# water

MAY / JUNE 2018 ISSUE 204

## Stormwater

**Coastal risk strategy**

**Tonga says a big thanks**

deeco services
Est. 1938

# Provider of Water Process Solutions for New Zealand since 1938

## METERING

Domestic and Bulk

SENSUS

Electromagnetic Flow Meters

EUROMAG INTERNATIONAL

Automatic Meter Reading System (AMR)

SENSUS

GSM/GPRS Data Loggers

DataCell

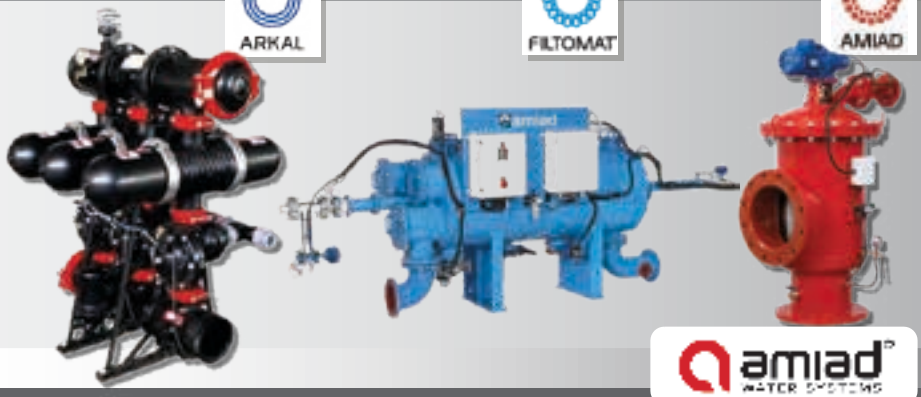
## FILTRATION

Innovative Filtration Solutions

ARKAL

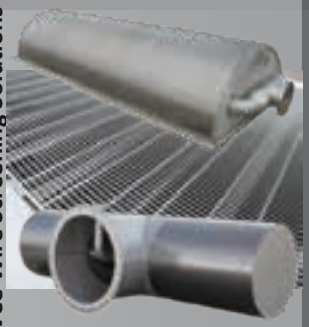
FILTOMAT

AMIAD



amiad WATER SYSTEMS

Vee Wire Screening Solutions



Hendrick Screen Company

## VALVES

Water Control Solutions

BERMAD

Backflow Preventers

WILKINS a Zurn company

High Performance Air Valves

VENT-O-MAT


**Deeco Services Ltd** | Water Process Solutions

**National Service & Distribution** | 21 Regent Street PO, Box 33-226, Petone

**Tel:** 04 568 5293 | **Fax:** 04 568 5273 | service@deeco.co.nz | **www.deeco.co.nz**

Wellington | Auckland | Tauranga | Christchurch

**WATER JOURNAL**
**Managing Editor:** Alan Titchall
P +64 9 636 5712, M +64 27 405 0338
alan@contrafed.co.nz
Contrafed Publishing
**Contributors:** Mary Searle Bell
**Advertising Sales:** Noeline Strange
P: +64 9 528 8009, M: +64 27 207 6511
n.strange@xtra.co.nz
**Design:** Contrafed Publishing
Suite 2,1, 93 Dominion Rd
PO Box 112357, Penrose, Auckland, 1642
P: +64 9 636 5715
www.contrafed.co.nz
**Distribution:** Pip Donnelly
P: +64 4 472 8925


ISSN 1179-2949 (Print)
ISSN 2382-1906 (Online)

**www.waternz.org.nz**

# water

**Issue 204** MAY / JUNE 2018

## INSIDE



## FEATURES



## REGULARS



*A consistent approach across the 3 waters sector.*




The official journal of Water New Zealand – New Zealand's only water environment periodical. Established in 1958, Water New Zealand is a non-profit organisation.

# The cost of improved water services

**Dukessa Blackburn-Huettner,**
***President, Water New Zealand***

Just prior to this publication going to print, the Government released its Cabinet paper *Review of three waters infrastructure: key findings and next steps*.

The much anticipated paper outlines the government's "comprehensive programme of reform" to transform the three waters services, strengthen the regulatory regime and start tackling the funding pressures facing the local government sector.

While this is an announcement that we in the water sector have been eagerly anticipating, the future management of water and how to improve water quality is now top of mind for many New Zealanders.

In Auckland, where I currently live, this was brought home clearly during what could be described as a 'summer of discontent' for many beachgoers. The city's rapid development, along with more heavy and frequent rainstorms, has placed unprecedented pressure on our ageing infrastructure.

Safeswim was launched by the Healthy Waters Department of Auckland Council, together with its project partners (Watercare, Auckland Regional Public Health Service and Surf Lifesaving Northern Region), in November last year.

It has highlighted and drawn Aucklanders' attention to beach water quality issues which occur as a consequence of stormwater contaminated by faecal material from animal sources, as well as human faecal material from poorly performing on-site wastewater systems, residual combined sewer catchments, and wastewater overflows due to stormwater and groundwater ingress in separated catchments.

In addition, Auckland's growth is expected to increase its population by the size of the city of Tauranga every three years, to reach two million people by 2028 and 2.4 million by 2043.

Perhaps then, it is not surprising that Aucklanders are increasingly prepared to support increased rates to see improved water quality.

This highlights that as awareness is raised through engagement and transparency by the Council, along with the public's desire to understand the implications of underinvestment, people are prepared to fund the programmes which are required to raise the standards and improve public safety.

Auckland Council received 26,500 submissions on its 10-year budget proposal. In regards to the water quality targeted rate, interim results show that two-thirds of Aucklanders support this increased investment to improve water quality in our harbours and waterways. Councillors will consider this feedback and make final decisions on investment over May 2018.

The message has clearly got through to ratepayers that clean water comes at a cost. At an average of $66 per annum for an average household (based on an average property value of just over $1million), or $308 for an average business, it's a price the public considers worth paying.

For that, residents will get improved water quality at beaches through increased investment in stormwater management, such as new networks which enable stormwater separation and new stormwater treatment systems in the Western isthmus which will help reduce overflows into the harbours from hundreds of times a year to an average of two to six times a year by 2028.

The targeted rate will also fund programmes of work to reduce contaminants, such as litter, sediments, metals and oils, in stormwater across the region in both urban and rural areas of Auckland.

There will also be improved ecological health of urban and rural streams and a proactive regional septic tank monitoring programme aimed at identifying which properties are contributing to the degradation of beaches and waterways, such as at Piha, Bethells lagoon and Little Oneroa, on Waiheke Island.

These are improvements that will happen much faster if Auckland Council was trying to fund improvement from general rates. Under current budgets, this would have taken 30 years to achieve.

The Council proposes to introduce a new targeted rate to increase funding for water infrastructure, and speed up delivery of cleaner harbours, beaches and streams within 10 years.

Of course, Auckland is not alone in grappling with the issue of how local authorities can maintain and fund much needed infrastructural upgrades and improve water quality.

In small populations, ballooning tourism places a huge strain on existing infrastructure and ratepayers' pockets.

A targeted rate provides for greater transparency and is clearly welcomed by many ratepayers, but there is a need to take a close look at the way we fund utilities in the future and look to identify fairer and better approaches.

> **"Aucklanders are increasingly prepared to support increased rates to see improved water quality."**

In June, the Government is expected to announce the terms of reference for a review of local government funding. That work, and the work currently underway by the Department of Internal Affairs will be important for looking at new mechanisms to assist in the delivery of improved water services for ratepayers.

The evidence from Auckland suggests there is an appetite to pay more in rates, provided the public knows it will be targeted at implementing the solutions to a specific problem. **WNZ**

## UPCOMING EVENTS

| | | |
|---|---|---|
| **Stormwater Conference 2018** | 23 – 25 May | Millennium & Copthorne, Queenstown |
| **Local Government New Zealand/Water New Zealand/IPWEA Water Summit** | 30 – 31 May | Macs Function Centre, Wellington |
| **IPWEA NZ 2018 Conference** | 21–22 June | Energy Events Centre, Rotorua |
| **2018 LGNZ Conference** | 15 – 17 July | Christ's College, Christchurch |
| **Water New Zealand Conference** | 19 – 21 September | Claudelands, Hamilton |

1958–2018 60 years

# water NEW ZEALAND CONFERENCE & EXPO

19–21 September 2018, Hamilton

## Save the date 19–21 September and join us in Hamilton

This year Water New Zealand will be celebrating 60 years as an association so this conference will be a particularly special occasion.

The Water New Zealand Conference and Expo is one of the must-attend events on the 3-waters calendar.

Registrations will open in June so keep an eye on our website for more information.

www.waternzconference.org.nz

---

BROUGHT TO YOU BY:

water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa
A consistent approach across the 3 waters sector

PREMIER SPONSORS:

APEX ENVIRONMENTAL | Citycare Water | HYNDS | VEOLIA | Watercare An Auckland Council Organisation

# Government's approach to three waters reform

**Local Government Minister Nanaia Mahuta** outlined the Government's approach to much-needed water sector reform when she spoke to Water New Zealand members at a recent Water Utilities' Association meeting in Wellington. At the end of April, the Government released its cabinet paper Review of the three waters infrastructure: key findings and next steps, which outlines the next stage in the review process.

The paper outlines four inter-related work streams around regulation and oversight, funding and financing, capacity and capability of decision makers and suppliers along with information for transparency, accountability and decision making. For more information and to see the cabinet paper, go to the Water New Zealand website.

The Minister told association members at the meeting that she plans to take a paper to Cabinet in October with a proposal to deal with the challenges facing the sector, including key questions such as whether there should be a drinking water regulator or whether there should be a regulator across the three waters.

Water New Zealand supports the recommendations of the Havelock North Water Contamination Inquiry, which called for a major shake-up of the drinking water sector and the establishment of a regulator.

Nanaia Mahuta told the WUA that the Cabinet paper will set the current challenges in context allowing the government to work collaboratively with the sector. She said local input is important, and so is the need to avoid the risk of the issues becoming politicised too early.


Nanaia Mahuta

Other challenges include the need for better understanding of the need for reform as well as the obvious diversity across local government.

While noting overseas reform, she said the solutions will come from the basis of a strong commitment to "our way of life and how we see things in New Zealand". Mahuta ruled out privatisation measures, but admitted the numbers were "scary" when looking at the costs of replacing aging infrastructure along with the cost to local authorities of providing for urban development and growth.

Water sector leaders will get an opportunity to discuss issues around regulation, infrastructure funding and freshwater management and allocation at a joint Local Government NZ and Water New Zealand summit in Wellington May 30/31.

water NEW ZEALAND CONFERENCE & EXPO
19–21 September 2018, Hamilton

1958–2018 60 years

# A 60 year focus

**The key focus for stormwater management throughout the second half of the 20th century was around flood mitigation by building and maintaining a robust network of pipes.**

**Over the last decade or two, the realisation that urban water bodies are at risk from flooding and poor water quality has led to a shift the way we manage stormwater towards systems that reduce flows and treat contaminants.**

**This has led to new and more innovative approaches around low impact design (LID) such as ponds and wetlands, permeable paving, swales and so on as well as a growing emphasis of water sensitive urban design (WSUD), best management practices and sustainable urban drainage systems.**


1


2

1. **Minor flooding on Willis Street, Wellington, following a water main breaking, including businesses Para Rubber, Grand Hotel, Boots Chemist and Thompson's Silk Shop Limited.** *Evening Post (Newspaper. 1865-2002) Photographic negatives and prints of the Evening Post newspaper. Ref: EP/1957/0633-F. Alexander Turnbull Library.*

2. **Burst water main on Willis Street, Wellington, in front of the office of the Evening Post newspaper, including tram tracks and businesses such as Martin's Shoe Store, Woodcraft Furniture, and Art Cabinet Company Limited.** *Evening Post (Newspaper. 1865-2002): Photographic negatives and prints of the Evening Post newspaper. Ref: EP/1957/0685-F. Alexander Turnbull Library.*

3. **View of a manhole storm water drain flooding on Willis Street after a downpour, Wellington City.** *Dominion Post (Newspaper): Photographic negatives and prints of the Evening Post and Dominion newspapers. Ref: EP/1960/2413-F. Alexander Turnbull Library.*

4. **Laying stormwater pipes in Evans Bay, Wellington.** *Evening Post (Newspaper. 1865-2002): Photographic negatives and prints of the Evening Post newspaper. Ref: EP/1957/3543-F. Alexander Turnbull Library.*

5. **A burst water main on the Hutt Road.** *Evening Post (Newspaper. 1865-2002): Photographic negatives and prints of the Evening Post newspaper. Ref: EP/1959/1845-F. Alexander Turnbull Library.*

Stormwater 2018
Wai Ora - Rising to the Challenge
23–25 May 2018, Millennium & Copthorne, Queenstown

## Make sure you register!

**www.waternz.org.nz**

**The conference theme of 'Wai Ora – Rising to the Challenge'** provides the platform to introduce, explore, address and challenge the impacts of stormwater on the environment.

It's an important event on the stormwater calendar and is an opportunity to participate in the industry, learn and share knowledge and experience, and find out more about emergent technology and research.

As stormwater professionals, our challenge is to provide the best environmental outcomes for our waterways. Wai Ora is a uniqueness that New Zealand celebrates, however maintaining its mana and indeed quality is where the challenge lies.

Don't miss this great opportunity to attend this thought-provoking conference and be part of the celebration of the mana of Wai Ora.

Go to the Water New Zealand website www.waternz.org.nz for more information.



# Trade and Industrial Waters Forum Annual Conference 2018

**The trade waste industry held its Annual Conference** and Industrial Forum in Auckland at Waipuna Hotel in early April with an excellent range of technical papers presented to an enthusiastic audience.

The conference started with a closed session for trade waste officers employed by councils. This was followed by the opening address delivered by Marlon Bridge from Watercare Services. He called for delegates to be bold and visionary, noting that it is incumbent on everyone in the industry to "raise the bar".

He noted the under-investment in water infrastructure by local authorities and predicted a bow wave of change and problems for councils in the decade ahead. He also talked about communication with customers, and being receptive to their increasing demands.

There was a lively debate between Chris Allen of Federated Farmers and Mark Brockelsby from Waikato Regional Council about work being done to improve freshwater management.

Chris noted the importance of everybody playing their part. The advent of Farm Plans, now required by most regional councils, has resulted in the development of a new consulting industry to assist farmers to improve their environmental management.

The conference dinner on the Tuesday night was entertained by Tara Okan presenting one of his magic shows, along with some member participation.

Finally, Geoff Young stood down as Chair of the Forum after seven years and was made a life member of the Forum. He was replaced by Hamish Jones from Hynds.

# Water service managers discuss hot topics

**Climate change adaption and managing summer water shortages,** as well as an update on Water New Zealand's National Performance Review benchmarking tool were among the hot topics discussed at the bi-annual Water New Zealand Water Services Managers' Group meeting in Wellington back in April.

About 40 water service managers from all parts of the country came together for the two-day forum to share ideas around key issues facing the water sector.

As well as a presentation from the Ministry for the Environment on the role of water suppliers in source protection, there was an update from the NZ Defence Force over its response to recent concerns around PFOS groundwater contamination from firefighting foam.

Water New Zealand's Technical Manager, Noel Roberts, says these twice-yearly meetings provide a great opportunity for water service managers to raise issues, concerns and share solutions.

The meeting was chaired by Lorraine Kendrick from Waipa District Council.

FILTEC
Water & Wastewater Specialists

Auckland: **09 274 4223**
Wellington: **042322402**
Dunedin: **034886200**
info@filtec.co.nz
www.filtec.co.nz

www.facebook.com/filtecnz/

# Water makes up 60% of who you are. For us, it's 100%.

**Backed by a world class service team, FILTEC's end-to-end services and capabilities range from product design and installation to remote monitoring and analysis.**

**With 25-years experience in the water and wastewater industry, FILTEC has the abilities to design cost-effective solutions to any problem.**

## FILTEC services:

- **Product design, installation and monitoring**
- **Equipment training**
- **Remote monitoring and analysis**
- **Service support**
- **Supervision of large treatment plants**

**25**
years in the water treatment industry.

# Water modelling gathering in Christchurch

**The Water New Zealand Modelling Group** held its Annual Symposium on 14-15 March at the Quality Hotel Elms, Christchurch.

Some 45 attendees from around the country (and a few from overseas) enjoyed two days of entertaining presentations and robust discussion.

The symposium opened with a keynote presentation from Paul Doherty, Eagle Technology, who provided an informative session regarding why we should use maps for data-driven decision making. There were many questions and discussions about this during the breaks in the remainder of the symposium.

There were also two further presentations given by guest speakers from Christchurch City Council and Queenstown Lakes District Council covering the way forward for their organisations and how they are adding value with modelling.

The first day was completed with a networking event at the hotel, followed by a very filling and unique BBQ dinner at a nearby restaurant.

Day two opened with a second keynote address focusing on using data-driven maps to engage your audience.

This followed on nicely from the first keynote and also provided some very good tips to get started in sharing information.

A third keynote address described examples of smart water and wastewater systems using hydraulic modelling and data analytics.

The final guest speaker complemented this by talking about their experiences implementing a realtime wastewater modelling system. They also provided some things to look out for when planning your real-time system.

In between the keynote and guest speakers, we had a wide range of presentations on all things related to water, wastewater and stormwater modelling from Councils and Consultants.

These included topics, such as using drones to do detailed bathymetric surveys, modelling cascading dam breaks, water supply modelling in the Chatham Islands and optimising pressure sewer systems. The symposium had a good mix of strategic thinking coupled with genuine examples of what modellers are doing in their jobs on a daily basis.

It was a very thought-provoking symposium, and attendees went away with plenty of new ideas to put into place in their workplaces.

Further information on the Modelling Group can be found on the Water New Zealand website:

www.waternz.org.nz/Modelling

# Wipes supplier hit with big fine

**Wipes manfacturer, Pental has been ordered** to pay A$700,000 in penalties for 'flushable' wipes claims after it was taken to task by the Australian Competition & Consumer Commission.

