

# water

SEPTEMBER / OCTOBER 2018 ISSUE 206

## Water crossroads

**2018 Conference & Expo  
– Keynote speaker profiles**



METERING

Domestic and Bulk



Electromagnetic Flow Meters



Automatic Meter Reading System (AMR)



GSM/GPRS Data Loggers

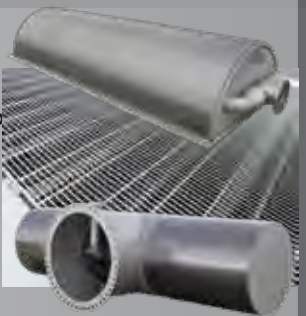


FILTRATION

Innovative Filtration Solutions



Vee Wire Screening Solutions

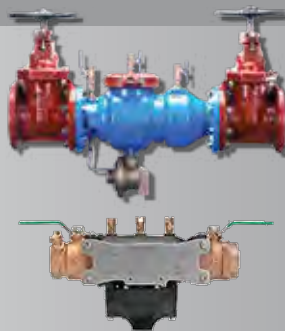


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# water

**Issue 206** SEPTEMBER / OCTOBER 2018

## INSIDE

- 4 President's comment – Looking back
- 8 Photo competition winner
- 10 Making a splash – conference keynotes
- 14 The crossroads ahead
- 18 Maori Language Week
- 22 Introducing the new Stormwater Group

## FEATURES

- 26 Watching our sea levels
- 30 When habitats sink
- 32 Award winning treatment plant
- 36 New city precinct – A water perspective
- 50 Lagarosiphon – weed invasion
- 64 Fluoridation – It's down to the dose
- 66 WAT – Water allocation tool
- 72 Environment – Adsorption of organic pollutants
- 74 Pacific – Good work in the Marshall Islands

## REGULARS

- 42 Profile – A passion for water management
- 46 Veteran profile – Rob Fullerton
- 56 Technical – decentralised wastewater
- 58 Comment – Stu Farrant
- 60 Legal – Supreme court decision on fluoridation
- 69 Environment – Microplastics
- 80 Commercial – Upgrading the flow in Pukekohe
- 84 Commercial – Hamilton's wastewater project
- 86 Advertisers' index

*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.

# Looking back at two years as president



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

**T**his is my last column as President of Water New Zealand and as I look back at the past two years I think I can safely say it's been a most eventful time – in the three waters sector nationally, in Auckland locally, and also for me personally with the welcome addition of baby twins, Jack and Elle to our family.

Looking at the national picture, not only have we had the Havelock North contamination event, there have been weather and consequent water quality issues, along with growing challenges faced by our waste and stormwater infrastructure.

Remember in March/April last year when Auckland was deluged with more than 740mm of rain across a 37 day period? We experienced flooding, wastewater and combined system overflows and our water treatment plant was compromised.

This meant that in a time of an abundance of water, Aucklanders had to cope with both flooding, and water conservation simultaneously. To top it off, some beaches were subject to long term health warnings due to the inevitable water quality issues.

For the first time in our history, water issues including pollution began to rocket up the scale of public – and therefore political – visibility.

In terms of quality of drinking water, Havelock North and its aftermath shaped much of our thinking – and

the country's – and helped highlight wider industry problems around lack of resourcing as well as the impact of agriculture on water quality. This fuelled and informed discussions led by the Department of Internal Affairs around a proposed water reform process that is currently being undertaken.

At Water New Zealand we found ourselves taking an increasing role in a nation-wide conversation on water, post-Havelock North. Our key business strategy of a more consistent approach across the three waters suddenly never seemed more relevant.

I'm proud to say we were able to ensure that the association was well represented throughout the Havelock North Inquiry and we continue to play a constructive role in the discussions that have emerged as a result.

Specifically, issues around resourcing came to the forefront post Havelock, and in particular challenges around workforce capability emerged – one of the key recommendations from the Inquiry.

This is an area we have begun to address through the establishment of a Workforce Capability Strategy. The strategy provides us with an important opportunity to help shape the future of the sector. We are very keen to hear what our members' thoughts and requirements are in this area so we certainly welcome any contribution to this process.

While we don't yet know the outcome of the Government's Three Waters Review (led by the Department of Internal Affairs) it is clear that there will be a need for a number of new roles in the industry. The strategy work we are undertaking will seek an understanding of exactly where the gaps are and how many of those roles will be needed.

For instance, it is clear there is a need for an industry-wide certification scheme and this is something that may be best placed under the ambit of a new regulator.

The Government's review process is focused on what new regulation needs to occur, how it will be delivered, and the shape and scope of the changes to water service entities.

Throughout these past two years we've worked hard to keep members up to date with these developments.

You may recall last year's Drinking Water Summit in Hamilton, which preceded our annual conference.

In February this year the Water New Zealand technical team went on the road, visiting 17 towns and centres to help members unpack some of the implications of the Inquiry and what the drinking water landscape may look like post the Inquiry. More than 900 people attended the roadshows.

Then, in July and August, they went back on the road – this time to keep members up to date with the various





options the Government may be looking at for water regulation and delivery. It provided another opportunity for members to provide feedback on the options.

While it is understandable that some members are concerned about disruption and uncertainty in the sector, there is certainly a need for change. With change comes new opportunities. I'm optimistic that any review of this nature puts us on track for a water regime more consistent with a developed country.

### Conference success

Our conferences have continued to be a huge success. Attendance numbers at our Annual Conference and Expo in Hamilton continued to break previous records – 1500 last year, and exhibition space was so coveted there quickly became a waiting list for expo space this year.

Those of us lucky enough to get to Queenstown in May for the Stormwater Conference were certainly in for a treat. It may have been minus one degree outside, but inside the atmosphere was certainly warm, convivial and as always, plenty of ideas and discussion especially around innovation and green, landscaped urban stormwater systems.

Local Government Minister Nanaia Mahuta delighted dinner attendees when she broke into song at

the conference dinner.

Our Modelling Group met in Christchurch earlier this year in what was a very thought-provoking symposium for the attendees including discussion around innovation and examples of smart water and wastewater systems.

Our Backflow Group held their biennial conference in August 2017 which was well attended by 60 – plus industry practitioners and council representatives. Backflow device compliance and installation issues continue to be of concern in the protection of potable water source, and the group works hard to ensure industry standards are kept up.

### Freshwater issues

The growing focus on freshwater has also been occupying considerable attention.

Environment Minister David Parker has signalled he wants to toughen up water quality standards and has sought advice on the new National Policy Statement on Freshwater Management (NPS-FM) which requires regional authorities to set limits around water quality and quantity.

Water New Zealand contributed with advice to the Government through its membership of the Land and Water Forum which went into abeyance following its final report in June. A number of our members were

also involved in a work programme led by the Ministry for the Environment to develop urban good management principles aimed at supporting the implementation of the NPS-FM in urban areas.

It is important that the three waters sector interests continue to be well represented in regional planning processes around the country and we'll certainly be keeping you up to date with developments.

### Stormwater innovation

I've been particularly excited about all the new approaches to stormwater management we've seen in recent times. Those of you who went to Queenstown in May would already know that this is a particularly innovative field.

In Auckland, our rapid development, along with more heavy and frequent rainstorms, has placed unprecedented pressure on our ageing infrastructure.

We've been working hard to improve things by optimising our renewals, extending asset lives and working to improve water quality through water sensitive designs and opportunities to restore natural systems such as daylighting projects.

### Customer focus

But along with these initiatives, there's a clear need for significantly increased funding. That's why it's vital to take customers along with us, ensuring

they understand what we need to do, and why. Despite our challenges in Auckland, we've had some success in that.

Recently 67 percent of Aucklanders who submitted on the council's 10-year Budget and Auckland Plan 2050 supported the introduction of a targeted rate to improve water quality.

This support indicates an underlying concern and care for clean water and a healthy environment, and there's a tacit understanding these qualities are worth paying for. Such support cannot be taken for granted. It requires us to continue to work to understand customers' viewpoints; maintain open dialogue; and to uphold honesty.

Alongside our customers we've learnt that almost all want to live in a city where they can take the kids to the beach with confidence that it's safe, and healthy.

With these considerations in mind, last summer we re-launched Auckland Council's Safeswim programme.

Safeswim was timed perfectly. In an environment of heightened awareness of water issues, Safeswim helped to focus public opinion on improving Auckland's water quality, and was fundamental to support for a targeted rate to help achieve that.

Safeswim continues to feature 'firsts' for our country: "real time" forecasts on water quality at 84 beaches; up to date information on risks such as rips, UV, tides, swells, jellyfish and even shark sightings.

When a vision for change – such as that delivered by Safeswim – chimes with customers' own beliefs and opinions, they choose to be part of the solution. They become allies.

Listening to our customers and ensuring they receive better information which they can choose to act on, was one of the key reasons we undertook a major Water Consumer Survey last year. The survey gave members a useful gauge of attitudes and concerns about water

issues. This continues to provide help for planning.

### **Collaboration across the sector**

Collaboration across the industry is important so that we build greater strength in our sector.

This year we established a Memorandum of Understanding with two key organisations, WIOG (Water Industry Operations Group) and NZTIWF (New Zealand Trade and Industrial Waters Forum). It came about after a great deal of discussion and relationship-building between the organisations and I'm certain we'll continue to work collaboratively with these two groups.

We're also working towards forging closer links with our neighbours across the Tasman. Our Chief Executive John Pfahlert and I recently met with the Australian Water Association (AWA) and the Water Services Association of Australia (WSAA) in what we hope



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will lead to further collaboration and more opportunities for members.

### National Performance Review and technical publications

This year too, I hope you got the opportunity to delve into one of our flagship projects, the National Performance Review.

New developments around this included an online benchmarking tool for drinking water, wastewater and stormwater performance and service delivery, enabling the NPR to be even more relevant and user friendly to councils and water utilities.

The new online data tool allows users to compare their performance against national results as well as selected authorities operating in comparable environments.

Water New Zealand continues to provide and facilitate the development of technical documents essential for effective water management. The revised Waste

Stabilisation Pond Good Practice Guide is but the latest of these documents. We followed its publication with a two week rollout around the country for operators, consultants and asset managers.

Other Good Practice Guides include the updating of the National Asbestos Cement Pressure Pipe Manual which will be invaluable to engineers and consultants in this field.

### Advocacy

We continued to advocate and speak out on issues that aligned with our evidence-based values such as supporting the Government's proposal to transfer decision making powers over fluoridation from Territorial Local Authorities to District Health Boards. We also strongly supported the ban on the sale and manufacture of microbeads.

### In conclusion

As a final farewell, on a personal note, I'd like to thank members for your support

over these past two years, especially since October when Jack and Elle came into the world.

Already they have joined me on many Water New Zealand and related forums including board meetings – many of you have met them. I am sure that with a start such as this they are destined to play a role in the water industry in the future. Yes, on reflection, last year was a very big year.

Water has rapidly become a dynamic area for us all and a lightning rod for public opinion. While I do understand that the future may be uncertain, I'm very optimistic that there will be some rewarding opportunities and challenges in the new environment.

Meantime, I'm looking forward to catching up with you in Hamilton. Our conferences are definitely a highlight of the three water sector and it's not surprising that this year's is looking to be every bit as informative and inspiring as in previous years.

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# Connecting, educating and empowering people

The Humanitarian Engineering Conference highlighted opportunities to work for 'values-based' organisations.

*By Lesley Smith, Water New Zealand.*

Several weeks ago, I was fortunate to attend the 2018 Humanitarian Engineering Conference, of which Water New Zealand was a proud sponsor.

The conference was organised by Engineers without Borders, a vibrant and growing member-based not-for-profit organisation that aims to connect, educate and empower people through humanitarian engineering.

The conference, like Engineers without Borders, is coordinated largely through the efforts of volunteers, many of whom are engineering students or recent engineering graduates. It is a much younger crowd than what you find at a typical engineering event, and the enthusiasm and energy for engaging with EWB's humanitarian values through their work and study were palpable.

Indeed, the desire of young engineers to work for "values based" organisations was a key theme that weaved its way through many



of the conference presentations, discussions and networking breakouts.

The conference is an annual event, showcasing volunteer stories and government agencies, with a heavy focus on engineer volunteering and the Pacific.

Much of the conference and volunteering efforts discussed were focused on water supply systems. I attended talks by volunteers and consultants working in Kiribati, the Cook Islands and Vanuatu – where the government's newly formed Department of

Water Resources was unable to find local engineers and so is working to develop capability in partnership with Engineers without Borders and Volunteer Services Abroad.

More information on Engineers without Borders and opportunities to get involved is available on its website. If you are an engineer with a desire to contribute your skills for a world without poverty and are looking for a network of like-minded people, I'd encourage you to take a look. [www.ewb.org.nz](http://www.ewb.org.nz).

## Water New Zealand photo competition winner

**Congratulations to Martin Scott from Hamilton City Council** for his winning entry (right) in the Water New Zealand photo competition. As first prize winner, Martin wins a full registration to the Water New Zealand Annual Conference & Expo – including a ticket to the Gala Dinner.

Thanks very much to everyone who entered. We were very impressed with all the entries and will certainly be including many of the other photos in future publications.

We hope to hold another photo competition next year – so start snapping. In the meantime, we're always on the lookout for great water images so if you have a photo that you'd be happy for us to publish, please send it to [enquiries@waternz.org.nz](mailto:enquiries@waternz.org.nz). This won't preclude you from entering the photo in any future competition.



SH1 Khyber to Gillies Soakage Inspection, Peter Mitchell.



Fitter in basin, Wastewater Treatment Plant Pukete, Hamilton, Martin Scott.





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# water

## NEW ZEALAND CONFERENCE & EXPO

19-21 September 2018, Hamilton



**O**ur Water New Zealand conferences reflect the dynamic sector that we're all a part of and this year, our 60th anniversary, is no exception. Resilience, urban issues and sustainability are key themes – and we look forward to hearing presentations from a high calibre of speakers and experts sharing their international experience.

As we know, water reform has been the big focus in the water sector this past year and so it's not surprising we'll also be hearing plenty about that at this conference. We're particularly honoured to have the Minister for Local Government, Nanaia Mahuta giving our opening keynote address. The Minister has recently returned from a fact-

finding trip to the UK and Ireland where she looked at water reform. We also have other keynote speakers from that part of the world so we'll get to take part in discussion with those who have first-hand experience of water reform issues.

Of course, our Expo continues to be an important channel for the vital business aspect of water and it's not surprising that this year expo stands sold out very quickly. So once again – we're looking forward to what will no doubt be our biggest and best conference yet – a fitting celebration for our diamond anniversary. See you there.

*John Pffhalert, CEO Water New Zealand.*

## Making a splash in Hamilton – Our keynote speaker lineup.

### Thierry Witkowicz

Plenary keynote – Towards smart and resilient cities

9.45am, Wednesday, September 19



Thierry Witkowicz is senior vice president business development – smart cities and is in charge of developing Veolia's digital solutions worldwide. He successfully started his mission by signing the first smart business deals in Australia and France.

Before that, he was deputy zone director and a member of the executive committee of Veolia Water in France. The area he managed had more than 3500 employees, 1000 contracts and over €600 million in turnover. Throughout his career, he has successfully carried out development and organisational projects in the field of

environmental services, particularly in water, in France and abroad.

He began his career in Brazil, then created and developed Veolia's business in China for 10 years. He has won numerous contracts for building drinking water and wastewater treatment plants throughout China and signed Veolia's first joint ventures in Tianjin and Chengdu.

He then developed the South of Veolia Water with major concessions gains. Additionally, he successfully managed the renewal of the Grand Lyon contract (€660 million turnover) by making it entirely digital.

### Cindy Wallis-Lage

Plenary keynote – Prioritising Water to Drive Sustainable, Resilient Communities

9.00am, Thursday September 20



Cindy Wallis-Lage is president of Black & Veatch's water business and serves as a member of the company's executive committee and board of directors. When named in 2012, she became the first female president of an operating division at Black & Veatch in the company's 100-year history.

Wallis-Lage leads a workforce of more than 2800 professionals in more than 75 offices located in the US, the UK, Asia-Pacific and India. Her responsibilities encompass Black & Veatch's water-related business strategies, development and operations.

As a licensed professional engineer, she has played a leadership role on projects involving

more than 100 facilities worldwide, helping public and private entities successfully develop, enhance and manage their water, wastewater and stormwater facilities and infrastructure.

On the basis of her experience and expertise, Wallis-Lage is recognised as a foremost expert in the treatment and reuse of water and wastewater resources. She has authored or co-authored more than 50 papers, 20 technical articles and 10 textbook chapters and is frequently asked to present on the challenges and direction of the water industry.

In 2017 and 2018, Wallis-Lage was named among the Top 25 Global Water Leaders by *Water & Wastewater International*.



## Alan Sutherland

Plenary keynote – Scottish  
Regulatory Framework  
10.30 am, Friday September 21



Alan Sutherland has been chief executive of the Water Industry Commission since its establishment in 2005, where he presided over the first successful liberalisation of a retail water market in the world, a model now replicated in England.

Prior to WIC'S establishment, he was the water industry commissioner, a role he took up in 1999. Under Sutherland's supervision, the water industry in Scotland has become much more efficient – both operating and capital costs are down by some 40 percent on a like for like basis – and performance standards have improved markedly. The introduction of competition to the Scottish market has further facilitated new and improved services, reduced costs and increased emphasis on efficient water use.

Following the success of market reform in Scotland, Sutherland was instrumental in the passage of the Water Act 2014 in England. He was originally invited to speak to the All Party Parliamentary Water Group on the future of UK water regulation and gave evidence to the House of Commons' Environment, Food and Rural Affairs Select Committee's inquiry into the Water White paper. He went on to be highly involved in the pre-legislative scrutiny of the Draft Water Bill and was just one of seven witnesses to give evidence on the Water Bill to the Commons Public Bill Committee. His contribution to the process was acknowledged during debate on the Water Bill in the House of Lords.

Sutherland oversaw the Strategic Review of Charges for Scottish Water for 2015-21 (SRC15-21) which was guided by the principle that a well-managed company will "go much further for their customers than they will for the regulator". He is committed to an unswervingly customer centric price control and is constantly seeking to improve the regulatory framework to make it more supportive of innovation and strengthen the relationship between the regulated company and its customers.

## Sam Johnson

Plenary keynote –  
Community Guardians and Student  
Volunteer Army  
11.00am, Friday, September 21



Social entrepreneur Sam Johnson is head of community for Mycare and a champion of creating new social infrastructure to support communities.

Johnson became a household name by founding the Student Volunteer Army after the Christchurch earthquakes and for his international work in the resilience and volunteering sectors.

His start-up joined forces with Mycare in 2017 to help recreate mutually beneficial models of community – without a natural disaster. He works closely with Citycare Group on creating community-centric models of service delivery and engagement, called Community Guardians.

Deeply linked to personal growth and leadership, Sam's presentation will focus on why new models of trust, work, community and the shared economy enable us to create new #socialInfrastructure.

Johnson is a Sir Peter Blake Trust leader and was previously named a Young New Zealander of the Year and Communicator of the Year.

## International Thought Leadership speakers

### Stuart Wilson

Water Services Association of  
Australia  
11.30am, Wednesday, September 19



Stuart Wilson is deputy executive director of the Water Services Association of Australia. He oversees WSAA's policy development and advocacy on regulatory and institutional reform.

Before joining WSAA, he worked at Sydney Water – Australia's largest water utility – as principle economist and manager, regulatory strategy and pricing for seven years.

During that time, he oversaw a number of regulatory price reviews and was heavily involved in

commercial transactions, such as the lease to the private sector of the Sydney Desalination plant.

Before that, Wilson held a variety of economic policy and research positions in the Australian Public Service.

These included positions at the Productivity Commission and the Commonwealth Department of Finance. He has also worked in private consulting and has a degree in economics from the Sydney University.

## Tracy Tackett

Green Stormwater Infrastructure  
2.00pm, Wednesday, September 19



Tracy Tackett is the drainage and wastewater capital portfolio manager for Seattle Public Utilities.

She is responsible for the management, direction and decision-making for capital improvement projects and significant programmes focused on reducing the effects of the city's urban stormwater runoff on Seattle's receiving water bodies, and public health and safety.

Tackett has more than 20 years of drainage and wastewater project experience. She has designed numerous innovative natural drainage systems projects, including the country's first full street retrofit to manage stormwater with bioretention, SEA Street.

Throughout her career, she has worked to incorporate

sustainability goals with other city goals. She led the development of Seattle's Green Stormwater Infrastructure Program and continues to play a significant role in expanding Seattle's use of GSI approaches. As capital portfolio manager, Tackett provides strategic direction and programme oversight for the drainage and wastewater portfolio (\$700 million for 2018-2020), including projects for stormwater conveyance, sanitary sewer overflow reduction, CSO reduction and water quality improvement. Tackett holds a Master of Science degree in civil and environmental engineering with a concentration in water resources management from the University of Washington.

## David Pernitsky

Canada's Walkerton Water  
Contamination Event: Impact on  
Drinking Water Regulations  
11.30am, Thursday, September 20



David Pernitsky is Stantec's global practice leader for water treatment. He is responsible for tracking and implementing current industry and research developments, ensuring that appropriate technologies are used on Stantec projects, and providing treatment process assistance and QA/QC support to Stantec staff and clients.

