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SEPTEMBER / OCTOBER 2016 | ISSUE 196

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Quality + quantity

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A view into the kaleidoscope

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Backflow: Graeme Mills, P: +64 7 577 7052
Digital Water: Thomas Joseph, P: +64 9 374 1599
Modelling: Jeff McLean, P: +64 3 363 5455
Small Wastewater & Natural Systems: John Pfahlert, P: +64 4 495 0896
Stormwater: Michael Hannah, P: +64 9 476 5586
Water Efficiency & Conservation Network: Sally Fraser, P: +64 7 838 6787
Young Water Professionals: **AKL:** Matt Ewen, P: +64 9 274 4223 **WLG:** Fiona Myles, P: +64 4 439 7433 **CHC:** Richard Gramstrup, P: +64 3 941 5778

WATER JOURNAL

Managing Editor: Alan Titchall
 P +64 9 636 5712, M +64 27 405 0338
 alan@contrafed.co.nz
 Contrafed Publishing
Advertising Sales: Noeline Strange
 P: +64 9 528 8009, M: +64 27 207 6511
 n.strange@xtra.co.nz
Design: Contrafed Publishing
 Suite 2,1, 93 Dominion Rd
 PO Box 112357, Penrose, Auckland, 1642
 P+64 9 636 5715
 www.contrafed.co.nz
Distribution: Debra Harrington
 P: +64 4 495 0895

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

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water

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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.



Introducing our 'plan on a page'

Brent Manning, President, Water New Zealand

Welcome to my last column as President.

To those who have read previous columns, thanks. It can be hard at times knowing whether what you write about and a particular perspective on an issue will strike a chord as you tap it out on the computer to meet a deadline. Or if anyone will even read it.

If you haven't been keeping pace, for the record, this year I have written about the following: the Oxfam Water Challenge (March) and the importance of workplaces that embrace altruistic values; the environmental debates around water quality and availability and the need for good data to inform these debates; and the case for change in the water sector and at home in our own association.

In this column, I want to share with you our new strategic plan which brings together elements of all the above, aka the Plan On A Page. Underpinning this graphic (opposite) has been a lot of good work done by my fellow Board members, chief executive John Pfahlert and staff.

I have previously mentioned the changes that were occurring within the Association staffing in order that we can better meet your needs into the future. This is driven by our vision and target that by 2020 Water New Zealand is recognised as the national spokesperson and standard-setter on water, in order that we can chart a "self-determined future" for water, which entails (amongst others):

- Greater progress on technical issues and provision of guidance;
- Advocacy for the water sector as the 'go-to' advisor on water; and
- Collaboration to reach agreement on consistent technical practice.

Change, however, doesn't normally come without some angst and pain, and hard work. Or as an engineer once said to me, "You can't make an omelette without breaking some eggs".

I can honestly vouch that one of the harder things I have done within my tenure was to sit with the staff and explain

the strategic case for change, and support John Pfahlert in the rationale for a new focus within the staff, which meant a restructure of positions and some resultant changes. While it was regretful to see the loss of a couple of long-term staff, it is important to recognise that we have to move with the times and anticipate your future needs, if our Association is to remain valid.

So it is with pleasure I welcome new staff, Vicki McEnaney and Debra Harrington, to Water New Zealand, while confirming that we will continue to strengthen our technical support and guidance to, and advocacy on behalf of, members. For example, at the time of writing, the revised Asbestos Cement (AC) Pipe Manual was undergoing its final review. We have also presented to the Parliamentary Select Committee on our submission to the latest Local Government Amendments (the "Better Local Services" bill), and we have registered the greatest ever number of participants in our National Performance Review.

These improvements and additions to resourcing, however, come at a cost. Consequently, we will be presenting a Notice of Motion to this year's AGM (incidentally returning to the Thursday early evening time slot during the Annual Conference) to increase membership subscriptions for Corporates from July 2017. Keep an eye out for that one in the AGM papers and do attend to ask questions or state your point of view and, of course, vote.

I am proud of what your Board and I have achieved over the past two years, acknowledging and continuing the work of my predecessor Steve Couper. We have charted an altered new course now and I trust you will support my successor Dukessa Blackburn-Huettner as she steers the helm of a newly constituted Board from October.

Thanks for your readership – I do truly enjoy writing on matters we can engage on and I sincerely hope that I will see some of you to continue that engagement at our Annual Water Conference or in the future. It has been my privilege being your President. [WNZ](#)

Since I originally drafted this month's column, we have witnessed the outbreak of over 4000 cases of gastric illness related to a water supply contamination with campylobacter (and possibly other pathogens) in Havelock North, a municipal water supply under the jurisdiction of Hastings District Council.

The Prime Minister has announced there will be a Ministerial Inquiry, a move encouraged and endorsed by Water New Zealand.

While the impacts on that community are lamentable, and there is much to be learned through the inquiry, it is important not to jump to conclusions about that particular event. The point all water supply managers should be considering is: "Could it happen here?"

Earlier this year, at the Water Industry Operators Group conference, the keynote speaker was Australia-based Peter Mosse who encouraged all of us involved in community water supply to be vigilant and

take an active involvement in risk mitigation and looking for quality improvements beyond mere compliance.

This is a wider public health issue and one that needs a Government-led discussion on what it expects from our water-supply authorities and what role the Government needs to play in the supply of safe drinking water.

If changes to the Drinking Water Standards and compliance model result, then a reinstatement of the drinking water subsidy will no doubt be mooted.

As the organisation that represents the water industry, Water New Zealand is looking forward to the independent national inquiry, one that will look at not only what went wrong this week but also the systemic issues that led to the crisis and the role of both central and local government in the supply, funding and treatment of public water.

OUR WATER OUR WAY

strategic plan 2016 - 2020

water
NEW ZEALAND



The New Zealand Water & Wastes Association Waipora Aotearoa

a self-determining future

OUR 2020 VISION
for the water industry

HOW

we will get there together

WHAT

we will do

collaborate to agree on consistent technical practice

advocate for the sector as their 'go-to' advisor on water

progress technical issues and provide guidance

use sector expertise to capture and promote good practice

- demonstrate leadership
- promote effective professional development

- encourage a collegial learning environment
- analyse data for key insights

OUR TARGET

By 2020 Water New Zealand is the national spokesperson and standard-setter on water

WATER NEW ZEALAND CONFERENCES

Annual Conference & Expo 2016 –‘Pathways to Excellence’

19 – 21 October, Rotorua Event Centre, Rotorua
For more information, visit www.waternzconference.org.nz or contact waternz@avenues.co.nz

Water New Zealand Modelling Symposium

15 – 17 March 2017
Rendezvous Hotel, Auckland

Water New Zealand Stormwater Conference 2017

3 – 5 May 2017
Pullman Hotel, Auckland

OTHER CONFERENCES

IWA Congress

8 – 16 October, Brisbane, Australia
iwa-network.org/event/world-water-congress-exhibition-2016

Water Loss Training Event

23 – 24 February 2017
Auckland, New Zealand

You can view upcoming conferences and events through the News & Events / National Calendar section of our website www.waternz.org.nz/events

Water Loss Training Event – February 2017

A follow-up Water Loss Training Event is planned for February 23 & 24, 2017 in Auckland. It will be similar to the February 2015 event but with the theory and training (basic through to advanced) on the first day. The second day will be more conference like in format with presentations on the latest water loss technologies and equipment, and from water suppliers sharing their experiences in managing water losses. The training will cover calculating a water balance and performance indicators for real water losses.

With the introduction of the Local Government Act (LGA) non-financial performance measures, which includes reporting on real water losses, this event should be of interest to all water suppliers. The issues around performance indicators for non-revenue water and real water losses will be discussed and the problems with using percentages, which can result in unforeseen negative outcomes, will be highlighted. Setting appropriate targets is more interesting and complex than what it seems!

There will be a small expo by companies supporting the event. At this stage the following companies are confirmed: Deeco Services, Cla-Val Pacific, Arthur D. Riley & Co., Detection Services, Jeff Booth Consulting and ABB. The venue will be The Holiday Inn, Mangere.

Richard Taylor, from Thomas Civil and Environmental Consultants, Auckland, is organising this event. Registrations will open in October at the website www.eventbrite.co.nz.

If you are interested in the expo or in presenting at the event please contact Richard at richard.taylor@tcec.co.nz.

Advance notice of WATER LOSS TRAINING EVENT 23 & 24 February 2017, Auckland.

Training and presentations covering:

- Water Balance and NRW calculations
- Water Loss Performance Indicators
- Water Loss management
- Pressure management
- Active leak detection
- New Technologies
- Case studies

Update by Ronnie McKenzie, Chair of the IWA Water Loss Specialist Group.

Contact: richard.taylor@tcec.co.nz

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Watercare's forward plans for \$4.9 billion spend

Watercare has made sweeping changes to the way it engages with the construction industry in an effort to be more transparent in the tendering and delivery of its capital projects.

With a \$4.9 billion spend planned on infrastructure projects across the Auckland region over the next 10 years, Watercare has released a detailed forward planning document which provides a timeline for more than 80 specific projects. Carrying price tags that range from around \$2m to more than \$200 million, these encompass relatively modest \$2 million plant upgrades to the 32-kilometre Hunua 4 watermain, the final stage of which will run from Market Road to the Khyber Reservoir complex.

Watercare infrastructure delivery general manager Steve Webster says there was a need to make changes to the way the company approached the procurement and delivery of its major capital projects.

"Construction in Auckland is booming and we need to ensure we are trusted in order to attract the best people and companies to deliver our assets."

Last October, Watercare released its first forward capital works programme, which outlines projects over \$2 million that the company plans to source from the market over the next five years. An updated and improved programme was delivered in July following the release of the company's 20-year asset management plan.

The programme, which is available on Watercare's website, outlines each project including a short description, its cost range, and a five-year timeline that illustrates the expected time required for planning, design and execution.

"The industry is very busy and we know that giving contractors advanced notice is essential for them to adequately prepare their tenders and plan the work efficiently," says Webster.



In late July, key construction industry consultants and companies attended a briefing hosted by Watercare to learn more about the company and its planned projects.

New Zealand Council for Infrastructure Development chief executive Stephen Selwood says Watercare's forward works programme has been universally welcomed by its members, who include equity owners, service providers, public sector agencies, and major infrastructure users across the country.

"Delivering this programme provides the market with certainty in regards to planning and delivering projects for Watercare.

"It has given our members the ability to plan and rally resources in a way that was not possible before. This enables the market to deliver value to both Watercare and, ultimately, the communities it serves," he says.

The forward works programme can be found on Watercare's website, www.watercare.co.nz, by searching for 'Working with Watercare'.

Water quality under the spotlight

As ripples from the Havelock North water contamination debacle spread into wider concerns about water quality, Water New Zealand has convened a special plenary session at its upcoming conference to discuss the resulting Government Inquiry.

The wrap-up session for the conference on Friday 21 October will include a panel of industry experts discussing the incident that left more than 5000 Havelock residents sick with a gastro outbreak attributed to campylobacter-contaminated bore water. How the water supply system became contaminated, how this was subsequently addressed and how local and central government agencies responded to the public health outbreak are all under the spotlight and the inquiry is expected to make recommendations related to drinking water management and operational practices.

The impacts of both the campylobacter outbreak and inquiry are already prompting more focus on the use on untreated bore water for town supplies and are raising concerns about whether more intensive farming practices could be implicated in the contamination of aquifers from which supplies are drawn.

Canterbury's medical officer of health last month ordered Christchurch City Council to provide assurance that water being supplied to some 80,000 people in the City's north-west is safe. It is supplied from shallow aquifers that are currently being replaced with deeper bores as part of a \$16 million upgrade. It now seems likely this work will go on fast forward.

Meanwhile, earlier this month, residents in the south-eastern North Island town of Pahiatua were told to boil their water after E.coli was discovered in a sample from *their* local bore.

Although outbreaks of illness related to contaminated water are not new – most have been on a smaller scale apart from one incident in 1984 when 3500 people in Queenstown became sick because of contaminated drinking water.

New drinking water legislation enacted in 2007 was designed to provide more effective protection against a major outbreak of disease caused by contamination of water supplies. Amongst questions raised by what appears to be this country's worst water-related disease outbreak is – has enough been done?



**WATER NEW ZEALAND'S ANNUAL CONFERENCE & EXPO
ROTORUA ENERGY EVENTS CENTRE 19-21 OCTOBER 2016**

THERE IS STILL TIME TO REGISTER

Registrations are still open for Water New Zealand's annual conference & expo 2016.

Visit the conference website to register. www.waternzconference.org.nz

Over three days delegates will enjoy inspiring keynote presentations, thought-provoking presentations and a huge technical programme. The preliminary conference programme can be downloaded from the programme page of the conference website.

Conference Theme and Highlights

New Zealand faces a number of challenges demographically. While some of our regions are facing significant growth, others have reducing populations, an increasing number of residents on fixed incomes, and aging assets.

How then can we get on a pathway to excellence? This year's event will explore innovative ways to mitigate the range of challenges the water sector faces.

MUST SEE PLENARY

**Government Inquiry into Havelock North:
Friday morning, 11.00am**

In the wrap-up session for the conference, join a panel of industry experts to discuss the recent water contamination event in Havelock North and the resulting Government Inquiry.

This Plenary Session is not to be missed!

The Friday Expo visitors' morning will be further complemented with two keynote talks focusing on "communication technology" and "the future of infrastructure".

Water New Zealand AGM

The 2016 Annual General Meeting will be held during the Annual Conference on Thursday 20 October at 5.00pm at the Rotorua Energy Events Centre.

Networking Opportunities

Social functions throughout the Conference continue to provide a prime networking opportunity.

ProjectMax Welcome Function: 5.30pm, 19 October 2016

Following the close of the breakout sessions, the Welcome Function will take place in the expo hall. This is a great opportunity to take some time to come and get to know others in your industry – drinks and nibbles provided.

Tickets for day registrations, students and guests cost \$49.00 including GST. All other tickets are included in registration fees.

Applied Instruments Operations Dinner: 7.30pm, 19 October 2016

This is an opportunity for delegates within the operations sector of the water industry to network and socialise, but it's open to all.

Tickets cost \$110.00 including GST.

Jeff Booth Consulting Modelling Dinner: 7.30pm, 19 October 2016

This is an opportunity for those within the modelling sector of the water industry to network and socialise, but it's open to all.

Tickets cost \$110.00 including GST.

Hawkins Infrastructure Conference Dinner: 7.30pm, 20 October 2016

A chance to enjoy a meal and entertainment while networking and celebrating the successes of your colleagues and peers.

Water New Zealand Awards 2016

There are 11 awards this year that will be presented at the Conference Dinner & Awards on Thursday evening:

- CH2M BECA Young Water Professional of the Year
- Hynds Paper of the Year
- ProjectMax Young Author of the Year
- Mott MacDonald Best Poster
- Association Medal
- IXOM Operations Prize
- Ronald Hicks Memorial Award
- YWP Conference Attendance Award
- Veolia Health and Safety Award
- Project Award
- Opus Trainee of the Year

Conference Exhibition and Sponsorship Opportunities

There are approximately 180 exhibition sites at the 2016 Conference & Expo. A few sites are still available for sale. Please visit the exhibition page on the conference website for more information and to book a space.

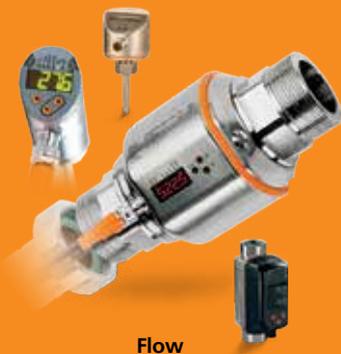
A few key sponsorship opportunities are still available. For details of sponsorship opportunities visit the sponsorship page on the conference website.

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For more information and to register please visit the conference website: www.waternzconference.org.nz

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CONFERENCE KEYNOTE SPEAKERS

PAUL BOWEN



President of the Water Environment Federation (WEF) & Coca-Cola Global Director of Sustainability
09:45am Wednesday 19 October
Water & Wastewater Sustainability with a Corporate View

Paul Bowen is the 2015-2016 president of the Water Environment Federation (WEF), an international organisation of water quality professionals headquartered in Alexandria, Virginia, USA.

Paul is currently the director, Environmental Sustainability for The Coca-Cola Company. In this role he leads a multi-disciplinary programme that reaches across the Coca-Cola System. He is responsible for delivering on company commitments in water, energy, climate, and packaging recovery. His team helps embed

environmental sustainability across all Coca-Cola System operations. He serves as a technical expert for developing water reuse with corporate quality standards and as a sustainable management expert on water and wastewater treatment issues.

A WEF member since 1977, Paul has held multiple leadership and committee roles within WEF. He currently serves as the vice-chair of the Committee Leadership Council. He has served on the Programme Committee as both chair and vice chair as well as served as a member and chair of the Residuals & Biosolids Technical Symposium, Industrial Wastes Technical Symposium and the Research Symposia.

