WATERLINES

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WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

Urban Water - an undervalued resource

ANDREW McCOWAN
- Managing Director

Welcome to our latest issue of **Waterlines**

In this edition of Waterlines, we showcase several relevant urban water-related projects that we have recently completed, including:

- Waterway system 'report card' assessments aimed at identifying and communicating the impacts of urban and rural water management practices on waterway health;
- Ambitious integrated water management investigations being undertaken for South East Water in Melbourne; and
- The use of innovative two-dimensional hydraulic modelling techniques to guide the optimal design of stormwater wetlands.

Two components of the urban water cycle, stormwater and wastewater, are some of Australia's most undervalued water resources. With respect to stormwater, there is either too much of it under flood conditions, or too little under drought conditions. By comparison, wastewater is something that is collected, treated and discharged with often-insufficient attention given to potential beneficial reuse opportunities.

A detailed knowledge of stormwater and urban water balances, both from a flooding and a waterway health perspective, is essential for sustainably managing many of our urbanised areas and the waterways that intersect them. Water Technology is working with a wide range of clients across Australia to provide this knowledge and to assist in delivering robust, high-quality solutions.

I am also pleased to announce that Water Technology now has a presence in New South Wales, with a key recent recruit, Chris Beadle, establishing a new office in Parramatta. Chris' presence will significantly enhance our capacity to service the coastal and broader water and environment related markets in New South Wales. In other office news, our expanding team on the Gold Coast has moved into new premises in Varsity Lakes, and we are looking at increasing our presence and client service offering in this region and in northern New South Wales.

In other exciting news, I am also pleased to welcome Scott Wills who will be taking over as the Regional Manager in our Perth office. Scott has an extensive record of accomplishments working in the surface and groundwater space in Perth, primarily within the urban development sector. Scott will work with our team in Perth to continue to grow the business in WA.

Waterway System
'Report Card' Assessments

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INFORMING COMMUNITIES

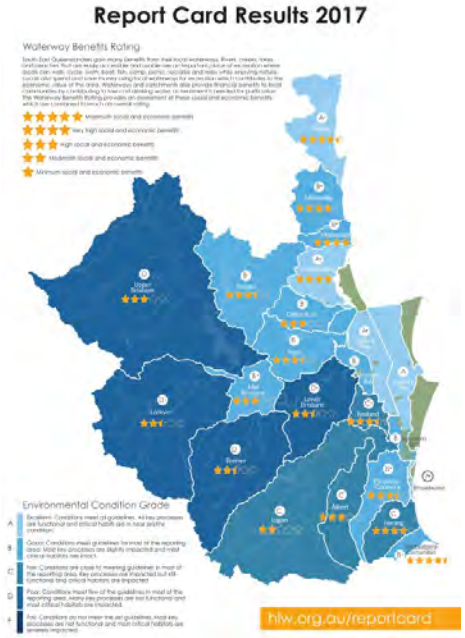
A key element of engaging stakeholders and raising awareness levels of the need to manage catchments and waterways is the development of waterway health 'report cards'. Across Australia, more than 20 of these initiatives are currently underway.

In South-East Queensland and Northern New South Wales, Water Technology has been providing important assistance regarding such report cards to Healthy Land and Water and Tweed Shire Council, in each case at different scales and with a different focus.

The Healthy Land and Water assistance saw Water Technology personnel undertake a significant commission to upgrade and calibrate existing receiving water quality models to more accurately simulate water quality conditions in seven major regional estuaries and Moreton Bay. These models were calibrated and validated to the internationally recognised Ecosystem Health Monitoring Program (EHMP) dataset, and our work was subject to thorough third-party peer review, from which we were commended for making significant improvements to the models.

The Tweed Shire Council work was more collaborative or communicative in nature. In association with staff from the International River Foundation, Water Technology personnel developed water quality grades based on data collected by Council personnel. Probably more importantly, these grades were presented by Water Technology in a highly informative hardcopy and digital media compatible newsletter.

Both projects are multi-year engagements and have significantly contributed to waterway awareness levels in the region.



For more information, contact
+61 7 3105 1460, Tony McAlister
(**tony.mcalister@watertech.com.au**)

COLLABORATIVE PLANNING

Integrated planning for improved water management outcomes

In 2018, Water Technology embarked on an ambitious integrated water management (IWM) and planning project with South East Water. The work follows from a previous study looking into opportunities within the Monash National Employment and Innovation Cluster (NEIC), touted as Melbourne's next CBD due to large forecast employee and population growth through to 2050. That study engaged with multiple stakeholder organisations, who ultimately agreed that the area needs an integrated approach to future planning and should set measures and targets for considered development.