For the past 25 years, Pernitsky has been the process and design lead on many large and small drinking water planning and treatment and wastewater re-use projects. These projects have included dissolved air flotation (DAF), ozonation, granular activated carbon (GAC), ion exchange, membrane filtration,

reverse osmosis, and high rate granular media filtration systems. He has been involved in many water treatment plant optimisation projects and has authored many publications on WTP operations, including AWWA's M37 Operational Control of Coagulation and Filtration Processes Manual, Online Monitoring for Water Treatment Plants, and the first operational guidelines for the use of polyaluminum coagulants. He has bachelor's and masters' degrees in civil and environmental engineering from the University of Alberta and a PhD in environmental engineering from the University of Massachusetts Amherst. He is based in Stantec's Calgary office.



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## Laith Furatian

The Chlorination Residual Debate  
2.00pm, Thursday, September 20

Laith Furatian has devoted more than a decade to the study and practice of safe drinking water production and distribution.

In 2017, he completed his doctorate at the University of British Columbia in the Department of Chemical and Biological Engineering, where he conducted fundamental investigations into the use of ultraviolet radiation for the treatment of trace contaminants in drinking water. His dissertation won second place in the 2018 Academic Achievement Awards of the American Water Works Association (AWWA) in the doctoral category.

He has collaborated with water utilities and equipment manufacturers, taught practical courses in academia and been an active volunteer in several professional

organisations. These include the AWWA's Disinfection and Distribution Water Quality technical committees, the Canadian Water and Wastewater Association's Drinking Water Quality Committee and the British Columbia Water and Waste Association's Drinking Water Committee. In addition to his many technical interests regarding water treatment and distribution, Furatian is a devoted student of the history of water supply science and practice. He holds a Master of Science in environmental engineering from the University of New Hampshire and a Bachelor of Science in engineering physics from the University of Alberta.

He recently accepted the position of water master planning engineer for the city of Kamloops in the British Columbia interior.



## Jerry Grant

Sector Reform Programme in Ireland – Processes, Challenges and Achievements

10.30am, Thursday, September 20



Jerry Grant has been managing director of Irish Water since early 2016, having served for three years as the first head of asset management in Irish Water following its establishment. In that role, he developed the first Water Services Strategic Plan (WSSP), as well as a multi-billion capital investment plan which will see €5.5 billion invested in water services between 2014 and 2021. The plan points to a longer-term requirement for a €13.5 billion programme to bring the water sector assets to the required standard over three investment cycles. In his current role, he leads a team of 700 staff in Irish Water, supported by 3200 staff in local authorities delivering services to over 1.7 million customers, while continuing the industry transformation to meet modern utility standards of performance and efficiency.

Immediately before Irish Water was established, Grant played a major role in the Irish Water Programme. This was the project to establish Irish Water as Ireland's national water services authority, creating a modern utility structure and capability, with the transfer of responsibility from 31 local authorities to the utility on January 1, 2014.

It included the transfer of a capital projects pipeline

worth some €3 billion, with local authorities continuing day-to-day operation of the assets under service level agreements. However, efforts to introduce domestic water charges supported by a national domestic water metering programme proved controversial, and therefore domestic charges have been replaced by exchequer funding in 2017.

Irish Water is now in detailed negotiations to deliver the next phase of transformation to a single public utility, with the full transfer of staff and associated industry rationalisation.

Grant has specialised in water services delivery in Ireland since graduating from University College Dublin with a first-class honours degree in civil engineering in 1974. Before joining Irish Water, he served as managing director of RPS Consulting Engineers in Ireland for 10 years, leading a team of 600 technical and professional specialists to deliver transport, water, energy and waste management infrastructure throughout Ireland.

He is a chartered engineer, a fellow of Engineers Ireland and a fellow of the Irish Academy of Engineers. He has a diploma in contract law and arbitration and is a member of the Institute of Arbitrators.

## Ken Hutchison

How Drinking Water Regulation Has Improved the Quality of Waters

11.00am, Thursday, September 20



Ken Hutchison is the managing director of Scottish Water International. His prime focus is to export Scottish Water's skills, experience and knowledge around the globe to help utilities transform their performance and customer satisfaction. He is the former director of capital investment for Scottish Water and he provided overall direction and leadership for the development and delivery of a customer-focused, safe and efficient capital investment portfolio (about £500 million a year).

Hutchison's career spans 25 years in the water industry in Scotland and he has held general manager roles in asset management, investment planning, capital delivery and operations.

He has led significant change projects that have transformed Scottish Water's operational and capital efficiency and customer focus and have delivered significant customer value.

## Batsirai Majuru

Water Quality in Rural Water Supplies

1.30pm, Thursday, September 20



Batsirai Majuru is a technical officer in the Water, Sanitation, Hygiene and Health unit at the World Health Organization (WHO) headquarters in Switzerland.

Majuru trained as an environmental health professional and received her PhD from the University of East Anglia. Her role at WHO is focused on drinking-water quality and regulation – she manages the day-to-day operations of the WHO International Scheme to Evaluate Household Water Treatment Technologies and coordinates the WHO International Network of Drinking-water Regulators. **WNZ**

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# The crossroads ahead

Will the Government make the hard decisions needed about drinking water, stormwater and wastewater?

By John Pfahlert, CEO Water New Zealand.

In October, the Cabinet is expected to respond to the Havelock North Inquiry report and the Department of Internal Affairs three waters review. It has taken officials more than 12 months to examine the sector and prepare options for the Government's consideration.

Water New Zealand has also conducted two regional tours this year, talking to our members about the issues: the first explaining the Havelock North Inquiry findings and the latter looking at possible reform options.

In some areas, the issues should be easy to resolve. For example, we haven't heard too much opposition to the establishment of a new drinking water regulator. However it isn't as simple as that. There are choices about what functions the regulator should be given:

- Should they regulate just drinking water or wastewater as well?
- Should the regulator also be the standard setter?
- Should it be a stand-alone organisation or attached to another regulator?
- Should there be economic regulation, and if so, where should that function sit?

We take the view it needs to be a well-resourced organisation with a high level of expertise. It needs to be respected and trusted by industry.

I suspect the Government won't make the hard call around mandatory treatment of public water supplies. I suspect it will say this is a technical matter that the new regulator should determine.

It's fair to say that some of the choices the Government faces will be considerably harder to make. The question of aggregating water supply away from territorial local authorities up into larger entities is an issue on which we received plenty of comment during our regional workshops. Recently, Christchurch City Council issued a statement saying it was opposed to aggregation.

The Government could pursue a number of possible options, from retaining the status quo through to the one-entity model such as in Scotland. It seems unlikely the Government will go for a one-entity model, despite the evidence



John Pfahlert, CEO Water New Zealand (left) with Alastair Scott, Wairarapa MP.

from overseas of the benefits that accrue from such an approach.

A regional approach, perhaps along existing regional council boundaries, is a possibility, but again, some regions would still fail to gain from the benefits of scale. For instance, aggregation along regional council boundaries on the West Coast, with a total population of just 32,000, would still fail to reap benefits of scale.

Both Local Government Minister Nanaia Mahuta and Water New Zealand have socialised the idea what we might call the Super Rugby franchise model, which could see between three and six entities established on a geographic basis. They could be asset owning or not. The advantages and disadvantages of these approaches have been well canvassed elsewhere.

The real issue we struggle with in New Zealand relates in large part to whether you support localism or a centralised approach. We have a tendency to be somewhat parochial. I understand the desire by communities to create a sense of place and to have control over what goes on in their district.

But does three waters provision routinely exercise the minds of ratepayers other than what they pay and whether the system keeps operating? I suspect not. As long as the tap water is wholesome and their toilet works, I suggest it probably never occurs to them.

In which case they probably don't mind who supplies the service either. I'm not sure

“ The problems we face are systemic ones that can't be resolved by minor tinkering around edges. ”

I subscribe to the view that because three waters assets were paid for by a specific group of ratepayers that we should never examine alternatives to how those services are delivered.

All a ratepayer really wants is a fit for purpose service at an affordable price. Increasingly, councils are offering substandard services at ever increasing prices. Doing the same old thing will keep us on that trajectory.

In our regional workshops, we haven't sugar-coated the fact that some of the decisions the Government faces involve options that will be disruptive to councils and their staff. Some options will be more disruptive than others.

Local government does itself a disservice if it opposes options that have proven to be highly effective solutions overseas, simply on the basis that it removes local control. I'd have thought being rid of the cost and complexity of water services would be welcomed by councils, since it allows them to focus on the issues that do exercise the minds of their ratepayers, such as place-making and community and regional development.

Whether there is the political will and the ability to make progress remains to be seen. It seems likely to take some time whatever the Government decides. If agreement can't be reached in October, I suspect it just means change will be made by a future government. The problems we face are systemic ones that can't be resolved by minor tinkering around the edges. [WNZ](#)



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# 25

years in the water  
treatment industry.

# Ch-ch-ch-changes

By *Aimee Barwick, NZ advisory sector leader, Mott MacDonald.*

'Change' was the only certainty that come out of the water discussion at the recent Building Nations Symposium, and based on the discussions by all the speakers during this session, it can't come soon enough.

It was a privilege to listen to Local Government Minister Nanaia Mahuta talk about her absolute commitment to improving this sector through a comprehensive and holistic approach.

This review and its outcomes will change the landscape of water services and infrastructure and, importantly, will be based on feedback from local government and many other stakeholders who have a role in this sector.

This Government has said it is committed to working with, listening to and understanding the challenges of multiple stakeholders, and more importantly it is clear that it has no predetermined solutions.

Currently, the three water services are the responsibility of 67 local authorities and a number of other stakeholders that have various roles to ensure water is safe.

It is clear the Government is carefully considering a multiple range of options; nevertheless new regulation that aligns the sector is likely to be key.

Better regulation is required to improve our environment, provide clean drinking water and ensure sound economic oversight of the industry regarding investment and services. What was made clear was that whatever the outcome, all three water assets will remain in public ownership.

While this will take time to work through, I left this session with the feeling it really is time for change, but also nervous.

We have known the issues for a long time, and though the successive reports over many years haven't managed to get traction, and I really hope that this Government can."

## Massive desalination plant

**One of the world's largest water desalination plants** has officially opened, pumping up to 281,000 cubic metres a day.

The Barka Independent Water Project plant in Oman is providing a sustained supply of high-quality drinking water at a record low electrical energy consumption and is said to offer more energy efficiency than current state-of-the-art desalination systems.

A consortium, made up of Itochu Corporation, ENGIE, SUEZ, and Towell Engineering, was set up to finance, build and operate the new seawater desalination plant in Barka under a 20 year water purchase agreement.

The construction of the plant was completed in less than 30 months.



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## Stantec gets new country manager

**Ralph Fouche (pictured) has been named** country manager for Stantec New Zealand, accountable for its operations, its financial performance and overseeing community engagement activities.

With over 30 years' experience delivering infrastructure projects, Fouche has spent a good portion of his career collaborating with clients to deliver project outcomes. He is a chartered professional engineer with

a background in managing projects and more recently in business management.

His governance experience extends to serving many years on alliance leadership teams and as a past board member of Engineering NZ and IPWEA NZ. He also brings management experience gained from leading business units and as Stantec's former strategy, marketing & sales director for Australia and New Zealand.



As country manager, Fouche says he intends to create a growth plan here and strategically position the business with regard to economic and market trends.

## A step in the right direction

**Water New Zealand says the** Government's move towards improving the safety of drinking water is a welcome step in the right direction.

The Government has announced that it is amending the Health Act to allow for faster and more efficient changes to outdated drinking water standards.

Water New Zealand Chief Executive John Pfahlert says this is a good interim measure

ahead of the much-needed reforms across the three waters sector. "The drinking water standards haven't been updated since 2008 and a lot of our understanding has changed in regard to drinking water science and technology since then."

The legislative changes will allow the standards to be updated more readily.

"Water New Zealand is looking forward to

seeing what further steps the Government will take in response to the Havelock North Contamination Inquiry's recommendation that a new drinking water regulator be established.

"Provision of safe drinking water supplies is dependent on a knowledgeable, well-resourced regulator that is respected by the drinking water industry."

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# Celebrate Maori language week

By Gretel Roberts, Auckland Council, and Troy Brackbank, 360.

**Water New Zealand is proud to tautoko** (support) te wiki o te reo Maori (Maori language week), Mahuru (September) 10–16.

This year's theme is *kia kaha* (being strong) and focuses on how we can all make the Maori language strong in everything we do.

What better way for our water industry to embrace this theme than to understand the importance of water and understand the words we can use to describe water from a Maori perspective.

We've prepared a poster for you to pin

up in your office or by your desk (see next page). Go to [waternz.org.nz](http://waternz.org.nz) to download it.

It shows key water types with a description of what they mean and includes the importance of Ranginui (Sky Father) and Papatuanuku (Earth Mother) in providing us with precious *waiora* – life-sustaining water.

*He wero* – a challenge for you (have some fun with this)

- Add some te reo Maori into your everyday work.
- Greet each other with “*kia ora*” (hi/hello) or *tenakoe*.

- Have a conversation about what you think when you hear the *kupu* (word) “*wai*” (water).

- Try to use the Maori terms on the poster in place of English ones.

And we can all help with the *kia kaha* theme by strengthening our understanding of “*wai*”.

Water and its *mauri* (lifecycle) is a *taonga*, a treasured resource that we should preserve and protect to look after us and the many generations to follow.

***Ko au ko te awa, ko te awa ko au***  
*I am the river, the river is me.*



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# Ngā momo wai

# Types of water

ua  
rain



Ngā Roimata ō Ranginui  
Tears of the sky father

## Wai-ora

pure / healthy water



This is water in its purest form. It contains the source of life and wellbeing.

fresh water

Water that is used for consumption, sustains life, runs free or unrestrained and has no sacred associations.



## Wai-kino

dangerous / polluted water



The mauri (life force) of the water has been altered through pollution and has the potential to do harm to all living things (incl humans and ecosystems). Also refers to dangerous water such as rapids.

dead water

Water that is no longer able to sustain life. It is dangerous to all living things (incl humans and ecosystems) because it can cause illness or misfortune.



## Wai-tai

seawater / salt water



This term also refers to rough or angry water as in surf, waves or sea tides.

sacred water

This is water that is used for ritual and ceremony.



Ngā puna wai (tapu) o Papatūānuku  
The weeping springs of the earth mother



Te Wiki o te reo Māori

Māori Language Week

10 – 16 o Mahuru (September) 2018



water  
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A consistent approach across the 3 waters sector

# New infrastructure agency welcomed

A number of associations involved with the country's infrastructure build have welcomed the recent announcement from Infrastructure Minister Shane Jones that a new independent infrastructure agency will be set up to improve government oversight into this essential sector.

Such a new entity will provide will help to resolve recent uncertainty over coming workflow following the change of government infrastructure priorities, as well as unifying the coming efforts to improve consistency and visibility in infrastructure investment, says Civil Contractors NZ.

"The proposed new infrastructure agency has the potential to provide infrastructure pipeline visibility, certainty and prioritisation across Government, as well as a clear and integrated action plan to deliver the pipeline," says CCNZ chief Peter Silcock.

"We hope the new agency will also provide a centre of procurement excellence to improve the quality and reduce the costs of procurement,

leading to greater certainty for Kiwi civil contractors and better ability to invest in our people, plant and systems."

He says because of these factors, the creation of the new agency will also have wider benefits for New Zealand, streamlining project delivery, ensuring projects are completed on time and on budget, and providing contractors more certainty around projects so they will be able to make more resources available for the employment and development of their staff.

Silcock says the delivery of critical community infrastructure water, transport, energy and communications must be a key strategic priority for this Government, given its stated goals.

"This is a critical time for New Zealand, with opportunities to achieve fantastic outcomes for our communities – or to squander more money than ever before. It is an essential time for the Government to work hand-in-hand with industry, and an independent agency can facilitate this."



## Letter to the editor

The report on page 12 of the last Water New Zealand magazine about the WIOG conference had a factual inaccuracy. The winner of the third Annual WIOG/Ixom National Water Taste Competition was reported as being Hauraki District Council's Raglan water supply, but it was actually Waikato District Council's Raglan water supply that was named as the country's best tasting water.

*John Brown*  
Senior communications advisor  
Waikato District Council

[apologies John, and we did think it was some distance to pump water – ed]

# Seismic resilience and water

Engineers have called for fresh thinking about our seismic and water challenges.

A report called Engineering a Better New Zealand from Engineering New Zealand, sets out an expert engineering vision on this subject and risk to water infrastructure.

Engineering New Zealand president Dean Kimpton calls for; "A new regulatory approach to existing buildings that better protects people from severe earthquakes.

"We also call for rethink on what we're designing buildings for – is it enough just to allow evacuation or should we be making buildings that have a life beyond a moderate earthquake?"

"In terms of water, we support the Government's move to fix our 'broken drinking-water system', and we ask the community to place a greater value on safe water."

Engineering New Zealand chief executive Susan Freeman-Greene says it's time for engineers to speak out and make their voice heard.

"Engineers work at the coalface of seismic and water issues. They're best placed to work with our communities to identify and solve these challenges."

The full report can be downloaded at [tinyurl.com/yatajwpe](http://tinyurl.com/yatajwpe).

## Sobering lesson from the US

The US state of Michigan's health director has been ordered by a judge to stand trial for involuntary manslaughter over two deaths linked to a tainted water legionnaires' disease scandal in the Flint area.

Experts claim Flint's water was not properly treated when it was drawn from the Flint river in 2014 and 2015, when at least 90 cases of legionnaires' disease occurred in Genesee county.

District court judge David Goggins said deaths probably could have been prevented if the outbreak had been publicly known. He said keeping the public in the dark was "corrupt".

The investigation is part of a larger investigation into how Flint's water system became contaminated when the city used Flint river water for 18 months. The water was not treated to reduce corrosion and lead leached from old pipes.

An additional 14 current or former state and

local officials have been charged with crimes, either related to legionnaires' disease or lead in the water.

"Normally we don't see government officials accused of manslaughter based on what they didn't do," says Peter Henning, a professor at Wayne State University law school in Detroit. "That does make it an unusual case, and it will make government officials be much more cautious."



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# Introducing the new Stormwater Group Committee

Innovation and resilience go hand in hand with stormwater management, so it's hardly surprising that Water New Zealand's Stormwater Group attracts an active and lively group of water professionals.

This year's no different, and they want to make sure they focus on promoting best practice and ensuring

members' relevant issues are heard and discussed; provide succession pathways for current and aspiring members; implement long-term planning for the future; and provide engagement within industry and with our country as a whole.

Here are the new committee members, along with candid and surprising facts about themselves. **WNZ**



## James Reddish

- Technical principal catchment management/chair Water New Zealand Stormwater Group
- WSP Opus
- **Stormwater fact:** I built a stormwater retention device and rain garden for garage and driveway at home. I'm not just all talk.
- **Interesting fact:** While working in London, I appeared in the advertising material for the London 2012 Olympic facilities, as someone had taken a photo of me reading a newspaper and then used it as stock footage for landscape visualisations – much to my surprise.



## Troy Brockbank

- Design manager/deputy chair
- Stormwater360
- **Stormwater fact:** Obsessed with taking photos of manhole covers.
- **Interesting fact:** Learnt to crochet when he was eight years old and has crocheted multiple blankets since.



## Dragan Tutulic

- Head of department, water resources
- DHI Water and Environment
- **Stormwater fact:** Everyone can help battle stormwater pollution.
- **Interesting fact:** He was an army tank driver; driving a 40-tonne beast was a surreal experience.



## Bronwyn Rhynd

- Director-environmental engineer/conference committee chair
- CKL/Stormwater Solutions
- **Stormwater fact:** Water-sensitive design integrates seamlessly with stormwater management.
- **Interesting fact:** My first child was the first baby to attend University of Auckland engineering lectures and be part of the engineering fraternity.





### Shaun Jones

- Principal development planning, healthy waters
- Auckland Council
- **Stormwater fact:** The "farm drains" we restore as part of greenfield development today become part of the urban waterways network tomorrow. What an opportunity.
- **Interesting fact:** My career started with an apprenticeship at Tranz Rail rebuilding locomotive v12 engines where the pistons are as tall as I am.



### John Rix

- Senior water resources consultant
- Tonkin + Taylor
- **Stormwater fact:** Never before have the opportunities to combine social, environmental and cultural outcomes relating to water been as good as they are right now.
- **Interesting fact:** I think my work colleagues secretly like it when I walk around in my cycling lycra.



### Sarah Boone

- Senior Policy Analyst – Water Directorate
- Ministry for the Environment
- **Stormwater fact:** Green infrastructure and water sensitive design can help us dramatically improve the ecosystem health of urban waterways.
- **Interesting fact:** One of my favourite places as a kid was an urban 'flood park' which provided natural drainage, recreation opportunities and important wildlife habitat.



### Zeb Worth

- Technical design lead/technical and policy subcommittee member
- CKL/Stormwater Solutions
- **Stormwater fact:** Water-sensitive design is more than just rain gardens.
- **Interesting fact:** I was the goalkeeper for the under-16 Auckland representative association football team.