Also an active member of the Georgia Association of Water Professionals (GAWP), Paul has served as a member and chair of GAWP's Programme Committee and a member of the Industrial Waste Committee. His other professional affiliations include: the American Water Works Association; American Society of Civil Engineers; International Water Association; and International Society of Beverage Technologists.

GRAHAM HAWKE



Deputy Director, Environment and Research at the Australian Bureau of Meteorology
11:00am Wednesday 19 October
Water information – a thirst for insight, igniting innovation

Graham heads the Bureau's Environmental and Research Division, which develops and applies advanced scientific knowledge related to weather, climate, oceans and hydrology to build world-class systems and prediction services to support decision-makers in government, industry and the community.

He is a non-executive director and was recently the independent chair of the Australian-China Joint Centre on River Basin Management.

Graham has served in both the public and private sectors, in various executive, corporate, technical and operational roles.

EDWARD TIMINGS



Motivation Guru
08:30am Thursday 20 October
Dynamic presenter on health and well-being

In this day and age, when health and well-being are in danger of becoming merely an industry, it is rare to meet a mentor who actually embodies their philosophy on life; Dr Edward Timings is that rare individual.

Dynamic presenter, chiropractor, disc jockey, ironman, university tutor and international speaker, Edward is able to inform and inspire with his unique blend of life experience backed up with 18 years in the medical field.

After various personal tragedies and time in diabetic research, Edward decided to accumulate his knowledge in a package that would not only educate but that could also inspire and make a difference in people's lives.

What began with local business soon became an international brand of health. The company Juggler Healthcare was developed as an organisation that helps people achieve balance in their busy lives and realise their potential. Juggler works with organisations to design health and well-being programmes that meet their business objectives and reflect their culture. This enables organisations to take control of their workplace issues by encouraging their people to take responsibility for their personal health and well-being. A dynamic presenter, Edward creates an atmosphere of learning and understanding the balance needed to achieve full and healthy lives.

RAVEEN JADURAM



Chief Executive, Watercare
9.15am Thursday 20 October
Observations on New Zealand's Water Industry

Raveen Jaduram was appointed as the chief executive of Watercare after performing the role in an acting capacity since February 2014. He leads an organisation with assets of \$8.7 billion, a staff of 850 and ambitious multi-billion-dollar plans to ensure Auckland's complex water infrastructure will meet expected growth and be resilient enough for future demands. In this keynote, Raveen will touch on the opportunities and challenges facing the water industry, nationwide.



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DR LESTER LEVY



Chairman of Auckland Transport and the Auckland and Waitemata District Health Boards

09:45am Friday 21 October

The Future of Infrastructure

Lester Levy is the appointed chairman of Auckland Transport, the Auckland and Waitemata District Health Boards and the Health Research Council. He is also the chairman of Tonkin+Taylor. He is a lead reviewer for the State Service Commission's Performance Improvement Framework, a joint central agency initiative to help public sector senior leaders lead performance improvement in their agencies and across the system. He is the

foundation head of the New Zealand Leadership Institute and adjunct professor of Leadership at the University of Auckland. Lester is best known for leading a number of organisational performance transformations as a chief executive, entrepreneur and chairman in both the public and private sectors. In the 2013 New Year's Honours List Lester was appointed as a Companion of the New Zealand Order of Merit for services to health and education.

WATER – COMING UP

This next issue of *Water* will be published in November.

Its lead theme is Water Governance and Management. The Sub-Topic is Small Water Systems.

The deadline for copy is Monday 31 October.

Please contact managing editor, Alan Titchall alan@contrafed.co.nz or phone +64 9 636 5712 if you have any story ideas, contributions or photos.

For all advertising, contact Noeline Strange on Ph: +64 9 528 8009; M: 027 207 6511 or E: n.strange@extra.co.nz. To view 2016 themes, visit www.waternz.org.nz

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Novel water cleaner – just add sun

Engineers at Washington University have developed an entirely new way to transform dirty water into potable water utilising a “biofoam” that combines graphene oxide with bacteria-produced cellulose.

The process, recently outlined in the *Advanced Materials* journal, is described as “extremely simple” as well as potentially inexpensive – and thus readily scalable. The material is formed in much the same way an oyster produces a pearl – bacteria forms layers of cellulose fibres and the graphene oxide flakes become embedded in the fibre.

The cellulose on the bottom of the biofoam acts like a sponge to

draw water up to the graphene oxide. Add sun, and you get rapid evaporation which allows clean water to be collected from the top of the biofoam sheet.

Because the materials can be created in mass, the foam can be made into large sheets at a low cost.

Its inventors say it has the potential to be a global game changer. They hope that for countries with ample sunlight, such as India, it will be possible to take some dirty water, evaporate it via the biofoam and collect fresh water.

Flint fallout continues as crisis ends

The state of emergency declared in Flint, Michigan over the town’s lead-contaminated water supply may have been lifted but the fallout continues.

Some 8000 children have been exposed to lead contamination, nine federal employees face criminal charges, two big companies face civil suits and social costs have been estimated at close to \$400 million after a debacle lasting more than two years. It started in April 2014 when the city’s municipal authority tried to save money by switching its water supply source from Detroit to nearby Flint River.

However, the river water proved much more corrosive and started leaching lead from the city’s aging pipes. Residents’ concerns were initially brushed aside and various lower-level public officials have subsequently been charged with concealing information and failing to take immediate action.

As local protest gained traction, President Barack Obama declared a state of emergency in Flint early this year and offered \$5 million of Federal assistance. The water supply has subsequently been switched back to Detroit and the state of emergency ended in August.

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Minister's take on water quality management

Stronger national direction, a more collaborative approach to resolving water policy problems and tighter regulation are some of the policy ingredients for freshwater quality improvements outlined by Environment Nick Smith – but he warns against “impractical” swimmable standards for all water bodies.

In his 2016 Lincoln Environment lecture, the Minister noted that we are blessed with an abundance of rainwater (equivalent to 145 million litres a year each) and freshwater resource – 600 trillion litres in total of which we utilise just 1.8 per cent. Its quality is “generally good” by international standards, he says. However, river condition trends suggest the most significant declines are in “more intensively farmed areas and caused by minimum flows being too low and levels of nutrients or sediment too high”.

In a wide-ranging speech, he stated that the Government's number one priority is improving freshwater quality. This, he says, can be achieved alongside the second priority – of maximising economic opportunities derived from freshwater resources with help from the third priority – improving Maori involvement in the process.

In terms of on-going reform, he highlighted six “drivers”. These ranged from a stronger national direction to a focus on science and innovation to deliver new tools for limiting pollution and improving water use efficiency.

They also include “more consistent and open reporting” to deliver meaningful data related to water take and water quality. National maps on the swimmability of water bodies will be a part of that.

Tighter regulation, compliance and enforcement are also part of the picture. The Minister noted that limits on nutrients are rolling out nationwide – with some already implemented (Taupo, Southland, Canterbury, and Manawatu) with 15 more in the pipeline. He also highlighted national regulations on stock exclusion and fines for non-compliance.

Looking at topical issues, he briefly addressed Havelock North's drinking water contamination describing it as a “serious failure” on which there are “many tough questions that will need to be answered”.

His full speech is available at www.beehive.govt.nz/speech/improving-freshwater-management.

Funding boost for water quality projects

The Rangitikei Awa is the latest waterway to get a funding boost from the Government to improve its water quality. A \$700,000 grant will go towards a project that includes restoration of the river and catchment by improving water quality, fish habitat and riparian health at sites important to the local Nga Pae o Rangitikei collective.

The grant was announced this month by Environment Minister Nick Smith and Maori Party co-leaders Te Ururoa Flavell and Marama Fox and follows earlier announcements on funding for Far North dune lakes and Gisborne's Uawa River and Estuary. The latter gets a clean up with \$500,000 from the Government's Te Mana o Te Wai Fund which will go toward fencing, planting, pest control and sustainable farm management in the Uawa catchment. Restoration work around Lakes Wahakari, Rotoroa/Split and Waiparera Wetland in the Far North will gain a \$350,000 boost from the same fund.

Dam project hits hurdle

The planned Ruataniwha dam in Hawke's Bay last month hit another hurdle when the Appeal Court last month ruled that the process to acquire protected conservation land was unlawful.

In February, the High Court had approved a land swap between the Department of Conservation and Hawkes Bay Regional Council involving 22ha of protected conservation land in Ruahine Forest Park for 170ha of farmland. This decision was appealed by the Royal Forest & Bird Society which said it was wrong to allow the land's protected status to be revoked for a commercial development. The Society was concerned this could set a precedent which undermined the protected status of Conservation land. The Appeal Court agreed saying that the land's protected status could only be revoked if the intrinsic values of the land no longer justify preservation and protection.

The project, which involves a 93 million m³ storage reservoir located in the upper Makaroro river has proved controversial with the “pro” camp regarding it as an economic shot in the arm for the region while others see the estimated \$333m project as both environmentally and economically risky.



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Tapping in to water news

Raglan wastewater spill

Waikato District Council earned a formal warning after an investigation into an incident that resulted in untreated wastewater getting into Raglan harbour. The incident happened in late March this year and was attributed to a failure of one section of pipeline, most likely due to a combination of technical factors. A second minor discharge occurred while repairs were being carried out. Waikato Regional Council said the decision to settle on a formal warning reflected the overall facts of the case plus the swift remedial actions taken by the District Council.

Boil water notice for Hauraki residents

Hauraki District Council opted to play it safe last month and issued some 200 households with a notice to boil their water after bad weather compromised the water supply to Kaimanawa and Mackaytown. E.Coli had been detected in Kaimanawa which is creek supplied and higher levels of sediment impacted on the effectiveness of chlorination. Mackaytown is to be connected to the upgraded Paeroa water supply by year's end.

Dirty water fallout in India

India is home to the world's largest number of stunted children according to a new report from WaterAid which says a lack of both toilets and clean water is to blame. Stunting is a form of malnutrition in which children are smaller than usual – a condition that generally cannot be reversed after the age of two. The number of Indian children under five estimated as affected totals 48 million; Nigeria ranks second with 10.3 million, while Pakistan is third worst with 9.9 million. Data collected by WaterAid in India shows that 140,000 children a year die from diarrhoea in the country while 76 million lack access to safe water and 774 million live without adequate sanitation.

Droughts to floods – extremes in Asia

A previously parched Southern Asia was hit by extreme monsoon weather in late July with resulting floods killing more than 300 and displacing millions. The worst impacts were felt from Bhutan to Assam and Bangladesh to Pakistan and are in line with climate change predictions of fewer but more intense rainfall events. Rainwater consequently tends to inundate surface areas rather than percolate through the soil to recharge the water table. In urban areas, it highlights the need to invest in better stormwater systems to cope with the "new normal".

SOCIAL MEDIA

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The Water Book: Alok Jha

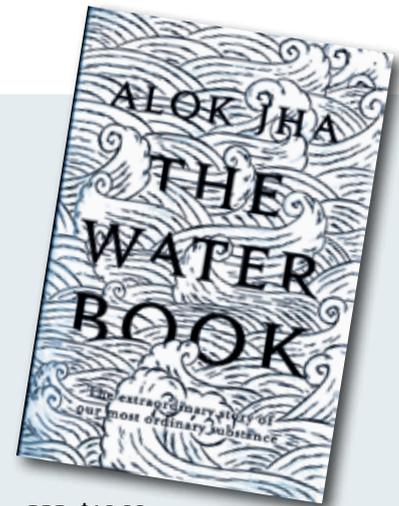
Water is the life giver... it courses through us, our societies and our planets. But this ordinary, ubiquitous substance also drips with mystery – as science writer Alok Jha was in New Zealand recently to explain.

Author of *The Water Book – the extraordinary story of our most ordinary substance*, Jha delivered the 2016 Thomas Cawthron Memorial Lecture in Nelson, spoke at the Christchurch book festival in August and earned a reference from Environment Minister Nick Smith in his recent speech about freshwater which, as Jha noted, makes up just one percent of all water on earth.

For anyone who likes their science delivered in an accessible, personal, even poetic manner, his book is a great read. It explains the unusual properties of water and highlights what

remains inexplicable. Most of us know the chemical formula for water [H₂O] but given the lightness of both its hydrogen and oxygen components, why isn't it a gas? How does it freeze? How come hot water freezes faster than cold in sub-zero conditions? Where did water even come from? Did it really arrive courtesy of asteroids and comets – the detritus of our solar system's birth?

Jha starts his journey through water literally – with a bout of sea-sickness brought on by a 2012 passage from Invercargill to "The Ice" of Antarctica on a science expedition. He concludes by noting that while we are inexorably tied to water and its various forms, it is not tied to us. More than a billion years hence, after the earth is gone and our sun reduced to ashes – "disassociated into its



RRP: \$40.00

constituent elements, all the water we have ever known will be atoms, floating in the blackness of space".

Definitely poetic.

Vicki Jayne

Whanganui's \$41 million plant gets go-ahead

In a divided vote, Whanganui District Council (WDC) last month gave the go-ahead for a new \$41.2 million wastewater plant to replace the one that started failing not long after it was formally opened in mid-2007.

That doesn't exactly draw a curtain over the long-running saga which has been subject to claims and counter-claims about whether and how the original MWH-designed system could be fixed or whether it was a lost cause. Now the whole process is being subjected to an independent inquiry being led by legal practitioner and senior manager Robert Domm, who was appointed to the task in early July.

The inquiry was requested in a petition from local ratepayers who are understandably concerned about the costs and resulting

impacts on their rates. It hasn't helped that various experts who've had their say on the issue don't seem to agree on the causes for the original failure.

In May, WDC chief executive Kym Fell released previously confidential advice from Humphrey Archer of CH2M Beca, which basically said the previous plant was never going to work. That advice had been presented to WDC the previous October and had formed part of WDC's case against MWH. The Council settled legal action against the global engineering consultant in February this year though the details of that settlement were not disclosed.

The new CardnoBTO design, which has been peer-reviewed by both Aecom and CH2MBeca,

was originally green-lighted in March. WDC advised that work would start immediately following its extraordinary meeting on August 9.

When the plant is operational in 2018/19 it is expected that the dried solids will be disposed of to the now redundant settling pond on the wastewater treatment plant site for the first three years (2018/19 to 2020/21) and thereafter be spread to local land.

Meanwhile, the Council is seeking a three-year resource consent to continue the discharge of milli-screened wastewater to the South Beach outfall.

Although the foul smells from the failed plant may have eased, it seems likely the political stink will hang around a bit longer.

Water proofing global sustainable development

World Water Week 2016, themed "Water for Sustainable Growth" concluded in Stockholm last month with a call for water to be recognised as the enabler of the entire 2030 Agenda for Sustainable Development.

"Water – the lifeline of our planet – will be needed to achieve nearly every Sustainable Development Goal (SDG), and to face the challenges that climate change presents," said Karin Lexén, director of World Water Week at Stockholm International Water Institute (SIWI).

The event attracted 3100 participants from 120 countries and the focus was on implementation and action with a call for across-the-board engagement from civil society, business and social entrepreneurs. "Water is too important to keep inside the water community – water is a central part of the entire society," said SIWI executive director Torgny Holmgren.

During the Week, climate was also discussed in relation to alleviating hunger in sub-Saharan

Africa. Delegates called for a Green Water Initiative in Africa with one speaker saying that rainwater harvesting and other green water management methods are necessary both to alleviate hunger in sub-Saharan Africa and meet the SDGs.

World Water Week 2016 was the 26th edition. The 2017 World Water Week, to be held from 27 August to 1 September in Stockholm, will focus on water and waste under the theme "Water and waste – reduce and reuse."

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SUZANNE NAYLOR

A real star

The 34-year-old who now manages water services for a big chunk of Auckland is not just a shining exemplar of the profession for would-be engineers. Suzanne Naylor is, literally, a star – as **Vicki Jayne** discovers.

There are not too many people who can peer up into the night sky and pick out their own star. Suzanne Naylor is one of them.

Watercare's Northern Networks Manager was recently dubbed "Inspirational leader" at the annual Connexis "Celebration of Women in Infrastructure" lunch and as she explains, that honour came with a pretty unique prize.

"It came from the British Astronomical Society which has named a star 'Suzanne Naylor' and given me the coordinates for it. Cool, eh!"

Already planning a family star-spotting trip to Stardome, she happily ponders the possibility of life in her distant quadrant of the sky: "Naylorians – we already named them. One of my staff came up with that. I like it."

With her easy manner, bubbly good humour and fairly stellar career trajectory, it's no surprise Naylor is also an ambassador for the Government's "Make the World" initiative to encourage youngsters into an engineering degree. It helps that she just loves her job.

Appointed to her current role earlier this year, she is responsible for ensuring provision of drinking water and removal of wastewater across commercial, industrial and residential sites stretching from Auckland's North Shore out to Rodney and Waitakere. That involves managing a big team as well as a \$20 million maintenance contract while constantly having to deal with the sort of crisis that accompanies the region's twin challenges of rapid expansion and aging infrastructure.

Asked to describe a typical day, she says it doesn't really exist.