The Australian Federal Court has ordered Pental and Pental Products (together, Pental) to pay penalties for making false and misleading representations about its White King 'flushable' toilet and bathroom cleaning wipes.

Pental's packaging and promotional materials for its White King wipes included statements such as "flushable", "Simply wipe over the hard surface of the toilet... and just flush away", and "White King Toilet Wipes are made from a specially designed material, which will disintegrate in the sewage system when flushed, just like toilet paper".

Pental admitted that this was not the case and the court decided such declarations and representations were false or misleading in contravention of the Australian Consumer Law, and ordered Pental to implement a compliance programme.

"The ACCC took action against Pental due to concerns that consumers were being misled into believing that the wipes were suitable to be flushed," says ACCC Commissioner Sarah Court.

"These White King wipes can't be flushed down the toilet, and Australian wastewater authorities face significant problems if they are because they can cause blockages in household and municipal sewerage systems."

The ACCC's action related to White King Power Clean Flushable Toilet Wipes (40 pack) and White King Power Clean Flushable Toilet Wipes (100 pack), later renamed the White King Flushable Bathroom Power Wipes. They were advertised as 'flushable' between February 2011 and July 2016.

The ACCC has separate ongoing proceedings against Kimberly-Clark Australia (Kimberly-Clark) concerning alleged false or misleading representations in relation to four 'flushable' personal hygiene wipes products that were marketed and supplied in Australia between May 2013 and May 2016.

Meantime, Pental has co-operated with the ACCC by making admissions and consenting to orders which included declarations, an injunction, the implementation of an ACL compliance training programme, and payment towards the ACCC's costs.

# Invitation to join the Water Complaints Scheme

**Water providers can join the new Water Complaints Scheme**, which was created earlier this year by Utilities Disputes and Watercare Services, and is now taking public enquiries and complaints about water in the Auckland region.

"Watercare has led the way with the Water Complaints Scheme and we are delighted to be working with them and their customers," says Utilities Disputes commissioner Nanette Moreau. "Joining the Water Complaints Scheme is voluntary, and we encourage all water providers to join."

The value of customer feedback applies also to complaints, she adds, which present an opportunity to learn, improve and create positive change.

"We invite water providers to contact us to find out more." Chief executive of Watercare Raveen Jaduram says; "At Watercare we work very hard to answer our customers' queries and satisfy any complaints, but sometimes disputes aren't easily resolved.

"This new service means customers have free access to an independent referee when all other avenues have been explored. The other benefit for us is that the Utilities Disputes team will then give us feedback to help us improve."

Water customers can contact the scheme when their issues have not been resolved to their satisfaction. Issues could include infrastructure, damage to property, or billing, where water is metered and invoiced separately (or itemised on rates bills).

While Utilities Disputes can look at a range of complaints, there are some restrictions. "For example, we can't investigate complaints about the price of water, but we can look at whether the water bill has been calculated accurately, and whether the customer is on the right plan," says Moreau.

"We draw on 16 years' experience investigating complaints about electricity and gas, and, more recently, broadband property access.

"Expanding our service to include water is a logical step and we look forward to facilitating discussions and working through complaints with both parties."

Nanette Moreau.

Contact: Annie Bannister
a.bannister@utilitiesdisputes.co.nz

# Fellowship to support issues of urban water management

**At a time of increasing national focus** on urban water quality, Stu Farrant from Morphum Environmental has been awarded a Winston Churchill fellowship.

This will support Stu with international travel and research to better understand the enabling factors which support leading cities around the world to address the complex issues of urban water management.

Stu will be travelling to Hamburg, Copenhagen, Malmo, Stockholm, Portland, Seattle and San Francisco during June/July to meet with industry leaders and practitioners who have been instrumental in transitions towards improved environmental and social outcomes through better and more integrated management of stormwater.

Stu's fellowship, therefore, provides a timely opportunity to learn from the experiences of a range of cities with similarities (and differences) to New Zealand to hopefully inform efficient and effective change within the public and private sector.

Specifically, Stu's research will investigate:

1. The environmental, social and economic drivers which have motivated cities to improve urban water management.
2. How these motivations have been successfully translated into actions to address urban impacts on receiving environments.
3. How regulation and policy tools have been developed and implemented to facilitate change.
4. How institutional and industrial capacity has been enhanced to ensure motivation and policy are translated into good practice.
5. How different financial models have been developed and used to fund public and private investment in stormwater management infrastructure.
6. How relationships between governance and industry have created a willingness to invest in new technologies and pursue a paradigm shift in urban water management.
7. How innovation and a culture of applied research are fostered to drive change and continued improvements.
8. How environmental and engineering elements are successfully integrated with urban design, landscape amenity and other important considerations to deliver multiple benefits.
9. How stormwater is managed to provide resilience to climate change and other chronic and acute shocks.
10. How social sciences and behaviour change programmes are used to educate the community as to increased awareness of the issues relating to urban stormwater management and increased uptake of change and private investment.

Stu Farrant.

The motivation for Stu's research is to identify and understand factors which have enabled improved urban water management in the selected cities which may be transferable to a New Zealand context.

The transfer of this knowledge and experience is fundamental to the success of the research tour and offers the potential to support local change which is founded on globally leading applied research.

Through personally connecting and engaging with leaders in the cities visited, the intent is to foster relationships which will extend beyond the immediate post-research period and enable ongoing collaboration and participation in industry forums.

This will also expand on the relationships which Stu has established with Australian researchers and thought leaders (through connections with the Co-operative Research Centre for Water Sensitive Cities) and enable well-informed advocacy and practice based on leading technical, social and policy thinking.

The association looks forward to the findings from Stu's research on his return and the insights which these may provide locally to support improved urban water management.

Water New Zealand also commends the Winston Churchill Trust on its commitment to supporting Kiwis to undertake important international research for the betterment of local practice.

# Introducing WSP Opus

**WSP Opus is the New Zealand operation** of WSP following the purchase of Opus International Consultants (Opus) by WSP Global.


Ian Blair (left) & Guy Templeton.

Ian Blair has been appointed managing director of WSP Opus, taking on the leadership role of the New Zealand business. He was previously a member of the Opus global executive team with accountability for Australia and New Zealand, and now a member of the WSP ANZ executive team.

"Our company has been a leading New Zealand design and engineering consultancy for 147 years," says Blair. "We've established deep roots in this country, our expertise contributing to some of New Zealand's most significant infrastructure and transportation projects.

"Now as WSP Opus, we have access to an even greater depth of expertise and talent through WSP's extensive global network, to provide innovative design and engineering solutions to our valued clients, and ultimately to benefit the communities they serve, today and into the future."

The executive team is led by Guy Templeton, president and CEO for WSP ANZ.

# Enter our photo competition

## Do you have an outstanding water-related photo you'd like to share?

### At Water New Zealand, we're running our first ever photo competition.

This is a great opportunity for you to show off your creativity and generate some positive, high profile coverage of the industry.

Submit your entry by Friday, 8 June in JPEG format to:
**enquiries@waternz.org.nz**
with the subject **PHOTO COMPETITION**, and include:
**• photograph title • photograph location**
**• photographer's name • contact number and email (for our records only).**

Entries will be uploaded to the Water New Zealand Facebook page where the "People's Choice" will be selected by member and public votes.

The winner will be notified by Friday, 6 July and will receive a free registration for the 60th Water New Zealand Conference in September.

Go to our website **www.waternz.org.nz** for more information and to see conditions of entry.

# Start thinking about nominations for your conference awards

**One of the big events at the Gala dinner in September** is the awards ceremony where we get to acknowledge the great work of many in our sector, and showcase some of the projects and innovations that have occurred thoughout the year.

Outlined below are three awards for which we are seeking nominations and submissions.

## Beca Young Water Professional of the Year Award

One of the highly coveted awards at the annual conference is the Beca Young Water Professional of the Year. Since 2009, this award has recognised one young water professional who has made a significant contribution to the water industry and the general community, and has demonstrated exceptional achievement in the early stages of his or her career.

This award recognises that the water industry encompasses a wide field of disciplines including, but not limited to, research, policy development, law, education, engineering, consulting, construction, and community initiatives.

Last year's winner, Dr Emily Afoa from Morphum Environmental Ltd, has been working towards finding environmentally-focused stormwater solutions.

The Young Water Professional of the Year is open to individual members who are under 35 years of age. Non-members may also apply if they have submitted an individual membership form with payment to Water New Zealand prior to, or at the same time as, their nomination form. There are no entry fees.

Completed and signed nomination forms can be downloaded from our website: **www.waternz.org.nz/YoungWaterProfessional** Please send completed nomination forms to the Chairman of the Judging Panel:

**Clive Rundle**, CH2M Beca, PO Box 6345 Wellesley Street, Auckland 1141, e: clive.rundle@beca.com

## Veolia Health and Safety Innovation Award

This award acknowledges and rewards a corporate entity or individual who has developed an innovation which eliminates or minimises a health or safety risk in the water industry.

It was won last year by Wellington Water for their development of a Safety in Design process that is being applied where significant changes to plant, substance or structure are planned in maintaining, reinstating, upgrading, decommissioning and other activities involving Wellington Water-managed assets and services.

This award is open to corporate entities or individuals working in the New Zealand water industry. Submissions will only be accepted if the individual is a member of Water New Zealand or works for an organisation that is a member of Water New Zealand.

Submissions should only refer to innovations developed in the 12 months prior to the closing date for applications. To find out more go to **www.waternz.org.nz/HealthandSafety** or send submissions to **amy.aldrich@waternz.org.nz**.

## Pipeline & Civil Project Award

The 2017 Project award went to Watercare for the Hunua 4 Watermain project. Hunua 4 Watermain is a major project that has increased the resilience of Auckland's water supply network. This award sets out to recognise excellence, not only in the delivery of a project, but also the contribution of the various parties to the final outcome.

Often awards recognise the contractor responsible for building a project while not fully acknowledging the contribution of others. The Pipeline & Civil Project Award seeks to redress that and celebrate the collaboration involved in completing a successful project. Conditions of entry can be found at: **www.waternz.org.nz/projectaward**

Visit **www.waternz.org.nz/awards** for more information on awards and criteria.

## Last year's winners.

Veolia health and safety winner – Wellington for their Safety in Design project Alex van Paassen and Ian Gill.

Project Award winner – Watercare for the Hunua 4 Watermain project; Dukessa Blackburn-Huettner and David Moore.


Beca Young Water Professional of the Year winner Dr Emily Afoa and Clive Rundle.

# Precious.

Excelling in the provision of electronic data capture systems, meter reading technologies and accurate metering solutions. Ensuring the sustainability of our most important resource.

## Because Every Drop is Precious.

www.adriley.co.nz

ADR
Arthur D. Riley & Co. Ltd.

fieldsmart technology

Auckland: (09) 444 2350
Wellington: (04) 472 7614
Christchurch: (03) 379 2628

# Education and training in stormwater

There is recognition beyond Water New Zealand that education and training is a potential barrier to the successful implementation of future stormwater management. **James Reddish** from the Water New Zealand Stormwater Group, explains.

The need for increased resilience against a changing climate, population challenges, historic under-investment in infrastructure, and increased scrutiny on the quality and quantity of water we discharge are driving changes in how stormwater is managed across Europe, North America, Australasia, and increasingly becoming a worldwide focus.

The need for continued professional development is not new. In the same way that relying on our previous stormwater management approach is unlikely to address our emerging issues, relying on the same skills and knowledge may not be suitable either.

Water New Zealand's Stormwater Group is supporting our industry by plotting a path forward for stormwater education and training. This is far from an exercise in isolation. Collaboration across organisations and sectors, all levels of government, and industry partners will be critical for success.

A key next step will be the Education and Training Forum to be held as part of the Stormwater Conference in Queenstown May 23-25.

## Education and training

In 2016 Water New Zealand conducted an online survey of the stormwater industry. Among 16 questions the survey asked 'What stormwater-related training do you think is required in the wider industry?' There were some clear outcomes raised by the 137 who responded.

1. Water Sensitive Urban Design is a knowledge gap, as well as associated topics of water quality, stormwater treatment and hydraulics.
2. New national, regional and local policy requires support and guidance on implementation.
3. Many respondents want to know what is going on elsewhere, including industry developments.
4. The need for knowledge on hydrological analysis techniques came through consistently, along with climate change.
5. A potential knowledge gap in cost/benefit analysis and economics of stormwater were also identified.

Some of these are not new training needs, but when overlaid with our emerging issues become new and pressing topics.

Further, the public is becoming increasingly aware, and knowledgeable, on stormwater issues – whether it is the effects of flooding or environmental impact. As an industry it is critical that the information the public receives is based on sound science. How, what, and when we as an industry engage with the public is critical.

Public engagement has often been the realm of public engagement professionals, however stormwater practitioners may find themselves needing to communicate with a wider range of people.

There is recognition beyond Water New Zealand that education and training is a potential barrier to the successful implementation of future stormwater management – whether it be Water Sensitive Urban Design, or other solutions.

At the national level the Ministry for the Environment is developing national urban water good practice guidelines, and Water New Zealand is developing a capability building programme for the wider water industry.

At the local or regional level Auckland Council has recently released best practice guidelines for water sensitive design and stormwater device design. Similar guidelines are under development in Canterbury and Waikato.

## What is happening overseas?

Some countries have set up programmes to facilitate changes in stormwater management. In Australia the Co-operative Research Centre for Water Sensitive Cities (CRCWSC) was set up six years ago and provides research, facilitates collaboration and shares knowledge.

'Susdrain' in the United Kingdom provides a similar platform. Does New Zealand need a similar organisation, or can we leverage off overseas knowledge and experience?

## What now for us?

National-level coordination on how to address industry training is required to share best practice, avoid duplication and enable consistency. The Stormwater Group has initiated development of a Training Plan for Stormwater, which will seek to identify how the emerging needs of practitioners can be met.

The next step is re-engaging with the industry in the form of an Education and Training Forum at this year's Stormwater Conference in Queenstown. This will be an opportunity to share what is happening nationally and locally, and an opportunity for attendees to contribute suggestions and ideas for future stormwater education and training.

Your attendance at the Conference Forum is a critical step to help solve the problem. If you are unable to attend the Conference, but have suggestions, ideas, or wish to be involved please contact Vicki McEnaney at Water New Zealand email: vicki.mcenaney@waternz.org.nz

From left to right: Geoff Young, President, TIWF; Kelvin Hill, Acting President, Water New Zealand; Nick Hewer-Hewitt, Chairman WIOG.

## Water New Zealand signs MoU with TIWF and WIOG

The MoU will provide a vehicle for Water New Zealand, the Water Industry Operations Group (WIOG) and the Trade and Industrial Waters Forum (NZTIWF) to develop stronger working relationships and communicate collaboratively on areas of common interest and national importance.

This is a positive step for the water sector and we look forward to working together and continuing closer links across the three organisations, says Water New Zealand Chief Executive John Pfahlert.

## NZ Utilities Advisory Group – Code Review

New Zealand Utilities Advisory Group (NZUAG) is currently reviewing its first round of submissions received as part of a review of its National Code of Practice.

The review is being conducted in accordance with s16 of the Utilities Access Act 2010 and s8.1.1 of the Code and the review will be promoted during June and July. There will be another opportunity for submissions between July and September.

The updated code will be published in March next year. Go to the NZUAG website for more information.

# National Performance Review goes digital

*By Lesley Smith, Technical Co-ordinator, Water New Zealand.*

**We require a lot from our water systems:** they need to protect public health and the environment, be reliable, resilient, resource efficient, economically sustainable, and be responsive to customers.

To benchmark performance of these core aspects of service provision (shown in Aspects of Service Provision), Water New Zealand facilitates the annual National Performance Review (NPR).

The Review is a voluntary initiative, developed in conjunction with and primarily for water managers, run since 2007.

The driving rationale of the review is to provide information useful to water service managers and their service providers.

In the past, information has been used to inform infrastructure plans, council reports and communications campaigns.

## Latest report available online

The report is based on data from the 2016/17 calendar year, drawn from 44 council and council-controlled organisations whose jurisdictions cover just shy of 90 percent of the population.

Split into two volumes: the first provides a comprehensive snapshot of sector trends; and the second provides comparative performance information across participant systems.

## An online data portal released

It is not often meaningful to compare performance across all the drinking water, wastewater and stormwater systems around the country, as a range of factors influence performance.

For example, climate affects water usage patterns; the quality and availability of water sources affects treatment requirements; and topography affects pumping requirements, to name just a few.

In response to the range of different drivers of network performance, Water New Zealand has developed a data portal. The portal allows users to compare the performance of selected authorities, deemed by the user to be operating in comparable environments.

Reports can then be run to export relevant performance comparisons in a range of formats.

## Water Services manager's insights

One of the central aims of benchmarking is to enhance performance by learning from the successful practices of others.

To this end, the Water Services Managers Group hosted a workshop examining key technical findings from the latest review report. Key insights from the workshop are summarised here.


Aspects of Service Provision

- **Climate change preparedness**

  The large majority of review participants identified climate change as a risk to water service delivery in high-level planning documents, but noted there was an absence of guidance to inform decision making. Many felt both central government leadership and quality science was needed to assist local decision-makers in confronting climate change issues within their communities. Many felt water networks were at the mercy of planning decisions, underscoring the need for a whole of council response to climate change adaptation.

- **Sewage containment**

  Wet weather related sewage overflows into the environment increased by a dramatic 379 percent from the previous year. Given the weather of 2016/17 this should be no surprise; the spring of 2016 was wetter than normal; and the autumn of 2017 was the wettest on record for parts of the country. The report shows that many have yet to adopt standards for sewage containment. Some water services managers thought this was an essential step in order to engage communities in trade-offs around the cost of upgrades and aspirations to protect the environment.