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### Wolfgang Kanz

- Team leader stormwater and wastewater
- Gisborne District Council
- **Stormwater fact:** Green infrastructure and natural assets can offer better resilience and sustainability than hard engineering
- **Interesting fact:** My birthday is on National Wetlands Day every year. That must be some sort of sign.



### Hannah Breeds

- Senior water and waste engineer
- Stantec
- **Stormwater fact:** Has explored a number of the original bazelgette combined brick sewers in London – stunning.
- **Interesting fact:** Loves to dance – anything from salsa to modern jive to ballet.



### Gretel Roberts

- Technical guidance principal engineering and technical services
- Auckland Council
- **Stormwater fact:** Taught her kids how to take asptic stormwater samples in the rain.
- **Interesting fact:** Loves hobbies that involve smelting, casting, and high pressure vessels.



### Kate Purton

- Senior associate civil engineering
- Beca
- **Stormwater fact:** Interested in how stormwater and flood risk interact with the wider environment and climate change.
- **Interesting fact:** Enjoys silver jewellery making, kayaking, auntying and whisky drinking – but not at the same time.



### Hamish Jones

- Stormwater services leader
- Pattle Delamore Partners
- **Stormwater fact:** Our stormwater issues are solvable; we just all need to work together for the common good.
- **Interesting fact:** I previously worked in the funeral industry.



### Sarah Sutherland

- Environmental and sustainability manager for City Rail Link/ stormwater conference committee member
- Downer Soletanche Bachy joint venture
- **Stormwater fact:** I have a keen interest in sources of metals in stormwater
- **Interesting fact:** I have been an avid yogi for more than 15 years and am currently working on improving my freestanding headstand.



### Tom Cochrane

- Associate professor, Department of Civil and Natural Resources Engineering
- University of Canterbury
- **Stormwater fact:** The more we learn about stormwater, the greater good we can do to keep our waterways clean.
- **Interesting fact:** Enjoys alpaca farming in his spare time.



### Peter Christensen

- Director/committee member
- CTN Consulting
- **Stormwater fact:** Getting kids involved in stormwater management will help clean up our waters.
- **Interesting fact:** I built a chicken underpass at our home.





# 'Water Futures + 1'

Our white paper explores the critical uncertainties, challenges, and opportunities for global water security and the water industry.



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# Keeping watch over our sea levels

**Alan Titchall** talks climate change with coastal engineer Dr Rob Bell, the Principal Scientist – Coastal and Estuarine Physical Processes at NIWA.



**A number of climatology websites point out that, because the world is not flat, we have variations in sea levels around the world. We also experience a lot of land movement around our coast. So how do you model future sea level predictions without taking this into consideration?**

When you look at absolute changes over time in ocean sea level around New Zealand regionally, there's not much difference.

Sea level variability is fairly similar in Dunedin as it is in Auckland. There may be a little bit of difference from the West coast versus the East coast through the Tasman Sea affect, but, generally, our models pick that up.

When it comes to the rise in sea level relative to the land, then we need to factor in differences in vertical land movement, which we are studying through a Victoria University led project called NZSeaRise.

Some areas like the lower North Island are subsiding due to inter-seismic activity, going down around 2-3mm a year, whereas absolute sea level has been going up 3 to 4mm a year over the past 25 years. But other areas are either stable or uplifting. We can add this vertical land movement into projections of relative sea level rise for different regions.

---

Dr Rob Bell, the Principal Scientist – Coastal and Estuarine Physical Processes at NIWA.

**When it comes to weather patterns the MetService can predict cyclic patterns and prepare us for extreme events. Does NIWA have a similar perspective on our weather in terms of the influence of sea levels?**

Around our coasts and estuaries, coastal flooding often occurs when cyclones or mid-Tasman lows coincide with a particularly high tide, or a storm surge, and rainfall in the catchment area.

So that's why I was talking at the Stormwater Conference this year about 'joint probability'. From a lot of observations we've analysed it to get a reasonably pragmatic view of these combinations and how extreme they might go in terms of challenging weather events. I don't buy into 'we haven't had a 100 year storm for 50 years so we're due for one' scenario, because – as we experienced earlier this year – we've had two big events within a month. These coastal flooding events are becoming much more frequent on the back of the rising mean sea level.

**If those two events weren't predicted, is there an inherent degree of 'unpredictability' around weather events where you just have to take it on the chin?**

Yes, but there was a signalled forecast for between one and two tropical cyclones, during that time, and NIWA produces on its website what we call 'red alert tide days' (well ahead of time) that highlights days for king tides.

This is where we say to managers and landowners and infrastructure operators – keep a watch out for the weather because any dip in low pressure or winds is going to tip seawater over the edge. January 5 and February 1 this year were both red alert tide days, and it shouldn't be any surprise that on these days, when those kind of storm systems coincide, that you're going to have problems.

**Does NIWA work with the MET office on this?**

I wouldn't want to comment on that specifically, because I'm not involved directly with weather forecasting.

In our coastal hazard work, NIWA has been developing high-resolution models to forecast storm surges and waves, which are generated by storms and winds. To do this, NIWA's current weather model operates at 1.5 kilometre scales and runs on a high performance computer, so it's down at the suburb level.

NIWA's HIRDS (High Intensity Rainfall Design System) is currently at version three and is used throughout the stormwater industry for designing runoff and so on.

Version four is going through a peer review process and is due out soon, and will be of high interest to our water industry. It will feature from one hour to three-day rainfall durations and their return periods and the increases per degree rise in temperature as the climate changes.

**Since sea levels have only been monitored by accurate satellite technology since the early 1990s, you have to rely on mechanical tidal gauges at our East Coast ports to monitor sea levels back to 1900. But how accurate were they and how accurate is the data?**

A lot of data processing from Land Information New Zealand (LINZ) archives and the datum control is really important, and I think we've got a pretty reliable set which has formed our four-port historical record.

Agreed, our wider tidal gauge network is a bit ad hoc, and not nationally coordinated although LINZ does archive much of the data.

And while vertical land movement at our four main ports is different, when you factor that in they all paint a very consistent picture of increasing ocean sea level and the variability from El Nino, La Nina in the longer term (20-30 year) Interdecadal Pacific Oscillation.

Wellington [port] is showing the highest rate of sea level increase (relative to the land), which is 2.3mm a year over a 110-year period, while Auckland a bit smaller and Dunedin smaller again. But then Wellington has been subsiding (although measurements have only been available in the last 15 years).

**And your modelling can accurately provide for this subsiding?**

Yes. If you factor in the subsiding and look at adjusting for that, our gauges all coalesce towards around 1.7-1.8mm a year in the past, so they tell a very consistent story. I also think there was reasonable control on the accuracy of the tidal gauges over this period; as mechanical devices they were often checked.

We do have some gaps in the late 1990s and early 2000s where we've got missing data, but we are now working from 10 stations which provide wider coverage.



**LINZ is the authoritative source of tide prediction data in New Zealand. Does NIWA use the system?**

The primary purpose of the LINZ gauges operated by GeoNet is to record and disseminate tsunami events, which the tsunami response agencies use to determine warnings. These high-frequency gauges are not necessarily designed for long-term monitoring, and nor do we use them for that.

We rely more on the port gauges, our own NIWA gauges, and some of the council gauges that are there for the long haul using more appropriate instruments.

**Are there parts of our coast that are more vulnerable than others?**

Results from the Parliamentary Commissioner for the Environment study in 2015 highlighted some regions that had more risk exposure than others and, no surprises, they're parts of Canterbury, Hawkes Bay, south Dunedin and Hauraki Plains.

There are other coastal pockets, but those regions are the most exposed in terms of number of buildings, roading or the number of people living on low-lying land.

And we are now re-doing that work with actual scenarios of storm tides with 0.1 metre sea-level rise increments to look at adaptation thresholds for different areas, at both local and regional levels.

As a general example, if these low-lying areas experience a sea-level rise of just another 10 or 20 centimetres, that would be enough to expose 100 to 1000 houses, whereas other regions might require a metre of sea-level rise before that level of hazard exposure occurs.

There are some areas already experiencing frequent

coastal flooding and they tend to be smaller pockets. Tamaki Drive (Auckland) for instance, that's just one area, and there are parts of it that are regularly flooded on king tides and, at other times, it only takes a moderate low pressure system or waves to cause flooding.

**Could this not be the result of the Tamaki Drive base-load subsiding or the effect of silting along the edges of the Waitemata Harbour?**

No, silting doesn't effect this situation. Even if this was dredged, the seawater fills up the space on the next incoming tide and the tide continues to rise and fall relative to the mean sea level which is set by the wider Pacific Ocean sea level. So local dredging is not a solution to moderating sea level.

With the North West Motorway causeway [Auckland] we came up with an adaptive plan there where the work can be sequenced. They have completed the first sequence and sufficient flexibility has been built in to enable future modifications to the carriageway to accommodate another 0.7 of a metre of sea-level rise on top of the 0.8 metre rise that has already been built, so it has been future proofed for the foreseeable future.

This causeway was designed about seven years ago and it emphasises the point that we need to be similarly adapting some of our major coastal infrastructure.

If you're going to sink billions of dollars in, it's no good second-guessing the future, picking what we think today might be a best estimate sea-level rise.

Instead, you need to develop an adaptive plan or design that can be sequenced or move to a different option when levels of service diminish. **WNZ**





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# When habitats sink

While the focus is on raising sea levels threatening low lying habitats around the world some major cities are actually sinking under their own weight.

**M**any large urban settlements around the globe were built conveniently on low-lying land where rivers flow into the sea.

Jakarta, for instance, was built on swampy land on the edge of the Java Sea and has 13 rivers running through it.

North Jakarta has sunk 2.5 metres over the past decade and reportedly continues to sink by as much as 25 centimetres a year in some parts. Almost half of this mega-city now sits below sea level.

The dramatic rate at which Jakarta is sinking is partly down to the excessive extraction of groundwater, exacerbated by lax regulation allowing just about anyone to pump up their own groundwater, as water authorities can only meet 40 percent of the city's needs.

Authorities are involved in what is called the 'National Capital Integrated Coastal Development' (NCICD) project involving Dutch engineering firms and a multi-billion flood protection-land development plan for Jakarta Bay, made up



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of a dam, 17 islands in the bay, and a new city district (Great Garuda). The costs is around US\$40 billion.

Other cities, some the most populous on the planet, reportedly sinking faster than the sea level rises, include Ho Chi Minh City, Bangkok, Mumbai, Karachi, and Lagos.

And if the Intergovernmental Panel on Climate Change has got its modelling and projections right, and sea levels surpass a metre at the turn of the century, an estimated \$15 billion worth of property across low-lying Florida could be threatened. Meanwhile, hundreds of millions of dollars have been spent in the city of Miami to raise sea walls and elevate streets.

Another sinking city is Mexico City, which has sunk nearly 30 metres since the end of the 19th century. A growing population of more than 21 million people has led to limited water resources as the city pumps groundwater from aquifers, leading to land subsidence, or gradual sinking.

A study by NASA and the California Institute of Technology on subsidence in and around New Orleans (using NASA's airborne radar) revealed areas of the city dropping by over five centimetres a year. Over 50 percent of the city is already below sea level.

Bangkok, Thailand's capital city, also suffers from subsidence caused by water pumped from the city's aquifers. A floodwall, costing over US\$14 billion, has been proposed

to protect the city and its surrounding areas from the sea.

Technology called 'artificial recharge' is available to replace pumped up ground water in urban areas, but it comes at great cost.

The city of Tokyo used this method when it faced severe land subsidence some 50 years ago, and restricted groundwater extraction at the same time. Reportedly, land subsidence has subsequently halted.

Closer to home, recent tectonic research shows us how different parts of our country are either rising or subsiding, based on data collected by GeoNet's GPS recorders between 2000 and 2015, based on measurements at 189 places across the country.

Some regions, such as the North Island's east coast, have subsided by as much as 3mm a year for the past 15 years.

Other areas are on the rise. Parts of the Bay of Plenty coast, the Whanganui coast and south to the Kapiti region, and along the Otago, Westland and Southland coastlines, are rising at least 1mm per year. Inland areas of the South Island and the Southern Alps are rising by up to 6mm per year, while the Rotorua area reflects a substantial subsidence rate of 15 mm per year.

Earthquake prone areas such Kaikoura-Cape Campbell region (and Wellington in the past) can experience a massive subsidence or uplift. [WNZ](#)

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# Award winning water treatment plant

In south Auckland, the Mangere Wastewater Treatment Plant has been upgraded and the project picked up two major Civil Contractors New Zealand Awards. By **Mary Searle Bell**.

**A**lready the largest wastewater plant in the country, the Mangere Wastewater Treatment Plant has been expanded so it has the capacity to cope with the expected population growth in the city over the next 30 years.

The plant uses primary (mechanical), secondary (biological) and tertiary (filtration and ultraviolet radiation) methods to treat wastewater before it's discharged into the Manukau and Waitemata Harbours. Central to the project has been the expansion of the biological nutrient removal (BNR) facility.

Owner Watercare Services and designers CH2M Beca worked closely with a joint venture team of contractors, comprising HEB Construction and McConnell Dowell.

The scope of work for the \$140 million project included the construction of two new reactors, two clarifiers, a blower building, a splitter box (including connections for future duplication of reactors in 10 years), two secondary effluent pipelines, sludge storage tanks, a gravity belt thickener facility and interconnecting pipework to provide additional secondary treatment capacity for approximately 250,000 people.

Earthworks began in late 2015, and were made challenging by the “horrendous” ground conditions. The coastal site meant peaty soil, and around 120,000 cubic metres of this had to be removed, and substantial haul roads also had to be installed. Making things more difficult, the ground was also highly inconsistent as it had previously been used as a rubbish dump.

The frequency with which water was encountered and the subsequent use of pumps and long hoses meant that the crew were unable to set up materials on site. However, even with the poor conditions, the earthworks completed on schedule with no issues.

To improve the ground, 2400 piles, up to 18 metres long and weighing up to 500 kilograms each, were driven into the soil to a top level of 5.5 metres below the current ground level, before the design-build elements could be constructed.

As the team explained in its Hirepool Construction Awards entry: “In a typical construction sequence, the excavation to the final level would be completed and then the piling crew would come through to install the piles, then backfill to the finished level. However, due to the poor ground conditions







Derrick Adams, CEO, HEB Construction, speaks on behalf of the contractors and client, at the CCNZ National Awards.

on the platform (black saturated peat and grey clays) the very real risk of a machine rollover or the semi-submergence of a crane required a different approach. Piling before excavation was adopted.

“As piling hammers are not designed to work under the ground, the team collaborated, presenting and vetting a variety of solutions. Ultimately, they fitted a pronged extension over the 150 UC steel piles to attach it to the vibratory hammer with ongoing refinements made over the course of the job.”

Next up was the construction of the design-build elements, plus all the associated above and below ground pipework.

The construction of the reactor alone demonstrates the level of complexity on the Mangere Wastewater Treatment upgrade. The reactor comprises two halves in one main structure, each side holding 28,000,000 litres. This capacity makes it one of the largest water retaining structures in the country.

McConnell Dowell says the JV chose lightweight post-tensioned precast concrete structures, cast on site by Preco

Precast Concrete. A total of 174 panels, each weighing 60 tonnes, were required.

“These heavy weight wall panels included a walkway and were placed over starter bars cast into the floor slabs. Incredible accuracy was required to ensure the 8700 starter bars were all in position. Jigs were used to ensure the starter bars aligned with the precast panel spacing. A 280-tonne crane dropped the reactor panels into place and a concrete stitch joined them together.”

“The drive was for resilient, watertight and quick to erect structures,” McConnell Dowell says. “The floors of the reactors and clarifiers were post tensioned slabs with the reactor floor poured in sections, each 1200 cubic metres.”

The floors were up to 400 mm thick and all graded to over 40 sumps. The use of post-tensioned floor slabs meant less reinforcing steel was required, making for much lighter structures.

The mechanical and electrical fit out was significant and took 11 months to complete. It included over 2.5 kilometres of handrail, hundreds of metres of 25mm to 600mm stainless steel pipe, 35 motors, 11,500 diffusers and 92 kilometres of cable.

Another challenge to the project was the installation of the twin secondary effluent pipes under Greenwood Road. The pipejacking method used required precision in execution due to a whole manner of services already present underground, including the main fuel pipeline from Marsden Point to Auckland/Auckland Airport, 11kV power cables, a high pressure gas main, water and telephone lines, running along the alignment.

The project also included the construction of a new road linking Ascot Road and Puketutu Island, and an embankment that will shield the plant’s neighbours from the facility. The embankment also provides a pathway between the Watercare Coastal Walkway and the Greenwood Road Park and has been enhanced by the planting of around 100,000 native plants over some 10 hectares of constructed landform.

The commissioning phase of the project was completed in March 2018 after six months of testing.

Watercare BNR project manager Sven Harlos has overseen the design and construction: “The new facility will increase Mangere’s BNR capacity as Auckland’s population grows by an estimated one million people over the next 30 years. It’s hugely satisfying to see the plant up and running, I’m enormously proud of all the work Watercare staff and our contractors have put into it.”

The plant’s increased capacity will ensure the highest quality treated wastewater continues to be discharged to the Manukau Harbour, even during heavy rainfall.

This is one of many major infrastructure projects Watercare will deliver to accommodate Auckland’s continued growth.

The BNR project forms part of the \$4.9 billion capital infrastructure investment forecast during the next 10 years.

Other upcoming infrastructure projects include the Central Interceptor project, Hunua 4 Section 11, North Harbour No. 2 Watermain and Northern Interceptor, a replacement for Huia WTP and Warkworth/Snells Beach wastewater upgrades and Clarks Beach sub-regional upgrades. [WZN](http://www.waternz.org.nz)



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# BUILDING A NEW – *a water*





# CITY PRECINCT

## *perspective*



Wynyard Quarter on Auckland's waterfront has been transforming over the past decade or so, as the old industrial and working heritage of this part of the city is slowly replaced by a new urban landscape with a modern water infrastructure.

BY MARY SEARLE BELL.

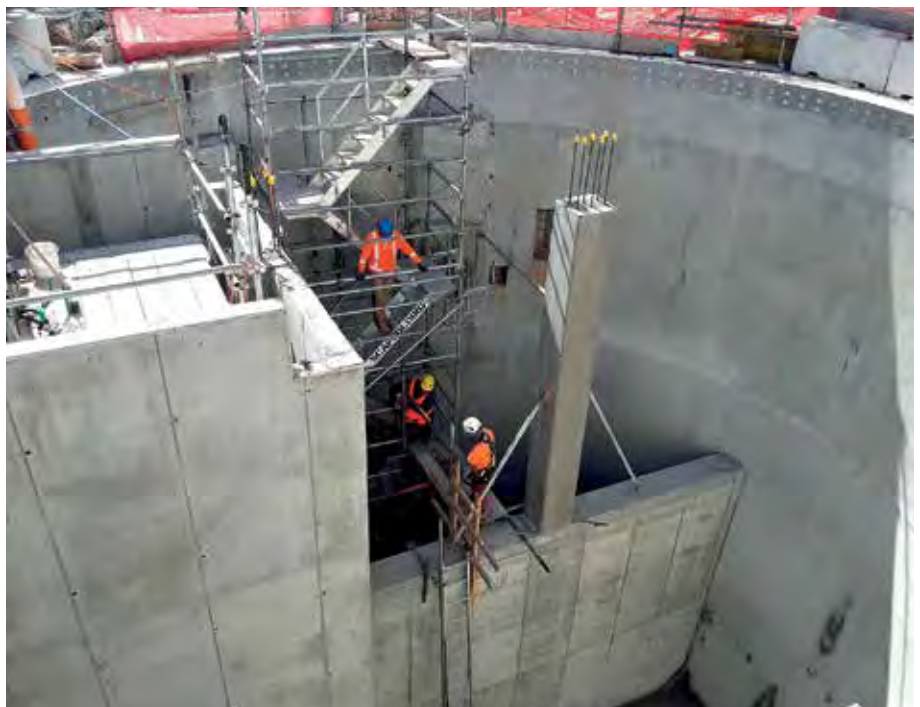
**W**ynyard Quarter was progressively constructed by the Auckland Harbour Board to provide additional berthage capacity and flat land for port related activities. From the 1930s it started to be used for bulk petro-chemical storage, leading to the area becoming known as the Tank Farm.

Changes to the way fuel was supplied to Auckland meant much of the land was no longer required for fuel storage, freeing it up for revitalisation. In 2005, a vision was developed to transform the area in stages over 25 years.

In August 2011, stage one opened and comprised \$120 million of capital projects. When Wynyard Quarter is fully developed in 2030, it will be home to around 3000 residents as well as 25,000 workers.

Along with the new buildings, the streets are getting a facelift. But it isn't just what is on the surface that counts. Much of the work is happening below ground.

New piping and landscape design improve the stormwater before it flows into the



A 200mm layer of shotcrete was applied on the tank walls in three stages as the excavation progressed. Then a two-metre-thick base was constructed to ensure the structure doesn't float.







harbour, and the wastewater network is getting an upgrade so that it can support the increased population forecast for the area.

Watercare awarded the construction of a new \$16 million wastewater pump station and rising main under separate contracts: the pump station to Fulton Hogan and the rising main to Hawkins (now Downer). Work on the rising main began along with street upgrades in early 2015, and on the pump station in December 2016.