"Every day is completely different. It sounds bizarre but the reality is that while I come to work with great schemes of addressing specific network issues and planning how things can be improved, I get there and discover, say, that Orewa is about to run out of water because of a mains break... So you have to drop everything to focus on that."

This is a region where there's a lot of new development – adding to both the size and complexity of the job. The infrastructure in new developments has to be up to standard so it can be seamlessly stitched into existing water networks.

"In my area alone, we're getting 30 new pump stations a year. That's phenomenal growth. So, every year, the assets I look after are multiplying. That's a challenge."

It is, she says, a "very reactive" job. Luckily, she's up for it.

"I do love a challenge – I love fixing things, making things better than they were, building in more efficiency, employing new technologies and asking how can we make this service the best for everybody: the best for users, good for contractors, easy for my team to manage."

Engineering, she reckons, comes with an inherent creativity.

"There's no 'one size fits all' solution – you have to come up with creative methods to find what is the best way for this to work. So there's a lot of problem solving and coming up with ideas that may not have been used before."

Yet it's a career she fell into pretty much by accident – mainly thanks to the treasured car she acquired after leaving school.

"It was worth 700 bucks and I loved it, so I wanted to

drive it to uni. That wasn't possible at Auckland so I got the prospectus for Unitec and circled anything that looked interesting."

That was influenced both by her parents and childhood experiences. A "born and bred Westie", Naylor and her brother enjoyed what was once seen as a fairly typical Kiwi upbringing – full of bush walks, beach visits and DIY entertainment with extended family.

She loves animals and wanted to be a vet right up until she took on an after-school job at a veterinary clinic and realised that if she went down that track, she'd probably end up running an animal refuge. Outdoor work also appealed.

When it came to choosing courses, her parents were pretty insistent she do a degree rather than a diploma so after crossing out landscape design, the remaining option was... environmental engineering.

"I didn't even really know what environmental engineering was all about but I had good grades so I was accepted."

It turned out to be a great choice.

"The classes were small – just seven of us were taking the full degree course – and it was also very hands on. You were out there in streams doing surveys – not just theory. When I look at the people who graduated from that degree, they're all doing amazing things."

It also proved a bit of a one-off as Unitec subsequently discontinued the degree. "I just lucked in," says Naylor.

Turned out she also had a nose for the work – literally. As part of her practical training, she applied for a summer job at Watercare – odour monitoring. The job interview consisted of a sniff test using an olfactometer.

"Three of us had applied and, honestly, it was like Goldilocks. One's nose proved too sensitive, the other's not sensitive enough and I was right in the middle. So I got hired because I had a 'plain nose'. They needed that as it was more representative of the community in which I would be doing odour control."

The summer role turned into a part-time job which then morphed, after she graduated, into fulltime employment – this time, in an environmental planning role. Although she enjoyed the work, a relationship breakup prompted her to extend her horizons offshore. That led to two years of working for a solid waste company in the UK. But she stayed in touch with friends at Watercare – and her decision to come home coincided with a job vacancy.

Initially appointed to do another compliance role, she was later promoted to Headworks Engineer – looking after Auckland's raw water resources. It was a big step up.

"I was 26 and in charge of a team looking after billions of dollars worth of assets. I inherited a team of nine men whose collective experience totted up to 350 years – but they hadn't had a lot of support."

She brought a stronger environmental focus to the role. One project she initiated was implementing a fish-trapping haul around the dams to facilitate fish migration.

"There was a lot of learning involved and it was quite a big thing to get those people passionate about moving fish around – it's quite a different sort of skill set."

Passion is a word that crops up a bit when Naylor talks

about her work. As a leader, she believes it is part of her role to find and encourage what gets people excited about their work.

“I think being a leader is about finding the bit in people that really fires them up – the passion for what they do.”

Although somewhat diffident talking about her ‘leadership style’ (“I’ve never done management training”), Naylor says her basic philosophy is to treat people as she’d want to be

treated. She likes to let people find their own feet – giving support where and when needed. A natural team player, she’d rather engage people in finding solutions than tell them what they should do.

That desire to help people discover what really works for them extends to her mentoring role with IPENZ. She currently has seven mentees and finds that, with the younger ones in particular, it is often a lack of confidence that holds them back.

“It’s the need to learn everything and gain respect at the same time and being a bit too shy to push yourself.”

It reflects early challenges in her own career – earning respect for her opinions and her decisions. In her case, that involved overcoming some preconceptions about the sort of person she was. Her quick humour is something she’s had to peg back a bit to earn her stripes in what is a very professional and male dominated world.

“The problem I’ve had is that I talk fast, I’m very social, tend to giggle – it’s a bit of a young and girly image. It took a while to get over the stigma of being a young blonde girl who laughs a lot – in a man’s world.”

That, she says, was a matter of time, maturity – and backing herself in terms of a growing knowledge base.

“If I’m not 100 percent sure about something, I hold back, research and basically do a lot more work to back



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my decisions. It's about learning as much as you can to gain people's respect so that when you make a decision, they'll go with it.

"Whether that is a young person's thing or a women's thing, what I've learned is that in this industry, you have to back yourself, 100 percent."

As with many women, she has also had to juggle career and children.

"It's been quite hard. We have three children and my husband opted to be a stay-at-home dad which allowed me to go back to work fairly early on."

Because life on one income wasn't a lot of fun, they decided to have three children in fairly quick succession so both could return to work a bit sooner. A flexible working environment and supportive parents have also helped but with three children under six, life tends to be a tad chaotic.

"The only way you can do it as a fulltime working mum is with lots of support;" she notes.

So – are enough women choosing a career in engineering?

"I think we could be doing more to promote engineering to them at high school level. You have to like maths and science – and women often prefer arts subjects. But engineering is not all hard hats and bridges and I think we could do a lot more to get rid of some of the preconceptions and stigmas around it."

One of the big challenges facing the 3-Waters industry is that it is losing a lot of experienced staff through retirement and finding good graduates isn't easy.

"I've got a good mix in my team. About half have a lot of experience and the other half are quite new to it. So the younger ones get technical mentoring and they also bring in some new ideas and new passion. So it's a good mix but we have to keep succession planning for everybody and it's a matter of finding people with the passion for the work."

Naylor still has plenty of that to share. Asked about the memorable bits of her career, she finds it hard to choose.

"It's been a blast. The people I work with are amazing; Watercare is a great place to work. I've had some wonderful opportunities, some really different jobs...."

"I really like how reactive the work is. It's interesting coming to work not really knowing what exactly is going to happen, having to think on your feet and make quick decisions – even if you sometimes don't have all the information you would probably like. It's about having good people around you and making good decisions."

The work is neither prescriptive nor boring.

"It's not like you have someone telling you what you're going to be doing today – you're left in charge and have to take control, to make things work better. There's a lot of accountability. And every day is different." **WNZ**

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One-stop safety shop

For water industry workers

Councils and contractors are working together for safer workplaces – and to help meet the challenges of new legislation, a one-stop shop for health and safety information is now being developed, as **Lesley Smith** explains.

In 2013, the Independent Taskforce on Workplace Health and Safety reported that New Zealand’s work health and safety system was failing. As a result, New Zealand underwent its most significant workplace health and safety reforms in 20 years which led to the formation of WorkSafe and the Health and Safety at Work Act 2015 (HSWA).

Many water, wastewater owners, contractors and suppliers around the country have been proactive in adapting their health and safety systems to changes in the Act. There is also a plethora of guidance and tools that have been developed to help these organisations comply with the new legislation and ensure we have healthy and safe work environments.

However, the changes have thrown up significant challenges for time-poor operational and management staff in the water industry in not only locating information but determining what is relevant. The Water New Zealand Water Services Managers Group (WSMG) thinks this could be made easier.

In response, the group is developing a new one-stop shop for providing key information.

The health and safety project will collate information and learnings from industry leaders, provide access to existing advice, and identify and plug any remaining knowledge gaps through a central resource that can be used by contractors and system owners alike.

DEVELOPMENT OF NATIONAL GUIDELINES

The aim is to collate a set of national guidance for the water industry on health and safety. The last time such guidance material was produced was 2001. The project will also collate resources from existing Water Services Managers initiatives including guidelines on Chlorine Emergency Response Planning, and Health and Safety aspects of Asbestos Cement pipes.

ADVISORY GROUP

An advisory group of Water New Zealand members is overseeing the development of the project. The group consists of senior staff and health and safety experts from Veolia, Downer, Watercare, BPO, Hastings, and Dunedin City council, all of whom have volunteered their time to advance the way our industry addresses health and safety.

INFORMATION ACCESS

Much of the existing guidance on health and safety can be accessed electronically. Accordingly, the framework will be

delivered on a web-based portal to provide easy access, and dynamic material for 3 Waters staff from across the industry.

IMPLICATIONS OF ACT

The HSWA came into force on 4 April 2016. Here are some of the most significant features for our industry.

WORKING TOGETHER

The HSWA Act strives to promote a concept of working together to ensure worker safety. With many contractors involved in the delivery of water and wastewater services, this has big implications for both project delivery and operations.

The new law essentially requires people to think and communicate about safety aspects faced in their everyday work activities. It requires cooperation, communication and coordination amongst all entities involved in design, manufacture, construction, implementation, maintenance, operation and removal and disposal of water, wastewater and stormwater services.

PERSONS CONDUCTING A BUSINESS OR UNDERTAKING

The HSWA introduces new categories of “duty holders”, with different but overlapping responsibilities. The primary duty holder is a person conducting a business or undertaking (PCBU). This can be an individual, but will typically be an organisation such as a territorial authority, council-controlled organisation, or consulting business.

A PCBU has a duty to ensure any workplace under its control or management is without health and safety risks to any person, so far as is reasonably practicable. These duties apply irrespective of the location of the workplace. PCBUs must also consult with workers and others on health and safety matters. This means that both contractors and system owners are likely to have duties that extend beyond their office and direct reports.

SAFETY AND DESIGN

The new legislation has a heightened focus on safety in design; ensuring life-cycle safety is considered during the design of products and structures. It places a duty of care to consider all aspects of safety through the design, manufacture or construction, and use over its serviceable life and then its safe removal or demolition.

continued on page 22...

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EXISTING RESOURCES

There is no cookie-cutter approach to health and safety because each organisation has a different level of maturity, risk profile, relationships, risks and resourcing. However, there are a

number of themes and approaches that can be shared and a plethora of information and resources available. Some of our favourite sources are listed in the table. **WNZ**

AGENCY	RESOURCES	ACCESS
WorkSafe	A range of resources including: Meeting HSWA obligations, Confined spaces, Asbestos, Disaster recovery	business.govt.nz/worksafe
Environmental Protection Authority	Chemical handling and storage requirements	epa.govt.nz
Business Leaders Health & Safety Forum	Case studies and benchmarking tools for organisational leaders to improve health and safety	zeroharm.org.nz
Safe Work Australia	Guidance on the Principles of Safe Design for Work	safeworkaustralia.gov.au
Civil Contractors of New Zealand	ConstructSafe – A safety competency system for staff in the civil construction industry	constructionsafetycouncil.co.nz
Auckland Council	Best management practices for health and safety of stormwater systems	aucklandcouncil.govt.nz/EN/environmentwaste/stormwater/Pages/stormwaterreferencelibrary

- Updates on project development will be provided via the Water New Zealand website or contact Lesley.smith@waternz.org.nz for further detail.



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Pipeline Project

Even the most straightforward of projects present unexpected challenges and opportunity for innovation as Higgins Contractors found when building the Havelock North Relief Sewer.

Mary Searle Bell explains.

Havelock North in Hawke's Bay is a growing community, and the town's sewer line has had to be upgraded to ensure it is able to cope.

Nick Cottier of Hastings District Council is the senior project manager on the Havelock North Relief Sewer project and says the work is to cope with expected continued growth in the region. He says the existing pipe out of the town is nearing capacity and the new, second pipe is a vital piece of infrastructure.

"This project has been in the wings for a long time," he says. "It will future proof Havelock North for the next 50 years."

The pipeline stretches just over seven kilometres and has a couple of major chambers along its length. Higgins Contractors won the tender for this work back in April last year and has almost completed the project – it finished laying the pipe five weeks ahead of schedule but things are on hold for a period while the council undertakes some other, complementary work. When that is done, Higgins will complete the downstream chamber.

The pipe is a 700mm diameter structural wall PE pipe. In places where there is shallow cover, a heavy wall structural PE was used, but the rest is standard pipe.

In many respects it has been a straightforward project. The pipeline was constructed offline – by building a complete new line there was no disruption of service. Also, as the line is mainly rural, there were not many properties to deal with, says Nick.

However, he also describes it as a difficult site and there were a few quirks that added challenges, the biggest being the plethora of existing underground services in the berm.

"There were a lot of cables and not a lot of room for the pipe," he explains.

Graeme Clarke of Higgins cites the excess of cables as the obvious difficulty with the project too.

A two-metre wide trench was required to lay the pipe so Higgins had to change the alignment in places – sometimes moving into the road – to sidestep the other services.



Foxbox from Real Steel is a new trenching product made from high tensile steel imported from Sweden.

Another difficulty was the very flat grade. Clarke describes this challenge as unique.

"The grade was 1:1078, which works out at 0.93mm of fall per metre."

Stretch that out over 7.3 kilometres and you can comprehend how vital it was to get it right and just how tight the tolerances were. Higgins had a survey control point set up and did two survey checks a day. The tolerance was just half a millimetre for every six-metre length of pipe.

"It was critical to get it right," says Clarke.

The weather also caused a couple of headaches.

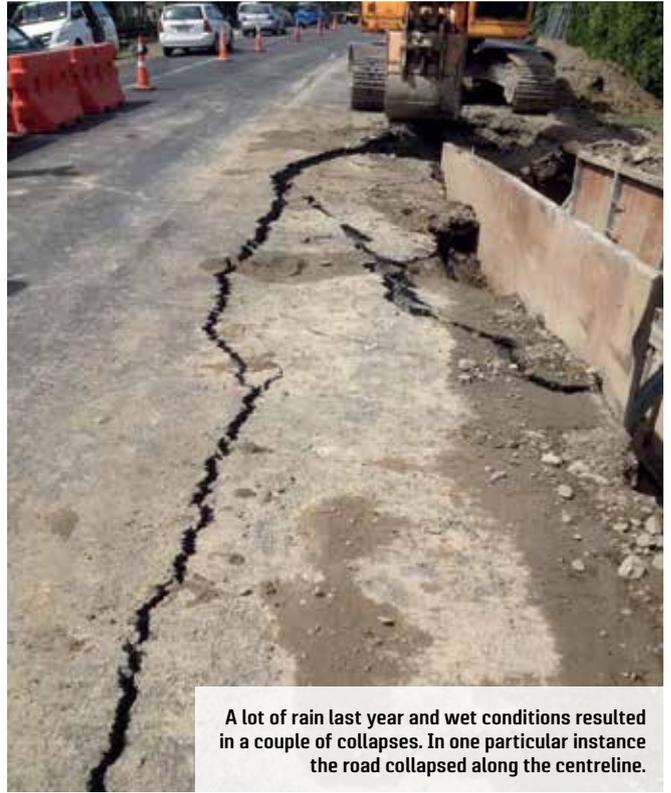
"We had a lot of rain last year which meant working in wet conditions and we had a couple of collapses," says Clarke. "In one particular instance we had the road collapse along the centreline – we had dug out some old stumps which must have been acting as a plug. When the trapped water was released it left a very deep 3.2-metre-long crack in the road, and put a big dent in our trenching cage."

Then there were the usual traffic issues to deal with too – particularly on the two kilometres which ran alongside the state highway.

Unbeknown to Higgins, the stretch of state highway between Clive and Hastings was originally a concrete road built after the World War Two. At one point, the pipe had to cross the highway, which meant digging through 250mm thick concrete, and then reinstating it in sections to ensure the road could remain open to two lanes of traffic.



A two metre wide trench was required to lay the pipe so Higgins had to change the alignment in places – sometimes moving into the road – to sidestep the other services.



A lot of rain last year and wet conditions resulted in a couple of collapses. In one particular instance the road collapsed along the centreline.

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Challenges surmounted, Higgins also employed innovation in the form of a bespoke trenching cage from Real Steel after its existing one was damaged when the road collapsed.

“The opportunity arose to buy a stronger trenching cage – one built from hardened Hardox steel,” says Clarke. “We had hired an aluminium one and while it was strong, it was super heavy. We wanted the strength without the weight.”

The standard length for cages used when laying six-metre lengths of pipe is 6.8 metres but Higgins asked Real Steel to build a 7.2 metre long cage (which, incidentally, was still lighter than the 6.8 metre aluminium one).

“We wanted it slightly longer – 6.8 metres is not quite enough room for the boys to be safe when working around the end of the pipe,” explains Clarke. “It proved its worth when the trench collapsed while the boys were in there.”

The new cage had a number of other innovations, including armoured struts which prevent the cage getting damaged when the digger moves it. Also, the pins on the struts were recessed, as was the ladder, to prevent accidental damage by the digger.

Carl Leenders, production and design manager at Real Steel, says the Foxbox, as the new product has been named, is made from high tensile steel imported from Sweden.