- **Inflow and infiltration**

  The report shows that in wet weather events, a number of networks have sewage flows more than 10 times their dry weather volumes, a problem which water services managers had found to be concentrated in older towns, areas with defective stormwater networks, and alarmingly often with new subdivisions with poor installations. Some water authorities were undertaking boundary inspections of inflow and infiltration levels, a practice which others are likely to benefit from adopting. Inflow and infiltration management approaches are listed in Volume 2 of the NPR.

- **Emergency Management**

  Most authorities have emergency management plans in place; however, the nature of events planned for varies enormously. Only a few authorities had in place plans for water supply interruptions. Water services managers saw this as an area which local authorities could easily address by sharing information. A list of the plans participants have in place is included in Volume 2 of the Report.

- **Fire hydrant testing**

  A number of authorities are not following hydrant testing guidelines outlined in New Zealand Fire Services Firefighting Water Supplies Code of Practice (SNZ PAS 4509:2008). Water services managers underscored that the core responsibility for assessing code compliance and liaising with the fire service rests with asset managers, especially where hydrants are faulty and have been blanked out.

- **Water demand management**

  The report demonstrated a slow rise in residential water metering. Water managers who had implemented them were keen to highlight the benefits realised in their community; not only for water efficiency, but also improved understanding of the number of connections and customer satisfaction. Conversely, the number of authorities completing water loss efficiency assessments was not increasing.

  Water services managers noted that without additional drivers, there are unlikely to be radical changes in water demand management practices.

Both volumes of the report and an accompanying data portal are available at: www.waternz.org.nz/NationalPerformanceReview

# Young water contractor acknowledged

**Working long hours during the day** and studying at night has paid off for a young Hamilton employee in the water industry – a growing industry that is striving to recruit more staff.

The demand in the Waikato and Bay of Plenty for construction-related employment is predicted to require a further 11,000 workers by 2022.

Dylan Samson's impressive self-determination, commitment and now leadership skills are shining through in his work at local Hamilton company, Allens United Drainage & Earthworks.

Dylan's achievements were recognised by winning a Connexis Trainee of the Year award.

Dylan has worked for the company since late 2014 after finishing at Cambridge High School. He is now working towards completing a NZ Certificate in Pipe Installation (Level 4). This qualification leads to Civil Trade Certification, which recognises skilled tradespeople in Civil Infrastructure.

**Allens United Drainage & Earthworks trainee Dylan Samson proudly accepts his Connexis Trainee of the Year award. Joining him on the stage are Candice Tiananga, Connexis Careers manager and Mark Baldock, Connexis Waikato Customer Services Account manager.**

# Auckland's massive wastewater project counting down to start date

**Preparation for Watercare's largest-ever construction projec**t is on schedule, it says, with the contractors already shortlisted.

The Central Interceptor is a new, 13 kilometre-long, 4.5m diameter wastewater tunnel that will run between Western Springs and the Mangere Wastewater Treatment Plant.

It is designed to reduce combined wastewater/stormwater overflows to local waterways and the Waitemata Harbour, and the tunnel will run underground at a depth of between 22 and 110 metres. It will cross Manukau Harbour at about 15 metres below the seabed and along its route will connect to the existing wastewater network, which will divert flows and overflows into the tunnel.

It represents one of the most significant wastewater projects in Auckland's history and will link existing sewers through 17 shafts at 16 locations along the route. Auckland is serviced by nearly 8000 kilometres of public wastewater pipes, with the largest seven collector and conveyance pipes known as 'Interceptors'.

The Central Interceptor will replace an aging section of pipe under the Manukau Harbour. This will enable other projects in east and south Auckland to be constructed allowing for future growth across Auckland. The Central Interceptor will also significantly reduce wet weather overflows and improve water quality in local streams and waterways.

Short-listed construction contractors for the project are: CPB Contractors; Ghella-Abergeldie Harker Joint Venture; Pacific Networks, comprising McConnell Dowell, Fletcher Construction and Obayashi; and VINCI Joint Venture, comprising VINCI Construction Grands Projets, HEB Construction and Solentache Bachy.

Shayne Cunis, Executive Programme director for the Central Interceptor, says the four strongest contractors have been chosen to move to the next stage of selection.

"All four groups have demonstrated that they have the ability and experience to deliver this project to the required standard, while adding significant value to the project.

"We are looking forward to working with them on the next stage of the process and remain committed to meeting our timeframes for delivery of the Central Interceptor for the people of Auckland."

Design and technical documentation were released in March, and 'Request for Proposal' will be issued to the short-listed contractors this month (May). Construction starts 2019 with a completion date in 2025.

www.youtube.com/watch?v=dJdbn7Qd-p4.

# Regional draft targets for cleaner recreational water

**Regional councils have been announcing draft targets** towards the goal of 90 per cent of rivers and lakes being 'swimmable' by 2040.

These draft targets draw on information contained in a report prepared jointly by regional councils, the Ministry for the Environment and the Ministry of Primary Industries, with advice from technical experts.

Councils have until the end of this year to discuss the draft regional targets with their communities and finalise them.

A report released last month, "Regional information for setting draft targets for swimmable lakes and rivers", outlines the work planned or underway in each region to improve water quality for swimming, including infrastructure provision, riparian planting and stock exclusion.

"Achieving this is a long-term goal and this report is a good starting point for more discussion with territorial authorities, communities and other stakeholders before finalising goals later this year," says Local Government New Zealand regional sector chair Doug Leeder. Agreeing with the science behind the data used to assess 'swimmability' is important, he adds.

Ministry for the Environment deputy secretary – water, Cheryl Barnes, says while there has been excellent work already underway, improving water quality is complex as all of our 4200 catchments across the country have different conditions and land use.

"This report helps communities understand what's planned and explore where more needs to be done. These targets are expected to evolve as regional councils progress with their planning and engage with communities about their expectations."

# Best career mistake

Lorraine Kendrick is manager, project delivery, at Waipa District Council, chair of the Water Service Managers group, and "an engineer by mistake".

BY **MARY SEARLE BELL.**

Growing up in Belfast, Ireland, Lorraine was educated at an all-girls Catholic school. There, the focus was on turning out secretaries and the nuns didn't quite know what to do with the girl who loved maths and science. Fortunately for Lorraine, a careers advisor suggested she try engineering.

She chose to do an honours degree in civil engineering at the University of Ulster, although admits she didn't really know what she was applying for. However, she soon found out, and it came as a bit of a shock to the system.

"I went from an all-girls school to attending lectures with all boys – the only other girl in our class dropped out after three months," she says. "Our first lecture on civil engineering materials was on concrete, which I wasn't expecting at all, and I wondered what I had signed up for.

"But I have to say, choosing engineering was one of the best mistakes I have ever made!"

Lorraine's degree also included a diploma in industrial studies with Ferguson & McIlveen consultancy engineers to gain in-the-field experience. After she graduated in 1999, she returned to the company as a graduate engineer.

A few years later she moved to Dublin, where she got work at Clifton Scannell and Emerson Associates and tackled both structural and civil engineering. That was when she met a Kiwi on his OE. He "kidnapped" her and brought her to

Lorraine Kendrick.

# World first in PE 100-RC.


## AGRULINE

fittings & pipes
resistant to cracks

**LONGER SERVICE LIFE**
crack resistant PE 100-RC

**HIGH ECONOMIC EFFICIENCY**
sandbed-free installation

**LASTING CONNECTIONS**
better welding results

**ONE STOP SHOPPING**
complete PE 100-RC piping system

50 YEARS IFAT

## Visit us at IFAT 2018!

**May 14 – 18, MUNICH**
**Hall B3 | Booth No. 217/316**
**Hall A4 | Booth No. 220**

www.agru.at

## All AGRULINE fittings are made of PE 100-RC

**agru Kunststofftechnik Gesellschaft m.b.H.**
Ing.-Pesendorfer-Strasse 31
4540 Bad Hall, Austria

T. +43 7258 7900
F. +43 7258 790 - 2850
office@agru.at

70 YEARS agru

> **"We try to find projects that are relevant and important to all councils and create really good guidelines and provide technical oversight. We're not reinventing the wheel but defining industry best practice."**

New Zealand, with the intention of living here for just a year. However, 15 years later the couple is still down under.

Her first role in New Zealand was with Beca in its Wellington office, later transferring to the firm's Hamilton office. It was then that the couple was due to return to Ireland, but their plans changed, and the trip was shortened from forever to only seven months. So, before flying out, Lorraine secured a role at Waipa District Council for her return.

"I wasn't really sure what the job was – it was a new role in the council as a services engineer," she says. "All my experience had been in consultancies, tackling big jobs. I assumed I'd be working on smaller engineering jobs with limited opportunities for development at the council. I thought I'd give it a year, meet a few people and then go back into a consultancy.

"I was wrong on all counts," she confesses.

In Waipa, Fonterra takes up to 40 percent of the district's water supply, and with just a few smaller towns, the district is very much a rural one. As a result, it has numerous water and wastewater treatment plants, of different types, spread throughout the region.

"Waipa is a growth council – we have a lot of big projects on, especially in the three waters space," she says. "We're upgrading water and wastewater treatment plants and pipelines, and extending the supplies to new growth areas. Alongside this there is lots going on in the roading and community facilities areas."

Over her 12 years with the council, Lorraine has moved through five different jobs – from design engineer, to roles in strategic infrastructure planning for both waters and roading, and manager water services. She now works across all disciplines as manager, project delivery, and is responsible for overseeing all the council's big projects.

"It's great. I love it," she says. "I'm lucky that I've never been pigeonholed, I've always moved in different disciplines."

She's been in the role three years now and the capital spend is set to increase again as signaled in the council's 2018 10-year plan, so the biggest challenge is getting enough resources to deliver the programme of works. But with the exciting projects ahead, she hopes that it will attract great people to join the team.

Back when she was the council's water services manager, Lorraine joined Water NZ and the water service managers group. She was soon nominated to the group's committee and is currently serving as its chair.

The group focuses in the technical area, promoting the interests and needs of three waters with all sectors with Water NZ. It provides advice on new technology and best practice, and shares technical knowledge for the advancement of three waters. It undertakes projects in areas of common need and interest which are funded via a project levy paid by councils (the fee is a percentage weighted to reflect the size of the council).

"We try to find projects that are relevant and important to all councils and create really good guidelines and provide technical oversight.

"We're not reinventing the wheel but defining industry best practice."

Lorraine says the group is humming and numbers are going up because it is producing outcomes. There are already some resources online and more will go on to the Water NZ website to create a library of information for water service managers.

"A lot of councils are in catch-up mode after years of low-cost/high-risk water management," she says. "Havelock North has been a prompt for many to change this to a high-cost/low-risk model.

"Coming from Ireland and the UK, where we operated under a strict framework, I have found the New Zealand legislation and regulations confusing," she says. "As water services managers, we need to step up and provide technical leadership and advice to make clear water policies and regulations.

"The engineers on the ground want to do the right thing – I haven't met a single water services manager who hasn't wanted to do the right thing for their community. And as engineers, we need to show professional leadership: leave the politics to the politicians."

Although she had no idea what she was getting into when she started her engineering degree, Lorraine reckons it was a happy accident, and the fact she's not your typical engineer is something that is working in her favour.

"One thing engineers need to do better is communicate – with the public, with the decision makers," she says. "It is important to present a customer-oriented solution, not a complicated technical one, which is often the engineers' default.

"We need to make sure that what we're putting up for consideration is clear, so that decision makers are well informed, and they are making decisions based on facts. And at times that may mean presenting at a layman's level to ensure the solution is understood.

"This is certainly what I try and do, and maybe I find it easier because I'm an engineer by mistake." **WNZ**

Stantec

Every year during Stantec in the Community Week, we come together across New Zealand to give back to the communities we call home.

**11** offices
**179** staff

Planting, weeding, track repair, litter collection and distributing rescued food.

Stantec.com/NewZealand

# A case study in coastal hazard risk strategy

**Lindy Andrews** and **Jonathan Clarke** review a recent coastal hazard strategy that provides hope for all our sea-battered communities.

The area spanning from Clifton to Tangoio is the most developed and populated part of the Hawke's Bay coastline, and home to the city of Napier and several outlying coastal communities, including Haumoana.

Subject to existing coastal hazards that are anticipated to become more severe with future climate change, the area embraces thousands of homes and businesses, industry and vital infrastructure such as Port of Napier, Hawke's Bay Regional Airport and Hastings Wastewater Treatment Plant.

Peter Beaven, 67, clearly remembers the Hawke's Bay coastline of his childhood.

In summer, the population of a few dozen residents was swelled by holidaymakers who pitched their tents at the Clifton campground, a broad grassy strip on the seaward side of the road. Over the years, Beaven, the chairman of Hawke's Bay's Joint Hazards Committee, has watched the sea claim the campground, then the road.

"The road used to be 40-50 metres seaward; it has been moved twice inland," he says.

With the erosion of its coastline has come the erosion of property values and property itself, along with the gnawing away of residents' quality of life and peace of mind. The 1970s saw the identification of the Haumoana 21, the properties most at risk from the advancing sea. Owners were offered land elsewhere, but only two took up the offer. The rest decided to stand their ground. Today, the Haumoana 21 are the Haumoana 15, with four more properties falling victim to erosion, and storms.

Now, there is a growing recognition that with climate change, sea level rise and continued coastal erosion, other areas of the Hawke's Bay coastline will be at risk in the near future. The present day value of potential economic losses due to coastal erosion and inundation over the next 100 years exceeds $1 billion.

Hawke's Bay Regional Council (HBRC), Hastings District Council and Napier City Council have led a process to develop a long-term strategy to manage coastal hazards. The 'Clifton to Tangoio Coastal Strategy' has been developed to understand coastal hazards, risks and the management options for this key part of the Hawke's Bay coastline over the next 100 years.

The strategy is a first for New Zealand in terms of the scale and complexity of assessment of such a large area. It

Left: Large swells regularly pound the Haumoana community.

is also a good example of a collaborative project between councils, consultants and academia, with a heavy emphasis on community engagement and working within the latest government guidance.

The collaborative project involved members appointed from Maungaharuru-Tangitu Trust, Manu Ahuriri Incorporated and He Toa Takitini. Technical and facilitation consultant support was provided by Tonkin + Taylor and Mitchel Daysch, with contributions from other consultants in the specialist assessment of economic, cultural and social impacts.

Community engagement was critical and a central part of the strategy development. Two assessment panels were set up to cover the southern and northern cells, with representatives including local residents, councillors and community groups.

Through a series of 12 workshops, the assessment panels worked alongside the Technical Advisory group (TAG) to develop and assess coastal defence and risk mitigation options, while also reporting back to the wider community at public open days.

Says Graeme Hansen, HBRC's Water Initiatives Group manager, "The benefits of planning and using the community based approach as undertaken in Hawke's Bay over the past two years has enabled a representative cross section of the regional community to be fully informed about the risks, threats and exposure of climate change to Hawkes Bay; have access to national and international expertise to inform themselves on options and approaches to addressing climate change impacts; and has empowered them to make local decisions to local problems by using short, medium and long term time horizons."

A team of researchers and technical experts from New Zealand universities and Crown Research institutes, with experience in climate change and adaption, form the award-winning 'Living at the Edge' project as a component of the Resilience to Nature's Challenges National Science Challenge. The team selected Hawke's Bay as a case study opportunity. Its input, critique and advice helped the TAG to develop the strategy framework throughout 2017.

The team contained some of the authors of the Ministry for the Environment's 'Coastal Hazards and Climate Change: Guidance for Local Government' (2017), including Dr Judy Lawrence, Dr Rob Bell and Dr Paula Blackett. Although a lot of the strategy work predated the release of the document, every effort was made to ensure consistency with the ten-step process that forms the backbone of the guidance.

Tonkin + Taylor (T+T) initially assisted the three councils and their communities by providing state-of-the-art probabilistic coastal hazard risk assessment techniques to identify the extent of hazard and the risks to social, cultural, environmental and economic values and then had a key role through the strategy development and assessment.

"We have worked with Council's team and stakeholders, using the Ministry for Environment's new pathways approach to develop a range of options to strategically manage the possible outcomes over the next 100 years," says T+T's Sector director of Natural Hazards Resilience, Richard Reinen-Hamill.

"This experience puts us at the forefront of coastal hazard vulnerability and risk assessments and helping communities both to understand the issues and assist them in selecting appropriate adaptation strategies to the changing coastal risk arising from climate change impact."

The following summarises how the five process stages described in the Ministry of the Environment guidance were applied.

## STAGE 1: What is happening?

Tonkin + Taylor was engaged to produce a regional scale coastal hazard assessment that would be used as a basis for assessing areas potentially at risk over the next 100 years. The coastal hazard report builds on previous hazard studies and ongoing research and investigations in the coastal processes of this area. The assessment quantifies the possible extent of the following hazards:

- Coastal erosion (storm cut, trends, effects of sea level rise);
- Coastal inundation (storm surge, set-up, run-up, overtopping and sea level rise);
- Tsunami (using modelling carried out by Hawke's Bay Regional Council).

The report provides the coastal processes context and the key information required for the coastal hazard assessment. Hazard information is broken down into time steps and probabilities of occurrence, which reflect the uncertainty in climate change, storm frequency/magnitude and sea level rise. A GIS mapping tool was developed to show the newly mapped hazard extents and is available through the Hawke's Bay hazard information portal.

## STAGE 2: What matters most?

To put the coastal hazards in context, Tonkin + Taylor was tasked with producing a coastal hazard risk assessment, over three time steps, to identify priority areas and the timing of any required coastal works or mitigation. The overall risk assessment examines 'hazard x vulnerability' where vulnerability represents damage and losses. The risk assessment presented information in terms of losses and likelihood for each hazard. Risk was categorised in human, economic, social/cultural and environmental terms for each hazard.

In response to T+T's coastal hazard and risk assessments, the two panels identified nine cells for priority action, Peter Beaven says.

"There are five cells south of the Port and four to the north. The next step was to consider possible adaptive policy pathways for the short, medium and long term."

## STAGE 3: What can we do about it?

Tonkin + Taylor formed part of the technical advisory group (TAG) that worked, in conjunction with the community panels, to develop options for coastal defence and hazard mitigation.