The work has seen the development of GIS-based IWM measures at a workable (and non-jurisdictional) sub-catchment level for the NEIC, which provide the ability to test the impacts of proposed visions on those measures. For instance, the impact of improved access to waterways and open space on liveability can be spatially measured to determine which sub-catchments (hence stakeholder groups) are impacted the most. This useful approach simplifies the planning process and allows for more seamless testing of proposed improvement works. The measures under the different visions are viewable on an easy to use online platform, allowing for quick assessment. A vitally important part of this integrated planning work has been strong leadership to enable a high degree of participation across stakeholder groups.

An intensive workshop series was undertaken, where stakeholders embarked on an ambitious 'vision setting' mission. We worked closely with key people within the Victorian Planning Authority and Melbourne Water to understand mechanisms available to realise these stakeholder visions. Stakeholders included the City of Greater Dandenong, Monash City Council, the City of Kingston, Yarra Valley Water, South East Water, Monash University and Melbourne Water. The future of the Monash NEIC is bright with these interested people!

> At South East Water we are trying to create a better world that won't cost the earth. The GIS measures, targets and visualisations that we have created are a critical step to get us there. Once proven at Monash NEIC, we would like to see this work expanded to other parts of our service area. It has been great working with the Water Technology team on this project; it's been an outstanding success.
>
> Chris Tancheff Manager of Integrated Water, South East Water.

For more information, contact
+61 3 8526 0800, Celine Marchenay
(**celine.marchenay@watertech.com.au**)

Understanding wetland flow velocities

to improve design outcomes

HARPLEY

For more information, contact
+61 3 8526 0800, Thomas Cousland
(**thomas.cousland@watertech.com.au**)

One of the key design parameters for constructed wetlands is flow velocity within the wetland macrophyte zone. The velocity criteria of <0.05 m/s is required to prevent stripping of biofilms from within the macrophyte zone, with current practice requiring velocities from flow events up to a 3-month ARI meet this requirement.

The use of 2-dimensional modelling, with TUFLOW, as part of the design process for wetland macrophyte zones provides improved understandings of velocities through a system. Current practice in Victoria requires either simple hand calculations or 1-dimensional modelling to assess macrophyte zone velocities. These methods have significant limitations in terms of their accuracy and ability to assess what is occurring within a wetland system during a storm event. 2-dimensional modelling enables the entirety of the macrophyte zone to be analysed, which enables the true flexibility of a wetland design to be explored, ultimately resulting in better design outcomes.

Through our experience, an advantage of 2-D modelling has been to show that the initial shallow section of the macrophyte zone is the most critical for the velocity criteria. This allows the design to be informed and tailored to suit site constraints and performance criteria. High velocities are generally located where water depths are at their shallowest, with current practice stipulating a minimum water depth at wetland Normal Water Level of 100 mm. By either modifying the width at the shallowest location or relocating shallow marsh sections elsewhere in the macrophyte zone, an optimal arrangement can be found, with 2-D modelling facilitating the design and approval process.

Due to Water Technology's advanced modelling capability, the use of 2-D modelling in wetland design does not significantly add to overall project costs, in fact design optimisation saves money in the long term due to the optimal outcomes achieved. Similar modelling methodologies can also be adapted to waterway design whereby optimal rockwork design can significantly lower capital works cost. 2-D modelling can also be used to identify areas of wetlands that are at risk from scour in large flood events.

Protecting our environment through innovative wastewater design

The seasonal nature of caravan park patronage means that wastewater systems in these settings, typically septic systems, are notorious for overloading and failing in peak periods. Typically caravan parks are located in environmentally sensitive areas where failed disposal systems, overloading and the cumulative impact of effluent can damage surface and groundwater dependent systems and the marine environment.

For more information, contact +61 8 8378 8000
Dave Pennington (**dave.pennington@watertech.com.au**)

Regulations typically require onsite wastewater systems to discharge without risk to the environment and public health. Furthermore, onsite wastewater must be managed within the assessed area of a property; discharge off-site is an offence (EPA Act). While some off-site carting is permitted, the cost is high and due to the growing incidence of illegal discharge, is no longer permitted for new developments. Onsite wastewater systems therefore must be designed around the physical constraints on the site, including available space, slope, depth to groundwater, soil type and nutrient capacity, and level of treatment before discharging to the environment.