“The Hardox wear plate is specifically designed to be

hard – it’s used to build digger buckets and the like,” he says. “Along with being extremely strong the properties of the steel allow us to do fancy things with the engineering.”

Most significantly, the Foxbox is much lighter than comparable products and Carl says this makes it more manoeuvrable on site. He says Higgins was able to swap out its 25 tonne digger for a 12 tonner to move the new cage.

Another helpful tool is that each Foxbox has its own webpage. Clients can enter the serial number of their Foxbox and see all the relevant documents specific to their cage, including the user manual and guide on ground pressure ratings, on their phone.

Real Steel is in the process of bringing out the next generation of Foxbox, which incorporates further innovations based on feedback from Clarke and other customers and promises even more safety features built in. But the original Foxbox has done the job nicely for Higgins.

“It works really well,” says Clarke. “We got the cage early this year and it has been great.”

Although the project is not completely finished yet, what has been done has gone well. Higgins laid an average of 36 metres of pipe a day, which, according to Clarke, and considering all the obstacles in the way, is pretty good going at up to 3.5 metres deep. **WNZ**

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From Flint to Havelock North

Should the Government take a larger role in ensuring we all have access to safe drinking water? Water CEO **John Pfahlert** points out that the Havelock North debacle raises wider questions.

The Government inquiry into Havelock North's water contamination provides a prime opportunity for a rethink of the regulatory environment around and whether we need a more consistent approach to ensure all communities are drinking safe water.

The public outrage against the Hastings District Council following the outbreak of campylobacter is understandable. New Zealanders have always expected that the water they pour from their household taps is safe. Havelock North reminds us that drinking untreated water comes with certain risks. While the probability of infection may be low, the consequences of infection can be serious.

Hastings District Council certainly isn't alone in supplying untreated water to a community, despite the calculated risk of contamination. For instance, Lower Hutt City which serves around 70,000 residents does not treat its deep bore water supply, nor does Christchurch with over 300,000 residents. It's likely that around a quarter, or even up to a third, of our national population is drinking untreated tap water.

There are a number of reasons for that. Cost, especially to smaller communities, is one factor. But it's also a matter of taste and preferences. We know that there is strong opposition from some people in the community to chemical additives such as chlorine and fluoride in water supplies.

The Government's "far-reaching" inquiry will look into the actions of the Hastings District Council, how the water supply became contaminated, and the subsequent response. We need to lay-off judgement and recriminations until we see findings.

However, it is very important that through the inquiry we look at the bigger picture and how we supply water to communities. For instance, why is it that we have Drinking Water Standards that are not mandatory? Why don't we require all people managing water treatment plants to hold a relevant qualification? Are the current legislative and regulatory approaches still appropriate?

Water is a public health issue and it's timely that the Government is conducting an independent inquiry into the role Government needs to play in the supply of safe drinking water.

The terms of reference for this current inquiry are quite broad, and it's a discussion that needs to be on the table along with the issue of funding.

Back in 2005, when the Government introduced the Drinking Water Standards, it set up a subsidy scheme in order to help offset the financial burden on smaller councils. But, as this was capped at a lamentably low \$10 million a year, many councils missed out.

Both Water New Zealand and Local Government New Zealand have asked the Government to reinstate this subsidy, but this time backed by a much more realistic financial backing. We've suggested around \$20 million a year is required on an ongoing basis.

It's likely that around a quarter, or even up to a third, of our national population is drinking untreated tap water.

Drinking water quality is an issue of national significance. Given that it's the Government setting the regulatory standards, it needs to come to the party with a realistic level of funding to assist small communities meet those standards.

As the organisation representing councils at the national level on drinking water standards, the independent inquiry provides us with an opportunity to provide sensible technical advice to the inquiry.

I've already established a review group of industry participants to assist Water New Zealand in responding to the inquiry. Later this year, the Water Service Managers Group and Water Utilities Association – representatives of the water utilities – will also be discussing how they believe the system should be altered.

I welcome input from any industry member who believes they have something to contribute to the debate.

Water New Zealand CEO, John Pfahlert

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When pure turns poor

Living with contaminated rivers

Water pollution is recognised as a major issue and a problem that demands ongoing evaluation and revision of water resource policy at all levels of government around the world.

Alan Titchall reviews the situation at home with our river water quality.

Water pollution is not just a major issue among developing countries. A decade ago, the Environmental Protection Agency in the US wrote a report for the US Congress called the ‘National Water Quality Inventory’. It starts off saying: “About 44 percent of assessed stream miles, 64 percent of assessed lake acres, and 30 percent of assessed bay and estuarine square miles were not clean enough to support uses such as fishing and swimming. Leading causes of impairment included pathogens, mercury, nutrients, and organic enrichment/low dissolved oxygen. Top sources of impairment included atmospheric deposition, agriculture, hydrologic modifications, and unknown or unspecified sources.”

Less than 30 percent of waters in the US were assessed for this report at the time, so one can only imagine the situation now.

Closer to home it has been a hell of a year for water quality news with the Havelock North fiasco standing out as a bad example of quality management. In reality though, it has been a hell of a century for water quality in this country.

Remember when in 2004 *didymosphenia geminata* (didymo) was discovered in Southland – the first time it had been found in the Southern Hemisphere?

A decade later, this algae blooms in over 150 rivers in the South Island where nutrient concentrations (nitrogen and phosphorus) are low. Ironic, when you consider many of our North Island rivers and water sources have an excess ‘nutrient’ problem.

A decade on and research by NIWA demonstrates that concentration of ‘dissolved reactive phosphorus’ (DRP) has an immediate effect on didymo blooms. Visible didymo has not been observed at sites when long-term DRP concentrations (eg, one to two year average) are more than about two parts per billion (ppb), leading to the conclusion that the blooms are caused by low phosphorus concentrations. The algae have not been found in the North Island because dissolved phosphorus concentrations in rivers are too high (greater than an average of two ppb, as a result of phosphorus-rich catchment geology).

NIWA is convinced the algae were ‘introduced’ from Northern Europe. “There are no historical records of didymo in the South Island, and only one (highly likely a case of mistaken identity) from the North Island,” it says.

“A likely scenario is that didymo arrived following the transformation of didymo in the Northern Hemisphere from a rare species with only occasional blooms in some locations to a common species with widespread blooms. In an age of increasing tourism and air travel, the transfer of cells to remote locations like the South Island – which also happened to have rivers with perfect conditions for blooms – was almost inevitable.”

Didymo eradication is considered unlikely, but chemical and biological methods can be used to control it in areas where it is a problem.

Warnings about boiling drinking water taken directly from rivers and lakes have been standard since the giardiasis parasite was found through our waterways. Also likely spread by tourists, this waterborne microscopic parasite is now common in our lakes, rivers, streams, roof water, municipal water supplies, swimming pools, whirlpool spas and wells. *Giardia* infection is the leading cause of human gastrointestinal illnesses globally and is the most commonly notified waterborne disease in New Zealand. The national incidence rate is said to be 46.6 per 100,000 and is considered one of the highest among developed countries. The parasite has a tough outer shell that makes it resistant to chlorinated water. There’s no drug or vaccine to prevent giardia infection, so commonsense hygiene precautions are relied on to inhibit infections.

Last year information released to the Green Party by regional councils and unitary authorities showed 66 percent of 160 monitored river swimming spots around the country had a Suitability For Recreational Grade (SFRG) of either poor, or very poor during the 2013/14 summer.

The data covered all of the country’s monitored rivers except for those in Auckland, Waikato, Northland and the West Coast, where councils did not use SFRG indicators in the period. However, the Land, Air, Water Aotearoa (LAWA) website launched in 2014 provides an overview of water quality by region and shows that median river bacteria (*E.coli*) levels in the Auckland region are in the worst 25 percent of sites in the country, while Waikato’s median bacteria levels were in the worst 50 percent.

Among the worst rated rivers in the 2015 SFRG were the Ruamahanga River in Wairarapa, the Manawatu River and the

Mangatainoka River. A total of 46 river sites, among them the Wharekopae River at the Rere rockslide, a tourist hotspot near Gisborne, were rated as 'very poor'.

At the time Environment Minister Nick Smith played down the report and said it needed to be treated with caution. "Just comparing the results from one year after another does not give a long-term trend on freshwater quality," he said, adding that he didn't think a "narrow data set" was representative of all freshwater bodies in this country.

A year on and the minister is still downplaying water pollution. Recently he presented a state of the environment speech at Lincoln University outlining the Government's objectives towards freshwater management. He suggests "one set of rules" for national water quality control instead of depending on regional councils to police water quality in their own way. The Government is also looking at instant fines on owners who let their animals stray into waterways.

However, he also said he doesn't think a legal requirement for every water body to be swimmable is possible. "Our ambition is for a lot more areas to be swimmable... but we want to be practical."

Smith had been invited to a gathering of our top freshwater ecologists in Palmerston North who were trying to find a simple method of grading and managing the health of our rivers. These scientists came from Massey, Auckland, Canterbury and Waikato universities, NIWA, the Government and regional councils. The results of the two-day workshop will be used in a Government review of the National Objectives Framework for rivers next year.

Currently, most of the information on the water quality of our national rivers comes from monitoring at 77 sites in the National Rivers Water Quality Network (NRWQN) operated by NIWA over the past 25 years. Regional councils also operate a much larger number of water quality sites, though almost all have been running for shorter periods.

According to Dr Rob Davies-Colley, a water quality scientist at NIWA, 'point' pollution from wastewater discharges (entering receiving waters at a point) needs to be distinguished from 'diffuse' pollution arising from land use.

"Improved wastewater treatment over several decades has resulted in water quality in New Zealand being dominated by the diffuse sources – which are much more difficult to manage," he says in his article, 'An overview of the water quality in NZ rivers' published on www.sciblogs.co.nz in 2013.

"There are three major categories of diffuse pollution: Fine sediment, the major nutrients (nitrogen and phosphorus), and faecal microbes. Toxic metals may contaminate a small number of river waters within urban centres or downstream of mines."

However, compared with Europe, North America and Asia, river water quality here is "fairly good overall" he notes.

Conditions vary greatly from place to place depending on land use, but water quality is very good (ie, supports most values including habitat for aquatic life) in rivers draining conservation lands, he says. "Conversely, there is widespread diffuse pollution from developed land, particularly pastoral agriculture which degrades rivers with fine sediment

(reducing visual clarity), faecal microbial contamination, and nutrient enrichment."

River water quality in rivers can also vary greatly from one day to the next, he says.

"Even rivers that have good water quality most of the time may be turbid and polluted by faecal microbes during floods or high flows. Typically, diffuse pollutants move mainly during storm flows, in sharp contrast to contaminants from wastewater, which are highest at low flow when dilution in receiving rivers is least."

In general, the water quality of numerous rivers has been declining over the past 25 years, he says, despite a very large expenditure on improved treatment (or diversion from rivers) of city and factory wastewaters.

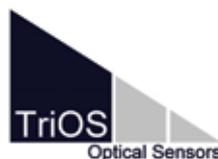
"However, the gains from this point pollution control have been outweighed by steadily increasing diffuse pollution, particularly nitrogen and phosphorus enrichment from intensification of pastoral agriculture.

"Fortunately, there have been encouraging signs of late that river water quality declines can be arrested, or even reversed. Water quality appears to have recently improved in a few polluted rivers in certain catchments and regions where there has been major effort on improved land management (eg, riparian fencing and planting), soil conservation and nutrient controls.

"Continued improvements in river water quality are expected to be an enduring challenge while intensification of pastoral agriculture and urban expansion also continue." **WNZ**

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Addressing quality & quantity at catchment scale

Managed Aquifer Recharge is an approach to sustainable groundwater management that is now being used at catchment level in New Zealand. **Robert Bower** and **Brett Sinclair** of Golder Associates outline the pilot scheme now underway in the Hinds Catchment in Canterbury.

The Hinds/Hekeao (Hinds) catchment is located in the Ashburton District on the Canterbury Plains and falls within the management area of the Canterbury Regional Council (CRC). In 2009, CRC initiated the Canterbury Water Management Strategy (CWMS), which is based upon a collaborative and community-based approach to achieving aspirational water management objectives (Canterbury Water, 2009). As part of the CWMS, each of the region's 10 water management zones develops recommendations based on a community-based consultation process. Each zone is led by a Zone Committee consisting of community members appointed to represent the varied interests relative to the current and future management of the resources.

The Ashburton Zone Committee (AZC) been responsible for the development of the Hinds catchment recommendations. Development was guided by AZC's Zone Implementation Programme (ZIP), which prioritised a list of 25 *Desired Outcomes* for the Hinds catchment (Canterbury Water, 2011). This process follows the CWMS *preferred approach* in which water quality and quantity objectives are first determined and then the means by which these objectives can be achieved are identified. A majority of the Hinds *Desired Outcomes* are directly dependent on the condition of the Hinds groundwater system. Prioritising the sustainable management of the groundwater quality and quantity within the catchment is therefore critical to achieving these objectives (Bower, 2014).

Biophysical numerical modelling was done for the catchment's water quality and quantity in order to support the AZC in the consultation process. The water quality modelling was conducted via a mass-balance, spreadsheet-based accounting tool. This tool utilised nutrient inputs from the on-farm modelling conducted in Overseer™ to calculate the nitrate-nitrogen (nitrogen) loading related to various land uses (Scott, 2013). The water quantity modelling was achieved through an integrated MIKE SHE (DHI) surface-groundwater spatial model (Durney, 2014). Other relevant

analyses used to support the consultation related to changes in local and regional economics, ecology of groundwater-dependent ecosystems, cultural aspirations and the social wellbeing of the Hinds community.

In 2014, after nearly two years of deliberations, the AZC presented final recommendations to CRC. These recommendations included the implementation of some catchment-scale changes including the use of Managed Aquifer Recharge.

WATER CHALLENGES IN THE HINDS CATCHMENT

The water resource challenges in this catchment are considerable, with the quantity and quality of groundwater being under significant pressure from increasing usage and contaminants derived from land use intensification. The Hinds catchment is bound by the Rangitata River to the south and the Ashburton River/Hakaterere to the north (Figure 1). The Hinds/Hekeao River flows through the middle of the catchment. The movement of water in this catchment, and the associated transport of nutrients, is controlled primarily by surface recharge, saturated groundwater transport, river interactions and spring-fed waterways near the coast (Scott, 2013). Water entering the groundwater system (recharge) primarily comes from a combination of rainfall, river leakage, and losses from irrigation (Figure 2). Groundwater leaving the aquifer (discharge) primarily occurs in the form of evapotranspiration, groundwater outflow (to ocean), spring flow back to lowland water bodies and groundwater abstraction for irrigation.

Over the past couple of decades, significant increases in usage have occurred, leading to the issue of overall allocation. At the same time, *accidental* recharge has declined due to leaky races being piped and more efficient irrigation practices becoming common place. Ongoing drought conditions have also acted to reduce the natural recharge.

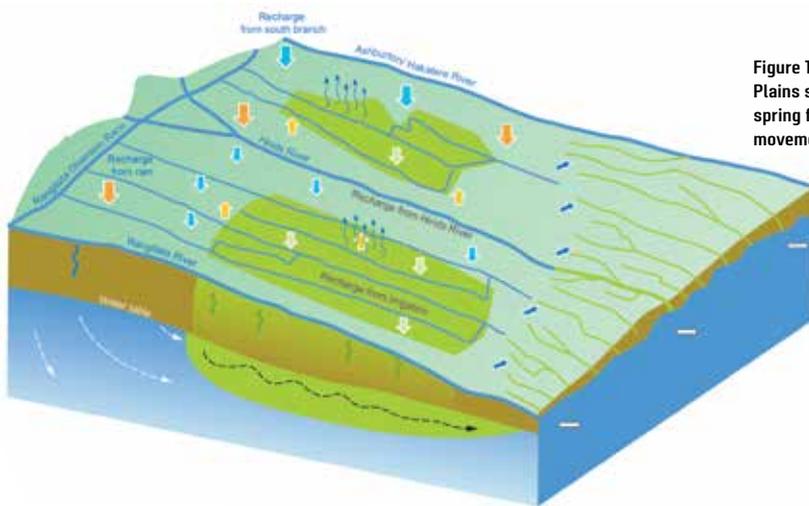


Figure 1. Conceptual block diagram of the groundwater system in the Hinds Plains showing water balance drivers; surface recharge, evapotranspiration, spring flows, groundwater movement and groundwater outflows, includes movement of nutrients into groundwater (Bower, 2014).



Figure 2. Balancing the drivers of groundwater storage

The combination of reduced recharge and increased abstraction has acted to reduce the overall groundwater stored in the system.

This reduction is expressed in drying of the spring-fed water bodies, loss of ecological habitat and traditional food gathering (kai), and water supplies bores needing to be deepened (Golder 2014). Correlating with these quantity changes, average nitrate-nitrogen (nitrogen) concentrations in the catchment have been steadily increasing in both the groundwater and dependent spring-fed waterbodies. These changes have been primarily driven by the intensification of land use in the agriculture sector combined with these losses in accidental recharge. Groundwater nitrogen concentrations in the catchment have exceeded the national drinking-water standard (11.3 mg/L NO₃-N) and are reported to be some of the highest in the country (Scott, 2013).