Initially all options were on the table, but these were narrowed down based on the practicality of implementation and effectiveness of each response. This included an 'ask an

Strong winds and big seas are a threat to Hawke's Bay's coastal property owners.

expert' panel discussion, where community members could pose questions directly to TAG members, gain clarification on technical points and query the rationale for removing options.

It was recognised that employing a single hazard mitigation option over a 100-year timeframe, acknowledging the inherent uncertainty in factors such as sea level rise, is rarely the most efficient approach.

This can lead to the over-design of defence options based on scenarios that may never eventuate, or may occur more slowly, and a loss of amenity and environmental benefits. Consequently an adaptive pathway approach was used to develop a series of responses over time that aimed to maximise the benefits, while minimising negative impacts and maintaining the ability to adapt through different strategies in response to observed impacts of triggers such as climate change.

Given both the large number of coastal defence and hazard mitigation options and the potential to switch between options through time, each unit had a large number of potential pathways over a 100-year timeframe.

Tonkin + Taylor worked with members of the 'Living at the Edge' team to refine the number of pathways to a maximum of six per unit, based on the practicality and feasibility of implementation. Each set of pathways was assessed using a Multi Criteria Decision Analysis (MCDA) framework developed by Mitchell Daysch.

This was scored by the community panels, with guidance and specialist input where required, based on technical, social, cultural and environmental criteria. The output of the MCDA produced a preferred pathway based on the best available information at the time.

## STAGE 4: How can we implement the strategy?

Initial analysis deliberately excluded an economic assessment so that it did not influence the selection of a preferred pathway. To gauge affordability and inform funding models, Tonkin + Taylor was required to produce high level concept designs and costings for the pathways for each unit. These were used by a consultant, Infometrics, to carry out a real options analysis (ROA) economic assessment.

Based on this information community panels were given the option of changing their recommended pathway. Councils were then able to assess the affordability of the recommended pathway and work with a financial consultant and TAG to develop a conceptual funding model based on targeted rates and charges to the wider district.

Development of a programme of works, detailed design, consenting and further public consultation is expected to occur over the rest of this year.

## STAGE 5: How is it working?

The decisions and recommendations made by the assessment panels are based on the best information available at the present time. It is acknowledged and accepted by all parties that decision-making in the context of climate change presents significant uncertainty, and that this uncertainty increases with time.

Accordingly, the Strategy will be reviewed every 10 years to:

- Consider new data collected over the proceeding period (e.g. beach profiles, wave climate, sediment movement, etc.);
- Consider the efficacy of coastal hazard response actions implemented under the strategy over the proceeding period;
- Consider any new information from the Intergovernmental Panel on Climate Change (IPCC) and other reputable sources regarding climate change and sea level rise projections;
- Consider any new studies or information regarding coastal erosion, coastal inundation or other hazards (for example the influence of sea level rise on groundwater levels in the strategy area); and
- Any other relevant information as may be identified.

Taking the above into account, the review will consider whether the actions identified by the strategy remain appropriate or should be amended in light of the new information.

Considerable investment will be needed to mitigate the effects of sea level rise and climate change, but will undoubtedly be "amply repaid" says Peter Beaven, and will likely require councils to establish a multi-generational contributory fund.

Nonetheless, he is happy with progress to date.

"I'm happy for several reasons. I'm satisfied that it is a robust, 'bottom up' process, which is both preferable and affordable. The community wants to have a hand in their fate, their future."

Keith Newman, a resident of Haumoana and spokesperson for the lobby group Walking on Water lives for the day when he and his neighbours will no longer fear "big tides and the wind blowing in the wrong direction."

He knows that, unless mitigation measures get underway soon, banks and insurers will turn their collective backs on the owners of properties under threat.

"It's the uncertainty… the big concern is not being sure what sort of future you'll have," Newman says.

"It has cost people's marriages, it has cost people's peace of mind… but there's a sense of hope there hasn't been before."

Further information and latest updates can be found at www.hbcoast.co.nz **WNZ**

# Past temperature and sea levels

A long-term perspective on temperatures and sea levels around New Zealand can be found on the NIWA website that reflects a forever-changing climate. Edited by Alan Titchall.

Palaeoclimate information indicates that the Oturi interglacial (the last interglacial before our current interglacial period) includes three identifiable periods of milder climate 140,000 to 120,000, 100,000 and 80,000 years ago respectively, with temperatures at the end of the Oturi 1 to 2°C below present day values.

(An 'interglacial' indicates a relatively warm period when glaciers and ice caps have retreated, while a glacial is a period of extensive ice cover).

Climatic cooling marked the beginning of the Otiran glacial stage at about 70,000 before present day (BP). Glaciations are marked by expanded New Zealand mountain glaciers over the period 70,000 to 15,000 years ago, although there is evidence of an important moderation of climate between 60,000 to 30,000 years ago. The Last Glacial Maximum was between 26,000 and 18,000 years ago, with New Zealand temperatures estimated to be 4 to 5°C below present day values.

During the Holocene (the current interglacial period which began about 10,000 years ago in this region), average annual temperatures for New Zealand appear to have fluctuated between about 10 °C and 14°C.

The beginning of the Late Glacial (14,000 – 10,000 BP) was heralded by rapid warming, with glacier retreat and ice diminishing to volumes close to that of present-day amounts by 12,000 BP. There was a brief cooling at around 11,500 BP.

The warmest conditions of the present cycle occurred between 10,000 and 6000 BP with temperatures about 1°C above modern values.

This warmer climate was mild, with light winds and lush forests. Moisture changes derived from past vegetation patterns indicate stronger north to north west airflow over New Zealand. Speleothems indicate a lowering of temperature after 7000 BP, with a resurgence of small glacial events in the Southern Alps at 5000 BP with strengthening westerly wind flow.

By 2500 BP New Zealand's current modern climate and broad scale circulation patterns were probably established, with more frequent and stronger west to south west flow.

Glacial advances in southwestern New Zealand and natural forest fires in eastern South Island began to occur, indicating that zonal flow had strengthened, and that the east was periodically subject to extreme temperatures and dryness.

These variations may have been partly due to establishment of modern El Nino Southern Oscillation behaviour, which continues to exert a strong impact on New Zealand's weather and regional climate characteristics.

The average temperature over New Zealand in the 3000 years leading up to the early 20th century is thought to have remained within about 1°C of 12°C, which is about 3°C below the global average.

## Our weather and ENSO

In New Zealand and the South Pacific, the El Nino Southern Oscillation (ENSO) is a significant source of seasonal and year-to-year climate variability.

Opposite inter-annual air temperature from detrended time series occur on either side of the South Pacific Convergence Zone (SPCZ).

The Southern Oscillation Index (SOI) explains up to 40 percent of year-to-year air temperature variations in these areas. When the Southern Oscillation Index (SOI) is positive, mean annual air temperature anomalies are positive in the area south west of the SPCZ (T1 and T3), and negative to the north east of the SPCZ (T2 and T4). Opposite air temperature anomalies occur during the El Nino phase (SOI negative).

Similarly, mean annual precipitation anomalies show marked inter-annual variability, and are also closely associated with the ENSO cycle. The SOI also explains over 40 percent of year-to-year variations in precipitation to the south west and north east of the SPCZ. Near and south west of the SPCZ, above average precipitation occurs when the SOI is positive (La Nina phase), and further to the north east precipitation is below average.

Opposite anomalies characterise the El Nino phase. **WNZ**

Even without the predicted modeling of sea level increases, coastal erosion is a natural but harsh reality for a country built on soft sedimentray rock. Even on the Australian east coast this receding sandstone cliff at Coogee Beach in Sydney is forever crumbling into the sea due to the action of the sea.

# T+T and Lutra team up for safe drinking water

Tonkin + Taylor and Lutra have joined forces to offer a new end-to-end solution for water suppliers that will provide a robust and efficient risk management system for groundwater and surface water supplies. This offering is based on the leading-edge work that both organisations have performed for Hastings District Council in response to the Havelock North incident.

**Tonkin + Taylor** - Are pioneers of integrated catchment risk management as well as having an unparalleled track record in new source developments. T+T also provide a wide range of engineering, environmental and project management services from source to tap.

**Lutra** - Are specialist water process engineers who provide process optioneering, process design, process optimisation and commissioning services. Lutra also provide state of the art operator training systems and through their Infrastructure Data on-line compliance reporting system can support end-to-end management of water supply risk.

## Our leaders

**Tony Cussins - Technical Director, Hydrogeology**

Tony is an expert in contaminant hydrogeology and human health and environmental risk assessment. This role requires him to work closely alongside clients to ensure they are empowered to make optimal decisions on sensitive, technically complex projects.

Email: **tcussins@tonkintaylor.co.nz** Tel: **+64 27 705 1368**

**Dr Jason Colton - Principal Process Engineer**

Jason is an expert in water treatment design, commissioning, operation and optimisation. He has a track record of maximising the use of existing assets and providing cost effective solutions for clients.

Email: **Jason.colton@lutra.com** Tel: **+64 27 607 0302**

## Summary of experience:

- T+T has undertaken numerous source risk assessments, led HDC's investigations into the source of *Campylobacter* contamination and contributed to investigations into Lower Hutt's Waiwhetu Aquifer contamination
- Lutra provides water treatment and data management services to HDC and many other clients
- The combined skills of this team cover every aspect of security of groundwater supplies, including strategies for catchment management and the option of treatment and disinfection as a barrier
- We are happy to discuss implications for Councillors, Councils' executive leadership teams, asset and water supply managers

Tonkin+Taylor

Lutra.

# Global and local sea level differences

*Source: National Oceanic and Atmospheric Administration, US Department of Commerce. Edited by Alan Titchall.*

Global sea level trends and relative sea level trends are different measurements because, as the surface of the Earth is not flat, the surface of the ocean is also not flat and is not changing at the same rate globally.

Sea level rise at specific locations may be more or less than the global average due to many local factors that include subsidence, upstream flood control, erosion, regional ocean currents, variations in land height, earthquake activity, and whether the land is still rebounding from the compressive weight of Ice Age glaciers.

Sea level is primarily measured using tide stations (originally set up for shipping) and satellite laser altimeters. While tide stations around the globe can tell us what is happening at a local level through the specific height of the water as measured along the coast relative to a specific point on land; satellite measurements (a relatively recent technology) can provide the average height of large sections of our oceans.

Taken together, these tools can tell us how our ocean sea levels are changing over time.

## Historical tide gauge measuring problems

In the past, before satellite recordings, tidal gauge records have ben used to estimate past sea level changes.

Tide gauges, usually placed on piers, measure the sea level relative to a nearby geodetic benchmark for shipping purposes, and are influenced by the likes of harbour silting.

Tide gauges may also move vertically with the region as a result of post-glacial rebound, tectonic uplift or crustal subsidence,

which greatly complicates the problem of determining global sea level change from tide gauge data.

Although the global network of tide gauges comprises of a poorly distributed sea level measurement system, it offers the only source of historical, precise, long-term sea level data. Plus early tide gauges were expensive and difficult to maintain.

Taking information from both tidal records and satellites into consideration, the latest report from the Intergovernmental Panel on Climate Change (IPCC) concluded that sea levels rose around 1.7 millimetres (0.07 inches) per year between 1901 and 2010 and that between 1993 and 2010, the rate was very likely higher, more like 3.2mm (0.13 inches) per year.

How much this 'recent' acceleration can be attribute to global warming and how much to natural variability is not certain, as it could be the result of more rapid melting of ice sheets or increasing ocean heat content, but two decades is also within the time frame over which natural climate oscillations can influence trends in global sea level.

## Sea level increases in NZ

New Zealand has four tide gauges with records for 75 years or longer – Auckland, Wellington, Lyttelton and Dunedin.

Hannah (1990) used these data to calculate a rising trend in sea levels of 1.3, 1.7, 2.3 and 1.4 mm per year respectively, giving New Zealand a mean of 1.7 mm per year. An update by Hannah (2004) confirmed that sea levels around New Zealand have been rising at an average rate of 1.6mm/year over the past 100 years.

It also has to be noted that the El Nino Southern Oscillation (ENSO) is a significant source of seasonal and year-to-year variability in sea levels.

For example at Mt Maunganui, the seasonal and inter-annual variability account for about 30 percent and 25 percent respectively of the variation in non-tidal sea levels.

On the same North East coast during El Nino events, seasonal sea levels can be depressed by up to 10cm (accompanied by a fall in shelf sea surface temperatures) while during La Nina phases, sea levels can be elevated by up to 8cm. **WNZ**

*Source NIWA.*

---

*The challenge with using historic data from any tidal gauge attached to wharf infrastructure (used for shipping) is that their data has been arguably influenced by the likes of harbour silting, wharf settlement and the quality/acuracy of the equipment.*

*John Hannah wrote an excellent paper eight years ago called 'New Zealand The Difficulties in Using Tide Gauges to Monitor Long-Term Sea Level Change'.*

*The International Federation of Surveyors declared it 'Article of the Month – July 2010.*

*You can read it here:*

*https://www.fig.net/resources/monthly_articles/2010/july_2010/july_2010_hannah.pdf*

# An illustrious career

With his 90th birthday not too far away, Dick Earle reminisces about his time in the wastewater industry. **BY MARY SEARLE BELL**

Dick Earle has been retired for many years now, and it's been even longer since he was actively involved with Water New Zealand, but from the late 1950s and through the '60s and '70s, Dick was actively involved in the association while tackling wastewater challenges in the meat industry.

His career highlights are focused in the latter half of his career, which he spent in academia, but this came on the back of many years' hard work in engineering research, including wastewater engineering.

Born in Gisborne in 1930, where his father was working on the construction of the East Coast railway, Dick grew up in Lower Hutt, before moving south to what was then Canterbury College (now the University of Canterbury) to study engineering.

"I did a Bachelor of Engineering – chemical, and also a Bachelor of Science," he says. "My father had been an engineer and I thought chemical engineering was interesting. I could see there was a need for chemical engineers, which meant there were jobs."

Graduating in 1953, Dick started his career with the DSIR (Department of Scientific and Industrial Research, a now defunct government agency), in its Dominion Laboratory in Lower Hutt. This was the DSIR's chemical arm, Dick explains, full of chemists and a few engineers who were interested in the processing of all sorts of things, including waste.

"I was actually employed by the NZ Defence Scientific Core – the army, in fact – and they sent me to work at DSIR."

This army initiative was established by renowned physicist Sir Ernest Marsden. With the outbreak of World War II, Marsden

had set about organising a multitude of scientific projects for the war effort. Many of these were in fields of physical science and engineering previously undeveloped in New Zealand, and they not only succeeded in meeting urgent wartime needs, but later provided the basis for the DSIR's assistance to post-war industrial development[1].

"Part of this was industrial research training," says Dick. "The army didn't really know what to do with a chemical engineer, but DSIR did."

While working at DSIR, Dick took a three-year sabbatical in Scotland, where he completed his Ph.D. at the University of Glasgow, a renowned research-led establishment that had celebrated its 500th anniversary just before Dick arrived.

Dick's doctorate was concerned with the "technology of mixing" – the way things change colour or texture and so on when you mix them together; food in particular. Dick explains: "When you mix, you are dispersing one component into another; and you want them evenly mixed, in fact, this is imperative in industry. Also, you want to get that mix efficiently, minimising time and effort."

On returning to New Zealand, Dick resumed work with DSIR, where a group had started to emerge to service the meat industry. In 1957 the Meat Industry Research Institute (MIRINZ, now part of AgResearch) was formed. It was charged with improving the quality of export sheep meat, a booming industry for the country.

"Their interests included waste treatment. Particularly liquid waste, as solid wastes were mostly burned," says Dick. "Part of my concerns was helping industry improve wastewater treatment.

"Most meatworks had been established on the sea or a river so that waste could be flushed out into the water. Of course, this was unsustainable, and alternatives were needed. And this is when I was introduced to the NZWWA [NZ Water and Wastes Association, now Water New Zealand]."

Dick's work took him from freezing works to freezing works around the country, from Moerewa in Northland, to Lorneville in Southland.

"The meat freezing works were increasingly under pressure to move to anaerobic processing and oxidation ponds to treat wastewater. I would work with the freezing works to find solutions – designing and building wastewater treatment plants.

"It was an increasing problem as industry boomed and freezing works grew. We almost always seemed to be a bit behind and felt like we were constantly being chased by local authorities of one kind or another, and, as time went on, by a more environmentally-minded public!"

At this time, Dick was closely involved with NZWWA, serving on the council for many years, including a stint as president in 1970-71. He also was the Kiwi rep on the International Association for Water Pollution, Research and Control (IWAPRC) for many years, and attended their 10th conference in Paris in 1959 as a member of the governing board – a trip he remembers fondly for the lavish treatment they received from their French hosts.

In 1965 Dick's career changed when an opportunity arose at Massey University in Palmerston North. He was appointed the world's first Professor of Biotechnology and, while one of his interests was waste treatment, he was busy setting up the faculty and became less involved in the wastewater industry.

As an academic, Dick is proud of his work to establish the faculty: "We achieved a planned annual growth at eight percent compound over 33 years with a correlation coefficient of 0.98, and a national fit attested by repeatedly being at the top of the graduate employment tables across all subjects and universities in the country."

As an engineer, his biggest triumph was his development of a continuous freezer at the former Longburn meatworks, a technology that was later picked up internationally.

After 30 years at the university, and after training many young engineers and technologists, including a number who entered the wastewater industry, and supervising numerous research students, Dick retired, although continuing to research and write. His book, "Unit Operations in Food Processing", has been translated into many languages and its web edition has had many millions of hits.

Dick was awarded a fellowship of the New Zealand Institute of Food Science & Technology in 1975 and was co-winner of the ER Cooper Medal of the Royal Society of New Zealand in 1984.