Middleton Caravan Park is in Middleton, a small town on the coastline south of Adelaide, popular with visitors and holiday-makers. The town has no sewage treatment system, and wastewater must be managed on site. The caravan park is near a watercourse, with several old septic tanks, a soakage system that failed and evidence of effluent discharge to the waterway.

A Land Capability Assessment indicated that over 15 caravan sites would be lost employing a conventional septic disposal system, however through innovative design using pressure distribution into subsurface 'beds', effluent oxygenation and soil amendment, only 4 caravan sites were removed. 'Dose loading' technology allows even distribution of the dispersal area, and sequential dosing promotes aerobic digestion by soil bacteria. Balance storage was provided for peak times and effluent discharged by timed dosing. Wastewater beds were placed within recreation areas in the park, allowing moisture into the root zone of overlying turf, improving nutrient uptake, supplementing irrigation, improving amenity and reducing water use on the property.

Wastewater design and reuse is critical to the health of our communities and the environment. The new onsite wastewater system at Middleton Caravan Park reduces impacts on watercourse ecology and the coastal environment while preserving recreational space, caravan sites, and realising wastewater reuse potential.

Water Technology specialises in the design of onsite wastewater systems, decentralised and modified passive systems in constrained sites and sensitive environments. The system designed for Middleton can be replicated in similar situations anywhere in Australia, providing beneficial outcomes for people and the environment.

No detention strategies

Most new developments are required to detain stormwater on-site to ensure flood conditions external to the site are not worsened. Occasionally, providing detention may in fact be detrimental and a no-detention strategy is the most appropriate approach for minimising off-site flood impacts.

The no-detention strategy is highly catchment dependent and requires detailed hydraulic analysis to demonstrate compliance with local regulations. If an analysis can show that on-site detention basins are not required and that the approach is beneficial to off-site flooding conditions, more developable land can be made available to maximise yield.

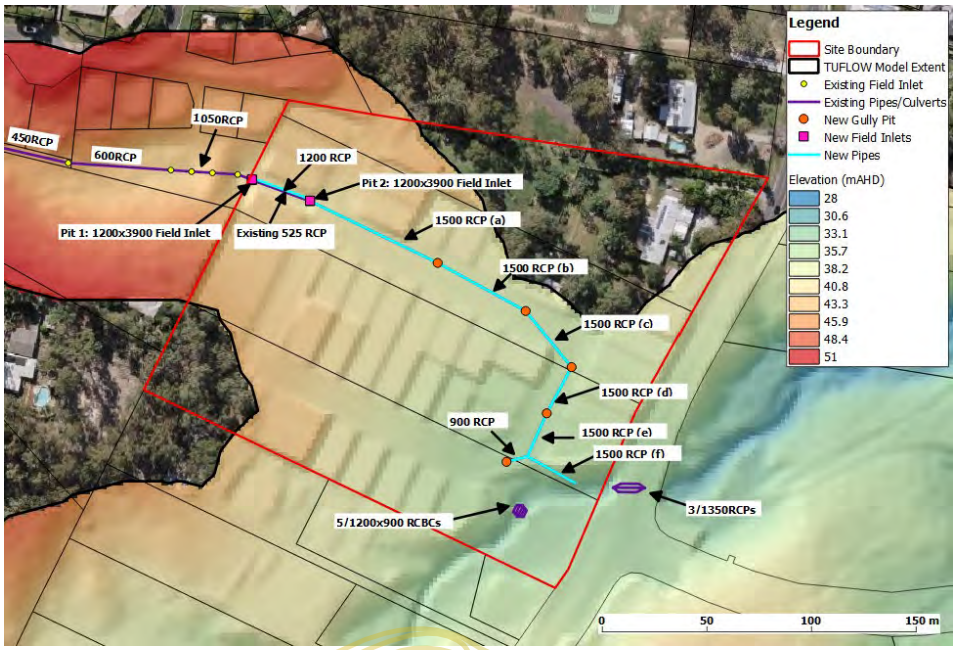
On numerous occasions, Water Technology has successfully demonstrated to local authorities that a no-detention strategy should be adopted to minimise flooding impacts. Two examples of such cases are discussed below:

Bellbird Park

Water Technology undertook detailed hydrological and hydraulic analyses to demonstrate that providing no on-site detention was the preferred stormwater management strategy for a proposed 3-hectare development site located at Jones Road in Bellbird Park, Queensland. The no-detention approach was shown to be robust under various sensitivity scenarios and meant that more land was available for development. The analysis went further to show that providing detention may have resulted in adverse impacts downstream of the site due to interactions with regional flooding.