AZC's primary recommendations to address these catchment-scale issues were to reduce nitrogen entering groundwater via improved management of on-farm nutrients and implement the use of Managed Aquifer Recharge (MAR) to increase overall clean water recharge. Targets were set for both water quality (6.9 mg/L NO₃-N) and quantity, seeking to restore groundwater storage levels and spring flows by 2035.

Beyond the MAR project for quantity, the AZC also made recommendations to cap the catchment's groundwater allocations, allow the transfer of less reliable surface takes to groundwater, and limit the transfer of water usage consents. The implementation of a Pilot Project to test the application of MAR to help address these issues began shortly after the AZC final recommendations were accepted. Consents for construction and operation of the Pilot Project were secured in early 2016.

COMMUNITY'S EVALUATION OF MAR AS A WATER MANAGEMENT TOOL

The AZC appointed a local community group called the Hinds Drains Working Party (HDWP) (no 1) whose members consisted of local residents and farmers, zone committee members,

representatives from Department of Conservation, Fish and Game, and Forest and Bird. Consultation in the form of hui with Te Runanga o Arowhenua, the local iwi representation, was also a key part of the process. One of the primary reasons for the formation of the HDWP was to have the community help to evaluate any risks and help guide the possible implementation of the MAR pilot site based on their local knowledge of the catchment. Their historical perspective on the extensive seasonal use of border-dyke irrigation (accidental recharge), which acted to maintain higher groundwater levels and consistent flows in the spring-fed water bodies, showed that the concept of 'artificial recharge' in the catchment was, in fact, known. However, due to the nature of this seasonal recharge, there were also concerns raised about the risk of unmanaged recharge increasing the risk for potential flooding in lowland streams and farms.

During this consultation process, the HDWP helped to finalise the location of the Hinds MAR Pilot site. It was situated specifically as a 'test' of managed recharge to improve groundwater storage and water quality. This site is located in a part of the Hinds catchment that has the highest groundwater nitrogen concentrations and the most depleted stream-flow conditions.

A variety of other factors influenced this site selection including the availability of good quality source water, water delivery infrastructure, access to property for construction and favourable hydrogeologic conditions. These hydrogeological conditions included adequate freeboard (depth) to the water table and reasonably permeable soils to allow the infiltration to occur. Through a consensus decision process, including support from Te Runanga o Arowhenua, the HDWP's final recommendations were accepted by AZC (March 2016) to initiate the commissioning of the site.

PILOT PROJECT DEVELOPMENT

A consortium of groups came together to provide the local leadership, infrastructure, staffing and funding required to

implement this project. The Hinds MAR Pilot Working Group was formed through a signed memorandum of understanding (MOU), with the primary members including CRC, Ashburton District Council, and the local irrigation companies: Rangitata Diversion Race Management, Valetta Irrigation, Mayfield-Hinds Irrigation, Eiffelton Community Irrigation Scheme and Barhill Chertsey Irrigation. A secondary group of technical experts was also established to provide input and review during the pilot testing. Members of this group include Canterbury District Health Board, Lincoln-Agritech Limited, New Zealand Forest and Bird and technical staff from CRC and Golder.

The pilot site (Figure 3) is consented to recharge up to 0.5 m³/s of good quality, alpine-sourced Rangitata River water to ground. The pilot testing process covers a five-year period (2016 to 2021) with two distinct phases.

Phase 1 occurs during the first year (2016 to 2017) and addresses fundamental technical and community questions surrounding MAR (Golder, 2015). Phase 2 (2017 to 2021) proceeds only if the community is satisfied with the Phase 1 results and will focus on further developing an understanding of the physical issues associated with applying MAR specifically to the unique geology and water properties found on the Canterbury Plains (Golder, 2015). The Pilot Project's water quality and quantity monitoring network collects real-time data (15-minute intervals) for groundwater levels, temperatures and surface water flows, coupled with monthly water quality sampling and analysis for parameters including nutrients and faecal bacteria.

On 10 June 2016, recharge operations at the Pilot site commenced. Preliminary results (first 80 days) are already showing groundwater quality improvements around the MAR site and increases in groundwater levels of up to 18 metres being recorded. Based on current operational recharge rates, three to four million cubic metres could be recharged to the aquifer during Phase 1 of the project. This volume represents between three percent and four percent of the capped allocation limit in this groundwater management zone (96.6 million m³).

¹<http://ecan.govt.nz/get-involved/canterburywater/committees/ashburton/Pages/drains-party.aspx>



Figure 3. Aerial drone photo of Hinds MAR Pilot site during construction (Lagmhor, Ashburton area, May 2016).

Analysis and reporting of the Phase 1 testing results will be available in August 2017, after a community and independent peer review.

SEEKING GROUNDWATER SUSTAINABILITY THROUGH THE APPLICATION OF MAR

Internationally, thinking in resource science and policy (Jakeman Et. al, 2016) is moving towards a more conjunctive and integrated approach to water management, including groundwater. Viewed at the catchment-scale, we define the application of a systems approach to managing surface and groundwater resources together as integrated water management systems (IWMS). In order to help achieve water quality and quantity goals sought by the community, it is necessary to envisage the use of MAR at the catchment scale.

In the case of the Hinds catchment, this IWMS concept was numerically assessed during the consultation process and a conceptual plan for integrating MAR into existing water management systems was derived. Much like an irrigation scheme, the Hinds Plains Groundwater Replenishment Scheme (GRS) would work with existing and planned surface water infrastructure to capture and deliver water to recharge sites throughout the catchment (Figure 4). Recharge operations would likely be focused on the non-peak demand (irrigation)

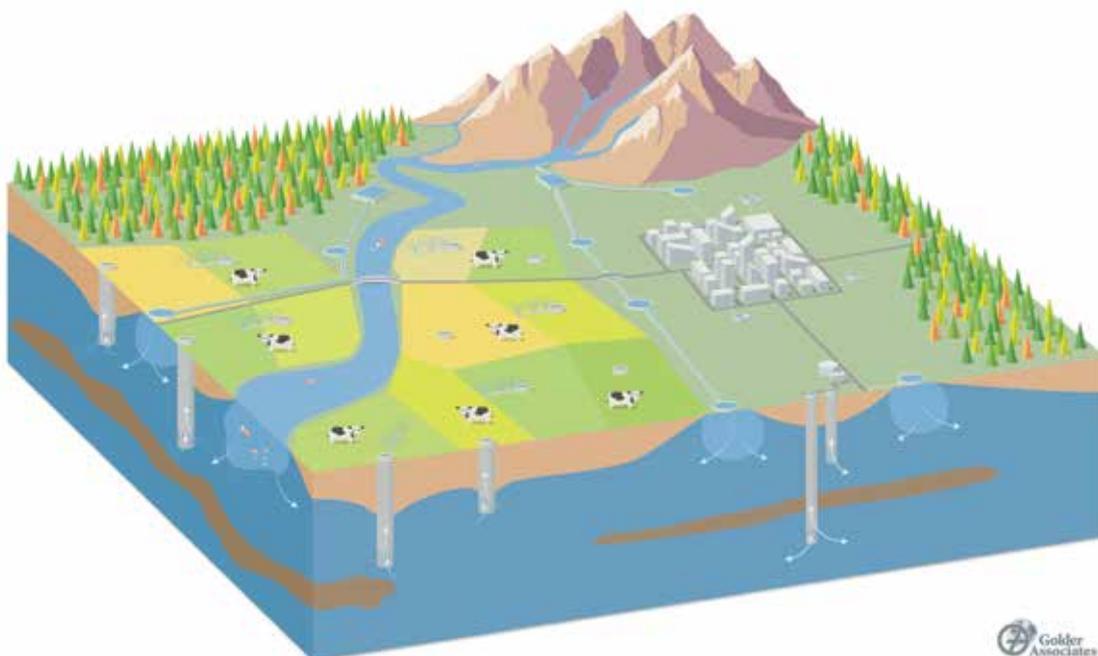


Figure 4. Conceptual illustration of a Groundwater Replenishment Scheme (GRS) using combination of small, off channel capture storage with distributed MAR sites to manage catchment's groundwater storage and water quality rural and municipal objectives. Aquifer's natural ability to spatially distribute water reduces need for costly surface conveyance systems as bores become the primary point of water delivery.

season and seek to replenish groundwater resources with good quality water. Sites would be placed according to specific physical conditions and be operated to maximise the amount of recharge at the appropriate times of year. Coupled with highly efficient irrigation practices and improved on-farm nutrient management practices, the GRS would work toward achieving the desired outcomes established by the AZC.

Governance of this GRS would be conducted in a coordinated approach, taking advantage of strategic partnerships, community goodwill and consensus fostered during the project development phase. A governance structure that recognises and is committed to ongoing stakeholder consultations will be determined by the AZC during phase 1 of the project. Complementing the existing water delivery infrastructure and existing monitoring networks, other potential factors of consideration will be consenting structures, funding mechanisms and ongoing community outreach and education. A catchment-wide, community-led GRS could make the most logistical and economic sense in developing MAR for sustainable groundwater management (Golder, 2016).

Fundamentally, the implementation of a GRS system would work to re-balance the recharge side of the currently declining groundwater storage balance, working first to recover the system to a *sustainable yield* (Figure 5). Most likely, a community defined *sustainable yield* scenario would be set to ensure that reliable groundwater resources for irrigation and drinking water supplies is maintained whilst providing more consistent and improved quality baseflows to the spring-fed water bodies. Once this scenario has been achieved, the possibility of utilising any additional natural aquifer capacity to further increase groundwater resources has also been shown internationally to be feasible (Golder 2016). This *additional yield* could help to protect both water users and ecological habitats from erratic weather patterns driven by climate change, such as prolonged droughts.

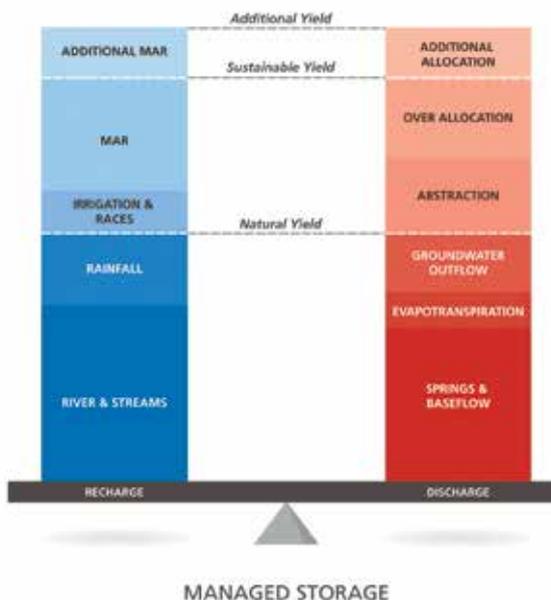


Figure 5. Challenges to managing groundwater storage – balancing catchment-scale recharge and discharges (Golder).



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SUMMARY

The Hinds MAR Pilot project represents one community's approach to achieving more sustainable groundwater management, improving water storage, and protecting the environment and cultural values. This project provides an opportunity for New Zealand to re-examine how we not only view the management of groundwater, but how we manage our surface and groundwater supplies in more conjunctive and integrated ways. With the uncertainty of a changing climate driving periods of prolonged droughts and unsettled weather patterns, we suggest that a proactive managed approach to preparing for the future is achievable. We can use collaborative approaches to empower communities to take action and implement change through the establishment of common goals to achieve sustainable and reliable clean water supplies for both the economy and the natural environment. Avoiding a “tragedy of the commons” is in all our best interests. **WNZ**

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Kapiti Coast strategic asset forecast

Confident planning in a changing world

When change is a constant, what are the key steps needed to build a reliable plan for the future? MWH water network specialist **Ben Davies** outlines the Kapiti Coast experience.

Kapiti Coast District Council (KCDC) needed a plan for long-term water network investment, but rapid development and the introduction of universal metering meant its existing model and data were quickly going out of date.

How can you plan for the future when all you know about the present is that things are changing? This article outlines the key steps taken to build a reliable plan for the future in the shifting sands of the present.

The Kapiti Coast water supply network model was old. Built in the early 2000s, it was updated and verified against field data by MWH in 2009/10. It was used to great effect over the following years to identify and eliminate network restrictions, assess the supply to new developments and design District Metered Areas (leakage monitoring zones). But time never stands still.

The MacKays to Peka Peka Expressway and Transmission Gully are looming, along with the associated increase in Wellington commuters, and development pressure is

increasing. KCDC needed to look urgently at its capital investment requirements for the future, but they had to be sure the model was giving them the right answers. In 2015, MWH was once again engaged to review the existing model, and to see what was needed to bring the model to the point where reliable plans for the future could be made.

PHASE 1: DATA AND MODEL REVIEW

The first task was to assess the general location and density of network upgrades since 2010. The most up-to-date network information was captured in an InfoNet database, but this held no common GIS reference with the old model. Recent network changes were therefore identified and this showed that there had been a lot of small extensions spread relatively evenly across the network, which was consistent with the ongoing housing intensification.

In terms of hydraulics, this meant that although there were now more customers, the patterns of flow across the network should not be affected too much.

Durney P, and Ritson J, 2014. Water resources of the Hinds/Hekeao Plains catchment: modelling scenarios for load setting planning process; Environment Canterbury Technical Report No.R14/51. ISBN 978-1-927274-03-3

Golder,2014. "Managed Aquifer Recharge (MAR) as a tool for managing water quality and quantity issues." Prepared for Environment Canterbury by Golder Associates (NZ) Limited. P55 with technical appendices. R14/80 ISBN 978-1-927314-41-8 [5].

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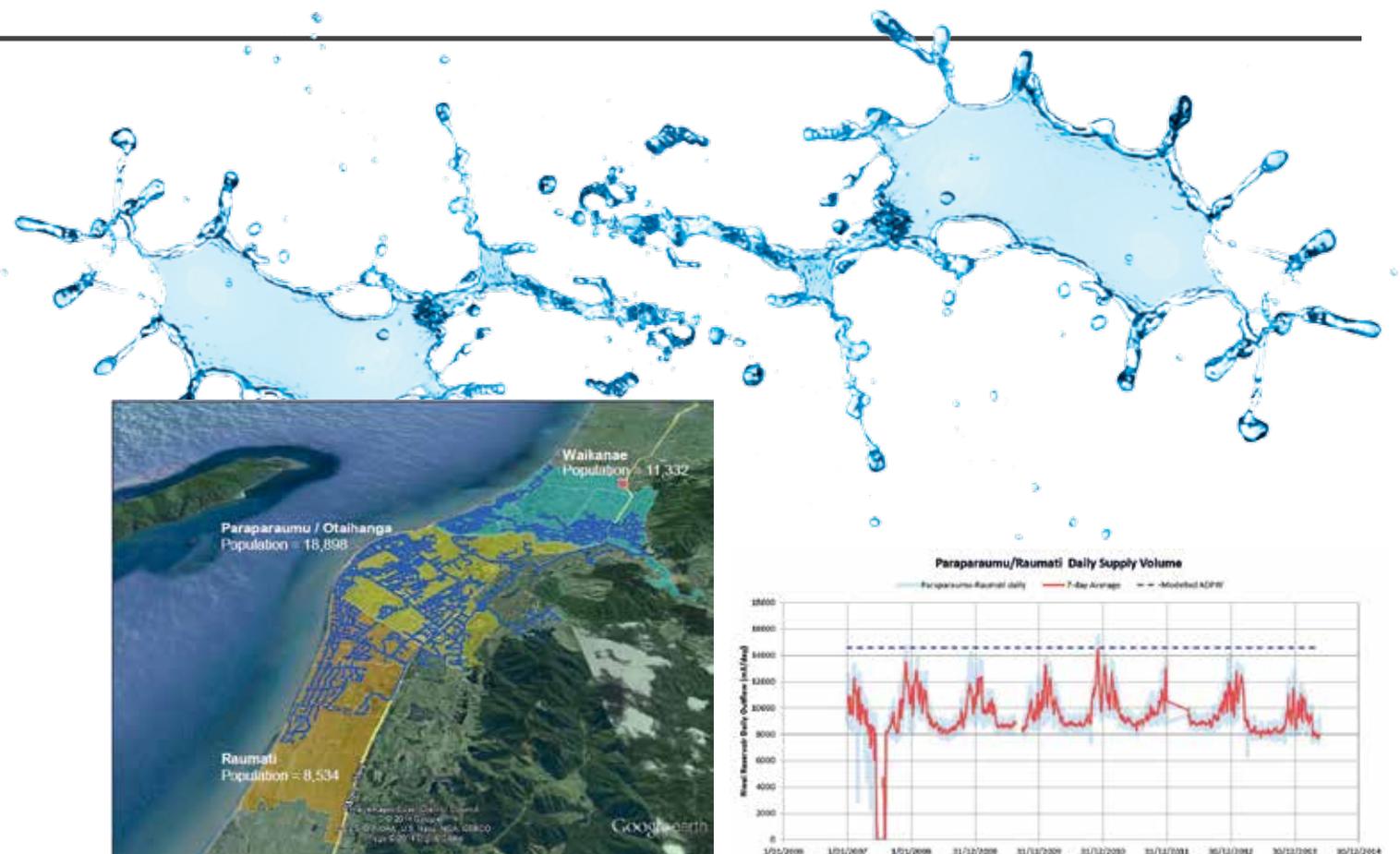
Replenishment Scheme – Conceptual Designs. Prepared for Environment Canterbury, Golder Report# 1538632_7410_007_R-Rev0. P15.