For his services to the association, Dick was made an honorary life member of Water NZ in 1990, and was appointed a Distinguished Fellow of Institute of Professional Engineers in 2003. In 2009, Dick was made an Officer of the New Zealand Order of Merit for Services to Engineering. **WNZ**

*1. www.teara.govt.nz/en/biographies/4m41/marsden-ernest*

# Stormwater project challenge:

# A CYCLIST'S VIEW

Catchbench discharge pipe.

**Angela Pratt**, a senior environmental engineer working at Beca with a special interest in stormwater conceptual and detailed design, has a personal interest in her involvement in major mitigation work on a popular cycling route.

Before the 2010/2011 Canterbury earthquakes, I cycled Sumner Road at least twice a week. Perched somewhat precariously on the side of a cliff with stunning views of Lyttelton Harbour, the 2.5 kilometre road was a key part of Canterbury's iconic Long Bays and Short Bays cycle routes.

It was also a critical transportation link for heavy vehicles leaving Lyttelton Port which needed to avoid the Lyttelton tunnel.

Located under numerous steep cliffs, it was heavily impacted by rockfall during the 2010/2011 earthquake sequence and by the 2014 flood events when several major debris flows crossed the road. Many of the 25-odd retaining walls were also damaged with the road being realigned at Windy Point to avoid an extensive an wall repair, and a range of other minor and major wall repairs required.

To say I've missed cycling this stunning piece of road would be an understatement. So when the opportunity arose to work on getting it open again, I was particularly motivated to be involved. The project, jointly funded by CCC and NZTA, required stormwater design for an erosion and sediment control pond, drainage design associated with rock-fall mitigation works, repair/rebuild of damaged infrastructure, and design of the road reinstatement.

## Overflowing with challenges

First, it was a complex site – think steep, highly erodible soils; designing for no / minimal future maintenance due to safety risks; limited space; the need to maintain existing flow patterns and discharge points as much as possible, as well as ensuring new channels and sump inlets were cycle safe.

Second, all new assets including channels and sump grates needed to be traversed by cyclists and vehicles.

Castellated Kerb.

Third, it required interaction with multiple stakeholders, including a number of internal of Christchurch City Council (CCC) stakeholder groups (roading, stormwater, safety, maintenance,) and neighbouring land owners.

These complexities presented some major challenges – needing smart thinking and close collaboration within our multidisciplinary team of geotechnical, roading and structural engineers, and our client/lead contractor McConnell Dowell to deliver stormwater solutions that met CCC's requirements.

## Mitigating major rock-fall risk source

A 400 metre-long catchbench and rock bund was constructed by blasting and excavating approximately 100,000 cubic metres of rock. Some serious problem-solving was needed to develop a solution to accommodate an anticipated 100 year Average Recurrence Interval flow upwards of 600L/s from the bench.

Adding to the complexity was a risky environment for maintenance (due to expected future debris and rockfall), and the need to mimic existing flow paths as much as possible. The resulting stormwater design involved several subsurface cut off drains that had to pass-flow beneath the outer edge bund on the catchbench.

Blockage risk of each drain inlet was avoided by using a permeable trench with twin subsoil drains. These discharge into one larger pipe under the outer bund and then into existing flow paths below the bench.

Cuttings were made through the bund to install the pipes and this needed to be reinstated in order to maintain a fully solid bund for rockfall risk mitigation. Each cutting was reinstated with rock and gabion baskets to match the profile of the rock bund on either side.

CCC required there to be no overflow from one trench to the next. Therefore, concrete canvas was used to prevent seepage through the side of the trench. High flows (>100 year) discharge through the outer bund via a permeable core of the gabion baskets used to reinstate the bund.

## Managing water drainage and debris from a steep gully

Just above a section of the road which traverses a steep gully, a large rock roll bund was required.

By nature, the bund is supposed to catch rocks, so a conventional sump to drain stormwater would likely block.

A channel was designed to convey stormwater along the back of the bund and then around the end to the road.

A traversable NZTA headwall was then used as an inlet structure to a large culvert under the road.

In this location, stormwater discharge below the road has been managed by several existing flumes due to highly

A 400 metre-long catchbench and rock bund was constructed by blasting and excavating approximately 100,000 cubic metres of rock.

erodible soils. These were damaged by rockfall and movement during the earthquakes, and tunnel gullies under the flumes meant we needed to rethink the existing system.

The solution: An above ground galvanised corrugated flume supported by a wooden structure. Galvanised pipe was required because the expansion and contraction of the main alternative, Polyethylene pipe, was going to be too hard to manage with an above ground flume.

In a secondary flow event, flows above the capacity of the culvert would first discharge to a channel on the uphill side of the road.

But in even bigger events, it would naturally head straight over the road onto the highly erodible soils below. This was managed by way of a castellated kerb with hydraulically-inefficient looking kerb cuts.

Rather than one concentrated discharge, the water would use multiple openings until all flow is distributed over the slopes below.

## Controlling stormwater discharge during flooding

Just past 'Windy Point' – a popular, scenic tourist stop, is a location where a major discharge of stormwater occurred prior to the earthquakes.

The existing discharge was uncontrolled, with water simply spilling out of a channel on the uphill side of the road, across the road and over the side. Furthermore, a major flood event in 2014 resulted in the downhill side of the road slumping.

Having used a castellated kerb further up the road to distribute flows, this was again our chosen solution. However, the location was more complex due to a new, three metre high retaining wall required to support the slope where discharge occurred.

Erosion risk at the base of this new wall was also a challenge. Managing high flows required a reno mattress at the base for energy dissipation, with this being wide enough to capture the expected trajectory of flow in a major event, and an High Density Polyethylene layer beneath to avoid erosion of the underlying soil.

## Getting an iconic cycle route flowing again

I hope that bringing this iconic cycle route back to life will make every day better for my fellow cyclists – both now and in the future.

It's a special piece of road that required a dedicated team of engineers to get it back into shape for future generations of cyclists and other road users to enjoy.

Soon, I'll look forward to swapping my steelcap boots, hard hat and high-vis for a helmet and lycra – and jumping on my roadie to cycle Sumner Road again. **WNZ**

# IN A CONFINED SPACE

In lots of ways we enjoy a luxury of space compared to many other countries. Nevertheless, infrastructure upgrades in urban environments are inevitably challenged by space constraints, and methodologies with a smaller footprint and lower impact on the surrounding area are likely to become increasingly popular. By **Ben Thompson.**

In our largest and most populous city, McConnell Dowell recently used a method rarely seen in this country to construct a two million litre wastewater storage tank for Auckland's water and wastewater provider Watercare. The project attracted attention from infrastructure planners, designers and delivery organisations all over the country, fascinated to see the technique in action.

The underground tank is part of a number of network upgrades undertaken to support significant population growth (from 24,700 to approximately 45,600 by 2051) predicted for Glen Eden in West Auckland. The existing wastewater network in the area did not have sufficient capacity to manage current flows during wet weather events, so during heavy rainfall the network was overflowing diluted wastewater into the surrounding environment. The new storage tank is designed to reduce these overflows from an average of 10 per year to two or less.

## Creative construction

The original tender design for the storage tank was for an open excavation, constructing the tank from the bottom upwards and backfilling around the completed structure. But space at the site at Harold Moody Reserve on Glendale Road was severely restricted on all sides with adjacent sports fields, children's playground, 910mm trunk water main, a busy local through-road and the entrance to the local community centre passing alongside the site. A new transmission sewer was also to be installed along the roadside and connected into the tank. The project had the potential to cause major disruption to local residents, community organisations and the travelling public. So the McConnell Dowell engineering team proposed an alternative, caisson design, which significantly reduced the work space required, as well as minimising risk and cost for Watercare.

"To have proceeded with an open cut methodology,

we would have needed up to 15 metres of working space around the circumference of the tank to allow for a safe batter – there simply was not the room for this," explains McConnell Dowell project manager David Pattinson.

"Our 'caisson' proposal brought this down to 50mm."

As well as protecting the safety of the public, the risk to the 910mm trunk main was vastly reduced.

## Cutting edge

Although rarely used in New Zealand, the caisson approach is more common in large European cities where space is at a premium. The key was a steel cutting shoe which was designed by McConnell Dowell's engineering team in conjunction with permanent works designer MWH, and fabricated and installed by McConnell Dowell's in-house fabrication division.

## In fine form

A bespoke formwork system to sit atop the cutting shoe was designed by McConnell Dowell in conjunction with formwork supplier PERI.

Each four-metre high section had to withstand pressures of up to 100kN per square metre, so was formed with eight sets of shutters forming the inner and outer rings, made from pre-curved primary walers, PERI lattice girders and curved plywood, prefabricated panels of wall reo and held together with three levels of tie-rods for each pour.

The 400mm thick concrete walls were cast in three separate lifts of 96 cubic metres (16 truckloads) each. Keen to ensure a continuous concrete supply throughout each pour, the team gained permission to work outside normal working hours, which meant a 4am start and removing Auckland rush hour traffic from the equation.

## Facts

The tank will be used as an overflow facility to deal with increased flows during storm conditions.

- The tank is 18.5 metres in diameter, 10 metres (four storeys) tall (12m underground) and holds 2,000,000 litres.
- It would take 25,000 bathtubs of water to fill the tank.
- 970 cubic metres of concrete were used in its construction.
- 100 tonne crawler crane, 55 tonne mobile crane, 12 tonne excavator, five tonne excavator and an excavator mounted piling rig.
- One concrete pump truck with a 36-metre boom (minimum).
- Approxiately 2500 cubic metres of earth removed from inside the caisson.
- 750 tonnes of downward force exerted on the steel cutting shoe from the weight of the concrete walls alone.
- 55,000 litres of bentonite lubricant used to reduce friction between the caisson and the ground.

Page 40: Inside the completed tank. Page 41: internal shutters in place ahead of the first pour. This page: casting the second wall lift. Pape 44: top image: steel cutting shoe; bottom image: cutting shoe cutting into clay.

## That sinking feeling

With the wall shutters stripped from the first pour, excavation began to sink the caisson under its own weight. A 12-tonne excavator clearing the bulk load from the central area was followed by a more sophisticated undermining of the steel cutting shoe with a five-tonne machine, with careful monitoring of the levels to ensure a smooth, even descent. A bentonite mix pumped into the 50mm gap (annulus) between the outer wall face and the cut face reduced friction and prevented ground collapse.

As the top of the wall approached the external concrete hardstanding, the sinking was stopped and the process repeated for the second and third wall pours. At these stages, the team also needed to be prepared for the possibility of any caisson movement as the added weight of the new concrete was applied.

"We needed the caisson to hold until the new concrete had cured and the formwork could be removed," says David.

Fortunately, harder ground (stiffer clay and then East Coast Bays rock) as the depth increased, and pre-loaded soil wedged around the cutting shoe, provided sufficient control, and the settlement encountered was far less than predicted.

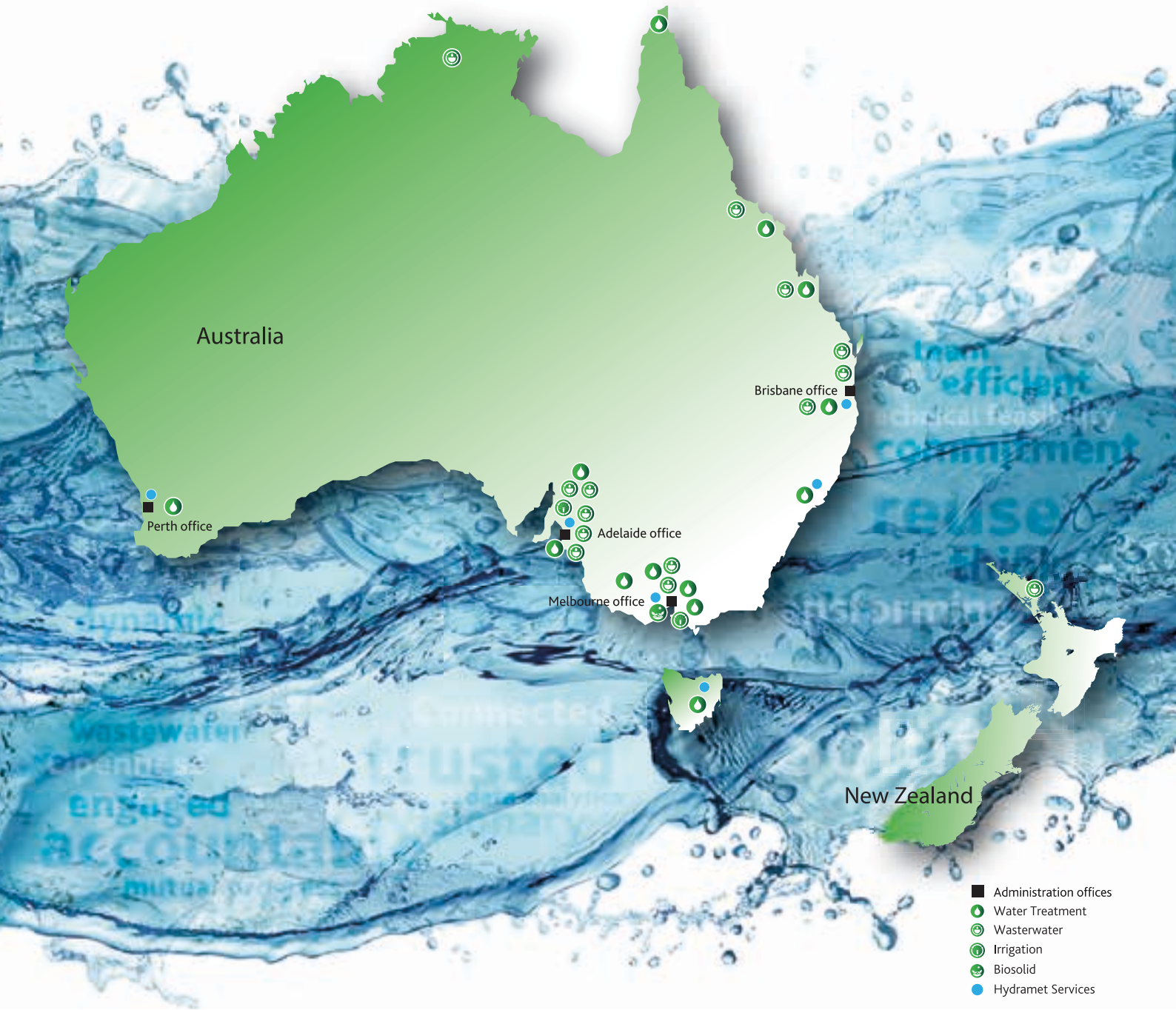
Three and a half months after commencement, the completed caisson, now weighing 750 tonnes, arrived in its final position. With the sinking complete, attention turned to construction of the floor slab anchor piles, 1.2 metre thick floor slab, self-cleaning vacuum chamber, pre-cast tee-beam roof, mechanical and electrical installation, and the network pipe connections.

Once the tank had been completed and commissioned, the existing car park and nearby sports field reinstated, the tank was brought into service and is now providing the local community with the benefits of cleaner waterways during storm conditions – all that remains visible are seven manhole covers and an electrical control box. **WNZ**

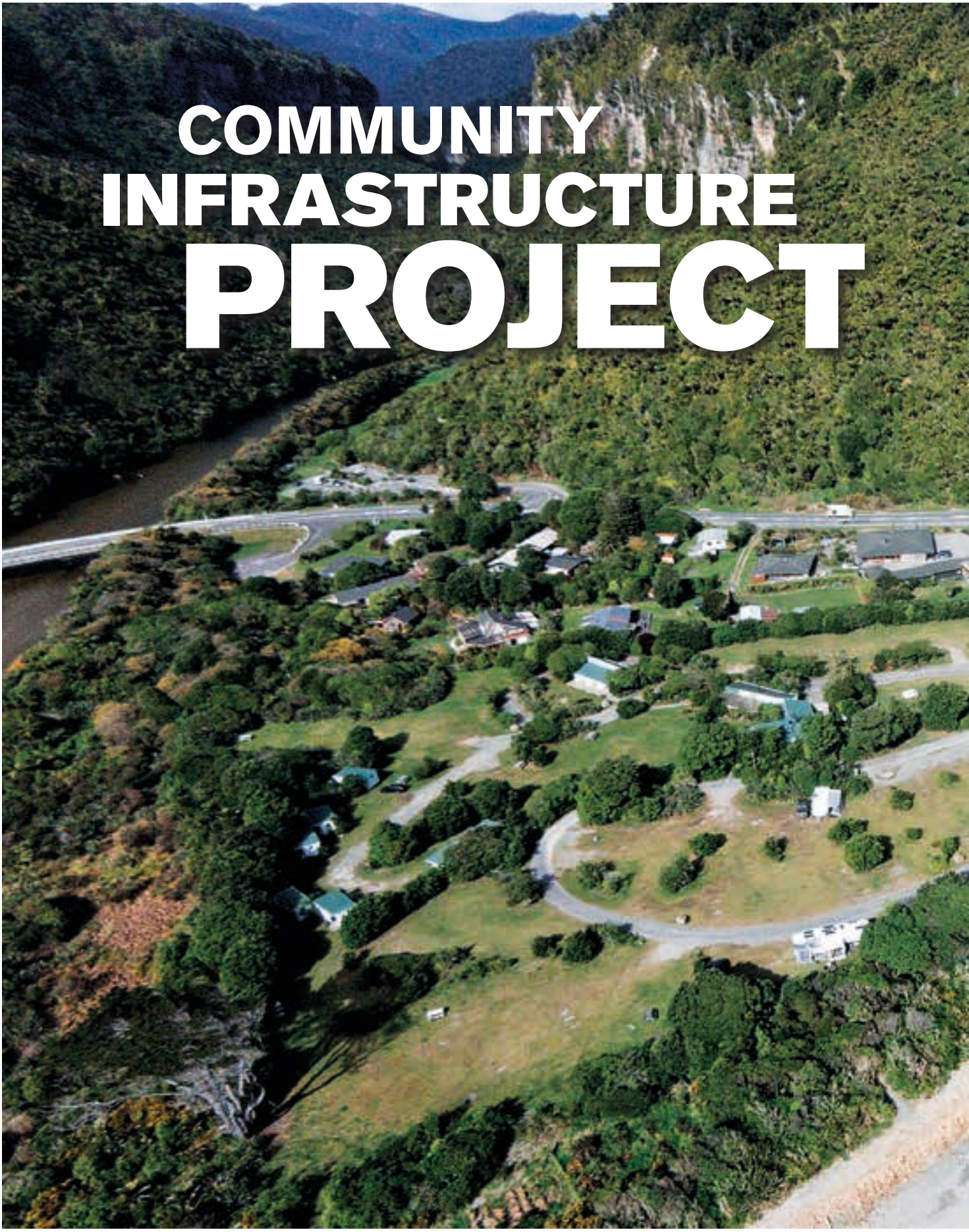
TRILITY™

A member of BEWG

# Innovative solutions, committed to the future and confident in making a difference




For more information visit us at **www.trility.com.au**



# COMMUNITY INFRASTRUCTURE PROJECT

The Government is stepping in to help Buller District cope with a fragile water supply facing soaring tourism demands. **Hugh de Lacy** reports.