Peter Kukulsky, project engineer at Watercare, says the 800,000 litre tank has been constructed using the secant piling method. This helped combat the difficulties posed by high ground water levels.

“Sixty-two interlocking male and female piles were drilled down to bedrock 20 metres below the ground level. Concrete for the piles was poured progressively – 45MPa for male and 8Mpa for female piles,” he explains. “A ring beam was poured to connect the piles at the top. Earth was then excavated out from within the piles.”

Peter says the total volume of excavated earth from the tank area was approximately 1200 cubic metres, plus a further 400 cubic metres from the ancillary chambers area (valve, flowmeter and odour control unit chambers).

“The soil within the site is contaminated (mainly



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hydrocarbons) – the legacy of the previous occupants. This meant any earth being carted off site had to be taken to a special waste disposal site and additional personal protective equipment had to be worn by workers when handling the soil. We also installed a sprinkler system around the entire perimeter to prevent any odours leaving the site.”

A 200mm layer of shotcrete was applied on the tank walls in three stages as the excavation progressed. Then a two-metre-thick base was constructed to ensure the structure doesn’t float.

Peter says, to install the inlet pipe for the tank, the contractor had to make an opening through the secant piles and thrust a steel casing towards the inlet manhole in Pakenham Street.

“Ground water was expected, however, the inflow was 10 times higher than expected and completely flooded the tank. It took two months to stop the ingress and pump the water down.

“Fulton Hogan came up with the method of injecting an inert chemical compound around the outside of the structure to seal it.”

Peter says an activated carbon odour control unit, housed in an underground chamber, will treat any odours from the pump station.

Above ground, a control building has been constructed – its 10.5-metre-high curved walls reflect the nearby silo stacks. It sits in what will be landscaped into a small neighbourhood park. This small ‘pocket park’ will be constructed by Auckland Transport once the pump station project is complete.

The pump station pipework connects onto a 720 metre long rising main installed by Downer under three separate contracts. The rising main discharges into the Orakei Main Sewer on Victoria Street West.

Within the Wynyard Quarter itself, the new pipeline has been laid by open trenching in ground that had been stabilised by IMS (In-situ Mass Stabilisation). Pieter Maarschalk, who was project manager with Watercare until recently, explains that IMS is a technique where cement is mixed into the ground using specialised machinery to create, in effect, a weak concrete that enables trenching to be done in poor quality ground that would otherwise need sheet piling or similar for support.

“The ‘poor quality’ here was due to it being reclaimed land with a very high and tidally-influenced water table,” he says. “There were, nevertheless, a couple of places within Wynyard

Quarter where IMS did not work particularly well, due either to proximity to existing services – where it was physically impossible to get the mixing head in – or where the trench got down into the underlying Puketoka formation, which the equipment could not penetrate. In two sections this was overcome by sheetpiling and in another a short timber heading was driven under existing services.”

Outside Wynyard Quarter, the section in Halsey Street, between Fanshawe and Victoria Streets, was laid by open trenching. Pieter says the main challenge here was traffic management.

For the crossing of Victoria Street West, to minimise the road width closed by excavation at any one time, an oversize (525mm) duct of concrete pipes was laid during a December-January low traffic period and the polyethylene service pipe pulled in afterwards.

The same method was attempted to cross Fanshawe Street. Pieter says it was successful for part of the way under the eastbound lanes but could not be used under the westbound lanes due to traffic management considerations.

“Due to underground obstructions such as an old sea wall under the eastbound lanes, in one part it turned out to be more practicable to lay the PE pipe by direct trenching rather than in a concrete duct. Under the westbound lanes, where the road could not be even partially closed, a 1300mm concrete sleeve was installed by pipe-jacking and the PE pipe laid inside. To support the PE pipe and achieve the required grade, a 525mm uPVC duct was first secured inside the 1300mm pipe, and then the PE pipe was pulled in.”

An additional challenge under Fanshawe Street was to safely tunnel under two 220kV cable clusters belonging to Transpower.

Peter credits the project’s success to having really good teams from Fulton Hogan and Downer. He also says the collaboration between the three council-owned organisations involved – Watercare, Panuku Development Auckland, and Auckland Transport – has resulted in an “unusual and cool building which will enhance the surrounding urban environment”.

“People using the park will quite likely not even realise that there is an underground wastewater pump station under their feet.” **WNZ**





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# A passion for **stormwater management**

Named as Stormwater Professional of the Year at this year's Stormwater Conference, Bronwyn Rhynd is an environmental engineer with a flair for stormwater treatment, disposal and management. She talks with **Mary Searle Bell**.





**W**hen selecting her for the award, the judges noted Bronwyn Rhynd's; "long track record of designing many innovative low impact/water-sensitive stormwater solutions and seeing them through construction, especially in the Auckland region."

They also commended her interest in helping young professionals in the industry and her time and service to the Stormwater Conference and Stormwater group.

After completing a diploma in civil engineering, Rhynd began her career as a cadet – surveying, drafting and building up her technical expertise. She then headed off overseas travelling, and when she returned, she decided to move into the professional sector.

"I started my Bachelor of Engineering degree, and also started a family, with my daughter Holly being the first engineering baby born at Auckland University. She's now 22 and just completed her degree – unfortunately not engineering, but a Bachelor of Commerce.

"As parents, you would love your children to follow in your footsteps. However, mine are not engineering-inclined – perhaps they feel as though they have done that vicariously," she says. "My younger daughter, Ruby, is about to start university in USA with a rowing scholarship, and my son, Maximillian, who's in year 12 at school, is more in the technical space through product design."

In the last two years of her degree, Rhynd chose to focus on water resources as they interested her, selecting hydrological and environmental papers. After graduating, she started working for an environmental consultant before deciding to go out on her own.

"It was happenstance," she says. "I wanted to work part time while raising my family, to enjoy the best of both worlds. It just made sense to set up my own business. In 2004, I established Stormwater Solutions."

While juggling work and family, Rhynd threw more study into the mix, enrolling in a Master in Environmental Engineering Science through the University of New South Wales.

"It's all about flexibility, being able to do a few things at the same time," she says of that hectic period. "It's as the old adage says, 'If you want something done, ask a busy person.' If you're passionate about it, you'll make time."

And passion for stormwater management is something Rhynd seems to have in spades.

Within 10 years, Rhynd's firm had grown to have a staff of eight and had built up a varied client base that included the likes of private developers, architects, insurance companies and like-minded consultants who required stormwater specialist input. It also supported community groups with environmental and stormwater management solutions.

Then came a crossroads: "We had a decision to make – either continue to grow Stormwater Solutions and develop a wider variety of skills or merge with a like-minded group, one that shared our vision and mindset."

She chose to join with CKL, a land development



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consultancy, with her team of stormwater solution specialists complementing the planning, surveying, land development and engineering work it undertakes.

The “happy merger” took place in 2015, and Rhynd is a director of the firm, with a governance and technical overview.

“I work vertically in the business; I still pick up a calculator and do CAD drawing. Engineers want to be involved – it’s in our DNA. Management is a separate skill that evolves over time and dedication.”

She also provides her expertise to the Environment Court as an expert witness.

CKL works supporting growth in the ‘golden triangle’ of Auckland, Waikato and Bay of Plenty. It has a staff of about 100 across three offices – Auckland, Hamilton and Te Awamutu. Rhynd is based in Auckland but spends at least one day a week in Waikato.

“As a company, we support land development from an environmental basis and have the knowledge to provide a wide variety of approaches to the projects we are involved in,” she says.

With regards to the wider stormwater space, Rhynd says some great initiatives are being implemented across the country, such as the Auckland Unitary Plan, which sets long-term strategies to minimise flooding risks as well as upgrading infrastructure.

“There is a focus on outcomes-based assessments through the Unitary Plan. This flows through to more effective applications of stormwater management within the urban developments. However, this could be supported more effectively with supplementary training through the industry.”

She thinks those in the water industry are serving the country well, providing sound advice and solutions to local authorities and developers alike.

“I think sometimes we are a little bit hard on ourselves. We are doing OK. We are learning from the past and from overseas experience – especially Australia, which is a world leader in this space. Ten years ago, stormwater management was tacked on to a development; now we are involved from the initial or start up meetings.

“Our clients do see the benefits of stormwater management. Some of our clients are developers who are business owners, and like all business owners, you do need to focus on the bottom line to be successful.

“However, most want to build good sustainable developments, and stormwater management is one part of this.”

She says the days of council versus developer are over, and the goals of the two are better aligned, making it much easier to deliver a solid outcome.

Rhynd has great praise for Christchurch, which she says has responded well post-earthquake, and also says Queenstown is also coping well with its rapid development.

“You have to respond according to your topography and geography, amongst other attributes of the site, when assessing options for management of stormwater. Look at other solutions; learn and adapt; exchange ideas; spend time investigating examples and ways to implement these more innovative ideas.

“More collaborative approaches are definitely the way forward. And there’s nothing quite like a natural disaster to bring stormwater management to the forefront.”

With this emphasis on working together, it comes as no surprise to hear Rhynd is a big fan of conferences and focus groups as a way of stimulating and sharing ideas. She is dedicated to supporting the growth and development of the industry and consequently regularly contributes to various local and international conferences.

She is also on the committee of the Stormwater Group and was fundamental in establishing the Professional of the Year award, saying that as an industry “we need to sing our praises” for the good work being done.

“When I suggested setting up this award three years ago, I never thought I’d be on the receiving end. It was an honour to be recognised by my peers and to be seen to be making a difference.

“I’m simply trying to improve stormwater management in New Zealand.” **WZN**



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# Four and a half decades later

Rob Fullerton has had a full and interesting career in the water industry, and most of that has been spent with Beca. He speaks with **Mary Searle Bell**.

**A**fter Rob Fullerton completed a Bachelor of Science degree in 1971, the next thing on his to-do list was the classic Kiwi OE.

While working as a truck driver in northern Queensland, he saw an advertisement from an engineering consultancy seeking a science graduate to build a pilot plant to extract water from a wastewater sewer to provide irrigation water for the Townsville Golf Course.

It's a commonplace technology now, but 40 years ago, the concept of 'sewer mining' was quite new, he says.

That serendipitous job with McIntyre & Associates was the beginning of Fullerton's long and successful career in the water and wastewater industry.

When time came for him to return to New Zealand, serendipity again played a key part in his career development.

"One of the partners at McIntyre & Associates had been working on a wastewater project with ENEX [Engineering Export Association of New Zealand] in Malaysia, and he said to me, 'I've been working with a water chemist, a Kiwi who works for Steven Fitzmaurice.'"

He joined Steven Fitzmaurice's water resources laboratory as a water chemist in 1974, tackling a variety of municipal water and wastewater projects all over the country before the sharemarket crash in 1987 brought a downturn for water and wastewater engineering in New Zealand.

Consequently, Steven Fitzmaurice was purchased by Beca, a move that expanded Fullerton's opportunities significantly.

That was 30 years ago, and Fullerton is still at Beca. Over the years, he's worked on myriad projects, all over the world. Along with many local water and wastewater treatment projects, he has worked on a number of Australian and Pacific Island projects and further afield.

His role at Beca has taken him from modelling a drinking water supply reservoir in Singapore, to a wastewater treatment plant in Jakarta, to swine wastewater treatment in Chile, to treatment plants for a brewery in Vietnam and a soy milk plant in Thailand, and many more.

"We had a staff of around 30 at Steven Fitzmaurice. Working for a smaller consultancy means you work in a wider range of engineering disciplines – from design to

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structural work and so on,” says Fullerton.

“Moving to Beca, which had a staff of about 500 when I joined and now has over 3000, meant my work became more focused on process engineering, but also meant a lot more overseas opportunities.”

One overseas project still stands out for him: a three-month stint in a warzone with UNDP (United Nations Development Programme).

“We were trying to improve the water supply in Kabul, Afghanistan. The Russian-backed communist Government was in charge, and the war had meant a lot of people had moved to Kabul as a safe haven – the city’s population had rapidly grown from 750,000 to over two million.

Our work was to drill more wells, construct more reservoirs and extend the reticulation to cope with all the extra people.

“Not long after we left, the Mujahideen took over from the communists, then the Taliban took charge, and the place has been a basket case ever since.”

A memorable local project was the award-winning work at Wairakei Power Station for Contact Energy.

“We were engaged to reduce the hydrogen sulphide in the cooling water flow discharged to the Waikato River. We developed the solution of growing sulphur oxidising bacteria inside a pipe. The Wairakei bioreactors comprise 347 kilometres of polythene pipe, or 1800 200-metre lengths of HDPE pipe in parallel.

“It is the largest tubular bioreactor in the world and was designed by Beca. We undertook the pilot work between 2000 and 2010, it was built in 2011, commissioned in 2012, and in 2014 it won the International Water Association Global Innovation Award. I was very privileged to go to Lisbon, Portugal to receive the award on behalf of the company.”

After more than 45 years in the industry, Fullerton has seen a lot of changes along the way.

“When I started in the 70s, a lot of projects were constructing wastewater treatment plants. There was a lot of growth in the level of wastewater treatment, and the key driver was public health. These days, wastewater treatment is often directed towards the environment, but it’s important to remember that our key driver remains public health protection.”

He says his focus over the past 10-15 years has been industrial water and wastewater. “These projects have become increasingly complex and sophisticated. Wastewater is not a disposal thing any more. It is now a resource to be mined for water, fertiliser and so on.

“When I started working we talked about sewage plants, then it became pollution control plants, then wastewater treatment and biosolids, and now it’s resource recovery. In fact, things have come full circle. In the 70s, sludge incineration was a thing in the States, and I can see it coming back in another 10-15 years. It’ll be used as a source of energy rather than as an alternative to landfill.”

With regards to Water New Zealand, Fullerton has been involved from the time he first joined Steven Fitzmaurice.

“Our chief chemist was Frank Lowe, and he was one of the pioneers of New Zealand Water Supply and Disposal Association, one of the early precursors to Water New Zealand.”

Fullerton served as treasurer of NZWSDA for a number of years and later served as president of the association in 1997-98.

“One of the highlights of my presidency was hosting the association’s 40th anniversary dinner at Te Papa,” he says.

“I have seen the association go through significant growth over the years, from a small group of engineers operating in a voluntary capacity to the professional multimillion-dollar business it is today.” **WNZ**

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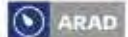
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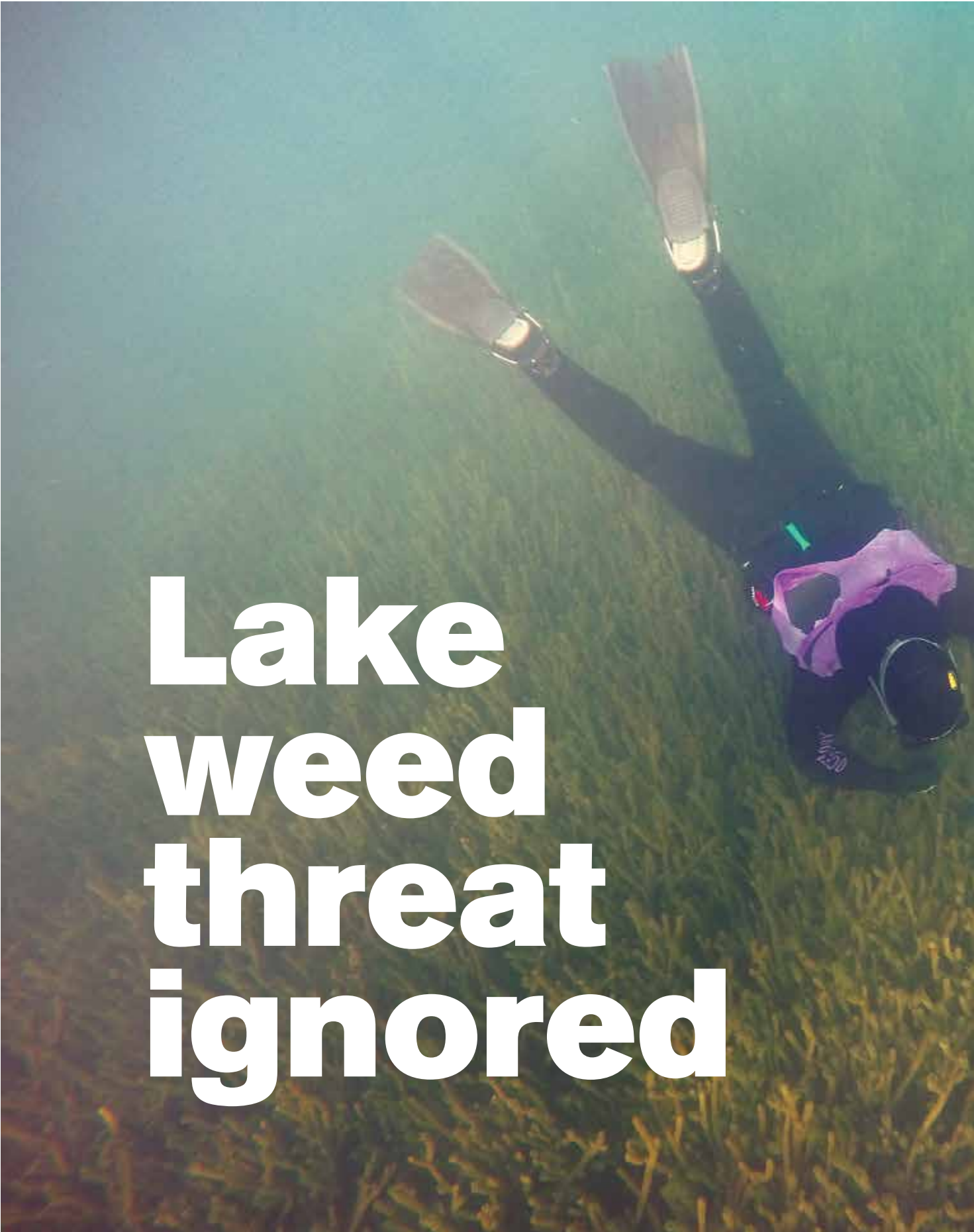
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# Lake weed threat ignored





A warning that invasive lagarosiphon weed would choke Central Otago's Lake Dunstan before flooding for the Clyde Dam power scheme went unheeded. **Denise McNabb** checks out the consequences of that inaction.

In 1985 Clive Howard-Williams was a scientist working at the Department of Scientific and Industrial Research (DSIR) when the Ministry of Works asked him for a report about any shoreline developments that could arise as a result of filling Lake Dunstan.

He wrote that lagarosiphon – more commonly known as curly oxygen weed – will saturate Lake Dunstan unless the lake's sides were cut straight down to a depth of at least four metres to prevent the weed taking root.

Today Howard-Williams is chief science adviser for the National Institute of Atmospheric Research (NIWA) in Christchurch.

He recalls clearly that back then lagarosiphon had already taken hold in Lake Wanaka since being discovered there in the lake in 1972. It would be only a matter of time before it spread down the Clutha River to Dunstan being artificially flooded for hydro generation.

"I remember drawing a diagram with a steep slope down to 4-5 metres to minimise the extent of the weed and prevent it rising above the surface, particularly at the northern end of the lake near Bendigo where there was a long gentle slope," he recalls.

"Before they filled the lake those bulldozers were clearing the shoreline of trees, boulders and all sorts of things so there was no obstruction. It wouldn't have been all that difficult for them to cut the sides."

Howard-Williams says he never received acknowledgement for the report, let alone any feedback.

Today the weed saturates just about every part of the lake habitat where there is a shoreline or terracing in the shallower areas.

There is no precise measure of the weed's biomass, but it's estimated it saturates around 500 hectares of the lake's 2600ha (26 square kilometres).

At the northern end, 20 kilometres from the town of Cromwell, near Bendigo, the lake is so choked the weed grows above the surface, a situation biosecurity experts call "top ending". In a large water body it can grow up to five metres tall.

This year the lake-bed's manager, government-owned Land Information New Zealand (LINZ) allocated \$100,000 to spray 70ha of the lagarosiphon infestation by helicopter using the desiccating and defoliating herbicide Diquat in "high value" areas around boat ramps, and swimming and camping spots. They also used commercial divers to cut the weed with a mechanical harvester.

Diver checking lagarosiphon.



Above: Aerial spraying lagarosiphon, Lake Dunstan.  
Opposite page: Diver gathering lagarosiphon.

Clyde Dam owner, Contact Energy, contributed \$50,000 to the control programme, and for the first time, the Otago Regional Council (ORC) contributed \$25,000 after more than 1000 people signed a petition in July 2017 demanding it take more responsibility for the lake weed.

The budget for Dunstan is small in comparison to the \$380,000 for Lake Wanaka funded by LINZ, the Queenstown Lakes District Council and \$50,000 from a local Wanaka philanthropist.

This year LINZ will spend \$415,000 in total on aquatic weed management at Lakes Wanaka, Dunstan, Wakatipu and the Kawarau River (flowing between Lakes Dunstan and Wakatipu) with other contributions bringing the total amount to \$550,000.

LINZ said there was no prospect of eradicating lagarosiphon in Lake Dunstan in the near or medium-term, but by clearing Lake Wanaka as much as possible it would reduce the downstream flows to Lake Dunstan.