Jakeman AJ, Barreteau O, Hunt RJ, Rinaudo, J-D, Ross A. (Eds.). 2016. Integrated Groundwater Management: Concepts, Approaches and Challenges. Australian National Groundwater Association, Springer Link Press (online). 1st ed. 2016, XI, 762 p. 101 illus., 72 illus. in color. ISBN 978-3-319-23575-2

Scott, L. 2013. Hinds Plains water quality modelling for the limit setting process. Environment Canterbury Technical Report No. R13/93. ISBN 978-1-927274-37-8 Available from <http://ecan.govt.nz>.

• Robert Bower, Principal Hydrologist: rbower@golder.co.nz

Brett Sinclair, Principal Hydrogeologist: bsinclair@golder.co.nz
www.golder.co.nz/iwms/



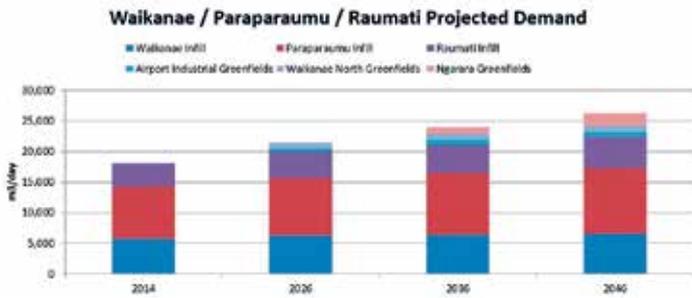
Telemetry flows and pressures appeared to support that changes were spread evenly across the system. At all flow monitoring points, the overall volume of water consumed appeared to have reduced since 2010. This was the case even before the universal metering had been implemented, and despite increasing population.

Additionally, since 2010 there had been a significant drop in evening use as opposed to morning use, right across the network. Evening use commonly relates to discretionary use (eg, watering the garden), as opposed to the more essential

uses (eg, showers) in the mornings.

It was theorised that these changes could be due to increased awareness of water conservation as the communications around the introduction of water metering intensified. Regardless of the cause, MWH came to two conclusions:

- The per-property demand in the model was overestimated compared to current demand.
- It was likely that further changes in demand could occur as the effects of the recently implemented universal metering took hold.



PHASE 2: MASTER PLANNING WITH CONFIDENCE

With this knowledge, MWH looked at KCDC’s requirements in terms of long-term asset planning: while the demand had reduced over the past few years, predicted population growth looked set to reverse that trend. To ensure the long-term plan contained provision for capital network development, KCDC needed to know where and when network development would occur. The Council had three options:

1. Use the existing model with its flaws;
2. Adjust the existing model to be more representative of existing demand; or
3. Carry out a full model update.

With time pressure to undertake the work, a full model update was not feasible. Universal metering had just been implemented – it would be a year before it produced enough customer meter data to make a reliable assessment of demand.

So why not adjust demands in the model to match current system flows as observed in telemetry? After some discussion, it was considered that adjusting the demand before the full effects of universal metering were known would give the impression of accuracy, but that there was no reason to think this would be a more accurate reflection of future demand than what the existing model provided.

It was concluded that although the existing model was known to require improvement, it could be used so long as its limitations were understood and acknowledged. After all, no model is perfect, all models are based on assumptions, and are simplified representations of the real world. In this case, the review had shown that the existing model reflected the distribution of demand reasonably well, if not the quantity.

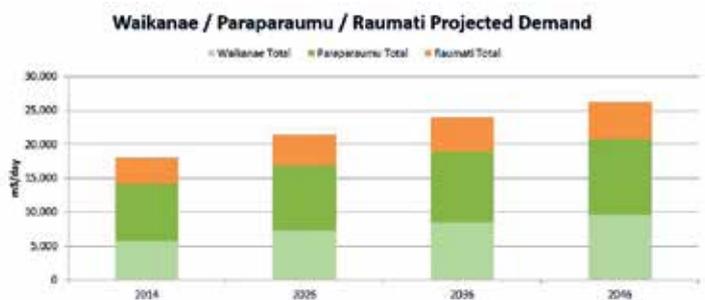
It was agreed that in the short term, a high-level “Strategic Asset Forecast” should be developed. This would identify likely network upgrades required over the next 30 years, but would clearly indicate that the timing and detail of these upgrades would be dependent on the outcomes of universal metering and would be reviewed once the model had been fully updated.

From this point onward, the methodology was more similar to a standard master-planning project: based on Statistics New Zealand projections, the demands of greenfields developments were calculated and added to the model, and the demand relating to the remaining increase in population was spread evenly across the existing network as infill.

Locations where pressures were below levels of service were identified, and upgrades to address these deficiencies were proposed.

When preparing the final outputs, care was taken to ensure the preliminary nature of the study was clear to all. In upgrade plans, greenfields developments were represented only as potato-like shapes on the map. The required upgrades were shown as broad arrows representing water transfer from one part of the network to another rather than detailed pipe alignments. These representations leave the viewer in no doubt that further refinement is required.

The outputs were graphically elegant and simple to understand, conveying the appropriate degree of accuracy of the study. This process clearly identified the key points where the network would come under stress in the coming years, and provided high-level sums to be included in the long-term upgrades plan to address the issues.



PHASE 3: FULL MODEL UPDATE / CALIBRATION / WATER NETWORK DEVELOPMENT PLAN

With the long-term plan in place, attention returned to the model update. In mid-2016, a full year of demand data was available from the fleet of approximately 23,500 customer meters in Otaki, Waikanae, Paraparaumu, Raumati and Paekakariki. This data had been previously identified as the main requirement to construct a new model, representative of current use.

The update then began in earnest. Customer billing data was used together with data from bulk-flow meters to develop new demand sets reflecting average annual demand and peak summer demand. The network was rebuilt from asset data taken from InfoNet. Pump and reservoir controls were rebuilt based on operational manuals, knowledge and construction records.

Future demand scenarios were once again built from Statistics New Zealand area unit information and Council knowledge of upcoming greenfields developments.

The model is now ready for calibration, which is to be undertaken in the summer of 2016/17. Once calibrated, the model will be used to carry out a full Water Network Development Plan (WNDP). This will seek to reproduce the findings of the Strategic Asset Forecast, and more accurately predict the timing and detail of the required upgrades.

The interim Strategic Asset Forecast, with its bold simplicity and clarity of purpose, will no longer be required, but it will stand as an example of what can be achieved with imperfect tools – so long as the limits of the tools are known. **WNZ**

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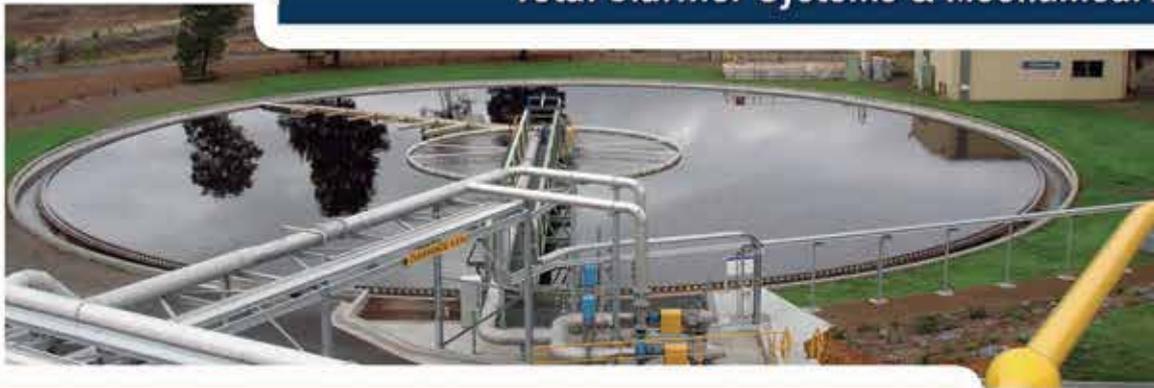
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The future of Water Modelling

The ‘age of intelligent water networks’ is fast arising – modelling has taken its first real steps into whole of water cycle modelling and is starting to become more established in the control room environment as **Dan Stevens** and **Emily Stevens** outline.

Water modelling has certainly come a long way in the past 30 years. Significant drivers for change have been ever-increasing customer expectations and legislative changes, catastrophic events (long-duration droughts, floods, terrorism) and more recently understanding and managing the effects of climate change on our infrastructure assets and communities.

We have seen remarkable advances in technology and computing power which have exponentially changed our expectations and ability to collect, process and analyse and present vast amounts of data with powerful visual tools. The age of “Big Data” is here and we are continually striving to develop “Intelligent Water Networks”.

Our industry is getting smarter and we are seeing the evolution of a new generation of “tech-savvy” system managers and operators. As a result, modelling of the three waters is migrating from just the planning domain into the “real-time” operational environment.

As well as the emergence of Operational Modelling, we now have the computing power and software tools to support modelling of the

whole water cycle in a single model. This presents an opportunity for a more holistic approach to three-waters modelling which will support planning of sustainable urban development and in particular urban regeneration and intensification.

So let’s have a look at Live Operational Modelling and Whole of Water Cycle Modelling in a little more detail and touch on some other likely developments that we expect to see.

OPERATIONAL MODELLING

Essentially the architecture of a live operational modelling platform is to place a hydraulic model at the centre of a system which pulls together a wide range of real-time information, runs hydraulic simulations using the model and then interprets the results and makes future predictions. The results are presented digitally and graphically in model results files and potentially as a series of alerts/alarms to key stakeholders. An example for an operational model of a river catchment is shown in Figure 1:

In some cases, investing in operational modelling is hard

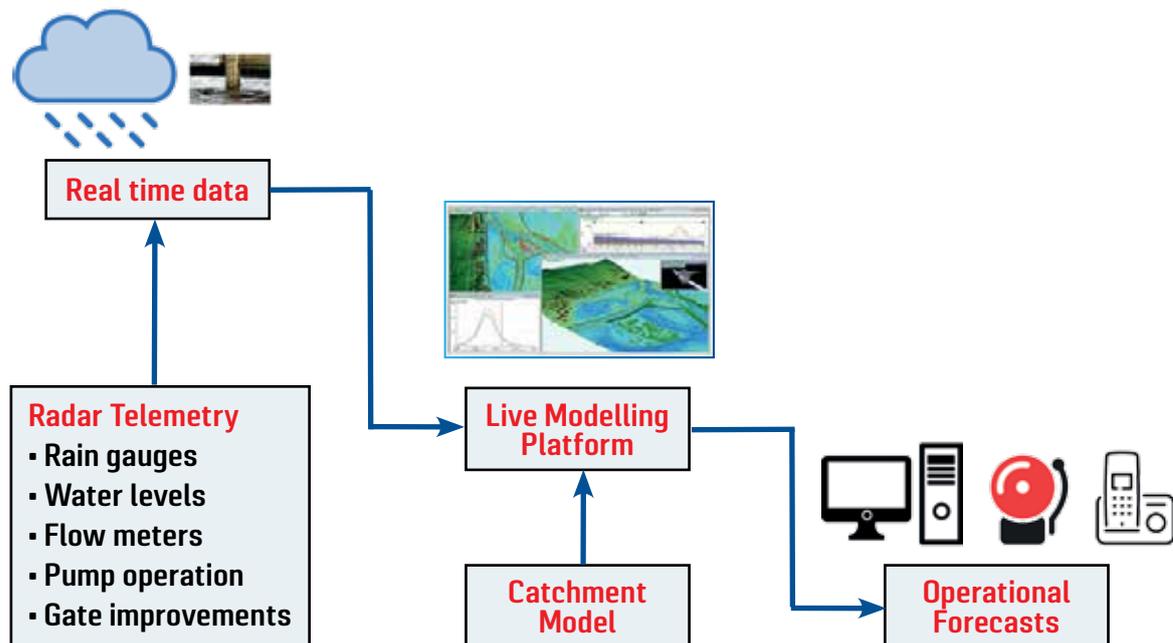


Figure 1: Operational modelling for a river catchment

to justify. The resources required to link models to SCADA, automatically run them and analyse the results may outweigh the perceived benefits. However, the case for operational modelling is often compelling and some early adopters have achieved an outstanding return on their investment.

In Australia, for example, South Australia Water (Adelaide) was an early adopter of operational modelling of water supply systems.

Driven by a significant investment programme as a result of connecting the new desalination plant to the transmission network and a need to optimise the network operation in the face of rapidly increasing power costs, SA Water has been able to achieve approximately \$3 million worth of savings in its annual power consumption and in the order of \$750,000 in other operational costs as a direct result of its investment in supply mix optimisation, optimising electricity consumption in line with electricity market prices and live operational modelling.

Expanding modelling from the planning domain into the operational environment is presenting a number of challenges, both at a technical and organisational level.

Modelling has traditionally been the responsibility of planning teams, as the operations teams are not experienced in model management. Frontline operators are simply not experienced modellers, and indeed many do not wish to be so.

Hydraulic modelling can be complex and the modelling software reflects this.

Software vendors have attempted to simplify operational modelling software but perhaps they haven't been able to do enough to make it truly user friendly to a busy operator who has multiple screens to monitor with multiple applications.

This presents a challenge that threatens to hold back the progress of operational modelling without careful handling.

With ever-increasing pressures on frontline operators, we see a growing need for the creation of a new role, the "Operator-Modeller", a technical support role located within the control room environment, working alongside and supporting the frontline operators. In some cases this will be a part-time role supplemented by other technical support duties such as compliance monitoring, reporting system performance and leakage management.

While many accept live operational modelling as a natural progression for the industry, recognising the potential benefits, it is fair to say adoption of the technology worldwide has been a little "patchy".

We have observed a range of different drivers that have encouraged the early adopters and leaders in this field. In Japan, for example, the focus for water utilities has been very much on operational optimisation of water and wastewater systems.

In the United States, it has been more the need to embrace

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technology to train and support the next generation of operators as experienced staff leave the industry. In Europe and Asia, there has been a take-up in operational models of river catchments which has not been reflected to the same extent in Australasia or the US.

So why has New Zealand been slow to adopt live operational modelling?

A few years ago, three-waters modelling in this country was at least tracking alongside or perhaps even ahead of Australia, but still a little behind the United Kingdom. Now, many Australian water suppliers have teams dedicated to identifying and introducing smart technologies as they strive to create “intelligent networks”. This was driven to a certain extent by the “millennium drought” and the need to become more innovative and carefully manage an increasingly scarce resource.

Fortunately, we’ve not had such a challenge to date, even though undoubtedly live operational models linked real-time to the SCADA system would have been advantageous during the response to the Christchurch earthquakes, where planning models were used to support the operators as far as possible.

Beyond doubt, the Australian Water Industry has changed as a result of the drought and indeed the ongoing threat of another similar event, and we believe this has helped push them ahead of New Zealand in seeking out and adopting such smart technologies.

WHOLE OF WATER CYCLE MODELLING

In Australia, there is a significant focus on urban regeneration and intensification as cities such as Sydney and Melbourne experience sustained and significant growth. Planners have to understand and manage the whole water cycle within an

area from stormwater management to water conservation and wastewater disposal.

Understanding the potential role of stormwater detention, rainwater tanks, sewer mining and permeable paving, for example, is becoming increasingly important.

In response to this growing need, Melbourne Water has recently run a pilot project to model the Whole of Water Cycle (WOWC) in a single model. The project team developed an integrated 1D potable water network, sewer network, stormwater drainage network and a 2D overland catchment model in InfoWorks ICM to replicate the water cycle down to an individual property level.

The proof of concept 1D/2D water cycle model has successfully been established at three distinct scales. These range from the local scale with 100 properties, to the precinct scale with 5000 properties and then the suburb scale with 27,000 properties.

Representing water, wastewater and stormwater in a single model is complex. Understanding the interactions between the processes is key to producing a meaningful representation of the integrated system.

This pilot project is a unique approach that leverages existing model tools in a way that has previously not been achieved. It opens the way to define new questions and measures for modelling water management that have up to now only been possible at a conceptual level or on a lumped or stochastic basis. By accurately replicating the physical characteristics of the urban water cycle, it is possible to provide definitive results that reflect the impact of integrated water management measures.

There is no doubt that this pilot model tested the software to the limit – and sometimes beyond, but this type of challenge is what drives development and improvement and propels our industry to the next phase.

