Leigh previously worked at Melbourne Water for over 17 years and before that, for Glenelg Hopkins CMA, giving him an outstanding appreciation of the challenges of

the public sector. Leigh enjoys tackling conceptually complex problems by working together logically and creatively to develop innovative solutions.

At Melbourne Water, Leigh was instrumental in developing and applying a novel approach for embedding asset management principles and practice into waterway management. This cross-business model now forms the foundation of Melbourne Water's investment planning, and prioritisation of capital projects and maintenance works addressing multiple aspects of waterway condition and value.

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