Its priority is to sustainably manage the weed in Lake Wanaka and to keep it out of Lake Wakatipu because of its 'iconic' status.

The 240 kilometre lake edge of Wakatipu has been saved from infestation mainly because its surrounding mountains have steep cliff faces that plunge straight down into the water so there is no substrate, preventing the lagarosiphon taking hold as it can only survive down to 6.5 metres.

Much of the lake is too deep for it to take root although some small patches have been found and destroyed in the shallows at Frankton and Kingston during regular checks.

The nearby Shotover River's different flows and sediment loading have prevented lagarosiphon taking hold there,

but there is an infestation upstream of the confluence of the Kawarau and Shotover Rivers below the Kawarau Falls Bridge.

Weed snagged on jetboats that travel up the Kawarau River and into the lake are considered the most likely cause of the incidents of weed found in Frankton and Kingston.

Lagarosiphon was first recorded in the upper Kawarau River in 2008, so now both it and the Clutha Rivers feeding into Lake Dunstan contribute source fragments of the weed.

Howard-Williams reflects on how more than \$1 million will have been spent in five years time on trying to control lagarosiphon in Lake Dunstan with no certainty that an eradication solution will have been found by then.

Boffa Miskell, a national environmental, planning and design consultancy, has a strategic advisory partnership with LINZ to manage aquatic weeds and other biosecurity issues in the country's lakes, including eight in Rotorua.

It also controls hornwort in Lake Karapiro (the South Island is hornwort-free), spraying and weed-cutting in Lakes Dunstan, Wanaka and surrounding rivers. It also uses hessian weed mats to suffocate the weed in Lake Wanaka's lagarosiphon control programme after seeing the success of this method in Ireland where lagarosiphon is rampant.

Boffa Miskell's biosecurity project manager, Marcus Girvan says the government of the day might not have appreciated how big an issue the weed would become.

"They created the water body shape in the way that they thought would be best for the community with shallow swimming areas," he says.





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Girvan adds that there are screens in front of the turbines at the Clyde Dam that stop big items going through, including clumps of lagarosiphon that had cut loose in the lake.

“The risk is the weed getting on the screens and reducing flow. Hydro generators have to clean those screens and there is a cost to that.”

LINZ has been looking closely at work done in countries such as Ireland where lagarosiphon is prolific. It uses bio-control measures such as a leaf-mining fly and a shoot-tip mining midge to eat the plant, but LINZ has found trials with those insects in a controlled environment are costly.

## TOO EXPENSIVE

The answer to why Howard-Williams’ warning about lagarosiphon was not heeded lies in the National Institute of Water and Atmospheric Research’s (NIWA) Ten Year Management Plan for Lagarosiphon at Lake Dunstan: 2016 to 2025.

Penned by NIWA’s aquatic plants group manager, Mary de Winton and aquatic biodiversity and biosecurity principal scientist, John Clayton, it points to the Ministry of Works’ focus on the weed’s risk to the hydro scheme rather than its potential to choke the lake.

“The upstream presence of lagarosiphon was explored as a risk to the planned Clyde hydro-generation scheme and, as early as 1977, large weed beds were predicted to develop in the Clutha Arm of Lake Dunstan, in particular,” they wrote.

“The design phase considered removal of topsoil from areas to be inundated as a means to limit weed growth.

“However, contouring to avoid creating weed habitat (i.e., removing terraces at 2-4 metre depth) was deemed too expensive and, as tools for potential weed management existed, this weed risk was considered acceptable.”

An environmental impact report of the time said an aquatic plant management programme would be formulated to, “effectively minimise any potentially adverse effects and to obtain the maximum benefits for a multiple water use.”

Although some fishermen have embraced the aquatic weed thickets as great places for finding fish (and the Clutha Fisheries Trust and Otago Fish and Game Council claims it benefits fish and other wildlife in the lake), lagarosiphon has been known to inhibit fish access to spawning areas, says NIWA.

It also tangles fishing lines and gets caught on outboard motors, boats, boat trailers, nets and machinery, exacerbating the risk of it being spread to other areas unless the equipment and boats are cleaned properly.

## WEED ORIGINS

The aquarium and nursery trade brought the female species of lagarosiphon to New Zealand from South Africa in 1950.

It is thought to have entered the country’s waterways through an aquarium owner liberating goldfish from a bowl containing the weed into a river or a storm-water system. It was found in Rotorua’s lakes in the late 1950s.

In 1982 the government introduced legislation under the Noxious Plant Act 1978 to prohibit the sale, propagation and distribution of submerged weeds, including lagarosiphon.

“Lagarosiphon subsequently invaded and replaced the



Marcus Girvan, biosecurity project manager, Boffa Miskell.

native plants, which now only persist beyond the most favourable habitat and depth range of lagarosiphon,’ NIWA’s report said.

By 1988 the weed was considered beyond a manageable level for containment or eradication in the upper Clutha River. By 1993, when Lake Dunstan was filled, native submerged vegetation established rapidly, probably due to greater sources in the Clutha River, the report said.

For a decade after that not a great deal of attention was paid to the detrimental effect of the weed on the lake as a recreational playground, or how its clumping nature trapped silt, inhibiting water flow and that it’s invasive nature squeezed out native aquatic plants.

“It was in a really bad state in the 1990s,” says Girvan.

“There was a time when it was deemed the state of weed in Wanaka was so habitat-saturated there was no control until it was deemed incorrect and that it should have been monitored all along.

“It’s disappointing because it sets the programme back years when that sort of thing happens.”

## CONTAINMENT

In June Boffa Miskell’s contractors sprayed Diquat on the weed at Lake Dunstan near Bendigo, Devils Creek, and Northburn to the north and at its swimming beach.

It also cut the weed in high-use areas down to 1.5 metres below the surface with mechanical cutters.

“When you cut away the old material it tends to grow back cleaner then, in late summer, we can go in and spray it again in suitable weather conditions when it is new and healthy,” says Girvan.

Divers also remove weed around “hygiene spots” such as boat ramps where people enter and leave the lake or put their boat trailers into the water.

“It’s really easy to snag weed on trailers, boats and fishing equipment,” adds Girvan.

“People need to understand what the risks are and to do the ‘check, clean, dry’ process we have been promoting since *Didymo* made its way into New Zealand.” [WNZ](#)



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# What a waste



A decentralised wastewater treatment approach could overcome many of the disadvantages of the present system. By **Daniel Gapes**, research leader, clean technologies, Scion.

**E**arth is a closed system. The amount of water and nutrients like phosphorus available is finite and we can't make any more. So why do we keep flushing our resources away?

People don't like to think about where their waste goes. It is preferable just to push a button or turn on a tap and see it all wash away. They are vaguely aware it travels down pipes to a treatment plant where it's stored in big ponds, cleaned up and somehow disposed of (best case scenario).

Has the centralised waste treatment approach had its day? It requires a lot of infrastructure, uses a lot of water, is energy intensive, vulnerable to natural disasters such as earthquakes and floods and is a system under pressure as populations grow. It is also a very linear process: waste in and largely waste out.

A group of researchers at Scion, the Crown research institute for forestry, wood and biomaterials research, is starting to ask how we could do things differently. The team has been thinking about decentralised systems, combined with resource recovery – where waste becomes a resource.

The idea has grown from the team's work on safe sanitation systems that can not only run "off the grid" in areas with limited water, sewer and energy supplies but also recover resources. The leap from self-contained units for developing nations to decentralised units that could treat wastewater and recover resources on an apartment, city block or neighbourhood scale is a short one.

The researchers began with some basic questions. What is possible? What is already happening? What might the pitfalls be? How could this sort of change be implemented? To help answer (some of) these questions and to take the idea of a decentralised, circular economy approach to wastewater

treatment further, the Scion team looked for practical and theoretical examples of similar approaches around the world and hosted a workshop for stakeholders working in and around wastewater and our wider urban infrastructure.

Thinking about cities in 2050, the workshop participants discussed possible futures and issues. Two representatives of the Cooperative Research Centre (CRC) for Water Sensitive Cities attended the workshop, giving an Australian perspective on transitioning city infrastructure to put water at the heart of cities' biophysical, economic and social wellbeing. At the conclusion, everyone was eager to be involved in future activities, particularly tackling government and societal issues to enable the development of new wastewater systems.

## THINKING AHEAD – A FUTURE VISION

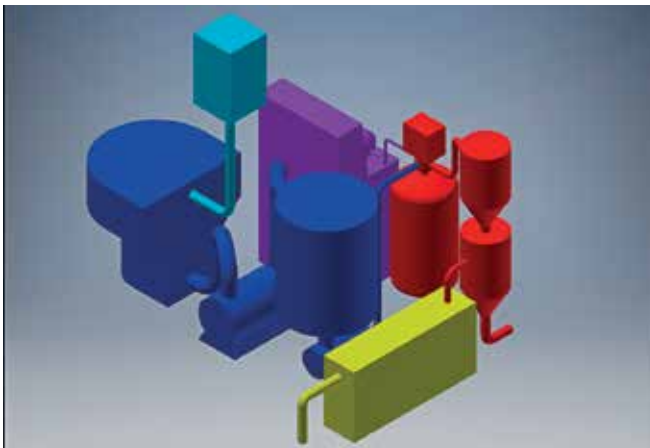
A decentralised, circular economy approach to wastewater treatment challenges the current linear urban-sprawl model. Combining the trend towards denser neighbourhoods with new small-scale wastewater processing options as they become practical gives rise to possibilities for local resource recovery.

In turn, use of these locally recovered resources for producing food and other products for the community is the step that closes the circular economy loop. In the long term, localised circular economies using the recovered resources are likely to create new opportunities and improve community wellbeing. People will also be able to reconnect with where their food comes from, as well as other aspects of urban living that make life comfortable.

## IMPLICATIONS AND CHALLENGES

Moving towards decentralised circular economy cities has implications beyond transforming existing municipal infrastructure and building new infrastructure. In particular, cultural and societal views and taboos around waste are likely to affect the social acceptance of community level wastewater processing and reuse of resources from wastewater.

New treatments and systems for recovery will be needed to avoid risks to human health. Many potential options have been demonstrated at a laboratory or pilot scale. Work is already under way to incorporate these and other technologies into centralised wastewater treatment to promote resource recovery and reduce environmental loads. Work is also going on globally on small-scale solutions for areas where centralised solutions cannot easily be used. Scion's own work using hydrothermal waste treatment at both large and small scale is just one part of the ongoing development.



Schematic representation of self-contained toilet and treatment unit.

IMAGE COURTESY OF ROB WHITTON.



Developing the technology is possibly the least problematic area of introducing decentralised and circular waste treatment. Alongside this, infrastructure development and the social acceptance of a circular economy need to happen. But even that may not be the biggest obstacle. The workshop and research found the biggest challenges of introducing a new way to treat urban wastewater were generating the desire and momentum to change.

## DISRUPTING THE STATUS QUO

Decentralising services is possible. The growing use of solar energy, especially as the technology improves and the costs drop, is a good example. Where people perceive a benefit such as saving money on their energy bills, they will make the effort and spend the money.

But solar energy systems are easy to retrofit. New systems would have to be perceived as equal or better to compete. Governance and policy are likely to be needed to incentivise change and de-risk the transition, given concerns about stranded assets and human propensity to value sunk costs.

It may be that a transition would have to happen in phases, perhaps using a hybrid of decentralised infrastructure and centralised management and changing regulations. New models of operation and ownership are likely to be needed and innovative community organisations could play a role. Health and quality would also need to be continually monitored and

ensured. It may be that greenfield developments such as the planned ReGen Village in the Netherlands, with its aims of integrated and resilient neighbourhoods that power and feed self-reliant families, lead the way.

## LOOKING FORWARD

The Scion team want to start a national conversation about interactions between urban living and neighbourhood infrastructure, incorporating decentralised, circular economy thinking. They have used wastewater infrastructure as a platform from which to view the opportunities and challenges that might arise with such a transition.

Beyond wastewater, the conversation needs to be widened to include all water (potable, waste and storm) as well as energy, transport, and communications interconnectivity. The concept does not have to be limited to urban settings either.

Moving to small efficient treatment systems could open up options for marae, isolated communities and small towns with outdated and overloaded systems to safely and cheaply deal with sewage problems.

The Scion group is keen to formulate ideas for future collaboration and research to transition decentralised wastewater treatment and other services, with the goal of greater urban sustainability. Share your ideas and opinions by emailing [daniel.gapes@scionresearch.com](mailto:daniel.gapes@scionresearch.com) **WNZ**

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# A winter in the sun



**Stu Farrant** (below), from Morphum Environmental, talks about lessons from his Winston Churchill Fellowship that provided international travel and research into the complex issues of urban water management.

**A**s New Zealand battled through an unusually wet and wild June and July, I was fortunate to be undertaking my Winston Churchill Fellowship travels in the somewhat warmer climes of the northern hemisphere.

Funded to research what the enabling factors to support better urban water management were, I travelled to cities in Germany, Denmark, Sweden and USA to meet with industry leaders, visit exemplars and take in all things water.

This provided insights, inspiration and moments of reflection which not only galvanised my passion to push for better urban outcomes but also demonstrated that transformative change is achievable with the right attitude.

Having returned here four years ago, following over five years working with industry leaders in Australia, I felt I had a reasonable understanding of the barriers which seem to limit our transition towards better integrated water management in the urban context.

Those involved in the recent and ongoing MfE WSUD workstream and the “*Activating Water Sensitive Urban Design*” National Science Challenge project will have recently delved deep into the barriers and challenges that the industry faces in the implementation of improved urban water practice.

These range from community disconnect with waterways, perceived financial constraints on developments, technical capacity and resistance based on previous bad experiences. These are all valid concerns to be overcome but the question for me was how have leading global cities been able to move beyond these.



Funding through the Winston Churchill Trust therefore provided an opportune chance to learn from cities which receive accolades as examples of how we can address environmental and social concerns regarding stormwater, wastewater and drinking water while still maintaining financial viability in the provision of public and private assets.

I selected cities based not only on accolades alone but also based on scale (500,000 – 1,500,000 people), geography (mix of river and harbour settings) and climate (distinct seasons and variable rainfall).

While this excluded some of the recent standout work being implemented in Asia (China and Singapore) and responses to extreme climatic challenges (such as Masdar City in the United Arab Emirates) it was intended to provide examples which were relatable to New Zealand and could therefore provide tangible lessons.

Details of the many different projects and city wide approaches, which I was fortunate to experience first hand would fill this magazine and will be the subject for a number of presentations and reports that I will be delivering over the coming months.

But as a succinct summary it would be fair to say that the opportunities to embrace a more integrated and holistic approach to urban water management are many and that if I was to draw on my recent experiences I could easily envision a future where:

- Flood encumbered land does not exclude high value economic activity;



- Our cities' roading networks can be co-managed as a fundamental component of the stormwater system;
- Green roofs can be used to substantially reduce the volume of urban runoff in addition to providing insulation and urban ecology;
- Downpipes can be disconnected in high density developments with stormwater celebrated in the landscape;
- Private utility companies can deliver largely off grid three waters management for new inner city high rise developments with financial benefits to the tenants, utility and the municipality);
- Communities can connect with their catchments and use an awareness to drive retrofit of stormwater treatment;
- Green roofs can be mandated on CBD high rises with due regard for significant seismic threats (San Francisco).

As the saying goes, *the sum of the parts is greater than the whole*. In the case of urban water management I would conclude that this is most definitely the case.

Through my fellowship it is apparent that the barriers to change are largely based on misconception and institutional inertia and that whilst focusing on individual aspects of water management will deliver positive outcomes, adopting a truly integrated approach offers so much more in terms of resilience at a range of temporal and spatial scales.

Adopting this integrated approach need not be intimidating or at the expense of other urban investment but rather can complement it and drive flow-on benefits that generate economic benefit, social wellbeing and inter-generational environmental outcomes.

In travelling to such a diverse range of cities I observed enabling factors which transcend the differences and are largely independent of place. These factors were replicated across these leading cities and encapsulated by public officials, utility operators, consultants, academics and community advocates alike. Key enabling factors included:

- Political will to take action and be proactive rather than reactive;
- Confidence to move from problem definition to problem solution without using residual uncertainty as justification to defer;
- Use of financial incentives as catalyst to drive initial change in practice;
- Learning from experiences (both good and bad) to develop consistent approach which reflects local climate, topography and urban form;
- Foster innovation through taking an open mind to changing the status quo and not being constrained by the business as usual mentality;
- Willingness to involve community in decision making.
- Empowering communities through weaving a water narrative into our cities which educates in terms of water quality, flood resilience and our roles in the interrelationships between our urban centres and the wider environment;

- Monitoring success in terms of social and economic metrics as well as purely technical performance.

Undertaking travel for the purposes of research and on my own led me to reflect on a wide range of other urban attributes which both reflect the cities' attitudes and define how they function.

It is perhaps no surprise that the cities which are leaders in progressive water management have also been bold in transforming how citizens move through efficient public transport and cohesive cycle infrastructure, integrate vibrant public open spaces throughout the urban fabric, support widespread municipal composting/recycling and value good architecture alongside heritage.

Oh, and they also seemed to embrace good beer and a move towards high quality organic food production.

I returned to Wellington feeling really positive about both our ability to be more progressive with how we manage water in consideration of future generations and how this can act as a catalyst for a re-engagement with our urban and natural environments.

It is clear to me that that the barriers are indeed a construct of our own making and that collectively there is a real opportunity to contribute towards this change.

I would like to sincerely thank the Winston Churchill Trust for their generous funding and the team at Morphem Environmental for supporting my fellowship.

It is fantastic to have employers who recognise the value of such research and support the professional and personal development that opportunities such as this bring. **WNZ**

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# Supreme Court decision on fluoridation appeal



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

In this article we detail the Supreme Court's decision on the legality of local authorities adding fluoride to water supplies, and a brief update on the draft Health (Drinking Water) Amendment Bill and the setting up of the Maori Freshwater Forum.

In June 2018 the Supreme Court held that local authorities do have the jurisdiction and legal ability to fluoridate water supplies, and that fluoridation of drinking water does not constitute a breach of human rights.

In 2012, following public consultation, South Taranaki District Council made the decision to fluoridate the drinking water supplied to the towns of Patea and Waverly for the purposes of improving poor dental health in these two towns.

New Health challenged the decision of the Council by judicial review and sought declarations that the decision to add fluoride to the water supplies was ultra vires (outside the power of council to do), and that taking the action to fluoridate the drinking water was in breach of section 11 of the New Zealand Bill of Rights Act 1990 (NZBORA).

Section 11 provides that every person has the right to refuse to undergo medical treatment. The High Court dismissed this application for judicial review.

New Health also sought declarations that the two compounds (hydrofluorosilicic acid (HFA) and sodium silico fluoride (SSF)) added to water supplies for fluoridation purposes were medicines in terms of the Medicines Act 1981. The High Court found that HFA and SSF were not medicines under the Medicines Act, however the High Court recommended that the Minister of Health might regulate to exempt HFA and SSF from the definitions of medicines under the Medicines Act.

This recommendation from the High Court was followed, and the Medicines Amendment Regulations 2015 was introduced to amend the Medicine Act to declare HFA and SSF not to be medicines for the purposes of the Medicines Act.

New Health judicially challenged the validity of the Amendment Regulations and questioned whether they were made for an improper purpose (the alleged improper purpose being that they were introduced with the aim of circumventing New Health's appeal in relation to the High Court decision regarding legality of fluoridation).

All three appeals were heard by the Court of Appeal, which dismissed all three. All three decisions by the Court



of Appeal to dismiss were appealed to the Supreme Court.

The Supreme Court agreed with, and upheld, the Court of Appeal's dismissal of the appeals relating to the Amendment Regulations and the Medicines Act.

In a separate judgment the Supreme Court analysed the appeal relating to the NZBORA, and focused on the following questions of law:

- a. Whether the council had statutory power to fluoridate water in its territorial area;
- b. Whether fluoridating water engages section 11 of the NZBORA on the basis that it is forced medical treatment in breach of the right to refuse such treatment;
- c. If section 11 of NZBORA is engaged, is fluoridation a limitation on the section 11 right that is a reasonable limit prescribed by law as can be demonstrably justified in a free and democratic society in terms of section 5 of NZBORA; and
- d. Whether the legislative power to fluoridate can be given a meaning that is consistent with the rights and freedoms contained in the NZBORA, and if so what the impact of that preferred meaning would be.

We detail the Supreme Court's approach to these four points below.

#### **Whether the Council had statutory power to fluoridate water in its territorial area.**

The Supreme Court considered various sections of the Local Government Act 2002 (LGA).

Section 12 provides local authorities with 'full capacity to carry on or undertake any activity or business, do any act, or enter into any transaction' for the purposes of performing its role, which the Supreme Court referred to as "a general power of competence".

The Supreme Court also looked at section 125 which creates the requirement to assess the provision of water services, including water supply and provision of drinking water, within the district.

Section 126 specifies that this assessment is for the purpose of assessing, from a public health perspective, the adequacy of water within a district in light of the health risks to communities arising from any absence of, or deficiency in, water services, the quality of services available, and the extent to which drinking water provided by water supply services meets applicable regulatory standards. Section 130 of the LGA imparts an obligation on a local government organisation which provides water services to maintain such water services.