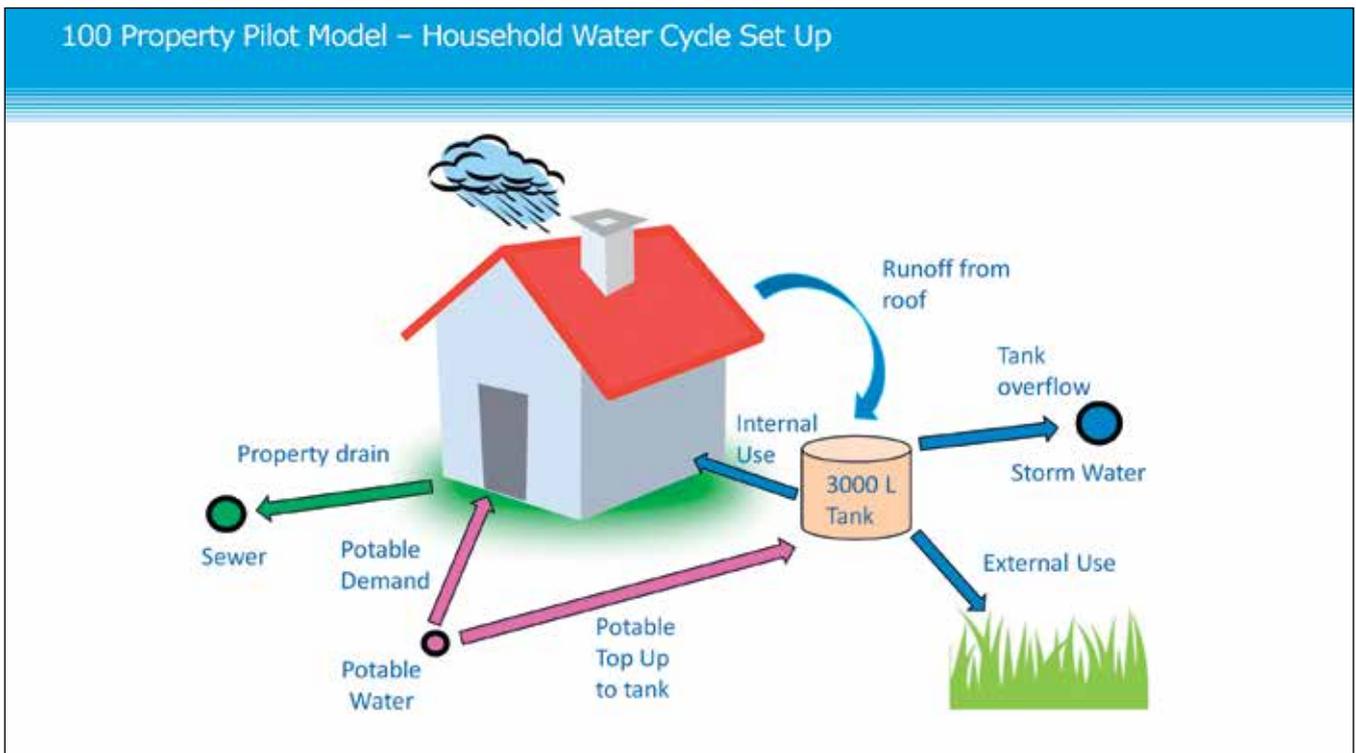


Figure 2: Whole of water cycle representation at a property level

OTHER RECENT DEVELOPMENTS

For a number of years, software vendors have been grappling with the best way to integrate modelling and GIS/corporate asset databases. Is there a way to have a “single source of data” that meets a range of needs?

We are seeing some significant software companies that have not traditionally been in the modelling space investing in developing ways to bridge the gap. It will be interesting to see what develops over the next five to 10 years and what level of integration is actually possible.

The technology is already in place for field operators to be able to run planning models on mobile devices in the field. Linking to live operational models is also possible but at this stage field operators are more likely to use portable devices with GIS capability with model results represented by GIS layers, giving them information on expected flows and pressures, or indeed which valves to close to isolate an area.

There are a number of smart technologies that have come into the market over the past few years such as smart valves and consequently the capability for dynamic DMAs. As live operational modelling becomes more widespread, we will see these technologies represented in the models and potentially with more automation based on model predicted results.

There is a growing interest in multi-species water quality modelling and we are likely to see some progress in this area in

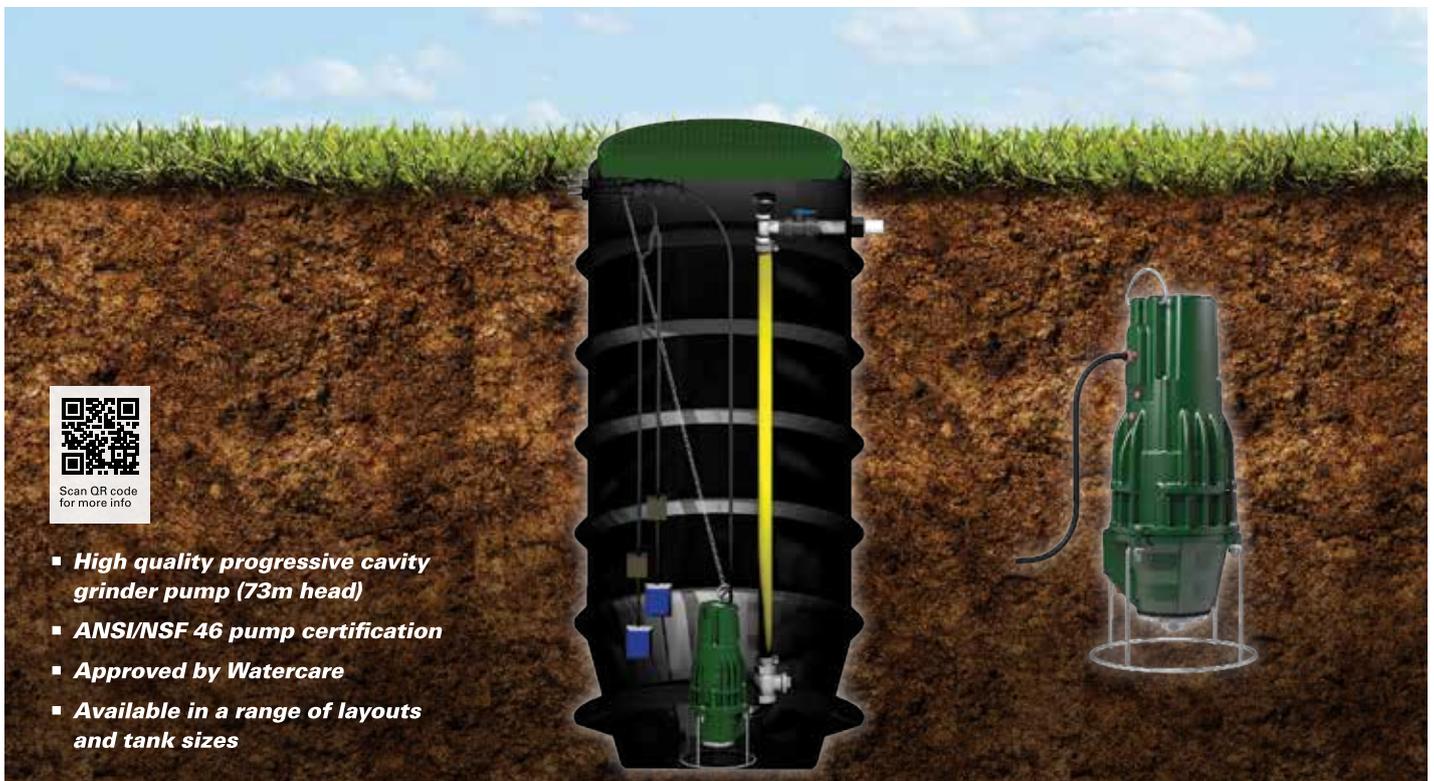
the next five to 10 years. Calibration of water quality models continues to be a challenge and progress has surely been slow up to this point.

The main challenge to date has been the collection of complex water quality information at a network level and an affordable price. However, there have been significant advances in this field and affordable monitors able to collect information on multiple parameters are now becoming available.

The “internet of things” will open up great opportunities in this area over the next decade and we will see significant advances in water-quality modelling as a result, most likely linked to operational modelling.

In summary, while the speed of future technologies and software development is hard to predict, we certainly see that modelling has taken its first real steps into whole of water cycle modelling and is starting to become more established in the control room environment. Undeniably, modelling will continue to play a key role in utilities planning and design, but we believe its role will become more central in integrating three-waters planning in the future, especially in urban intensification and regeneration projects. We see modelling becoming a more recognised and valuable tool for future generations of network operators, eventually being transformed into a key operational decision support tool linked to a wide array of real-time network information. **WNZ**

• *Dan Stevens is Business Director, Water, with Beca and Emily Stevens is Senior Water Engineer at Beca.*



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Sydney's smart take on metering data

Australia's largest water utility Sydney Water has adopted a smart strategy for their meter data collection, blending automated and manual approaches to achieve the best commercial benefits – as Datacol's **Michael Dennis** explains.

The complexity of serving a catchment of over 4.6 million people, consuming around 1.4 billion litres of drinking water every day, means deploying technology in commercially smart ways is critical to Australia's largest water utility, Sydney Water.

When it comes to the collection of the lifeblood of any utility, metering data, their approach has been no different. After evaluating strategies and technologies for collecting and processing metering data from their customers, Sydney Water decided on combining manual and Advanced Metering Infrastructure (AMI) approaches.

“We've done a lot of work on it, we understand exactly what the pros and cons are, and the case just isn't there for an AMI roll out at this stage,” says Mirko Sramek, Customer Metering Manager of Sydney Water.

“In the foreseeable future, in the next five or 10 years, there is a very strong place for manual meters and a very strong place for AMR meters.”

Sydney Water found that implementing a smart combination of AMR and AMI was the best solution to read multi-level buildings. They use AMR in buildings three levels or lower, and AMI in buildings over three stories. “The technology is used where it is cost-effective,” says Sramek.

Sydney Water has worked with meter data management experts, DataCol Group, to implement this approach, using a solution based on DataCol's SevenX meter data management product, which combines software that manages field force logistics and collects meter data from handheld units in the field via manual or automated reads. SevenX is used by water, energy and gas utilities across Australia, New Zealand and the African continent.

“Sydney Water is one of the largest utilities in Australasia and their needs are varied. There couldn't possibly be a ‘one-size-fits-all’ solution that would work for these requirements – ‘out of the box’. The DataCol team delivered a solution that was flexible and customised specifically for Sydney Water's business requirements”, says Bruce Franks, CEO of the DataCol Group, who pointed out the SevenX solution was originally developed in the electricity sector and had been extended for use by gas and water utilities.

Sydney Water has been able to improve and simplify their



quarterly reading cycle by providing added functionality and visibility.

“It's enabled us to pull in new technologies and there are some significant benefits in how the SevenX system allows us to read mixed routes with manual and AMR meters,” says Jason Dagger, programme manager, Metering at Sydney Water.

“If we weren't able to do that, it would push the case for AMI a lot better. But by being able to cost effectively read AMR allows us to defer a large capital outlay that comes with implementing AMI.”

Sydney Water meter readers now complete their rounds faster using SevenX AMR. It enables them to read all meters in a building as one group, regardless of meter brand, rather than one by one, says Sramek. “The ability to adapt the

system to be able to read AMR, and particularly to be able to read two different AMR manufactured metres and be able to incorporate them with our manual reads has been a real bonus.”.

He also points to cash flow previously being restricted due to an inflexible billing system. Whole routes needed to be completed before customers could be billed. “Under the new solution our cash flow, or billing process, hasn’t been held up while we wait for the entire route to be read.”

This has helped Sydney Water to send bills faster, which has sped up the cash-flow process, helping customers and the utility to stay up to date with payments.

“The speed, accuracy and the quality of meter reading is essential to a utilities organisation striving for customer satisfaction, as well as being cash-positive. SevenX allows the streamlining of the ‘meter-to-cash’ process,” says Bruce Franks.

Clever SevenX features like being able to add notes in, ensures that customer messages and information updates are passed on to readers. “It’s a big improvement to make sure that the reader got that message,” says Dagger. “It makes for much better customer service and a lot less customer calls.”

Customer service has also benefitted from photo identification of meter faults. “The photo capability has reduced our need for check reads and improved the efficiency of our back end office processes, where previously if you

had a reading, you didn’t know if it was a data entry error,” says Dagger. “But with a photo you don’t need a check read and that exception can be processed there and then and then it’s done.” The customer can be notified and action taken immediately to remedy the problem.

Although added confidence, efficiency and functionality have been the outcomes of the SevenX rollout, the real success x-factor throughout this process has been the strong partnership between Sydney Water and DataCol.

DataCol are available for any enhancements and upgrades and can turn these around in a timely manner – another advantage that the giant vendors often struggle with. There is an open exchange of ideas between the two organisations that then make up a roadmap for ongoing enhancements.

“In essence this solution processes billions of dollars’ worth of billing data and nothing but the best technology will do, to ensure absolute accuracy with class-leading efficiency of operations. We understand this is a mission critical system for Sydney Water and we’re proud of the role we play in the delivery of this service,” concludes Franks.

Sydney Water’s pragmatic approach to implementing new meter data collection technology has meant they can meet their commercial drivers, as well as ensure customer service is maintained at a high level. A truly smart approach. **WNZ**

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RESILIENT STORMWATER FUTURES FOR COASTAL CITIES

Liam Foster, Opus International Consultants

ABSTRACT

With the majority of New Zealand's population living along the coastal fringe and a large proportion of these located in no more than five urban areas, the risks of stormwater management in coastal cities is an important issue that New Zealand must look to face sooner rather than later.

This paper will look globally at what other communities are doing both reactively and now proactively to face the uncertainty associated with climate change, population growth, sea level

rise and creating liveable cities in the coastal margins.

Much can be learnt from on-going work overseas across the USA, Europe and Asia-Pacific Regions following on from major events such as Cloudbursts (Copenhagen), Hurricanes (i.e. Katrina, Sandy), Tropical Storms (Nock-ten) as well as other specific catchment approaches to protect communities.

The paper will draw specific examples from recent projects such as New York's Rebuild by Design Competition, the 100 Resilient Cities Programme, The Copenhagen Cloudburst Management plan and New Orleans's response to Hurricane Katrina. It will also identify how decentralized approaches to

stormwater management, including smaller scale catchment solutions (such as programmes of Water Sensitive Urban Design, Natural Flood Management) can yield multiple benefits for creating places where people want to live and work in harmony with nature.

The author will then draw all of these examples back down to New Zealand and identify emerging approaches to building resilience across this country's Coastal Communities and signpost where further effort may be required.

The rest of this paper can be viewed at the Water New Zealand website: www.waternz.org.nz



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Hurricane Katrina at its peak during August 28, 2005 and its impacts on New Orleans.

COURTESY OF: NASA AND KYLE NIEMI.

PRESENTER PROFILE

Liam Foster is a Chartered Water and Environmental Manager (C.WEM) and Principal Environmental Consultant with over 16 years of experience across New Zealand, Holland, the Middle East and the United Kingdom. He has a background in hydraulic modeling, water-sensitive urban design, hydrology and flood risk management, including how spatial planning and designing for exceedance can assist in avoiding putting more communities at risk unnecessarily.

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ASSESSING THE NET BENEFITS OF AUCKLAND COUNCIL STORMWATER PROJECTS USING THE MAURI MODEL

*Claire Cunningham, Auckland Council
Te Kipa Kēpa Brian Morgan, University of Auckland*

ABSTRACT

The planning process for stormwater infrastructure includes an assessment of the net costs and benefits of different project options. The standard approaches, cost benefit and multi-criteria analysis, respectively quantify the costs and benefits arising from a project, and capture some of the qualitative benefits that are difficult to capture in dollar terms. However, standard approaches can underestimate environmental and cultural benefits, as these are hard to quantify. Further, multi-criteria analysis does not typically consider the unique cultural context of Aotearoa. Therefore, the true value of projects with significant environmental and cultural benefits may not be captured.

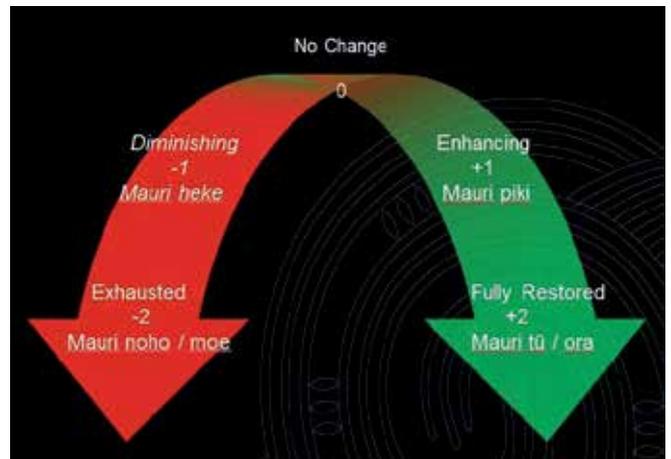
The Auckland Council Stormwater Department has trialed the Mauri Model Decision-Making Framework, developed by Dr Kēpa Morgan of the University of Auckland, to complement cost benefit and multi-criteria analysis.