The scope of works included dam failure and severe storm assessments to ensure that all flooding hazards were adequately identified and assessed. Technical advice was also provided for internal trunk drainage requirements.

Overall, the adopted stormwater management measures for the site represented an excellent design outcome for the client and a compliant development proposal with respect to the Ipswich City Council Planning Scheme.



Victoria Point

Water Technology was able to draw upon extensive experience working in the Redlands area to prepare three separate Stormwater Management Plans for different development sites at Double Jump Road in Victoria Point. The projects involved detailed assessments of stormwater quality and quantity provisions for the sites and were successfully delivered within a very tight timeframe. One of the sites (approximately 40 hectares) discharged directly to Moogurrapum Creek and will employ a no-detention strategy to meet flooding and stormwater requirements.

Detailed analysis demonstrated that the no-detention strategy was preferred hydraulically and resulted in a better outcome to private properties downstream of the site when compared to a scenario where detention was provided. The approach will eliminate the need to construct large detention basins and will maximise developable land. Critically, the approach will make available extra space for additional uses within the proposed multi-function corridor traversing the site. The site can now maximise the effectiveness of the nature corridor to encourage fauna movement, provide connected areas of green and recreational space and incorporate aesthetically desirable drainage features.

This project is one of many examples where the stormwater and flooding advice provided by Water Technology resulted in considerable benefits to the client and the community.

For more information, contact
+61 7 3105 1460
Greg Hansell (**greg.hansell@watertech.com.au**)
James Weidmann (**james.weidmann@watertech.com.au**)

Building capacity and resilience in regional Victoria with HydroNET

"The flood portal will assist our residents in having access to the latest on-line information in regard to flooding for specific properties and this will lead to an increase in flood awareness and flood preparedness"

Greg McKenzie, Manager Environment, Greater Shepparton City Council

"The Goulburn Broken Regional Floodplain Management Strategy has highlighted the priority about the sharing fit-for-purpose flood information for communities to build community resilience from flooding across the region. Such information can assist with pricing flood insurance, land-use planning, and particularly, flood education and awareness at a site-specific-property level to prepare for flood. The sound accessibility is the corner stone of sharing such information, which is achieved through the HydroNET architecture."

Guy Tierney, Goulburn Broken CMA

WT Hydro established

Water Technology has recently renewed its cooperation agreement with HydroNET and created a new company called WT Hydro - wholly owned by Water Technology - to manage all HydroNET projects and subscriptions in Australia.

HydroNET clients will now be able to contract directly with WT Hydro for HydroNET projects and subscriptions.

For more information, contact
+61 3 8526 0800
Brian Jackson (**brian.jackson@watertech.com.au**)

PERTH
Climate Change Resilience

Water Technology recently completed an investigation into the impacts of climate change on stormwater flooding in the Perth metropolitan area. The study area was approximately 20 km² consisting of a mixture of residential, parkland and CBD catchments.

The main objective of this study was to identify areas prone to flooding due to stormwater under present-day conditions and then to assess the increased risks due to projected climate change conditions in 2050 and 2070. The climate change conditions were based on the very high scenario consistent with the current emissions trend, with increased rainfall intensity due to temperature rise applied in the analysis.

The assessment was based on the latest recommendations in Australian Rainfall and Runoff (ARR2016), utilising a variety of temporal patterns and storm durations to assess frequent, rare and extreme storm events.

Flood modelling was completed using TUFLOW, which covered upstream catchments as well, for a total model area of 35 km². The surface water was modelled on a two-dimensional grid at a 2m resolution, based on LiDAR data and other more recent topographic data. The model also included the trunk drainage system of the extensive pipe network in the Perth metropolitan area.

The outcomes from the study included extensive mapping of flood depths, velocities and flood hazard risk for a range of storm event frequencies and climate change scenarios. Flood hazard was assessed using the categories in ARR2016, which are based on risk to people, vehicles and buildings.

The project identified areas most at risk of flooding due to stormwater, and assessed potential impacts on these areas due to climate change. These areas were prioritised based on flood hazard risk, with potential mitigation solutions considered. The report and maps will help prepare the Perth community to respond to the risks of stormwater flooding, making for a more resilient city.