The Supreme Court considered that section 130 must be read against the power of general competence conferred on local authorities by section 12 and the broader public health powers and responsibilities in the Health Act.

The Supreme Court found that when read in that context,

section 130 can be considered an indication of Parliament's intention not to remove the power to fluoridate with the introduction of the LGA, where prior to the introduction of this law local authorities were recognised as having the power to fluoridate prior to the LGA entering into force in 2002.

The Supreme Court concluded that the council and other local authorities have the power to fluoridate drinking water.

#### **Does fluoridating water engage section 11 of the New Zealand Bill Of Rights Act 1990?**

Section 11 of the NZBORA specifies that 'Everyone has the right to refuse to undergo any medical treatment'.

The Court of Appeal concluded that section 11 applies to 'any compulsory medical treatment, whether provided in the course of a practitioner/patient relationship or as a public health measure'.

The Supreme Court majority decision found that the fluoridation of drinking water is the provision of medical treatment, as it involves the provision of a pharmacologically active substance for the purpose of treating those who ingest it for dental decay.

The Supreme Court also found that people who live or work in areas where fluoridation occurs have no practical option but to ingest the fluoride added to the water, and that therefore the treatment is compulsory. The Supreme Court concluded that section 11 is therefore engaged.

William Young J in a minority decision considered that section 11 of the NZBORA was not engaged by the fluoridation of drinking water as he considered that fluoridation was not medication:

'[207]... Fluoridated water is not a medicine in either the ordinary understanding of the word or as it is used for regulatory purposes. Local authorities who supply water are not medical professionals. So we have something which is not a medicine supplied by parties who are not medical professionals. I see the fluoridation of water as closely analogous to the iodisation of salt. And I do not regard those who ingest iodised salt or bread made with iodised salt as undergoing medical treatment.'

On this conception of fluoridation not comprising medicine, William Young J considered the Council's actions of fluoridating drinking water to be acceptable, and agreed with the decision of the majority to dismiss the appeal.

#### **Is the statutory power to fluoridate a justified limitation on the section 11 right?**

Section 5 of the NZBORA provides:

"Subject to section 4, the rights and freedoms contained in this Bill of Rights may be subject only to such reasonable limits prescribed by law as can be demonstrably justified in a free and democratic society."

The Supreme Court considered that their conclusion that council and local authorities have legal power to fluoridate drinking water under the LGA and the Health Act satisfied the section 5 requirement that the fluoridation of water is ‘prescribed by law’.

In answering the question whether the power to fluoridate is a reasonable limit on the section 11 right that can be demonstrably justified in a free and democratic society, the Supreme Court acknowledged that scientific evidence relating to fluoridation is contentious; however it noted that the benefits are considered by the World Health Organisation and the Ministry of Health to be significant and the detriments insignificant. The Supreme Court also commented that fluoridation is common practice in many free and democratic nations.

The Supreme Court agreed with the lower Courts’ assessments that the objective of preventing and reducing dental decay is sufficiently important to justify a limitation on the section 11 right, assuming this can be done in a manner that is otherwise justified.

The Supreme Court also agreed that there is a rational connection between fluoridation and the purpose of preventing tooth decay, and that fluoridation of drinking water is a reasonable option to combat tooth decay. The Supreme Court concluded that the limit on the section 11 right was proportionate to the objective.

The Supreme Court concluded overall that the provisions authorising the fluoridation of drinking water limit the section 11 right only to an extent that is demonstrably justified in a free and democratic society for the purposes of section 5 of the NZBORA.

In an individual judgment, Glazebrook J considered that whether section 5 is satisfied depends on local conditions.

Dissenting minority Decision – Elias CJ.

In a dissenting minority judgment, Chief Justice Elias ruled there was no basis to interpret that either the LGA or the Health Act provide authority for bodies to add fluoride to water.

Elias CJ agreed with the majority assessment that the addition of fluoride is ‘medical treatment’ within the meaning of section 11 of the NZBORA, however concluded that section 12 of the LGA does not convey the power to local authorities to administer fluoride or other medical treatment for public health purposes, even when section 12 is read alongside the requirement of continuation of water supply in section 130 of the LGA, and the responsibilities of local authorities for public health and water supply contained in the LGA and the Health Act.

Her reasons for this included the consideration that part 2A of the Health Act and section 11 of the NZBORA mean that section 12 of the LGA cannot properly be interpreted as empowering local authorities to administer any medical treatment through the water supply, including fluoride.

Elias CJ further comments that she would be ‘reluctant to conclude that the provision of general discretionary powers is itself justifiable as a limitation of rights “prescribed by law” without more “explicit acknowledgement and empowerment”’.

## THOUGHTS ON THE DECISION

The majority of the Supreme Court has confirmed that fluoridation is a justified addition to the drinking water and that there is a clear legal authority for local authorities to fluoridate water supplies.

While there were dissenting opinions, we consider this will be the last to be heard of this issue for a while, unless there is a legislative amendment to make the Supreme Court’s decision a more express part of local government law.

### Draft Health (Drinking Water) Amendment Bill

The Health (Drinking Water) Amendment Bill (‘Bill’) was introduced to parliament on July 5, 2018. The Bill follows the release of the Report of the Havelock North Drinking Water Inquiry Part 2 in December 2017 (Inquiry). The Inquiry recommended the following changes to the management and regulation of water which are not dealt with in this Bill:

- a. Mandatory treatment of water supplies;
- b. Mandatory compliance with the Drinking Water Standards;
- c. Establishment of a dedicated drinking-water regulator; and
- d. Establishment of aggregated, dedicated drinking-water suppliers.

Major changes in response to these recommendations are being explored, with Cabinet forecast to receive further advice in late 2018.

The changes contained in the Bill are proposed as an interim step while work is underway to design a potential new regulatory regime. The Bill aims to improve the efficiency and efficacy of the existing drinking-water safety regime, allowing for faster implementation of major reforms to come in the future.

One of the key changes contained in the Bill is the removal of the requirement for a five year consultation and notification period for changes to Drinking Water Standards. The Bill incorporates changes which would allow the Minister of Health to be able to amend the Drinking Water Standards once satisfied that adequate consultation has occurred.

The hope is that this change will provide the ability to respond more quickly to address emerging public health risks and recognise new technologies in the water area.

The Bill also clarifies that water safety plans must be implemented in accordance with the timeframe as approved by a Drinking Water Assessor (Assessor), thereby ensuring that suppliers know that they must implement their plans in a timely manner as part of protecting public health.

The Bill includes provisions to streamline the process to appoint Assessors by removing the requirement for third party accreditation of Assessors. The requirement remains that the Director-General must be satisfied that a proposed Assessor has the experience, technical competence, and other qualifications to undertake compliance verification function.

The Bill is sought to be referred to the Health Select



Committee for consideration. Subject to the detail to be considered through the select committee process, we consider this Bill to be a meritorious interim response to the Inquiry's recommendations.

### The Maori Freshwater Forum

On August 3, Environmental Minister David Parker announced the establishment by the Government of Kahui Wai Maori; a new advisory group to facilitate discussion between the Crown and Maori interests on freshwater quality.

Water quality standards were outlined as a priority for the Government in their coalition agreement and the establishment of this group comes off the back of the June Land and Water Forum report which recommended the creation of a high-powered Land and Water Commission to provide national direction and oversight.

The key objectives of the group will be to collaboratively develop and analyse policy options on issues of particular importance to Maoridom across the freshwater reform programme and to facilitate engagement with the wider Maori community on key issues.

The Minister has said that, for nutrient-enriched

catchments, nutrient discharges will be a part of the conversation and there must be a fair allocation of nutrient discharges between existing investment and under-developed land. Parker continued that the Maori Freshwater Forum will advise on finding this balance as under-developed land is held disproportionately by Maori. While he maintains that freshwater quality is of huge significance to all New Zealanders, Parker said that "as we take the next steps towards this goal, we want to widen our engagement with Maori".

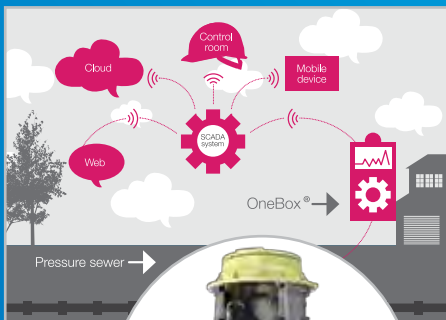
Part of the initial discussions with the group will include the agenda and priorities relating to 'at-risk' catchments to "ensure plans are in place for those catchments and take action where necessary". It is intended that the issue be addressed on a catchment-by-catchment basis – an approach recommended by the Land and Water Forum to enable rapid progress on 'at-risk' catchments.

The Iwi Chairs Forum and other Maori leadership groups have been asked to nominate members to the group who already have in-depth experience in water and land issues and additional members may also be appointed where they have particular knowledge or skills.

Members appointed will be approved by Cabinet. [WNZ](#)

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# It's all down to the dose

By **Keith Davis**, honorary life member and one of the founders of Water New Zealand.

**O**ne thing many seem to miss when it comes to the fluoridation of water supplies is that we all have some fluoride in our bones (about 3000 milligrams) and 1-4 milligrams of fluoride in our bloodstream, derived from sources not always available to children as their teeth are developing.

The reason we add it to drinking water is to ensure that children get an adequate supply of fluoride that may be lacking in their everyday diet. An adequate intake of fluoride contained in drinking water combined with wholesome eating habits and good dental hygiene will go a long way towards developing sound teeth and reducing dental bills in later life.

Several elements are considered essential in human nutrition. These include the metals: iron, a component of haemoglobin; zinc, a component of many enzymes and hormones; copper, for the metabolism of iron and a component of enzymes; manganese, for the metabolism of carbohydrates and lipids; molybdenum, a component of enzymes and for the metabolism of proteins; selenium, associated with vitamin E; chromium, for glucose metabolism; and cobalt, a component of vitamin B12.

The other essential elements are three of the halogens: fluorine, a component of tooth enamel and bone; chlorine, by far the greatest amount as hydrochloric acid in the stomach; and iodine, for the synthesis of thyroxin in the thyroid gland. It should be noted that all of the elements mentioned are toxic in high concentrations. Note the end comment.

We source much of our rock phosphate from the Western Sahara and Morocco. The rock phosphate is sedimentary in origin, having been laid down some 30-60 million years ago. The raw phosphate or the waste product of marine animals and birds that still contains the remains of bones and teeth is not readily usable as a fertiliser because of its low solubility in water.

To make the phosphorus more readily available as a fertiliser, it is acidified, usually with sulphuric acid, to produce a more soluble form of phosphate. One of the co-products of the process is fluorine, which can be captured in an acid form, hexafluorosilicic acid, and then, if required, converted to a water soluble salt, sodium silicofluoride.

It is this fluoride that is used to fluoridate drinking water. It also has a number of other uses, including in enamels for china and porcelain, insecticides, rodenticides and pharmaceuticals.

Fluoridation of our water supplies is governed by the

requirements of Drinking-water Standards for New Zealand 2005 (Revised 2008). Management is achieved through the use of Water New Zealand's good practice guide, Supply of Fluoride for Use in Drinking Water (May 2014).

This is a comprehensive 18-page manual dealing with all aspects of the handling and use of fluoride-containing compounds used in drinking water. Product quality control is included.

Apatite or hydroxyapatite is more basic than fluorapatite and is therefore more subject to acid attack. The key to sound teeth is to replace some hydroxyl ions with fluoride ions to make them more resistant to acid attack.

**“ All things are poison and nothing is without poison; only the dose permits something not to be poisonous. ”**

Carbohydrates, including sugars that can be converted to acid in plaque on teeth as well as acid drinks, are the No 1 enemy of hydroxyapatite and make oral hygiene paramount.

To determine the efficacy of fluoridation of water supplies in respect of dental caries, four major components must be accounted: the amount of fluoride in the drinking water, the regular amount of water being consumed on an average day, the eating habits of the children involved and the degree of oral hygiene practised. Unfortunately all parameters are difficult to truly assess on a continuous basis.

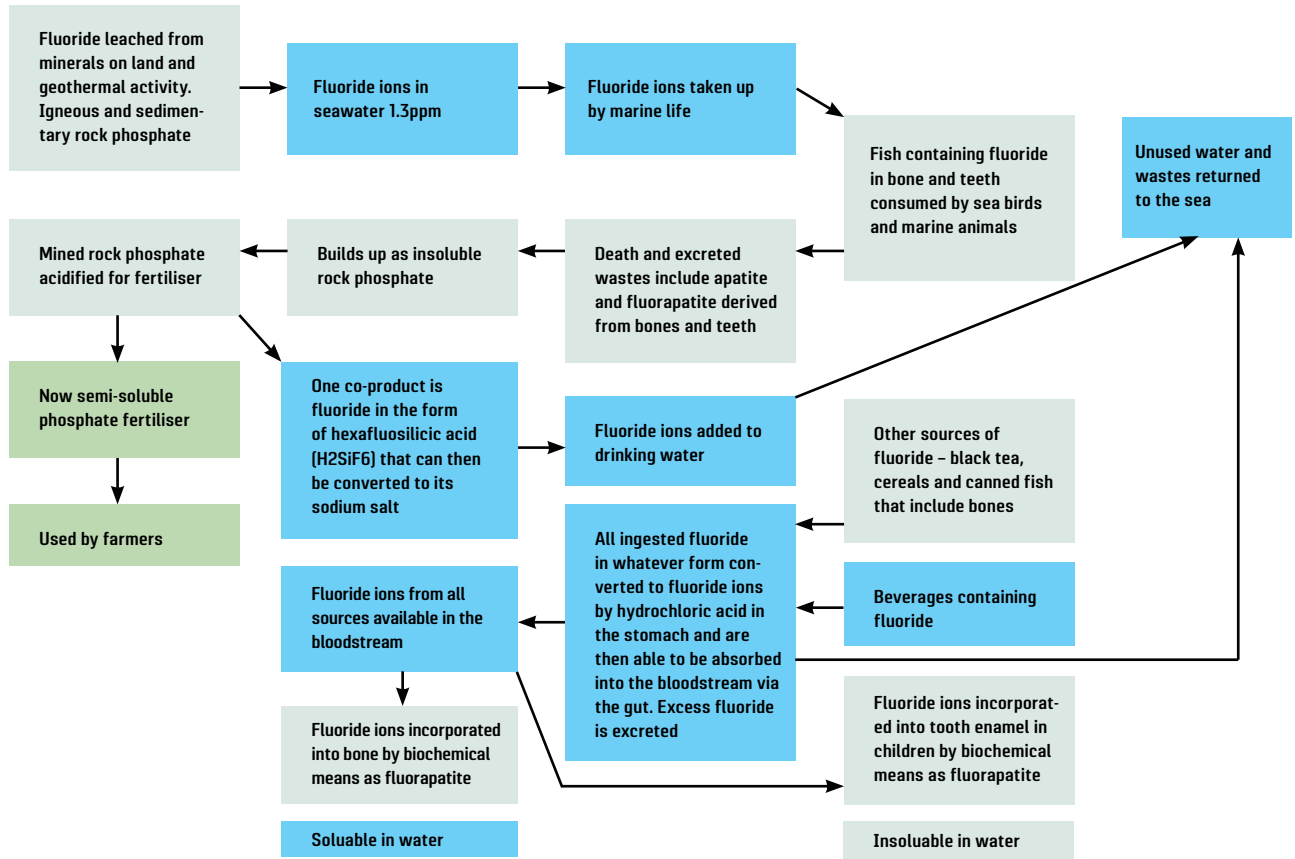
Fluoridation of water supplies applies the Paracelsus\* thesis: “All things are poison and nothing is without poison; only the dose permits something not to be poisonous.”

In plain language, this means that substances considered toxic are harmless in small amounts or doses. Conversely ordinary harmless compounds can be deadly if overdosed. It is therefore the dose that matters. In this case, 0.7-1.0 milligrams per litre of fluoride is the dose that matters. **WNZ**

\*Real name Theophrastus Bombatus von Hohenheim (1493-1541), a Swiss physician and alchemist who pioneered the use of specific treatment of ailments based on observation and experience.



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# What's WAT?

Northland Regional Council has a detailed and accurate big-picture view of how much surface and groundwater is available in its region. Its water allocation tool (WAT) is an integral part of decision-making, helping council balance the needs of ecology and people, make decisions faster and streamline consents processes.

First developed in 2014, Northland Regional Council's water allocation tool (WAT) meant council could, for the first time ever, see at a glance how water was allocated in its region.

It showed which catchments were over-allocated and enabled council to focus its resources into those areas. "This level of insight was really valuable to our teams," says Northland Regional Council's geospatial analyst Janelle Palmer. "I can't emphasise that enough."

Janelle was speaking at the ALGIM Autumn Conference 2018 in Wellington. She went on to say that, although she was about to critique the limitations of the first version of WAT – and outline subsequent adaptations and their benefits – it was a "big deal" at the time to be able to get such a big-picture view.

"However," she said, "it quickly became apparent that this level of detail, which is sources and catchments, was not fine enough for us to use for decision-making."

Janelle emphasised that water is a primary focus at Northland Regional Council. "It's our job to ensure there is enough water for everyone and that we maintain the quality of water for future generations. With over 127,000 reaches in the Northland region, it's a large and significant resource for us to manage."

Water allocation is an essential part of water management, she said. "It's the process of determining how much water we can take from our various rivers and aquifers, and how much more is available once we've taken from them. The science behind water allocation is quite complex with many factors in play."

Janelle said that while her presentation focused on surface-, rather than ground-water, both are included in its water allocation tool.

"The big question in water allocation is how much water can be taken from a reach without a negative impact," she said. "There's two parts to that. The first is environmental protection. That looks at how much water can be taken without affecting the flora and fauna within our streams.

"What we're talking about there is minimum flow. This 'magic number' looks at the sensitivity of flow within a stream. Different streams have different sensitivities based on the



Janelle Palmer.

ecology within them. Some native fish species, for example, need to have a certain level of flow for them to survive.

"On the other side of the equation is the security of supply. When someone applies for consent to take water we need to know how reliable that supply is. That's important because, particularly in Northland, the levels of our rivers change quite significantly from summer to winter, and from drought to flooding.

"The 'magic number' in that case is called the allocation limit and that value is set by the regional council in our regional plan.

"Those two magic numbers have a relationship and that is, pretty much, the essence of water allocation."

Janelle described WAT as "a collection of ArcGIS models and scripts" that enables NRC to see which rivers and aquifers are under pressure and where any restrictions are needed.

## CHALLENGES & ENHANCEMENTS

While the first version of WAT added considerably to NRC's understanding, council's hydrologist Susie Osbaldiston could see opportunities for improvement. Susie and Janelle became the water allocation tool team.

Initially, council was only looking at catchments, for example. "They are quite large catchments when you're doing source-to-sea as well," said Janelle. "So, we wanted to get right down to the reach level: to individual branches of a river."

That meant consent data had to be improved. "In the beginning, our staff didn't really understand the importance of entering that data accurately so that it could be pulled into the tool at the reach level," said Janelle.

"Susie spent quite some time educating staff about the importance of that. But it didn't really hit home until our staff were able to see the value in the outputs from the tool. Then

Northland Regional Council's water allocation tool (WAT) won the Association of Local Government Information Management (ALGIM) GIS Project of the Year Award at the ALGIM Autumn Conference 2018 in Wellington recently.



they were more motivated to give quality data in order to produce quality outputs.”

Resourcing the project was another issue. “We had quite a large body of work that needed to be done,” said Janelle, “so we decided to cut it into discrete little sections of work.”

“The first advantage was we only had to focus on one part of the tool at one particular moment. The other advantage was we were able to get the work done as business as usual because they were two- or three-week blocks of work rather than a massive project that needed to go through a formal resourcing process. So, we staggered projects across the year until we got what we were after.”

## REFINEMENTS

The benefits were many. Janelle explained that, in addition to calculating at the reach level, the revised tool now also applied the allocation up the river network. That gave a more accurate picture of water allocation in the region.

The ability to apply more real-world data to WAT also improved accuracy. Other improvements to the quality of the data came from refining the recharge algorithms for groundwater.

“We also spent a lot of time improving the reclassification of the ecological sensitivity of the streams,” said Janelle. “That was a result of our Regional Plan work, where we were having to set these allocation limits. We really wanted to understand

the ecology of our rivers a lot better and feed that back into the model.”

Further refinements came from improving the boundaries for groundwater aquifers and lifting the usability of the tool. “I did quite a bit on improving the structure of the model; naming things well; documenting the tool well; all that kind of work to reduce the learning curve for the next person coming through.”

NRC also automated the model “so that each time the tool was re-run it was not a big laborious process and it wasn’t as time-consuming”.

## BENEFITS

The outputs from the tool are now an integral part of decision-making at Northland Regional Council. The enhancements made improve both the quality of the data and council’s confidence in the tool and its data sets. The benefits were many and spread across multiple parties.

## ACCURACY / POLICY REQUIREMENTS

Council’s hydrology team, the biggest users of the tool, all of a sudden had the accurate and detailed picture they were after, said Janelle. They could identify, and get research on, reaches that were under pressure. They were also able to meet central government reporting requirements under the National Policy Statement on Freshwater Management (NPS-FM) – one of the initial triggers for needing the tool.