Providing potable water for half a million visitors a year to a tourism hotspot with only 81 ratepayer shares is the conundrum facing the Buller District Council (BDC).

Not only are visitor numbers sky-rocketing at the famed Punakaiki pancake rocks and blowholes south of Westport on the South Island's West Coast, but the local water supply is subject to boil-water notices much of the time, is struggling to meet the volume demands from a range of accommodation suppliers, and is prone to being knocked out by passing weather events, including cyclones.

All this is occurring against the background of the district ratepayer base shrinking in line with the formerly buoyant local coal industry.

Coastal storms have knocked the supply over entirely on occasions, and access to the water supply site has been problematic given it is on private property.

The BDC installed the original Punakaiki supply around 1987 when tourism was but a glint in the eye of local authorities whose ratepayer base was founded on mining and farming.

At the time there were few buildings near the rocks and blowholes, but today there is a comprehensive range of accommodation from hotels to backpackers' hostels.

The supply was upgraded in 2011 to comply with the 2005 drinking water standards, but slips and other changes in the catchment area meant that turbidity increased sharply during Cyclone Ita in 2014.

This was partly addressed by the replacement of the PCDM filter in mid-2017, but periods of prolonged and heavy rain generated greater turbidity than the filter could cope with, requiring the plant to close down, leaving only 210m3, or three days' supply, of treated water.

The water supply originates at a weir north of Hartmount Place above SH6, and reticulation extends to the southern end of the Punakaiki village precinct.

In recent years the supply has run into problems not only from increased demand, but also rising sediment levels and turbidity which have exceeded the capability of the associated water treatment plant, especially during the peak of the holiday season, necessitated repeated impositions of boil water notices.

Public meetings were held in late 2017 where the council committed itself to developing short, medium and long-term strategies to meet the challenge, the upshot of which was the engagement of technical specialists to create a gap analysis to identify improvements to enhance the system's functionality, safety and resilience.

Based on the principle of extracting as much value as possible from the existing system, the gap analysis made 17 recommendations, including identifying a range of relatively small changes – "low-hanging fruit," as the specialists put it – that could quickly and inexpensively improve the systems processes, equipment and operation.

The recommendations begin with limiting plant to a maximum of 2NTU raw water turbidity for a three-log-unit pathogen reduction, and the installation of a hundred-litre raw water tank into the feedline, together with a hammer arrestor and soft-start for the backwash pump.

The PCDM filter was to be decommissioned because all it did was restrict the water supply with no gains in chemical treatment.

Other minor developments included relocating the automated AV3 valve and installing a new AV1 valve to by-pass the AV7 Macrolite inlet, and programming a drain sequence to include the new raw water tank for post high-turbidity events.

The Macrolite filter was to be operated at higher pressures to increase the flow capacity, and a new electronic pressure

sensor installed to control the plant.

Water storage capacity would be increased to seven days' reserve, with water meters on the network laterals to commercial connections.

A system of early water restriction warnings to users was to be installed for when heavy rain was forecast, and the existing storage tanks cleaned and isolated from raw water recontamination.

The council is in discussions with the water-source landowner to resolve the previously disputed access, and the water treatment plant will be fenced as a security measure.

All of this will cost around $280,000.

In late February the Minister for Regional Economic Development, the New Zealand First Party's Shane Jones, announced a million-dollar grant from the Government's Provincial Growth Fund (PGF) to develop the two Great (cycle) Rides on the West Coast, the West Coast Wilderness Trail and the Old Ghost Road Trail.

At the same time Jones said the fund would also provide $350,000 to examine the possibility of a waste-to-energy plant for Buller District and, most importantly for Punakaiki ratepayers, $100,000 "to help develop a much-needed master-plan to future-proof the township."

Jones noted that future-proofing Punakaiki is already a priority action in the West Coast's Economic Development Plan, released last year, not least because the opening of the Paparoa and the Pike29 Memorial Tracks in 2019 will further boost tourist numbers.

"There is a need for a long-term strategy that addresses Punakaiki's infrastructure needs and secures its status as a premier attraction," Jones says.

"Getting a master-plan for Punakaiki will ensure there are options for solving some of its infrastructure issues, enhancing visitor facilities and growing the economic opportunities that exist in the district."

The work, which is expected to take about two years, will be done in two stages, the first prioritising the functional, operational and compliance aspects, and the second the perimeter fencing and the upgrading of the treated water capacity.

The work has also been endorsed by the Minister of Conservation, the Green Party's Eugenie Sage, who noted that the popularity of the Pancake Rocks and blowholes had opened up further tourism opportunities with the karst landscapes on the nearby Pororari and Punakaiki Valleys.

"Of course people want to come and see these special places but there's been a failure to plan for increased demand, and we need better infrastructure," Sage says. **WNZ**

# Tonga says a BIG THANKS to the water industry

Thank you for standing with Tonga through Cyclone Gita and, because of you, the island nation is rebuilding stronger than ever. Article supplied by Oxfam.

Cyclone Gita ripped through the Pacific back in February, first hitting Samoa then moving on to strike Tonga with full force.

It was the biggest cyclone to hit Tonga in living history. But, through incredible industry support we were on standby the whole time, watching Gita's path, and supporting the long term recovery.

"Because of our amazing Kiwi donors, we were prepared," iterates Darren Brunk, Oxfam humanitarian specialist.

"We had supplies stationed in Tonga ready to be deployed. You saved lives. Thank you!"

Oxfam's immediate priority was ensuring that safe, clean water was accessible. Dengue fever had broken out the month before, so it was crucial that sanitation was a top priority to stop its spread.

Cyclones are becoming more violent and more common in the Pacific region and our Pacific neighbours are most at risk.

The next steps are to hand out additional WASH kits, seedlings and equipment to ensure recovery and food security for Tongan communities in the future.

It is through your support that we can be there, on the ground, helping in crises like these. **WNZ**

## You can help with WASH kits for Cyclone Gita

**We are putting together WASH kits for school classrooms in response to Gita, and want to include water bottles for students to fill up at schools where we have been filtering the drinking water supply.**

**We will also include hygiene-related messages with stickers on the bottles, to introduce safe hygiene practices in students' homes. Not to mention reducing the huge amount of waste generated from disposable plastic bottles typically used in emergency water distributions here.**

**We are looking for corporate sponsors to assist in the funding of 3600 reusable 500-1000ml stainless steel water drinking bottles.**

- **If you can help assist in any way please get in touch directly with Corporate Relationships Manager: charlene.ftisemanu@oxfam.org.nz.**

# LOW-TECH WAYS TO IMPROVE WATER QUALITY

Clever, fundamental engineering could go a long way toward preventing waterborne illness and exposure to carcinogenic substances in water.

By **Kelley Christensen.**

Mohammad Alizadeh Fard, a doctoral student in Michigan Tech's Civil and Environmental Engineering Department, and Brian Barkdoll, professor of civil and environmental engineering, are developing low-tech, affordable solutions to improve water quality in municipal water tanks, and to remove micropollutants from water using renewable materials.

In most communities there are large water-storage tanks for municipal drinking use. Many such tanks have a line in to supply the tank with water, and a line out. However, these lines in and out are frequently at the tank bottom.

Though the tanks are refilled daily, the water at the top of the tank is never used and becomes stagnant. Even though many municipal water supplies are treated with chlorine, the top water layer can become a breeding ground for bacteria, algae or waterborne illness, such as giardia and E. coli.

"If the water is not moving, (bacteria and algae) can start growing," Barkdoll says.

"It may not be originally from the water source; it could be from the air. Or the chlorine in the stagnant water could be used up after some time. You want the water to keep moving, especially in hot regions."

But if there's a large fire in the community or surrounding countryside, the water tank is drawn down significantly, and people then drink the stagnant water.

"So, when you have a fire, all the stagnant water goes out to everybody's house," Barkdoll says. "After a fire, people get sick, that's a known thing. That's the problem that we're trying to fix."

To remedy the problem, Alizadeh Fard and Barkdoll created shower head-like attachments that can be added to new or existing water tanks for minimal cost. Adding a PVC-pipe sprinkler at the top of the tank, and a reverse sprinkler at the bottom of the tank, injects water into the system and keeps all the water circulating.

Alizadeh Fard and Barkdoll published their article on this simple but effective system in the Journal of Hydraulic Engineering in March this year. They hope it will be a low-tech solution easy for water quality managers to adopt.

## Unseen menace: micropollutants

Organic contaminants are not the only source of contaminated water. Few municipal systems are equipped to handle micropollutants – such as pharmaceuticals, hormones, microplastics, nanoparticles in socks and synthetic fleece, and antifungal compounds – even types of industrial waste that are present in very low concentrations.

Despite the small amounts (mere micrograms) of these pollutants in water, they still have carcinogenic effects on humans and aquatic creatures. Retrofitting treatment plants to filter for micropollutants is expensive, leading Barkdoll and

Alizadeh Fard to explore potential solutions.

"These contaminants have long-term effects on health," Alizadeh Fard says.

"Most of our treatment plants have not been designed to remove them from water, so it's important to find a reliable solution to address the problem."

The researchers struck on the idea of adsorbing pollutants from water. Adsorption occurs when molecules essentially stick to a surface.

The first method Alizadeh Fard and Barkdoll tested was to use polymer-coated magnetic nanoparticles to adsorb Tonalide (used to mask odors and often found in detergents), Bisphenol-A (better known as BPA, used to make plastics clear and tough), Triclosan (an anti-bacterial and anti-fungal agent used in cleaning products that is now banned), Metolachlor (a herbicide), Ketoprofen (an anti-inflammatory), and Estriol (an estrogen supplement).

The polymer-coated magnetic nanoparticles were most effective at adsorbing Ketoprofen and BPA, removing the pollutants in 15 minutes with 98 and 95 percent effectiveness, respectively, with only 0.1 milligram of the adsorbent.

But what happens once the nanoparticles have done their work?

Because the adsorbent is magnetic, the researchers can use magnets to remove the nanoparticles from the water.

Barkdoll and Alizadeh Fard say that one of the key components of their work is that the adsorbents are reusable once rinsed with a restorative methanol solution. In the lab, the polymer-coated nanoparticles were restored and used again five times before seeing decreased effectiveness.

The researchers have also used magnetic carbon nanotubes and activated carbon as adsorbents. During the lab trials, the polymer-coated nanoparticles have so far proven to be the most efficient.

The researchers say the next phase is to scale-up for use in water treatment plants. Removing micropollutants from water using technology that is sustainable and affordable offers the potential to protect human and aquatic health without expensively retrofitting treatment plants. **WNZ**

# TOILET TO TAP WATER TASTE TEST

Researchers at the University of California, Riverside, have published a study of recycled wastewater with a focus on 'taste' rather than the usual 'safety' concerns. By **John Warren** and originally published in URC Today.

After years of drought, the notion of drinking recycled wastewater has gained momentum in California. Thoughts turned to all the water being discarded – to supplementing "conventional" groundwater with recycled water.

But consumers were quick to flag the euphemism of "recycled." Some have even branded the technology "toilet to tap".

It seems that this term (wastewater), and the idea of recycled water in general, evokes disgust reactions," says Daniel Harmon, a graduate student in psychology and the lead author in the study on water taste. The study published in print in the February edition of the journal Appetite.

"It is important to make recycled water less scary to people who are concerned about it, as it is an important source of water now and in the future," he adds.

The water's safety has been the source of most related research. The wastewater is treated using reverse osmosis. A preferred technology is called indirect potable reuse, or IDR, that reintroduces treated wastewater into groundwater supplies, where it re-enters the drinking water system.

Six California water agencies already employ IDR. These include the Water Replenishment District of Southern California, the Orange County Water District, the Los Angeles County Department of Public Works, the Inland Empire Utilities District, the city of Los Angeles, and the city of Oxnard.

Studies have found IDR removes virtually all contaminants, but no one has considered its relative taste – at least, not in a blind taste test, and not in a scientific study.

The UCR study included 143 people, who were asked to compare IDR-treated tap water with conventional tap water and commercially bottled water. The waters were presented in similar cups and were unlabeled, hence the participants were "blind" to the source of the water.

After tasting the water, participants ranked the samples' taste from one to five, then also in categories including texture, temperature, smell, and colour.

The researchers weighed factors that influence taste perception.

There are genetic differences in taste sensitivity. That was gauged using a tried-and-true measure: Paper strips coated with the chemical phenylthiocarbomide, or PTC. Those who find the strip's taste to be bitter are considered to have more sensitive taste.

Researchers also considered two personality traits that help determine water preference. These traits are referred to as "Openness to Experience" and "Neuroticism." Openness is how receptive people are to novel and diverse experiences. Neuroticism refers to anxiety and insecurity.

At the outset, researchers hypothesised the three waters would score equally. In fact, one emerged the least preferred.

"The groundwater-based water was not as well liked as IDR or bottled water," says Mary Gauvain, a professor of psychology at UC Riverside and co-author of the study.

"We think that happened because IDR and bottled water go through remarkably similar treatment processes, so they have low levels of the types of tastes people tend to dislike."

The more nervous, anxious people in the study expressed the preference for IDR and bottled water, and were more negative about the more mineral-rich tap water. People more open to new experiences liked the three samples about the same.

Another surprise: Women preferred bottled water two-to-one over men.

The researchers' best guess: Women register higher "disgust reactions" than men, which means their reactions to tastes they dislike are more extreme. These disgust reactions are the subject of the team's next research paper.

In their conclusion, researchers suggest that favorable comparisons between reverse osmosis and bottled water may make consumers more amenable to drinking recycled wastewater. In particular, they suggest, marketing to women – who make most consumer purchasing decisions – should focus on these similarities, and also cater to women's demonstrated openness to new experiences.

"We think this research will help us find out what factors people pay attention to in their water decisions, and what populations need to be persuaded to drink IDR water and how to persuade them," Harmon says. **WNZ**

# WHAT EVALUATORS NEED TO KNOW

By **Heather Murray,** Plan A

Over the course of a year, a company might submit up to 100 tenders to secure their upcoming pipeline of contract work.

That requires a lot of time and resources, so the process must be fair, clear and worthwhile. Interestingly, procurement professionals across local government have noted a decrease in the number of bids they receive.

Anecdotal evidence suggests this is due to several factors, ranging from tenderers questioning the viability of a project to a simple lack of time or resources to prepare the tender response.

For the water sector to get the best possible value from the tendering process, it is essential that all eligible contenders bid. This drives competition to achieve the best possible value and pushes bidders to think outside the box to deliver innovation, and time and cost efficiencies.

The Plan A team asked clients what they would like procurement professionals to know to make bidding easier and more attractive:

## Ask us

We design, build and maintain three water assets with you and for you. So please ask us to provide input on which tendering process will achieve your objectives. This sets the scene for collaboration and transparency from the outset and has us thinking about your project before the tender comes to market.

## Clear messages and thoughtful questions

Share as much as you can with us. Allow us to understand what you want, what you are going to do, and how you are going to do it.

So often, tender documentation comes to market and the outcome you want is unclear. When developing the evaluation criteria, consider what you want to see in the answers and draft questions accordingly. Rolling out an RFT with a set of generic questions means there is a focus on compliance, rather than value and innovation. Make us think!

We scrutinise documents. We look at the language, your drivers and objectives. For example, noting that traffic management will be a key focus area for you means it will be one for us too; it will be reflected in the attributes and pricing. If the requirement is simply a cut and paste from another document, it compromises our chances of winning.

## Don't penalise us on location

We have often been disregarded purely on location. Appointing a contractor from another region has a raft of benefits ranging from fresh ideas through to the possibility we may open a branch in your town and create more jobs. If in doubt, ask the question: how will you deliver and drive value if you are not locally based?

## Be clear and play fair

Make sure that all potential tenderers are treated and seen to be treated equally and fairly. Take particular care when changing a requirement or when exercising discretion, for example allowing one tenderer to sharpen their pencil or provide additional information after the bid is closed is not fair. If we feel this is compromised, it is unlikely we will bid for your work in a hurry.

## "Why the rush?"

In the maintenance space, we have been asked why we only submitted a bid for two of three regions. Our response: because there was no time. This compromised an exceptional value for a money solution for the council in question. If you are not in a rush to appoint a company, give us ample time to submit our responses and for you to evaluate them.

## "Tell us why we won or lost"

Take time at the end of the process to sit down with the bidders and discuss why they were unsuccessful. This not only helps us understand the shortcomings in our bids but also gives us a clearer picture of what you like to see in your bids. It is also an opportunity to build relationships, which will make us want to bid for you again, and which in turn provides more bidders wanting to deliver better value. Also, it drives innovation. **WNZ**


- Heather Murray is operations manager and senior consultant at Plan A. Over the last eight years, she has been working with New Zealand and international clients, including many in the water and wastewater sector, to develop winning proposals and awards submissions.