For more information, contact
+61 8 6555 0105
Scott Wills, Deidre Kelly
(**scott.wills@watertech.com.au**)
(**deirdre.kelly@watertech.com.au**)

NEWS

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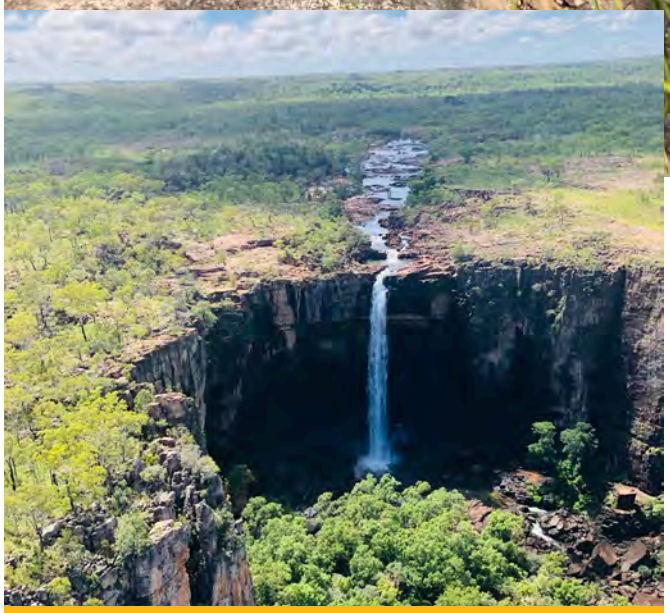
Techer Travels

Stone grinding site on the Upper Mitta Mitta River in Victoria



Kakadu National Park, Northern Territory

Modelling for Non-Modellers

At the recent Floodplain Management Australia National Conference in Canberra, Steve Clark, Ben Hughes, Danny Rose (FMA and Tweed Shire Council) and Lachlan Inglis presented a workshop on "Modelling for Non-Modellers" to over 50 people from across Australia in Local Government and Emergency Services.

The workshop provided the basics necessary to understand the often complex world of flood modelling to better understand flood studies and reports, better manage consultants and prepare briefs, and understand the various technologies available.

Find out more online: watertech.com.au/making-australia-flood-safe

Staff Profile

Celine Marchenay

Senior Project Engineer

Celine is a resourceful environmental engineer with 13 years' experience in the water industry and a passion for integrated water management. She completed a Master's degree in Hydraulic and Environmental Engineering in France before settling in Australia, where she started her engineering career.

During the first five years, Celine focused on delivering a series of potable water and sewer network hydraulic models for water authorities undertaking master planning investigations in Queensland, New South Wales and Victoria. With a deep understanding of the operations and challenges on the potable water and sewer networks associated with population growth and aging infrastructure, Celine joined the Department of Sustainability and Environment (now DELWP) as a Water Resource engineer. During her time spent in a state government organisation, she familiarised herself with the water supply and river catchments across the State of Victoria, water allocations including environmental water, irrigation demands and other such diversions.

Over the last eight years, Celine has worked at Water Technology as part of the Integrated Stormwater Management group delivering drainage and stormwater quality related projects including flood studies, stormwater management strategies, design of WSUD assets and stormwater harvesting schemes. More recently, Celine has applied her hydraulic modelling skills to the development of innovative IWM pilot models within the Monash employment precinct looking at simulating storm, potable and waste waters all in the one model using InfoWorks ICM.

Celine's professional experience within the various areas in the water industry gives her a level of appreciation of the constraints and challenges different water beneficiaries and managers are facing in planning and managing for the future.

Contact: +61 3 8526 0800, **celine.marchenay@watertech.com.au**

Office Locations

MELBOURNE
(Head Office)
15 Business Park Drive
Notting Hill VIC 3168
+61 3 8526 0800

SYDNEY
Level 1, 20 Wentworth Street
Parramatta NSW 2124
+61 2 9354 0317

BRISBANE
Level 3, 43 Peel Street
South Brisbane
QLD 4101
+61 7 3105 1460

ADELAIDE
1/198 Greenhill Road
Eastwood
SA 5063
+61 8 8378 8000

PERTH
Ground Floor,
430 Roberts Road
Subiaco WA 6904
+61 8 6555 0105

WANGARATTA
40 Rowan Street
Wangaratta VIC 3677
+61 3 5721 2650

GEELONG
51 Little Fyans Street
Geelong VIC 3220
+61 4 5801 5664

GIPPSLAND
154 Macleod Street
Bairnsdale VIC 3875
T+61 3 5152 5833

WIMMERA
597 Joel South Road
Stawell VIC 3380
+61 4 3851 0240

GOLD COAST
Level 4, 194 Varsity Parade
Varsity Lakes QLD 4227
+61 7 5676 7602

SUNSHINE COAST
+61 7 3105 1460

EMAIL: info@watertech.com.au
HydroNET: hydronet@watertech.com.au