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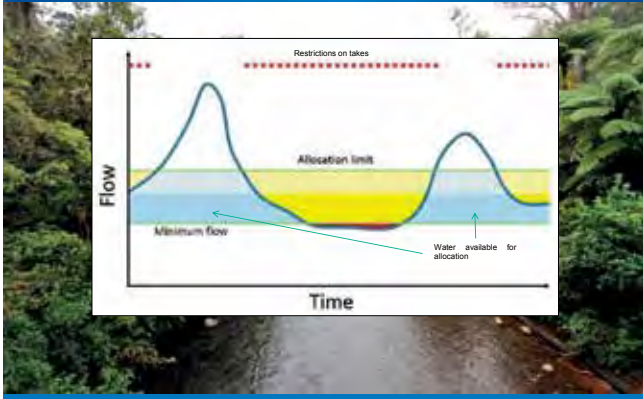
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## It's all about flow...



Minimum flow and allocation limits are the integral parts of Northland Regional Council's water allocation tool (WAT).

The hydrology team also no longer had to generate individual water allocation documentation. “In the past, each time a new resource consent came in, we would have to go to that particular reach and do essentially what the tool is doing now, but manually and individually, and a different person might do it slightly differently each time. Now, hydrology no longer had to take on that role.”

### CONSENTS

For council's consents team, there were similar benefits. The “big picture” view made it easy for the team to see, at a glance often, whether or not a consent would be likely to be passed.

“That significantly reduced the amount of time they took processing consents for our water takes and bores. It also made it a lot easier for them to explain to people why they couldn't get a consent. It's really easy to show a picture with a big red line through it and say, ‘that's why’.”

The team now also had a standardised and consistent approach to water allocation documentation.

### PLANNING

For the planning team, the results were “interesting”, said Janelle. “They could suddenly see the impact of the decisions they were making, because these are the guys that are setting the allocation limits in the first place. I remember the first time they saw the maps and realised the impact that their policy was having on our region.”

Fast forward to the most recent round of policy-setting for the regional plan, and planners could see a variety of scenarios through the tool. They could visualise what would happen if they set the allocation limits at different levels.

“That helps them make better decisions now,” said Janelle, “and we do future scenario planning as well.”

### THE PUBLIC

One unexpected, and unplanned for, advantage was for the public. WAT had initially been conceived as an inhouse tool.

But, as Janelle explained, council realised that the quality and robustness of the data set was such that it could be delivered to the public.

So, when NRC released its proposed regional plan in September last year, it decided to include the outputs from the water allocation tool.

“This was the actual data that we are using for decision-making [being put] out there in the public domain. That was a pretty big deal at the time. It meant the public could understand allocation limits as set out in the regional plan.”

Importantly, members of the public could also see by glancing at the maps whether any idea they had about water takes – such as the possibility of setting up a water-thirsty commercial enterprise in a particular place – would be likely or not.

“That created a sort of self-service scenario which reduced the number of inquiries we were getting for consents as well,” said Janelle.

“It also reduced the complexity of the planning and presenting the regional planning data because it was visual, easy to understand, and it just looked simple: even if the science behind it was not.”

Janelle added that sharing such information improves the transparency of council's processes and helps increase public confidence that NRC is taking into account the ecological impacts that water takes are having on the region's rivers. “It shows that we are taking the health of our rivers seriously.”

### WHAT'S WAT'S FUTURE?

So, what's next for WAT? “Better data for some of our data sets,” said Janelle. “For example, Northland is getting a Northland-wide LIDAR data set in the near future. So, we will be able to derive a more accurate river network from that.”

She noted that NRC already has a “pretty good” understanding of its river network. “But because we have some quite flat areas, the model is showing those as straight lines when they're not.”

NRC also wants to include more outputs in its accumulation. “We'd like to investigate whether it would be possible to get stock water use data at the reach level,” said Janelle.

“And there will also be further refinement of the tool as our staff go out and collect data about river levels and the ecological sensitivity of rivers. That will all get fed back in.”

“Also, as other organisations such as NIWA do better modelling we'll include that into the tool as well.”

For Janelle, the biggie would be modelling and presenting groundwater data in 3D. If council could get the data – and it is not yet sure whether that will be possible – 3D imagery would have the same kind of impact as changing the surface water from catchment to reach level.

“I mean, aquifers don't exist in blocks, they exist in substratas,” said Janelle. “So, to be able to more accurately model the difference between drilling a bore here or over there will give us an even clearer picture and we'll be able to manage that resource better too.” **WNZ**





# Small plastics massive problem

This glimpse of the future was crafted by **Paul Stephenson** at *Aurecon*.

**A**lmost everything we own and buy contains plastics. Look around. If it's not the chair you're sitting on, or that part of a pen in your drawer, that bottle in your refrigerator, it may be this thing you're holding – your smartphone, or a keyboard, or a tablet.

They are everywhere. But before you blame plastic water bottles and candy wrappers solely for marine plastic pollution, think again.

It turns out, as with many other relationships, sometimes it's the small things that create the biggest impacts. And in this case, it's the plastics that we don't see, the microplastics, that are about to damage the world we are living in.

## IT'S NOT JUST 'SMALL' STUFF ...

The United Nations Environmental Programme (UNEP) identified microplastics as an 'alarming issue' as plastic pollution remains the biggest threat to our marine biodiversity.

But are we already too late?

Based on current rates of plastic pollution, the World Economic Forum predicts that by 2050 there will be more plastic than fish in our oceans.

Microplastics, while tiny, pack a big punch.

They have been around for more than five decades as microbeads and microfibres ranging in size from 0.5 to 5mm in length.

And we have unknowingly let them into our homes and closets, as they have replaced the natural ingredients of our personal care products, and cosmetics such as toothpaste, facial and body scrubs, and have been manufactured into some of the clothes we love to wear.

However, it's not actually the products that directly harm us, but rather what happens to them after they go down the drain. These synthetic fabrics (polyesters, acrylics) have been found to release more than 700,000 particles to the environment after just one cycle in the washing machine.

In a study titled '*Plastic Pollution in the World's Oceans*', oceanographer Dr Marcus Eriksen and his team went on several expeditions to investigate which kinds of plastic were most polluting the oceans.

To their surprise, significantly outnumbering bigger plastic items such as toothbrushes and the balls in deodorant roll-ons were confetti-sized and smaller shreds of plastics.

Because here's something that not all people know: Plastics rarely degrade.

Once these microplastics enter our water system, treatment facilities cannot break them down or filter them out, and they end up in the ocean, mistaken for food by fish and other sea creatures – ultimately infiltrating our lives via our food chain.

"Plastic pollution is surfing onto Indonesian beaches, settling onto the ocean floor at the North Pole, and rising through the food chain onto our dinner tables," says United

Nations Environment Programme (UNEP) executive director Erik Solheim.

“We’ve stood by too long as the problem has gotten worse. It must stop.”

True enough, not only have microplastics been found in fish and shellfish, they have also been found in beer, honey, tap water, sugar and even air.

We just didn’t know it! And, contrary to popular belief, when it comes to microplastics, what we don’t know can actually hurt us.

Now, here’s where it gets scarier... while the studies about the effects of microplastics are still at a relatively early stage, initial researches published by UNEP and in the Proceedings of the National Academy of Sciences (PNAS) have discovered that eating plastic particles may cause reduced activity rates, reproductive disruption, weakened schooling behaviour, and altered feeding behaviour among sea creatures.

## HOW DOES THIS AFFECT HUMANS?

According to the One Health approach, the health of all living things (humans, animals and plants) and everything that surrounds us are interconnected.

If something is wrong with the animals and plants around us, then something is likely to go wrong with us, unless we do something about it.

“Microplastic may not only affect species at the organism level; they may also have the capacity to modify population structure with potential impacts on ecosystem dynamics, including bacteria and viruses,” says a report by the joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP).

“Negative effects on the photosynthesis of primary producers and on the growth of secondary producers, potentially result in a reduced productivity of the whole ecosystem and represent a primary concern.

“Our understanding of the fate and toxicity of microplastics in humans constitutes a major knowledge gap that deserves special attention.”

So, if we ignore this issue now, it is probable that the ‘plastic soup’ will no longer be metaphorical in the next 20 or 50 years. It will be a reality – and one at a scale we simply can’t ignore.

## CAN WE SURVIVE WITHOUT PLASTICS?

The journey to a plastic-free world may be unimaginable to think about now.

The truth is, if almost everything around us is made up of plastic, it’s going to be hard to live without them – especially if they are cheaper, durable and more convenient to use.

There are, however, many things that we can do on a personal level to reduce our consumption of plastic.

In 2017 the US and UK Governments banned the use of microbeads. And there is a lot industry and we consumers can do too.

“Shifting to a genuine circular economy for plastics is a massive opportunity to close the loop, save billions of dollars, and decouple plastics production from fossil fuel consumption,” says Dame Ellen MacArthur.

According to a report by her foundation; “Manufacturers could redesign plastic items so they could be reused better, and rethink their production methods to make recycling easier.

“More products could be made out of materials which can be composted on an industrial scale, including rubbish bags for organic waste and food packaging for outdoor events, canteens and fast food outlets.”

In December 2017, the French Government reaffirmed an important commitment towards tackling plastic pollution by pledging to recycle 100 percent of plastics by 2025.

A number of large manufacturers such as Nestle, Adidas, Unilever, and HP Hewlett-Packard have recently started initiatives looking for alternatives to make their products and their packaging sustainable and environment-friendly.

To tackle this crisis, there is an urgent need for governments, industry and entrepreneurs to develop systemic, more innovative, and more audacious solutions that prevent plastic from becoming waste in the first place.

## TURNING OIL TO PLASTIC AND BACK AGAIN

Priyanka Bakaya is one entrepreneur who has discovered the power of plastic waste – quite literally. Bakaya is an Australian-American entrepreneur and founder of a clean energy company that converts plastic waste into fuel.

Her company, Renewlogy, makes diesel, kerosene and light fuels in a process that chemically takes the plastics back down into their basic building blocks without creating toxic emissions in the process. Investors are watching closely.

Meanwhile, China has done the world a favour.

In January, China stopped taking the world’s plastics back for recycling for environmental reasons and recyclers worldwide were left scrambling for alternatives.<sup>1</sup>

This is a good thing. What if every country closed its doors to others’ waste? This could drive greater innovation and new business opportunities that benefit local communities.

In the UK, scientists and engineers from the University of Bath have developed a way of making microbeads from cellulose, which is not only from a renewable source, but also biodegrades into harmless sugars.

Work is underway to scale this process for manufacturing. If offered a choice, consumers will prefer not to rub plastic into their skins when they exfoliate – brands that are earlier adopters of these alternative ‘ingredients’ can create competitive advantage.

So, how might we get products to people without generating plastic waste and mitigate a potential eco-genocide?

We’re not sure yet, but some smart people and organisations are working on finding solutions.

If nothing else, microplastics have taught us that sometimes the smallest things can make the biggest impact. **WNZ**

(1) In July 2017, China’s Ministry of Environmental Protection told the World Trade Organization that it would no longer import (from January 2018) 24 common types of once-permitted solid waste due to contamination concerns. The ban extended to various recyclables including several plastics such as PET and PVC, certain textiles and mixed waste paper. Easier-to-recycle metals are not included in the new restrictions. And in April this year China banned another 32 types of solid waste – including stainless steel scraps, compressed car scraps and ship scraps. Sixteen of them will go into effect at the end of this year, and the other half at the end of 2019.



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# Adsorption of **organic** pollutants

system stimulants and lipid-lowering agents, among others.

Within the industrial pollutants, several compounds frequently used as cleaning products were analysed, as well as others used as water – and oil-repellents.

With the personal care products, two synthetic preservatives were analysed (methylparaben and propylparaben), both widely used in cosmetic and pharmaceutical products.

Lastly, nine active pharmacological ingredients were also tested (diclofenac, ibuprofen, salicylic acid, trimethoprim, carbamazepine, propranolol, caffeine, clofibric acid and gemfibrozil). Taken to achieve different therapeutic effects, these all end up polluting our waters, essentially, via human excretion.

The study was carried out on untreated urban waste water, treated urban waste water, surface water from rivers and potable water.

“Studies like this, and others in the same line, are showing the potential of certain adsorbent materials for use in the industrial treatment of water affected by different types of pollution,” says professor Esteban Alonso, head of the research project at the University of Seville.

“Obtaining universal materials with a high elimination capacity and which can be used for a wide range of pollutants is the main goal in this area of investigation.”

The following steps in this line of research will be: The evaluation of these materials in the elimination of other families of water pollutants, their application on an industrial scale, and, in parallel, the improvement of the functionality of the material itself. [WNZ](#)

- You can find the paper by Julia Martín at: Environmental Research (2018). DOI: 10.1016/j.envres.2018.03.037

Source: Universidad de Sevilla via Phys.org

**W**orsening pollutants in water has caused the scientific community to research new solutions and alternatives.

Along these lines, a group of University of Seville scientists has shown the effectiveness of two new absorbent materials capable of eliminating organic pollutants in solution in less than 24 hours.

Specifically, they have evaluated two types of phyllosilicates: A highly charged expandable synthetic mica (Na-Mica-4); and one obtained from cation exchange with an organo-functionalized mica (C18-Mica-4). (Phyllosilicates are a subclass of silicates and include common mineral in very different environments).

The results show that the material C18-Mica-4 is capable of eliminating the majority of pollutants that were evaluated in urban waste water, as well as surface water and potable water.

The study also, provides data on the adsorption mechanism and establishes a significant correlation between the physical chemical properties of the selected criteria and emerging pollutants and the adsorption to the material.

In total, 18 organic pollutants were studied, among which were industrial pollutants, personal care products, and the pharmacological active ingredients such as anti-inflammatories, antibiotics, anti-epileptics, central nervous



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# Good work in the Marshall Islands

Being a country made up of low lying atolls with no surface source of freshwater, the Marshall Islands are particularly susceptible to the effects of climate change.

Beca has recently being involved in a major water infrastructure upgrade there.

By **Kristina Hermens** and **Andrew Watson** from Beca, and **Halston deBrum** from the Majuro Water & Sewer Company.

**O**ver the past 25 years, Beca has worked with the Marshallese people to improve their schools, hospitals and other public infrastructure.

Most recently, Beca partnered with Majuro Water & Sewer Company (MWSC) to create strategic and development plans to meet the country's 20 year vision that; "All of Majuro has access to safe, affordable, reliable and resilient water and sanitation services that support healthy communities to flourish now and in the future."

This project illustrates how stakeholder engagement and consideration of cultural values can be used to develop tailored solutions that can lead to positive outcomes for current and future generations.

The Republic of Marshall Islands (RMI) is an independent country in Micronesia (approximate population of 53,000) located about 4900 kilometres north of New Zealand. RMI is most well-known for its traditional canoe navigation and the legacy of nuclear testing in the region. Today it has the second largest shipping registry (after Panama) and is at the centre of the biggest tuna fishing grounds in the world. In terms of building and maintaining infrastructure, the Marshallese are mostly reliant on foreign aid.

Beca's work focused on the capital atoll of Majuro, an area of less than 10 km<sup>2</sup> which is home to approximately half of the country's population. Most people live in the urban centre which covers Djarit (Rita), Uliga and Delap. The largest rural centre is at Laura.

Majuro has a young population with about 40 percent of people under the age of 15. However, population growth is relatively low and is mainly based on birth rate and rural migration from outer islands. The population is expected to increase to about 34,000 in the next 20 years. Households have an average of 6.7 people and the average household income is less than US\$10,000 per year. Less than half of the adult population is employed.

Majuro has a tropical climate with an average rainfall of 3.25m per year, however water supply can be variable during the drier months of January to April. There is usually



Kristina Hermens and Andrew Watson, Beca.

an extreme drought every 10 years – dry periods have also increased in frequency and duration over the last 20 years.

In terms of waterborne disease, about one in 15 people on Majuro are medically treated for gastroenteritis every year and about 10 percent of all deaths of children under five are due to diarrhoea. In 2016 there was a hepatitis A outbreak across the atoll.

## EXISTING SERVICES

MWSC supplies water to around one quarter of the population via three treatment plants. For most customers they provide water for three to five days a week, up to eight hours per day. This water is treated but it is not guaranteed as potable due to the intermittent nature of the supply. Only the hospital receives a continuous potable supply.

MWSC uses a combination of groundwater, reservoirs (136ml capacity) and desalination to supply its customers. During dry or drought seasons the reservoirs can reach low levels and MWSC restricts its water supply to customers.

Most households in Majuro have rainwater tanks and a small number have private wells. Most houses need improved guttering and regular maintenance to maximise collection and to keep their water supplies clean. A lot of people buy their drinking water from local shops.

MWSC collects wastewater from about 80 percent of





Beca's work focused on the capital atoll of Majuro, an area of less than 10 km<sup>2</sup>.

urban properties via a saltwater flushing system which goes directly to an ocean outfall with no treatment. The combination of saltwater and long retention times creates a corrosive environment, and the receiving pump stations and manholes are generally in poor condition.

As a result, the ocean outfall has been broken at the surf line for many years.

### MWSC'S VISION

MWSC's vision and the following project goals guided the development of a 20 year strategic plan and development plan in consultation with community stakeholders. The aim is to provide services which are:

- **Reliable and available** – Water and sanitation services are available to every property on a 24 hour per day, seven days a week basis across Majuro. Also, operations and maintenance practices are improved so that services are reliable and maintain the agreed level of service.
- **Affordable and equitable** – Providing services which make best use of existing infrastructure, and that tariffs consider the ability of customers to pay for these services.
- **Sustainable and resilient** – Services must be environmentally and economical sustainable and also resilient to climate variability and extreme events.

The strategic plan establishes the most appropriate water and sanitation services for Majuro over the next 20 years and describes how this service will be delivered. The development plan sets out how these services will be implemented, including technical assistance, capital upgrades, institutional strengthening and financial management improvements.

Supporting studies were undertaken to inform the 20 year strategic and development plans. On the water supply side these involved a condition assessment report, hydraulic modelling of the network, and a study of non-revenue water.

On the sanitation side it involved condition assessments

and, for the replacement of the failed sewage outfall, a preliminary engineering design and an assessment of environmental effects.

In parallel with the engineering work, institutional reform and economics specialists worked on an institutional strengthening evaluation of the MWSC business, and an evaluation of the financial management and the tariffs needed to allow the business to be sustainable while delivering on the preferred options.

Stakeholder engagement was a very important part of creating the strategic and development plans. A community survey, several stakeholder workshops and community meetings were held to develop the proposed level of water and sanitation services. Long and short listed options were developed and evaluated using quadruple bottom line (considering social/cultural, environmental, economic and technical factors) assessments in consultation with stakeholders.

Stakeholders included government and environmental organisations that have an interest in community infrastructure, as well as the wider public. Community meetings were also held in local villages to obtain feedback. People were engaged via a weekly radio programme, media articles, social media and face-to-face discussions.

MWSC also carried out a community survey of households across Majuro which provided valuable information on customer drivers and expectations around levels of service and willingness to pay.

Six stakeholder workshops were held over several months to assist with developing the proposed water and sanitation levels of service. Once options were shortlisted, MWSC held meetings in different communities across Majuro to present the options and obtain feedback from the community.



Top: Stakeholders included government and environmental organisations.  
Above: Majuro Water & Sewer Company (MWSC) outfall.

## WATER SUPPLY

Feedback from the community and other stakeholders was important in shaping the proposed levels of service. For water supply, cost and reliability mattered most. There was a clear preference for household rainwater tanks, but people did want a reliable supply during dry and drought periods.

The proposed level of service for water supply across Majuro was to: Provide 75 litres of water per person per day; connecting all properties to the supply network, and install or upgrade rainwater tank and collection systems to all households; make water supplied via the MWSC network potable at point of supply; and have household rainwater collection systems maintained by MWSC.

To deliver this water supply required considerable capital improvements – to the treatment plants, the storage reservoirs and the distribution network, including a programme to reduce water losses and illegal connections. To improve cost recovery, pre-paid water meters were recommended as well as changes

to the fee structure to introduce a fixed tariff in addition to the volumetric tariff.

A key component of the water supply service would be regular servicing of household rainwater tanks and collection systems by MWSC staff to minimise contamination and optimise collection capacity. This service could also be extended to repair leaking taps and toilets in residential properties.

## WASTEWATER

With regard to wastewater, stakeholders wanted reliable services which should be fully available in areas with the highest population densities. The following preferred options for sanitation services across Majuro were: Cover the urban area from Djarrit, Uliga and Delap (DUD) to the airport with a full wastewater gravity network that is installed with pump stations



feeding a new longer outfall with maceration (or similar) and treatment to disperse effluent into the ocean environment; keep the mainly rural area from the airport to Laura on septic tanks (reviewed in the next 10 years); and replace the rural centre of Laura (which sits on a large groundwater lens) septic tanks with a pressure sewer discharging to a new ocean outfall.