**Plan A specialises in support for bid teams: from strategy to writing and review. In the past year, the 15-strong Plan A team wrote over 300 tenders, across almost every industry sector. For more information, see: www.plana.co.nz/resources for more advice about tender writing.**

# Water Update

By **Helen Atkin**s, partner, **Nicole Buxeda**, solicitor and **Rowan Ashton**, solicitor, of Atkins Holm Majurey.

**In this article, we explore changes arising** from the new coalition government in relation to irrigation funding cuts, an update on the Havelock North Stage 2 Water Inquiry and the direct impact this is having on Cantabrians' drinking water. Also, two case summaries of recent decisions involving wastewater and discharge proceedings, and a few interesting statistics from Statistics New Zealand around our natural environment and our use of the water within it.

## GOVERNMENT ACTIONS

Recently, the Minister for the Environment, David Parker, spoke to the Resource Management Law Association about the priorities of this government for the environment: freshwater; climate change; and urban development. In regards to freshwater, the Minister indicated there would be changes to the National Policy Statement on Freshwater, and that faster work to hold the line against contamination and degradation is needed. As per the Labour Party's election promises, there was a focus on 'swimmability' of freshwater. This metric of 'swimmability' is a slightly different approach to the previous National Government's focus, and the transition to focusing on achieving 'swimmability' will be an interesting process to watch.

One step the Government has recently taken is to announce cuts to public funding for large-scale irrigation projects through Crown Irrigation Investments Limited. On April 5, the Minister of Finance, Grant Robertson, announced:

*"The decisions announced today are the result of an extensive review of how to wind down funding through CIIL while honouring existing commitments, as provided for in the agreements signed on the formation of the Government. The decisions will provide certainty to the individual schemes which had applied for Government funding alongside private investment.*

*"This represents a shift in priorities to the previous government. Large-scale private irrigation schemes should be economically viable on their own, without requiring significant public financing. We must also be mindful of the potential for large-scale irrigation to lead to intensive farming practices which may contribute to adverse environmental outcomes."*

All existing commitments for development contracts will be honoured to the close of the current phase of each contract. Commitments have been made for completion of Central Plains Water Stage 2 situated on the Canterbury Plains, construction of the Kurow-Duntroon scheme situated in Kurow, South Canterbury, and construction of the Waimea Community Dam situated in Nelson/Tasman. While the future of other irrigation projects is less certain Robertson has indicated funding may still be available for water schemes through the Provincial Growth Fund.

This move has been supported by Forest and Bird, whom Annabeth Cohen says "...have been calling for an end to irrigation subsidies for some time, as part of the solution to New Zealand's freshwater crisis."

Farmers and agriculturalists have criticised this move as a blow to regional New Zealand communities in a time of climate uncertainty.

With the Supreme Court decision stalling the proposed Ruataniwha Dam, and these recent indications of limits on funding going forwards, there are bound to be heated discussions over future irrigation options and practices.

## UPDATES

### Havelock North Water Inquiry – Stage 2

In our previous article, we detailed the findings and outcomes arising from the Stage 2 Report on the Havelock North Water Inquiry.

The damning findings coming out of that Report in relation to our drinking water standards, sources and regulatory regimes are already coming home to roost, with the first notable action taking place in Christchurch.

Cantabrians are famously proud, and rightly so, about their delicious drinking water. However, in December 2017, new assessments of the water were undertaken which found that the well-heads which were assessed did not meet the standard to be declared secure. Accordingly, the Drinking Water Assessor advised that the water supply was no longer provisionally secure. The Christchurch City Council discussed this situation with the Canterbury Medical Officer of Health, and decided to temporarily treat Christchurch's drinking water with chlorine while it upgrades the below-ground well-heads. Temporary chlorination started 26 March 2018, and is being touted as providing 'an extra level of protection against waterborne illnesses".

However, recently the City Council has conceded that the temporary nature of the chlorination may need to be extended due to the huge challenge to complete all repairs necessary to ensure the city's water fulfils standards for being secure. Recent estimates indicate that 103 well-heads will need to be repaired, incurring significant cost and time. While Mayor Lianne Dalziel is confident that chlorination will end in 2018, the repair options to ensure the safety of removing chlorination requirements are significant. The Council is currently considering two repair options: the first involves raising 81 well-heads above the ground, costing $21.5 million and taking up to five and a half years to complete. The second option is to secure 76 well-heads beneath the ground, and raise five, costing $10.5 million and taking up to three years to complete. Further to this, an additional number of shallow wells would either need to be replaced with deeper secure wells (estimated cost $15 million) or be treated with an ultraviolet system (estimated cost $5 million). Both of these options would take over two years, with replacement of shallow wells taking up to six years.

The importance of these actions has been highlighted following the Havelock North incident, and the following reports. This approach to water standards and infrastructure will require patience from the populace, and a mindset change around chlorination and water safety.

The Government's response to the inquiry's report is due to occur in the same week as this journal is due to go to print, so a further update will be provided in the next version.

### Case Summaries

The following cases deal with statutory obligations to notify owners when constructing sewage and stormwater components on private land, and proceedings regarding discharge of contaminants into water.

### Re Watercare Services [2018] NZHC 294

Watercare Services sought declarations as to the interpretation of section 181 and schedule 12 of the Local Government Act 2002, which deals with the construction of works on or under private land for sewage and stormwater. Specifically, they sought an interpretation as to:

(a) If there is a change of owner after an owner has given consent to the works, is Watercare required to obtain the written consent of the new owner, or give notice under schedule 12 to the new owner before it is completed?

(b) If there is a change of owner after notice has been given in accordance with schedule 12, and the works proceed, is it necessary to give notice under schedule 12 to the new owner?

The High Court answered:

(a) "On a proper construction of section 181(3) of the Local Government Act **if there is a change of owner after written consent has been given, it is not necessary either to obtain the written consent from the subsequent owner or give the subsequent owner** notice under Schedule 12(1)(b) of the Act of the intention to construct the works before the work is done.

(b) "On a proper construction of Schedule 12 of the Local Government Act, if there is a change of owner after notice has been given under clause 1(b) of the Schedule, **it is not necessary to give notice to any subsequent owner before the work is done."**

Such clarifications of the law, and obligations under the Local Government Act are helpful for all involved in this space.

## Taranaki Regional Council v Gill [2017] NZDC 23453

Due to a blockage of pipes caused by a build-up of leaf matter, effluent overflowed into a first-order stream (classified in the regional freshwater plan as one of high natural ecological and amenity values, highly rated for recreational use) in Taranaki.

Upon being notified of this contamination, Gill immediately took steps to rectify this, and had in fact been prevented from checking the pipes solely by merit of poor health.

The Judge considered the balance in the RMA between deterrence, personal accountability, and personal circumstances.

The Judge held that this was a one-off event, considered his poor health, prompt response, previous compliance record, and guilty plea, and arrived at a fine of $35,000.

## Environmental Economic Accounts

Statistics New Zealand released a summary of New Zealand's environmental assets as measured to date, and the economic activities being undertaken to protect the environment, and interactions between the environment and the economy in their "Environmental-Economic Accounts: 2018" statistics.

This report includes interesting statistics relating to water, including:

(a) In the year ended June 2014, the West Coast region received the highest precipitation;

(b) Abstraction for hydroelectricity generation amounted to an estimated 94 cubic metres per person per day, roughly equivalent to 627 full baths of water per person each day;

(c) In September 2016, the calculated asset value of New Zealand's commercial fish resource was $7.2 billion;

(d) Wastewater management accounted for 56 percent ($586 million) of local government environmental protection final consumption expenditure in 2016;

(e) Investment in environmental protection amounted to $970 million in 2016, with $880 million from local government and $91 million by central government;

(f) From 1996 to 2014 New Zealand's estimated glacier ice volume decreased 35 percent.

From this data, we might learn that we are losing our glaciers, wastewater management is incredibly expensive, and the West Coast is incredibly damp. However, we can rest safe in the knowledge that no matter what our water use case, Statistics New Zealand will be logging it!

Boffa Miskell

**www.boffamiskell.co.nz**

Ecology | Landscape Architecture | Planning | Biosecurity
Landscape Planning | Urban Design | Cultural Advisory

Photograph: Sarah Rowlands_Waterloo Park, Christchurch

# Case study:
# Stormwater discharge monitoring

Story by **Kathleen Kinney**, Boffa Miskell.

Tauranga City Council was granted a comprehensive stormwater consent in 2012 for the discharge of stormwater throughout Tauranga City.

Conditions of that consent required monitoring of stormwater quality and ecological values of freshwater and marine receiving environments.

A monitoring plan was developed with input from a team of ecologists from Boffa Miskell's Tauranga office and implemented the following year.

The end of 2017 marked the completion of five years of monitoring which provided data to assist in identifying sub-catchments with stormwater quality and/or receiving environment issues in order to focus on treatment and/or remediation efforts.

"The monitoring incorporates both stormwater discharge quality and the ecological values of receiving environments," says Boffa Miskell ecologist, Kieran Miller. "Monitoring of receiving environments is further divided into freshwater and marine ecosystems."

Stormwater samples were collected from 41 sites over five years. At each site, water samples were collected on five separate occasions each year, including quarterly baseline samples and a single storm event sample.

Baseline samples were collected from each site after a period of at least three days with no rainfall, while the storm event sample was collected within 24 hours of a less than one in ten-year rainfall event.

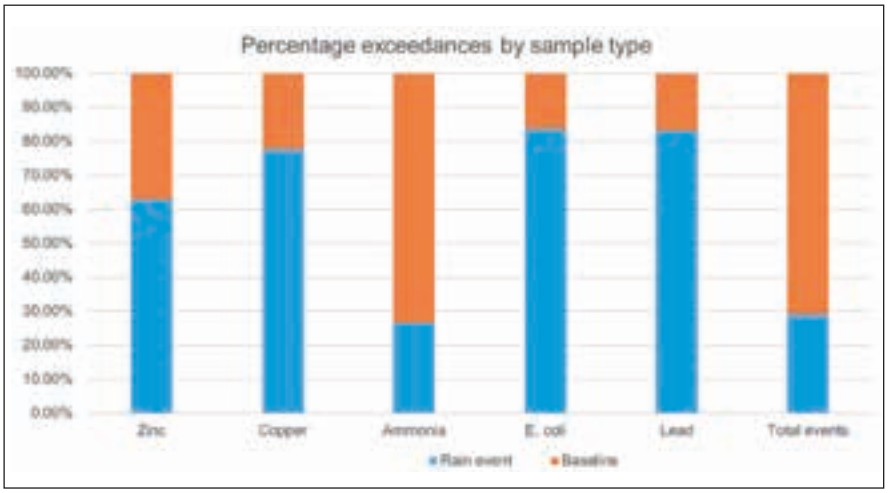
Samples were analysed for parameters, such as pH, total suspended solids, total petroleum hydrocarbons, chemical oxygen demand, nutrients, heavy metals and E. coli.

The results were compared against trigger values, and if a particular contaminant was found to exceed the trigger level over consecutive sampling occasions or in the same quarter over consecutive years, then further investigation of the contaminant source would be required.

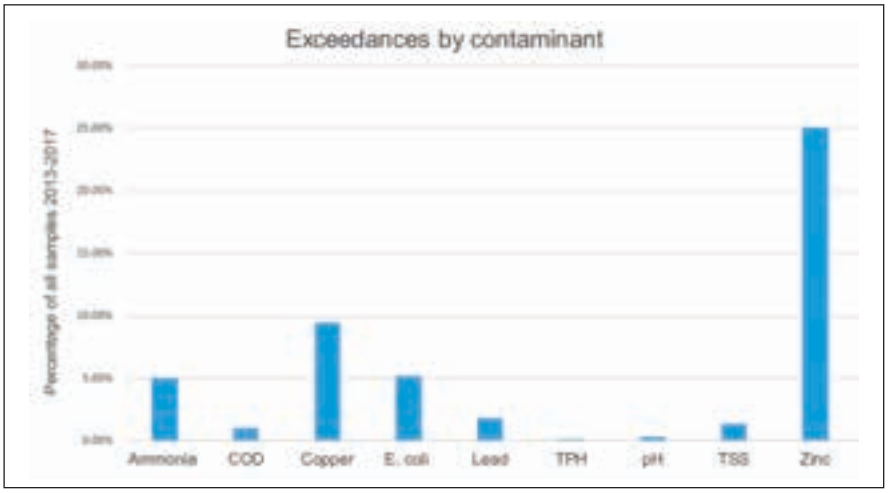
The sampling results are being used by Tauranga City Council to prioritise future work on sub-catchments with contaminant issues.

Of the 41 stormwater quality monitoring sites: Water quality samples from 24 sites (across 16 sub-catchments)

Graph 1.




Graph 2.




Graph 1: Although baseline event samples comprise the majority of samples, zinc, copper, E.coli and lead are disproportionately represented in rainfall event samples.

Graph 2: Zinc clearly is the headline contaminant for the measured sites.

contained contaminants which exceeded trigger values over consecutive sampling occasions and/or in the same quarter over consecutive years requiring further investigation.

Of the 28 freshwater ecology sites: Three sites recorded a contaminant which exceeded consent trigger levels, and nine sites were categorised as having poor ecological values, including poor macroinvertebrate indices, low fish diversity, and low habitat score.

Of the 49 marine ecology sites: Three sites recorded a contaminant which exceeded consent trigger levels, and three sites were categorised as having poor ecological values, including a low number of invertebrate species and low Shannon Weiner diversity index.

Zinc was the most common contaminant to repeatedly exceed trigger values, with this occurring at 23 sites. Copper was the next most common, with repeated exceedances occurring at six sites. E.coli repeatedly exceeded trigger values at four sites.

"The completion of the first five years of stormwater monitoring comes at an opportune time for Tauranga City Council," says Radleigh Cairns, TCC Consents officer.

"Council recently set up a new Environment Committee and are forming an environment strategy, which includes a focus on water quality, and protecting and enhancing Tauranga's natural environment.

"It is also the start of a new Long-Term Plan cycle, thus enabling funding for proposed mitigation to be included and the opportunity to collaborate with other programmes such as City Transformation and Parks restoration projects."

Proposed remedial actions include:

- Refining the monitoring programme to better represent the receiving environment, increase monitoring of stormwater discharges and remove redundant sites;
- Investigative sampling to identify the specific areas of a sub-catchment, or particular sites which are the source of contaminants;
- Pollution prevention audits or site investigations within sub-catchments which have recorded repeated contaminant exceedances;
- Installation of stormwater mitigation (rain gardens, bio-swales, filtration devices, floating wetlands) where contaminant issues are well understood and where exceedances cannot be attributed to individual sites; and
- Riparian enhancement and habitat restoration within open waterways to improve ecological values and protect existing values.

Kieran and Radleigh will jointly present a comprehensive report on this project at the Stormwater Conference in Queenstown this month. **WNZ**

# Piping wastewater THROUGH A PRISTINE ALPINE LAKE

The Traunsee is considered one of the purest lakes in Austria and to keep it that way, a 47-year-old sewer pipe is being replaced by a modern, underwater pressure line in a project costing around €2.2 million. Based on information supplied by Agru.

The lake community of Traunkirchen and the market town of Altmunster are home to 17,000 people. Its sewage, about 1500 cubic metres daily, is directed to a water treatment plant in the city of Gmunden via a common sea-pressure pipeline in the Traunsee lake.

Built in 1970, the original sewage pipes (Outside Diameter 300 millimetres) were laid side by side in the lake over a length of 2.3 kilometres. Twin pipes secured the operation in the case of a rupture.

The wastewater is pumped alternately through one of these two pipelines every day to ensure that the abrasion in both pipes runs evenly. In the first few hundred meters of the PE pipeline, pump pressure is built up several times a day to set the several kilometres long water column in motion. The beginning of the line became stressed over past decades, and the local authority decided to replace the old pipe system with a new, 3215-metre long double sewage pressure pipe.

Agruline HDPE 100-RC pipes with a protective layer of OD 355 millimetres in SDR 17 have been supplied by AGRU Kunststofftechnik Gesellschaft (Agru – an Austrian supplier) and two parallel pipelines have been installed in a two-phase project involving three upper Austrian based companies, including Agru.

In order that sewer gases can escape at both ends of the submerged sewer line through special ventilation valves (to prevent buoyancy problems with gas cushioning) the pressure pipeline must be laid in a steady gradient.

In this case, a wash-boring in the area of the sea outlet was required to lay the maritime pressure line at an even gradient.

In addition to the accurate drilling curve, a major challenge was the anchoring and bracing of a pontoon floating on the water surface. On this platform, the horizontal directional drilling system was installed that had to withstand a pulling force of 40 tons and was

Like a string of pearls, the weighted AGRU wastewater pipeline floats in front of the majestic Traunstein.

The new pipeline will lead wastewater (1500 cubic metres a day) of the communities of Traunkirchen and Altmunster to the city of Gmunden for treatment.

correspondingly secured by means of ropes from the bridge piers and from the shore.

After completing the horizontal directional drilling operations, the sewer pipe was pulled into the underwater tunnel with several tons of traction. The pipes are designed to take this pressure and are made of point-load and crack-resistant material PE 100-RC.

The new pipeline sections were butt-welded on site and temporarily stored at the water surface of the lake. In March this year they were towed in the planned route and ballasted with concrete elements, which are clamped every three meters around the pipe (the pipeline sits on the lake bottom by means of these concrete weights).

Lake water is then pumped into the pipes from one side, allowing the air to escape in a controlled manner on the opposite.

The pipes are carefully lowered to the bottom of the lake in an S-shaped curve. The pipeline route runs gradually from the water surface to a depth of 20 metres. Starting from this low point of the pipeline, the two pipes then reach the surface again along the route. Thus, digester gases can escape at both ends of the line through special ventilation valves, and a buoyancy of the line by gas cushion prevented.

In order to create an accurate elevation profile of the underwater landscape, the seabed in this area was measured three-dimensionally. This showed that the eastern slope drops off almost vertically under water. To prevent the double line from slipping, divers permanently anchored it to the slope.

The complete sewer pipeline was laid on the bottom of the lake without a protective sand bed as the protective layer pipes absorb the point loads caused by stones without any problem.

Josef Leidinger, a water engineer and manager of the Altmunster sewer department, notes that crystal-clear lake Traunsee is known as a jewel of nature and is a popular bathing lake throughout Europe and no deterioration in the quality of the water due to pipe bursts or leaks can be tolerated.

"I chose Agru's PE 100-RC pipes with protective layer because I think they are the safest alternative on the market. If you pump wastewater through drinking water, you cannot compromise.

"I think in generations, not legislature periods. Our polyethylene PE 80 wastewater piping system, installed in 1970, has suffered a few scratches over the decades and has been in use for 47 years despite incidents.

"Thanks to the much more robust and crack-resistant HDPE 100-RC, the computer-controlled welding technology and last, but not least, the additional scratch-resistant PP protective layer, that Agru pipeline will be in service for the next 100 years without any problem.

"The benefits of greater operational safety, longer service life and better protection of our drinking water reservoir Traunsee far exceed the slight additional cost of pipes with protective layer."

A pipe burst monitoring system using IDM via a wireless remote control system relays a constant comparison measurement between incoming and outgoing water volumes at the beginning and the end of the sewage pipeline. In the event of non-compliance, an alarm is automatically sent to the head office of the pipeline operator. **WNZ**

Ing. Erich Peer, in the foreground, is responsi-ble for the installation of the sewage system in the Traunsee. Next to him stands Josef Leidinger, a water engineer and manager of the Altmünster sewer department.

# Resolving WATER SCARCITY

Some 70 percent of the surface of our planet is covered by water, so it's easy to assume there's plenty of it to drink, cook, and bathe with. It's time we threw that assumption out with, well, the bathwater. By **Laura Newcomer**, Waterlogic.

Less than three percent of the water covering the earth is freshwater, and the bulk of that freshwater isn't accessible. This is one of the reasons why humans in many parts of the world rely on extremely limited water resources.

Though we all rely on water for our survival, we also contribute to the rise of water scarcity. The vitality of rivers, lakes, and other bodies of freshwater is threatened by a variety of causes, many of which are the result of human activity.

These include pollution, climate change, industrial agricultural practices, unsustainable energy production, and population growth. The end result is that more and more people around the globe face water shortages.

While water scarcity is predominantly a man-made creation, we also have the capacity to develop solutions to mitigate the rise of water scarcity. Read on to learn more about water scarcity plus some of the exciting ways people are reducing it.

## Defining water scarcity

At its simplest, the term water scarcity refers to insufficient access to the water resources necessary to sustain a region.

The term applies to both human activities such as drinking and cooking, as well as the healthy functioning of an ecosystem. Water scarcity can range from a challenging but manageable water shortage such as in the Greater London area or the High Plains in the U.S. to a full-blown water crisis such as in Flint, MI or Durban, South Africa.

When it comes to the human experience of water scarcity, the term is divided into two categories: physical water scarcity and economic water scarcity. As you may expect, physical water scarcity refers to a lack of available water resources relative to its demand.

Economic water scarcity refers to limited water access resulting from insufficient financial resources to access, store, and/or distribute water to homes, business, and so on.

If you grew up with unlimited access to water resources, it's easy to feel less connected to the gravity of water scarcity. However, water scarcity affects every continent at an increasingly alarming rate.

According to a 2016 study, at least two-thirds of the world's population already live with severe water scarcity for at least one month each year.

In addition to this, 500 million people live in regions where humans consume water at twice the rate it is replenished by rain, particularly in China and India. For those regions that fall into this category, severe water shortages are all but guaranteed in the future.

The situation is so serious that the World Economic Forum now ranks the water crises as one of the top biggest risks to humanity and human economics. The people most vulnerable to water scarcity today live in India and China, while the problem also affects dozens of other countries including Great Britain, Australia, Mexico, Yemen, Iran, Pakistan, Saudi Arabia, countries throughout sub-Saharan Africa, and the United States. While water scarcity manifests differently in different regions, it produces a number of predictable consequences.

## Dire consequences

When people can't access clean water for drinking, agriculture, and washing, their lives are at stake.

Every year 842,000 people die from diarrhea caused by consuming unsafe drinking water or insufficient sanitation practices. Eighty percent of the illnesses in developing countries result from unhealthy water and/or sanitation systems, and one out of four deaths of children under the age of five are the result of water-related illnesses.

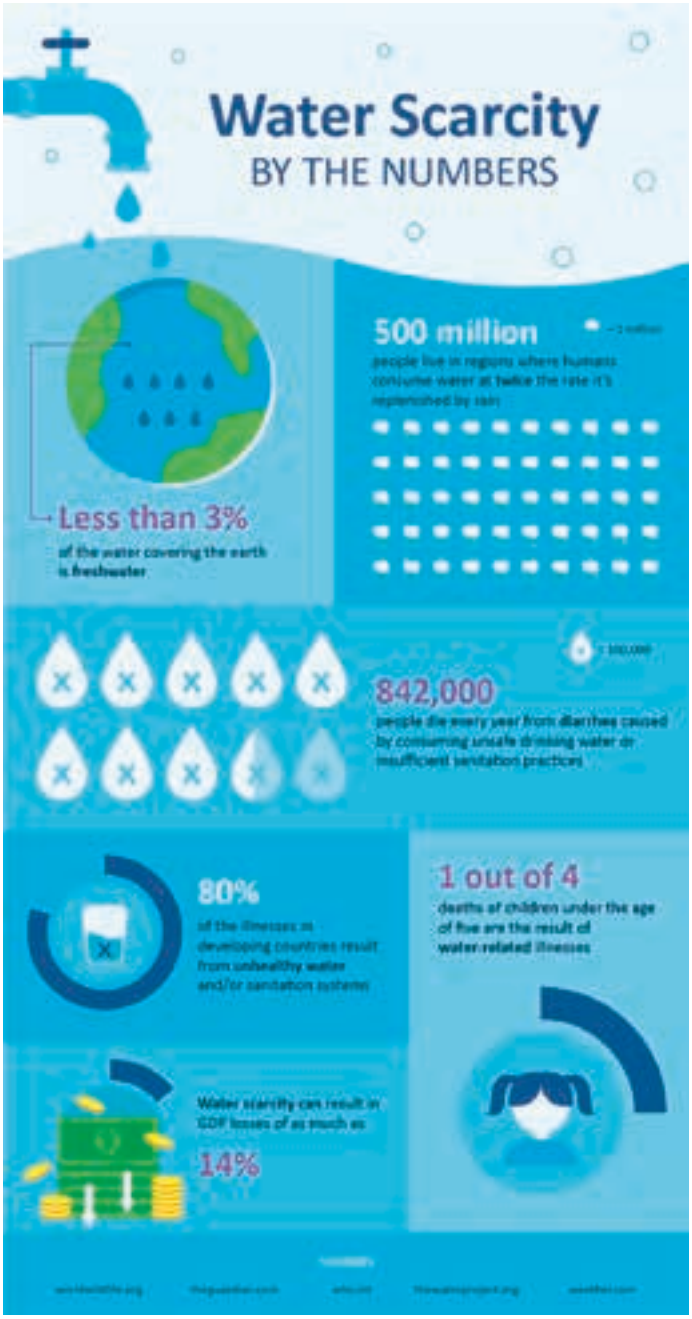
## Threatened ecosystems

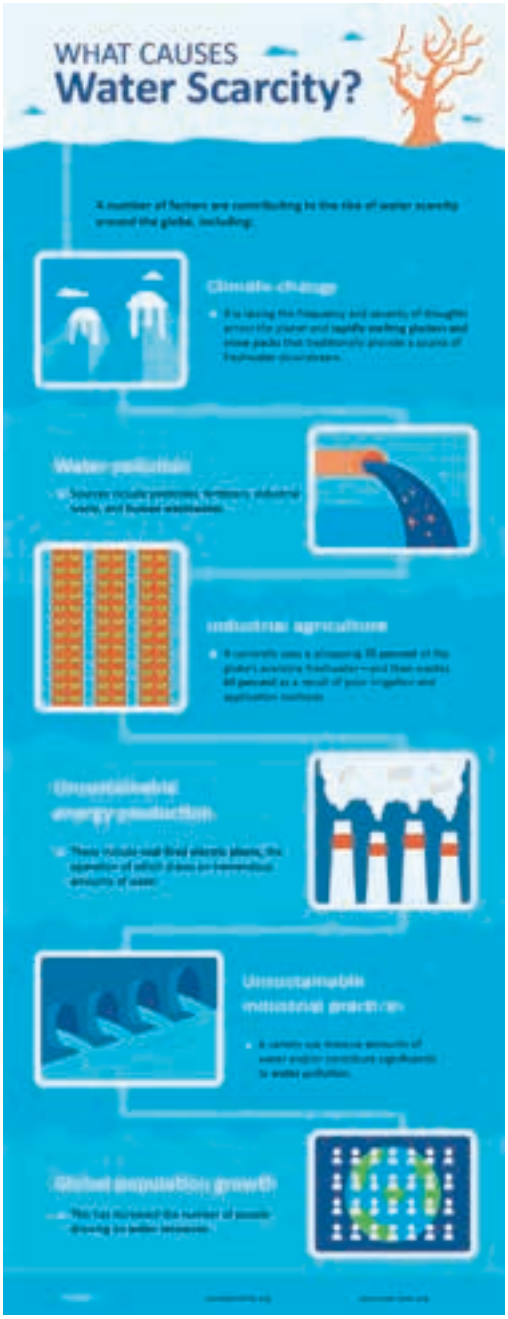
Water scarcity has serious effects for wildlife and flora. Especially notable is the rapid disappearance of wetlands, which reduces wildlife habitat and causes the loss of water filtration, storm protection, and flood control services typically proffered by wetlands.

Collectively, the world has lost 50 percent of all its wetlands since 1900, and nowhere is immune: Even places like California, Florida, and Louisiana have witnessed high rates of wetlands disappearance.

## Unhealthy economies and increased poverty

When water is hard to access, people will spend an inordinate amount of time obtaining it. This means people are not free to invest in education and careers, among other things, and this trickle down impacts both individuals and their countries.




For example, the World Bank estimates that water scarcity can result in GDP losses of as much as 14 percent.

## Decreased food access and higher food costs

As water becomes scarcer, it also becomes more expensive. That increases the cost of producing food crops, which then increases the cost of food in local grocery stores and markets. For example, a mere 10 percent rise in the cost of water could increase the production cost of a single orange by as much as thirty percent.

This simultaneously makes farming more difficult and decreases access to healthy food, which has ramifications for public health.

## Heightened conflict

History shows that when food prices spike, so do rates of violence and social conflict. This makes sense when you consider that starving people are more willing to break with social convention if it means getting something to eat.

## Higher costs

The fashion and electronics industries are notorious for their astronomical rates of water use. As water gets more expensive, it becomes more costly to create a variety of products. This could increase the difficulty in accessing clothing, phones, and more.

## There is some good news

In fact, one study found that water scarcity can be significantly reduced by 2050 if we commit to making big, yet practical changes.

## Water filtration systems

It's one thing to have access to water, and it's another to have access to water that is safe to drink. Effective water filtration systems help ensure freshwater can be put to good use – not making us sick.

That's one of the reasons why companies worldwide are committed to developing sophisticated water filtration systems that produce purified water free from bacteria, microbes, and

other contaminants, and bringing this clean drinking water to as many schools, hospitals, workplaces, and homes as possible.

### Water stewardship

It takes every community in the world to reduce the threat of water scarcity. Now more than ever, the world needs water stewards in all forms.

Whether that means taking shorter showers, installing low-flow toilets, and collecting rainwater for garden use at home; reusing gre ywater and eradicating leaks and other water inefficiencies at schools and offices; or investing in sustainable energy and water reduction initiatives by companies, water stewardship is a big part of the puzzle when it comes to limiting water scarcity.

### Protecting wetlands

Remember when we mentioned that wetlands are natural water filtration systems? Well, that means they have a big role in collecting and purifying water. Wetlands are disappearing at an alarming rate, but conserving wetlands could have a major payoff.

Currently, an international treaty called the Ramsar Convention has helped protect more than 2,000 wetlands. More aggressive conservation measures are required if we want wetlands to assist our efforts to reduce water scarcity.

### Irrigation efficiency

Industrial agriculture is one of the biggest drains on water resources. Simply switching from flood irrigation systems to sprinklers or drip irrigation systems could help the agricultural sector save a tremendous amount of water.

When combined with better soil management practices such as no-till or limited tillage and mulching, which reduces evaporation from the soil, more efficient irrigation systems can significantly reduce water usage.

### Water storage in reservoirs

By expanding the reservoir capacity we can capture and store floodwater, to prevent its loss to the ocean, where it becomes salinated and more difficult to treat. This stored water can be used to provide water during times of drought. In the U.S, many states (such as California and Wyoming) are considering enlarging existing reservoirs or building new ones.

### Desalinating seawater

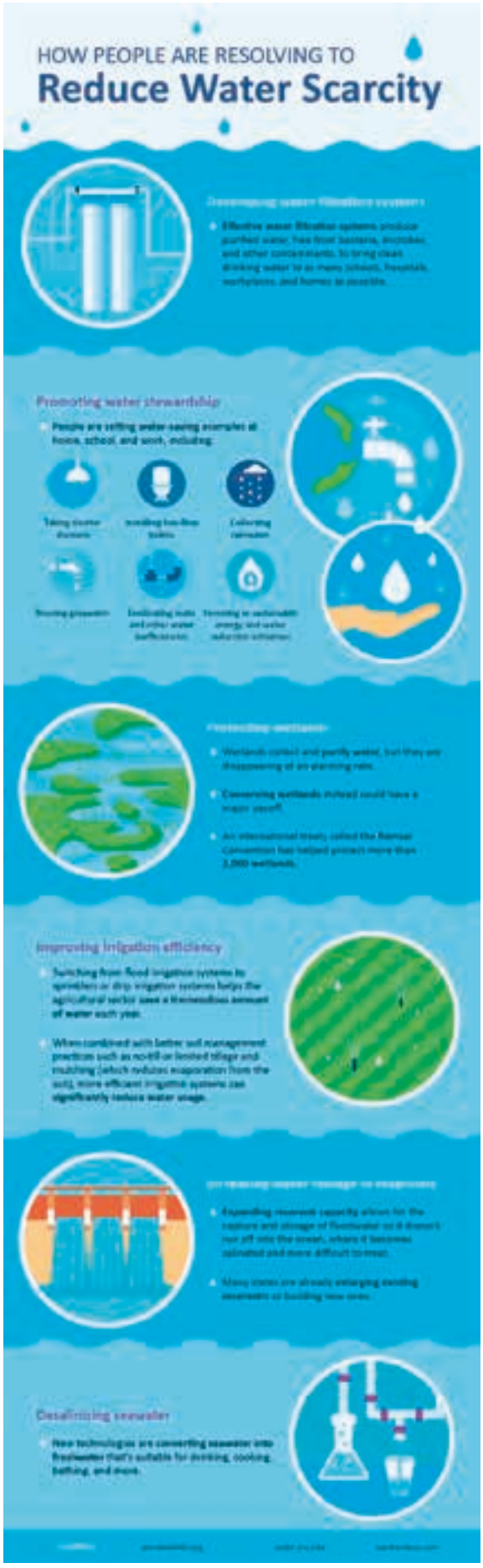
The technologies involved in seawater desalinisation are new but promising. The process involves converting seawater into freshwater suitable for drinking, cooking, bathing and more.

The researchers of the study predict that increasing the number of seawater desalinisation plants by 50-fold would make a big impact when it comes to reducing water scarcity.

The biggest downside is that desalinisation requires huge amounts of energy; it's important that these energy sources be sustainable so they don't contribute to more water scarcity.

While the topic of water scarcity may feel pretty daunting, there's a lot of hope. The future of our planet and its water resources is not written in stone.

If we come together to invest in reducing water scarcity, we can help ensure people are able to rely on healthy water sources for decades to come. **WNZ**



# ACUFLO®

NZ OWNED & NZ MARKET COMMITTED
PROVEN PRODUCTS & PERFORMANCE

## MANIFOLDS

New Zealand 20 year industry favourite.
Meter, Backflow, Flow Control, Strainer.
Full range. DR Brass or Composite Materials

## WATER METERS

Full range of models and sizes.
OIML R49 and ISO 4064 listed
Sensus - Maddalena - Acuflo models

## BOXES

Full range of sizes. Superior polypropylene material. Customised lids, boxes and bases.

## BACKFLOW

Full range of models and sizes.
AS/NZ 2845 and ICNZ listed.
Febco - Wilkins - Acuflo models

## PERFORMANCE TESTED

All Acuflo products are performance tested against pressure loss and accuracy.

ACUFLO® INDUSTRIES LTD

31 Reeve Street, Levin, New Zealand | Phone 06 368 4996 | Fax 06 367 9201
PO Box 660 | sales@acuflo.co.nz | www.acuflo.co.nz

ISO 9001 CERTIFIED GCS

# Technology for efficient water quality management & control

### Amiad EBS Filters
The largest automatic self-cleaning filter for fine filtration


### Amiad SAF Filters
The automatic self-cleaning filter – suitable for more applications than ever


### Krohne Electromagnetic Flow Meters
Precision German engineering from the pioneers of electromagnetic flow measurement


### Dorot control valves
State-of the-art automatic control valves designed for the most demanding water control requirements


### Arkal Spin-Klin filters
Reliable, effective self-cleaning SpinKlin® disc technology for clean water


### Apollo Backflow Prevention
Easy to maintain, Watermark approved and made in the USA


### Arad Bulk Water Meters
Advanced mechanical and ultrasonic technology for maximising water measurement efficiency


### Dorot air release valves
Optimised design for air release even at very high air flow velocities


WSP
Water Supply Products

For further information contact our industrial sales manager:
**Mike Stapleton** | P: 09 916 0094 | M: 021 475 601 | mstapleton@watersupply.co.nz