## LESSONS LEARNT AND CRITICAL SUCCESS FACTORS

Some of the important lessons learnt and critical success factors in developing the 20 year strategic and development plans were:

- Early engagement with wide cross-section of stakeholders, including Board members and politicians – It is important to understand the perspective of decision makers, business organisations and the general community. For example, an urban business which relies on large quantities of non-potable water will have very different needs to domestic households.
- Adapt consultation techniques to the community – Notices, feedback forms and community meetings should be in the most common language. Schedule meeting times and locations which suit the community, and research the most common forms of media for providing updates. For example, people on Majuro listen to the radio and Facebook is used widely.
- Understand key influences within society (e.g. land ownership

structure, decision makers). For example, all land in the RMI is privately owned with a matrilineal three-tier ownership system. Each tier has a role in how land is used and should be consulted when planning infrastructure.

- Solutions should be tailored to incorporate cultural traditions and practices. Services should recognise the community's relationship with the natural environment and their common beliefs and practices. For example, standalone toilets may not be used by women in some cultures if they can be seen entering and leaving the facility.
- Understand funding agency requirements. As strategic planning studies are often provided to support funding applications, it is prudent to meet with likely funding agencies to understand their drivers and requirements.

These can be incorporated within the studies so the agencies receive the information they need. For example, an environmental safeguards analysis as required by the Asian Development Bank was included in the 20 year strategic plan.

## THE FUTURE

MWSC is applying for funding for the next stage of the project. This funding would allow MWSC to make organisational changes to improve service delivery and for the concept designs to be developed further and subsequently constructed to improve the overall level of water and sanitation services across Majuro in the next decade. **WNZ**



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The company has become an integral partner of our event since 2011 and an essential part of the events success and continued growth in New Zealand, and has donated \$260,000 to Oxfam from gold sponsorship and employee fundraising since 2011.

In addition to the role it takes supporting the journey of the participants, Tonkin & Taylor has also had over 80 staff take part in the Oxfam Trailwalker event. Each year at least two of the

company's teams (made up of four participants in each team) have taken part and, every year, have achieved above and beyond their \$3,500 per team fundraising commitment.

The local version of the globally successful Oxfam Trailwalker started here in 2006 and has since established itself as one of this country's leading endurance charity challenges.

Over 10,000 participants have taken part and raised more than \$10 million to support Oxfam's life-changing work.

Recognition of the event includes awards from the Fundraising Institute of New Zealand (*Best Fundraising Event*) and New Zealand Association of Events Professionals (*Best Environmentally Sustainable Event & Best Partnership for Event*).

Despite growing competition in the charity events sector here, the Oxfam Trailwalker remains at the forefront, being one of the longest standing and most successful fundraising events on the calendar.

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# Upgrading the flow in Pukekohe

Ground-breaking in every sense, the Pukekohe Trunk Sewer Project is a success story for partnerships, innovation and sustainability. By **Garry Macdonald**, business director – water, Beca, and **Paul Armstrong**, associate – water engineering, Beca.

**U**pgrading Watercare’s sewerage infrastructure was vital to deliver a resilient, reliable and long-term solution to meet the needs of the fast-growing south Auckland townships of Pukekohe, Paerata, and Patumahoe.

Beca was engaged to work on the design by the chief contractor, Fulton Hogan, and together the firms worked closely with client Watercare over the duration of the project.

With this foundation of collaboration and partnership, Beca delivered detailed design packages for all stages of analysis, modelling and construction of the 6.5 kilometre trunk sewer and associated network upgrades.

Throughout the project, world-class innovations delivered value for money, reduced the whole-of-life maintenance costs, mitigated environmental risk and significantly reduced the impact of construction on the local community.

## THE SCOPE

The objective for the Pukekohe Trunk Sewer Project was to design and construct a new wastewater conveyance system, incorporating a large pump station, and single rising main from Pukekohe to the Pukekohe Waste Water Treatment Plant (WWTP).

In addition, the upgrade would require an additional local network pumping station, a rising main to service the Buckland community and a new temporary lift pumping station with high flow diversion at the WWTP inlet works.

Now complete, the project provides a lasting solution to the region’s current and future needs, catering for the current flow conditions and an estimated population growth of 30,000 people.

Given demands on existing infrastructure, the works needed to be completed as soon as possible, with a focus on safety and environmental awareness and many other considerations:

- Watercare found that even with minimal growth, the existing system was significantly under capacity and needed to be future-proofed and easy to maintain.
- Innovative design and construction solutions were needed to manage the technical complexity, tricky topography and interface and performance of new and existing infrastructure assets.
- Over five kilometres of pipeline needed to be installed as



Garry Macdonald business director – water, Beca.  
Paul Armstrong, associate – water engineering, Beca.

- open cut works within the road reserve.
- Rigorous controls were required around public safety, traffic management and road reinstatement.
- Difficult sections of poor ground conditions and rock required a diligent and adaptable approach during directional drilling.
- Working to tight deadlines across many simultaneous work fronts and managing multiple elements required meticulous planning and programming.
- Working in a high-complexity, high-profile and highly visible environment meant strict health and safety, quality and environmental controls were essential.
- The project location crossed boundaries between the Auckland and Waikato District councils, requiring coordination and engagement with each.

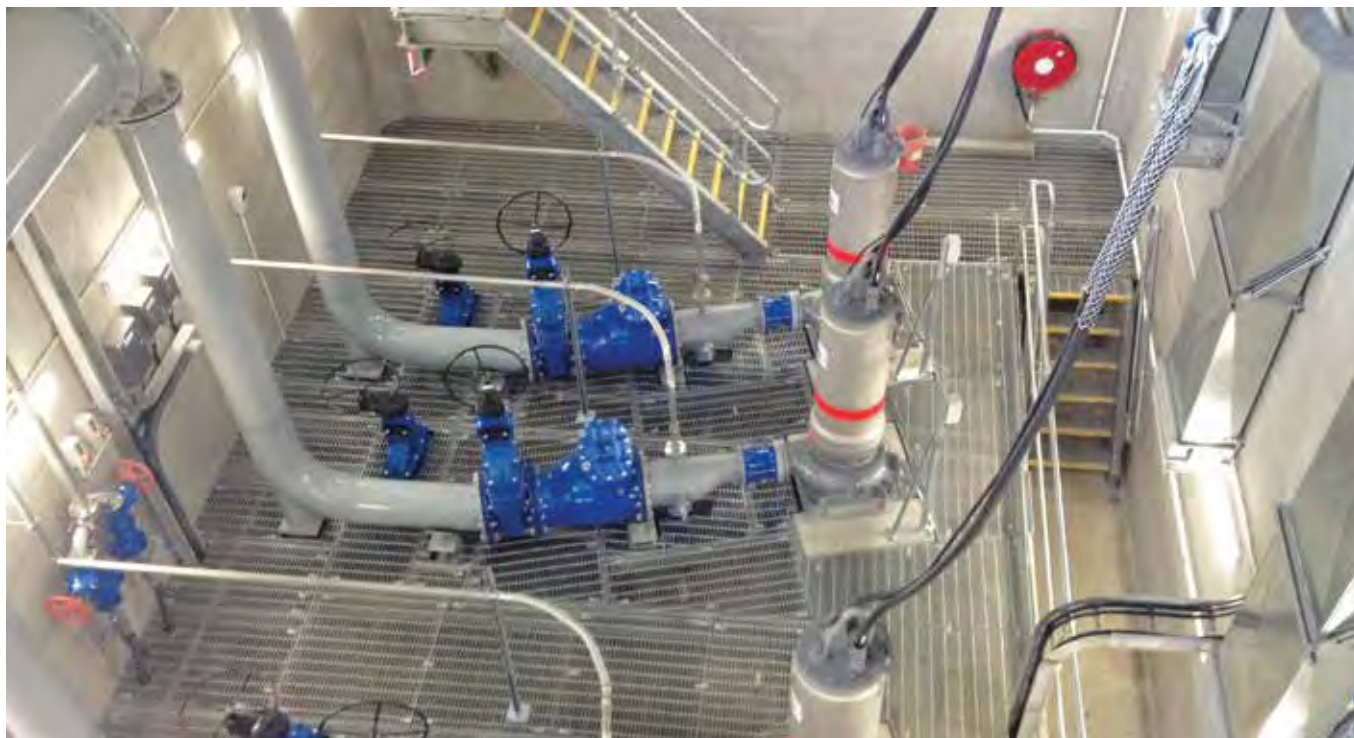
## EARLY CONTRACTOR INVOLVEMENT (ECI) APPROACH

With rising demand on existing services, technical complexity and challenging site conditions, the project called for a new approach to accelerate the works.

This dynamic and demanding timetable saw Watercare move away from its traditional design-bid-build process to a contract with Early Contractor Involvement (ECI).

Under the ECI approach, Beca’s design, Fulton Hogan’s construction and Watercare’s project delivery teams were integrated, with design progressing in parallel with early procurement and construction of the pump station and pipeline.





The new approach was a game changer, providing the flexibility for teams to adapt to project changes without compromising objectives, and resulting in an accelerated construction programme.

By streamlining how the different project teams worked, ECI enabled the ambitious project to progress through the works' design, construction, testing, and commissioning, within two years of the preliminary design starting.

## SAFETY FIRST

Alongside the challenging and complex project environment came the need to ensure all risks were properly identified and managed and for the health and safety of staff and stakeholders to be kept in focus at all times.

The combined teams from across Beca, Fulton Hogan and Watercare took on a "best for project" approach and an emphasis on team resilience to develop a strong safety culture onsite and throughout the project environment from day one.

As an example of scale, during the construction phase of the project, over 800 staff and subcontractors were inducted. At peak times, more than 100 people were working on site each day, presenting very real health and safety risks if not properly managed.

Awareness of the environment and potential issues and risks was maintained through a focus on education and training and through specific strategies for managing key risks. These included comprehensive traffic management planning and execution; control of erosion, sediment, noise, dust and the disposal of soil and contaminated material; and keeping public roads, and roads onsite, clear of mud and dirt.

## STAKEHOLDER AND ENVIRONMENTAL AWARENESS

As with the focus on safety, given the scale and complexity of the project, it was important to identify and manage risks and concerns for stakeholders and the environment. At the same time, Watercare's existing network needed to be maintained and protected and any disruption kept to a minimum.

With houses and businesses in close proximity along the 6.5 kilometre route, the project teams maintained a proactive and open approach to communication and engagement with

The objective for the Pukekohe Trunk Sewer Project was to design and construct a new wastewater conveyance system, incorporating a large pump station.

stakeholders, including local Iwi, community groups, schools, property owners and regional and regulatory authorities.

Maori waterway values were identified in the design. For example, pressure pipes used bridge crossings over waterways, rather than the drilling being done underneath.

Bespoke designs were developed for the waterway crossings to mitigate any environmental risk and to provide future resilience. Temporary sediment control measures ensured that only treated water from the construction sites entered the surrounding drainage system.

## TECHNICAL CHALLENGES WITH INNOVATIVE SOLUTIONS

The fast pace and large scale of the project presented an array of technical challenges for the various teams to solve in new and innovative ways.

In the wastewater environment, no other system had been designed like Pukekohe.

The topography of the proposed route using the road reserve resulted in a small rise in level for the first four kilometres, followed by a steep initial vertical descent of over 60 metres, siphon and final descent down to the Waste Water Treatment Plant.

During detailed design, it was identified that the velocity in the pipeline, if run as a gravity section, was significant. This introduced major hydraulic design challenges, presenting odour, noise and scour problems at the transfer location between the rising and gravity sections. Additionally, the chosen alignment meant 60 metres of head had to be absorbed when the flows entered the WWTP, something the plant was unable to cope with.

The non-conventional design solution, a first in New Zealand, was for a series of passive and actuated mechanical control valves, termed 'pinch valves', followed by a 10 metre tower structure, to provide constant backpressure on the rising main. With the pipe remaining fully charged at all times, the airflow in and out of the pipe would be reduced, cutting down on odour and noise.



Glass fibre reinforced plastic (GRP) pipe.

Through optioneering workshops, the final arrangement of the pinch valves was defined. The pressure main splits into three trains via a manifold, with each stream having four pinch valves and three static pressure reducing valves, before finally discharging into the tower.

Additionally, the valves were programmed to sync with the pumps via a fibre cable 6.5 kilometres away. This solution allows for multiple flow rates and future maintenance schedule requirements by allowing individual valve trains to be taken offline.

## PUMP STATION CONSTRUCTION

Precast and prefabricated concrete panels for the main pump station led to a very functional and fitting building right on the road side – and close to Pukekohe Park Raceway.

The pump station was an eight-metre deep 30-metre long and 20-metre wide in-ground wet/dry well. Sheet piling was selected as the shoring method as a fast and cost-effective solution given the poor ground conditions in the area.

The sheet piling also gave an element of flexibility, which was used later in the project when a second excavation for the storage tank was installed adjacent to the pump station site. The team were able to quickly link the two excavations by simply removing one of the sheet piled walls, thereby gaining access to the second excavation.

## GLASS FIBRE REINFORCED PLASTIC (GRP) PIPE SUPPLY

During the optioneering stages, pipeline solutions were assessed for cost and constructability benefits.

Glass fibre reinforced plastic (GRP) pipe has not been a standard choice for New Zealand in wastewater pressure solutions, yet it is a material used extensively overseas.

After assessing a number of options during the early design phases, GRP was found to offer an excellent alternative to

the typically high-density polyethylene (HDPE) pipes used in similar pipeline works.

The benefits included:

- Accelerated construction due to the workability of the pipe lengths;
- a reduction in the dimensions for excavation and trenching works, which not only was an exceptional safety benefit but also reduced the impact on the neighbouring surrounds and local roads; and long-term maintenance benefits with significantly reduced shut-down times.

From a construction and long-term operational point of view, the use of GRP proved to be a major innovation, of great benefit to the project and to the wider water infrastructure industry across New Zealand.

## MAJOR TEMPORARY WORKS

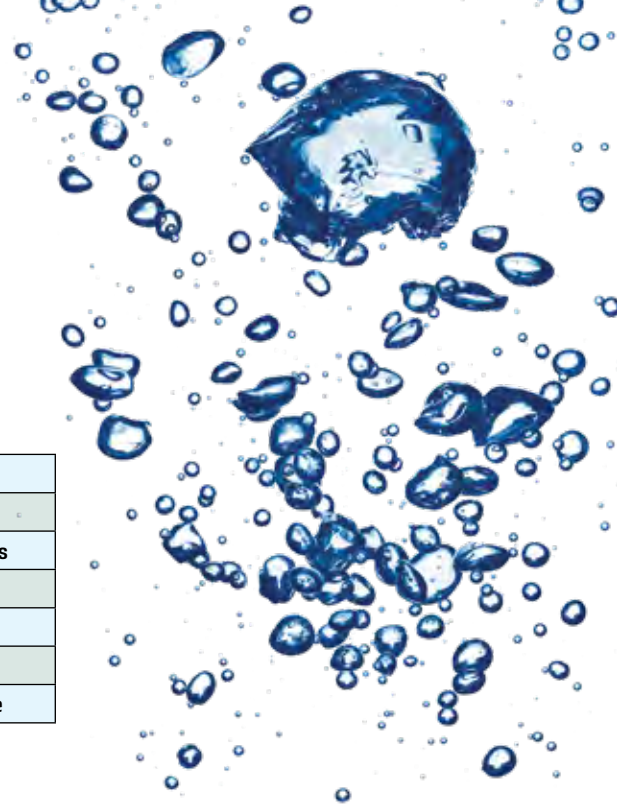
Specialist temporary work elements featured throughout the project and extended across all disciplines from site setup, excavations and structures through to the final commissioning.

By way of an example, sheet piling methods were developed for excavations and pipeline works, which proved to be an outstanding innovation in terms of cost, safety and dealing with poor ground conditions.

Temporary works also formed a key component of the commissioning phase. With a lack of water available on the project, temporary works were redesigned to limit water use, including pipework to recirculate water during cold commissioning stages.

Thrust blocks were designed to isolate each section of sewer being pressure-tested. At its peak, a section of pipe held more than a million litres of water at 16 bar, exerting 47 tonnes to the end of each pipe section.





## PROJECT HIGHLIGHTS

Alongside its innovative solutions to challenging problems, the Pukekohe Trunk Sewer Project presented a number of stand-out components:

6.5km approx.	Total length of the trunk sewer
3km	Length of existing trunk sewer decommissioned
85L/sec to 650L/sec	Raw wastewater pumping station with variable speed pumps
600mm diameter	Single rising main
173L/sec	Temporary lift pumping station capacity
47 tonnes	Force of water being pressure tested
800	Staff and subcontractors inducted in the construction phase

## CONCLUSION

Wastewater was transferred from the existing main sewer to the new trunk sewer on December 4, 2017, meeting the project's main needs by significantly reducing the risk of overflows in the area and catering for growth.

Providing a future-proofed design solution for the Pukekohe Trunk Sewer Project was a priority that Beca was proud to deliver on, making a lasting difference for Pukekohe, Paerata and Patumahoe.

In collaboration with Fulton Hogan and Watercare, the combined teams were able to bring their best work to the project and deliver ground-breaking results within tight and accelerated timeframes.

The dynamic and unconventional ECI approach adopted by Watercare enabled the project to proceed at a fast pace, without compromising safety, quality, value for money, environmental risks or the impact on the community. **WNZ**



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# Future proofed solution for wastewater project

Hamilton City Council's \$7.65 million wastewater project in Rotokauri, is vital to unlocking growth in the area.



The far Western Interceptor Extension extends the city's current wastewater network with a two kilometre pipeline from the Te Rapa bypass to the existing pipeline beside Avalon Drive.

Rotokauri has been identified as key for future growth on the perimeter of Hamilton, with about 1000 hectares identified for residential, commercial and industrial expansion. Up to 20,000 new residents are expected to move into the area over the next three decades.

The decision was welcomed by developers and landowners in the Rotokauri area who endorsed the extension through submissions to the council's 10-year-plan.

Hamilton city council awarded West Construction this project and Humes was made the exclusive supplier for concrete products. Due to the large nature of the project, Humes and West developed a partnership approach to the job.

Heath Rickit, Civil Engineer at West Construction says; "To accommodate all the growth in Rotokauri, the Western Interceptor was built to take some of the flow.

"The project was originally going to start with a 450-capacity pipe that would have been large enough as it was going to be sufficient to take over the excess wastewater of the Western Interceptor, but the council decided to upgrade to a larger diameter pipe (DN1050), which is actually a lot easier to work with."

Hundreds of pipes and two manholes were first delivered to site. The project required 860 DN1050 class 4 Polyethylene (PE) lined pipes and 14 DN1800 PE lined manholes.

Stan Hodson, account manager at Humes, says the biggest challenge Humes faced was the ground condition and the timing for the project.

"The council had put a tight deadline and we had to match our production schedule to the required contractual time frame," he says.

The project window meant Humes had to produce a





minimum of 15 pipes per day.

The manholes and cover lids are also all PE lined so Humes used a different manufacturing process for this as it's not standard.

"About 300 pipes and two manholes were first delivered to site and then we based our production schedule around their lay schedule," says Hodson.

"It gave us credibility in the market place to be able to deliver a large volume of concrete pipes and manholes to the technical specifications of the Council and the contractual requirement the contractor had to meet within the deadline.

"We believe Humes' manufacturing process is the only process in the country capable of delivering large volumes of concrete pipes and manholes within such a tight timeframe.

"Like any project, until the contractor had started digging, we had no idea what the ground condition would be like. So once they started laying, they were able to give us their lay schedule."

Another challenge was welding the pipes to match QA requirement from the council. The PE liners were welded in all-weather and ground conditions, section by section to avoid contamination of liner.

"Humes has a full 360 degree AGRU PE liner, and to be honest, it is much easier to weld," says Heath Rickit.

"We also found the PE 80 AGRU liner a lot easier to work with because it's softer and therefore it's much more malleable."

The pipeline is future proofed as it allows for population growth and being PE lined, there will be no hydrogen sulphide degradation, therefore extending the asset life.

Due to hydrogen sulphide issues here, Stan believes PE-lined concrete pipes will become more widely used.

Moreover, as shields for pipe installations in deep ground conditions are required, Humes' 2.5 metre long pipes are embedded in the shields, making it a safe environment for contractor staff to install.

"Humes West partnership have delivered the council a very successful outcome. There will be more stages in the council growth plan, so this is a pretty critical project that will improve the city network," says Hodson. **WNZ**



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ACO.....	65
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Alta.....	47
Applied Instruments Group Ltd.....	16
Arthur D Riley.....	71
Asmuss Water Systems.....	23
Beca.....	9
Brown Brothers.....	79
City Care.....	45
Connexis.....	77
Deeco Services.....	IFC
Ecoflow.....	63
Eurofins.....	44
Filtec.....	15
Grundfos.....	55
Hach Pacific Pty Ltd.....	21
Hall Machinery.....	OBC
Hill Laboratories.....	6
Hynds Pipes.....	83
ifm Electronics.....	7
Iplex Pipelines NZ Ltd.....	59
James Cumming & Sons Pty Ltd.....	12
Kaeser Compressors Australia.....	17
Linak.....	13
Lutra.....	41
MacEwans Pumping Systems Ltd.....	39
Pipe & Infrastructure.....	53
Schneider.....	29
Siemens.....	35
Stantec.....	25
Steelpipe.....	31
Viking Containment.....	43
Water Supply Products.....	49
Waterco (NZ) Ltd.....	67
Wateroutlook Ltd.....	57
ZwikZip.....	48

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Backflow Prevention Ltd.....	85
CIWEM.....	85
Detection Solutions.....	85
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