The Mauri Model assesses project options in terms of their impacts on mauri, which is the binding force between spiritual and physical attributes, or the life force – the capacity to sustain life in the air, soil and water.

Mauri is a meaningful metric as it encompasses each of the economic, social, cultural and environmental well-being dimensions described in the Resource Management Act. It is also a concept that has resonance with mana whenua and Aotearoa’s cultural environment.

This paper describes the development of a stormwater-specific Mauri Model assessment tool which was trialed on a number of stormwater infrastructure projects. The output from the tool and feedback from Stormwater Department project engineers and Auckland mana whenua are also discussed.

The Auckland Council Stormwater Department considers that while a cost-benefit analysis provides a useful dollar



value output, the Mauri Model in addition provides a more balanced analysis of net benefits than the traditional approach, and will support ongoing engagement with mana whenua throughout project planning and delivery.

*The rest of this paper can be viewed at the Water New Zealand website:
www.waternz.org.nz*

PRESENTER PROFILE

Claire Cunningham is a Senior Stormwater Specialist in the Auckland in Council Stormwater Strategic Planning Team. She has experience water quality analysis, environmental compliance, and development of monitoring programmes and continuous improvement tools and systems.

GETTING ALL THE MULTI-DISCIPLINARY DUCKS IN A ROW – STREAM

*Murphy A (Beca), Smith I (Beca),
McMurtrie S (EOS Ecology), Keesing V (Boffa Miskell)*

ABSTRACT

Waterways are often the most visible feature of a stormwater system for the communities they pass through. Communities can be highly engaged with their valued waterways and often seek ways to restore, interact with and improve their environmental sustainability. Therefore, waterway design must deliver hydraulic engineering performance and ecological values as well as other community concerns like aesthetics. This requires a balance of often-conflicting perspectives.

Hydraulically, waterways need to convey baseflow, small storm freshes, and floods. However, the other drivers result in the form of a waterway being complex, needing to incorporate varying morphology, slope, ground conditions, vegetation, habitat features, engineering structures and spatial constraints, to list but a few. Accommodating all this is complicated by competing requirements; for example achieving flood conveyance while providing a healthy, sustainable habitat. The first would see wide, open, smooth, stable waterway

cross-sections while the second seeks nearly the opposite with narrower, dynamic normal-flow channels incorporating shading, plant cover, bank undercutting and variations in velocity and depth. This paper presents two different project examples where hydraulic, ecological, landscape and other multidisciplinary design elements have been successfully balanced, and identifies the key project features that can be applied in other waterway designs.

Firstly, Christchurch City Council's Dudley Creek Flood Remediation project aims to restore the pre-earthquake flood risk to the Flockton Street Area. It involves two kilometres of flood channel widening through private property and road reserve, plus a 790 m flood bypass conduit.

The second example, NZ Transport Agency's MacKays to Peka Peka Expressway on the Kapiti Coast, includes more than five kilometres of new and enhanced waterway to mitigate that lost to the Expressway. This, too, must balance the significant flood risk that is a feature of urban and rural areas around the project, while supplying suitable ecological mitigation.

*The rest of this paper can be viewed at the Water New Zealand website:
www.waternz.org.nz*

PRESENTER PROFILES

Amber Murphy has worked on a range of stormwater, water, and wastewater projects over the last six years as an Environmental Engineer in Christchurch. Her work has involved investigating flooding issues and flood risks, identification and design of solutions, and implementing projects to improve drainage infrastructure throughout the region.

Iain Smith is a Civil Engineer who has focused on stormwater management across a wide range of infrastructure projects for the last 14 years. He recently delivered the stormwater detailed design for the MacKays to Peka Peka Expressway being the culmination of five years of investigation, design and implementation.



A select sludge shoveler

At 87 years of age, John Fitzmaurice is only recently retired from a long, full and successful career as a sewerage specialist. He spoke to **Mary Searle Bell** about his life as a sanitary sludge shoveler.

John Fitzmaurice was born in 1929 at the start of the Great Depression. Those years of hardship left a permanent mark on his generation but provided a wealth of opportunity as he matured.

“It affected people of my age throughout our lives – it made us cautious about spending – but I consider us the lucky generation,” he told the Water Journal.

“Those of us born in the Depression suffered deprivation but there was a corresponding low birth rate and this made it easy to get jobs throughout our lifetime.”

Also, being born between the first and second world wars meant that, while he trained and served in the military, he was never called to war. John volunteered for the Royal NZ Engineers, serving 12 years in the territorial force and retiring with the rank of major.

In the early 1950s, John completed a Bachelor of Civil Engineering degree and, in 1952, started work as an assistant engineer for the Drainage Board.

“There was a wealth of opportunity for graduates at that time,” he says.

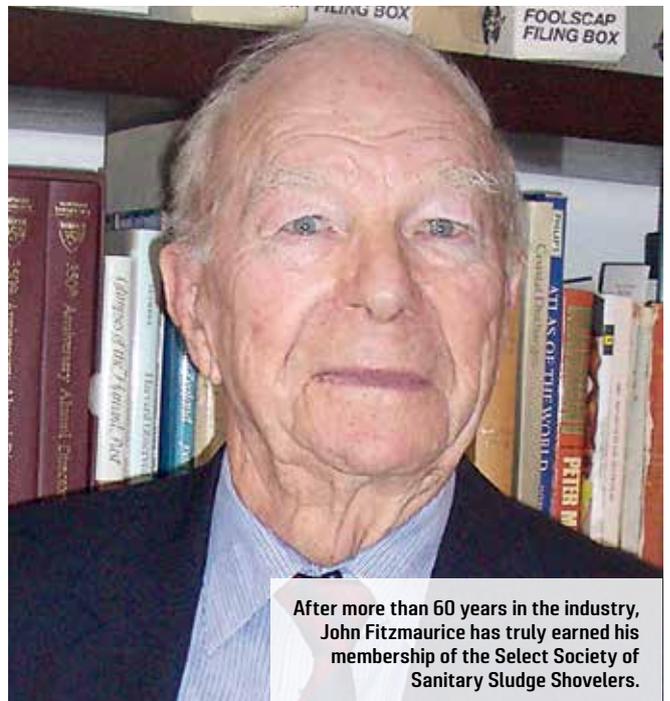
The most glamorous was the construction of the Auckland Harbour Bridge, but there were many other large civil projects underway.

John had begun working on the Browns Island Sewerage Scheme. However, when Dove-Myer Robinson was appointed chair of the Drainage Board in 1953, he brought delays to the project by appointing a panel of overseas experts to review the highly controversial scheme.

Inability to progress on the project prompted John’s boss, Ron Browntree to suggest he apply for a Fullbright Travel Grant to study sanitary engineering overseas as there was a shortage of expertise in New Zealand.

So he did – and was granted the funds to travel. He applied to six different universities and was accepted to all. His final choice was the prestigious ivy-league Harvard University where he would study for a Master’s Degree in Sanitary Engineering. A big factor in his decision to go to Harvard was that the university also offered him a half-time position as a teaching fellow.

This role as assistant to the professor of sanitary engineering entailed marking papers and taking a few lectures when the



professor was called away to advise the government on some matter.

“I was only a page or two ahead of the students,” laughs John. However, this work provided the necessary money to cover his living expenses.

The terms of the Fullbright travel grant allowed him to work during its two years’ duration. So John doubled up on his coursework to finish his study in just one-and-a-half years. Over the summer break and in the eight months following the completion of his degree, he had a job with a consulting civil and sanitary engineering firm, Brown & Caldwell.

Meanwhile, back in New Zealand, the Browns Island Scheme was abandoned in favour of oxidation ponds at Manukau. And it was Brown & Caldwell who were appointed, in 1955, to design this sewerage scheme. It was commissioned five years later in 1960.

Upon returning to New Zealand, John resumed his role with

the Drainage Board, staying there for 12 years and dealing with the ongoing problems with the Manukau scheme. Shortly after it opened, the Mangere Wastewater Treatment Plant had issues with bad smells and midges among other operational problems.

In 1963 John left the Drainage Board to set up his own consultancy in partnership with Lester Steven, who he had met while working in the USA. Steven & Fitzmaurice were integral to the sewage schemes of major towns throughout New Zealand. Projects included the Hamilton Pollution Control Plant, sewerage schemes in Tauranga and Mt Maunganui, the milliscreening plant in Hutt Valley, sewerage projects in Blenheim and Christchurch and the Invercargill sewage treatment plant.

The company grew to include five partners – the name change to Steven, Fitzmaurice & Partners reflecting this.

However, with the economic downturn in the late 80s, work dried up. John says they were approached by another consulting firm with a view to merging. While they thought this was a sound idea, they also thought it better to go elsewhere. So John approached Ron Carter of Beca Collins Hollings & Ferner (now Beca Group) and in 1989 they merged to become a division called Beca Steven.

Once the merger was complete, John was appointed as executive director. A year later he became a consultant to Beca Steven, a position he held for five years.

He then spent six years as deputy commissioner of the Environment Court and also served as the deputy convener of the audit group for Project Manukau, a position he only retired from in 2013. In this role he was responsible for overseeing the resource consents for Mangere Treatment Plant upgrade – this \$460 million project was the biggest local body expenditure to that point and involved the progressive removal of the oxidation ponds and their replacement by nine large BNR (biological nitrogen removal) activated-sludge reactor-clarifiers.

John has also served as chair of the NZ Institute of Engineers (1963-64) and has been involved in Water New Zealand from its very early days when it was the NZ Water and Wastes Association – his membership number is 00014 – and he helped draft the association's constitution. He is a life member of this association as well as of the Water Environment Federation (WEF).

One time WEF president Geoff Scott selected John for membership of the Select Society of Sanitary Sludge Shovelers, or 5S as it is known. The society honours 'outstanding, meritorious service above and beyond the call of duty'. Back in the day, John says, membership required being immersed in sewage. John was duly inaugurated into this elite group when a plug burst in the manhole he was working in, flooding the manhole and drenching him in filth. He wears his golden shovel insignia with pride. **WNZ**



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On disaster's frontline

Emergencies are a near daily diet for Oxfam's veteran field worker Carlos Calderon. On World Humanitarian Day in August, he talked about his work for an organisation that specialises in water and sanitation work.

Over the past 16 years, Oxfam Humanitarian Manager has witnessed the impact of tsunamis, cyclones, radioactive spills, bloody civil wars, devastating droughts and floods across all five continents. In a recent Q&A, he talks about his work – and how he got into it.

HOW DID YOU BECOME A HUMANITARIAN WORKER?

I have always worked for NGOs, it all started when I started working for the volunteer fire-fighting brigade in Peru. I would volunteer eight hours a day, four days a week. So far, I have clocked up to 3000 emergencies. As well as firefighting, I worked as a hazardous materials technician and a paramedic – 80 percent of the call-outs were for medical emergencies. I worked with chemical spills and a radioactive spill at the local hospital – the whole gamut; so I was well prepared to move into this field. After finishing my degree in Communications for Development, I worked with Firefighters without Borders as a rope technician which is a fancy name for using ropes to rescue people from trenches and cliffs. After completing my Masters in Humanitarian Aid, I became an intern at Oxfam in Spain. Since then, I have worked for a variety of agencies and across a number of countries – South Sudan, Somalia, Palestine and Japan after the tsunami.

WHAT DO YOU FIND MOST HEART-BREAKING?

I think one of the hardest things to deal with is the fact that you can return to a country again and again and in the long term, it still remains broken because there is no traction from the government or international actors to address its problems. I have worked to return refugees to South Sudan only to see the country erupt into violence again. It's heart-breaking because you have all these international organisations working hammer and tongs trying to help out in one of the world's worst humanitarian situations even though all of that work amounts to zero.

AND SURPRISING THINGS THAT YOU HAVE LEARNT?

Well, it's critical to consult with the community to find out their needs, otherwise things can go awry. You hear heaps of stories of 'fails'. I think one of the most interesting of these was a seed distribution drop that was done, I think, in Africa. This particular seed variety was sourced from a neighbouring

country and the recipients were unfamiliar with it, so they ate the seeds instead of planting them. In this situation, you really need to consult with the community.

THINKING ON YOUR FEET MUST COME NATURALLY?

Oh yes, I primarily work in the Pacific and in the past few years, the cyclone season has ramped up and the storms are becoming more frequent and more ferocious. One of the biggest problems with the Pacific is that the community maybe scattered across hundreds of islands and yet there is only ferry services and air travel is prohibitively expensive. Often that means empowering and training locals so they can do the job. For example, in the past, we've had the option to fly an engineer out there to service desalination units but this really isn't cost-effective, so we have trained up locals to use this complicated equipment. So when disaster strikes, they can switch into engineer mode, like they did when Cyclone Ian Winston struck in 2014.



In an emergency we're the ones handing out water, installing portable desalination units, water tanks and working to build pit latrines.

HOW IS CLIMATE CHANGE AFFECTING YOUR WORK?

We are already witnessing the impact of climate change – it's creating more intense cyclones throughout the Pacific. And for many low-lying islands, their only source of water is rooftop rainwater harvesting and what gets lopped off in a cyclone? Roofs. So it's a matter of creating cyclone-resistant houses, so that families aren't left without this important water source after a disaster. Climate change is also causing droughts and if you're a family that's harvesting rainwater, then this can greatly reduce your water supply, so we're also working to encourage smart use of water and, in critical situations, we'll look at installing a temporary desalination unit.

WHAT ARE SOME INNOVATIONS IN THE FIELD?

Oxfam specialises in water and sanitation, so in an emergency we're the ones handing out water, installing portable desalination units, water tanks and working to build pit latrines or sketch out poo maps. This work is often critical because after a disaster, you have a secondary crisis caused by open defecation and people drinking unclean water. Our nifty buckets and water tanks are the gold standard, so many NGOs order our sanitation products in emergencies. We're not an organisation

that looks to fix-n-dash, we look for long-term solutions to sanitation problems. It is estimated that one billion people still don't have hygienic toilets, so we're working to ensure that people have access to low-cost toilets in their homes such as tiger toilets and bio-digesters. This is especially important for women who risk getting sexually assaulted if they have to use a government toilet at night.

CHALLENGES OF WORKING ACROSS THE PACIFIC?

The top one would have to be accessibility – you have two million people scattered across thousands of islands and these islands aren't well served by flights or public ferries. For example a return flight from NZ to the Marshall islands costs \$4000. That said, there have been some innovative solutions to this problem, such as an NGO that works with super-yachts. These yachts often contain desalination units, so they were deployed to the outer islands after Cyclone Winston in Fiji. The second biggest problem is the fact that many of these countries don't have a cash-economy, so you may install a desalination unit but they work on a bartering system, so it's hard to find parts to keep it maintained. Also you can't 'pay' an engineer to maintain this unit because the money is useless. **WNZ**

World Humanitarian Day (WHD) recognizes the aid workers who risk their lives in humanitarian service, and mobilizes people to advocate for humanitarian action. This year's theme is "One Humanity". For more information visit: www.un.org/en/events/humanitarianday. Water New Zealand is an Oxfam supporter.

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Flood – coping with a new threat

Recent flooding incidents highlight the need for more constructive national debate, says Water New Zealand chief executive **John Pfahlert**.

In a recent *Listener* article, journalist Rebecca Macfie detailed a somewhat acrimonious debate that followed the severe flooding event that struck residents of South Dunedin in June last year. A year on, the debate still simmers.

In very simplistic terms, some central government politicians and Mayor Dave Cull asserted the flooding was related to climate change and suggested parts of low-lying, close to the sea South Dunedin would need to be relocated.

Meanwhile, former engineering staff from both the city and regional councils has presented a strong case that the argument the infrastructure was inadequate to deal with an extreme weather event was misinformed. They argue the system was not ‘ancient’ nor subject to rising sea levels. Rather they contend the flooding was largely a consequence of blockages to intakes, mud tanks and large filter screens not being cleared of debris – effectively acting as dam walls.

A further complication in resolving the debate is that the Dunedin council’s third-party contractor advised council some time prior to the extreme weather event that a routine inspection of the mud tanks had found a third were not up to

specification (i.e. over 30 percent full of silt and rubbish). Macfie reports, however, that the same contractor told the *Listener* that its services had been, “delivered to Dunedin City Council in accordance with contract requirements. Its performance was supervised by the council and it had ‘passed numerous performance audits’”.

Such debates around flooding are not new, but are clearly not a productive way of dealing with what is this county’s leading natural disaster. Shortly after the South Dunedin event, Whanganui was struck during the night with the worst flooding on record. The city was isolated and many residential and business properties were severely inundated.

This year, on March 24, parts of Franz Josef village was devastated when heavy rain altered the course of the Waiho River and a stopbank intended to protect the village was breached. The swollen river wiped out the town’s sewage ponds and the river ran straight through one of the hotels. After the event, some suggested the entire township, population 450, should be relocated way from the river. Interestingly, while the village has only 450 residents, more than one million tourists visit each year, many staying overnight.



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The three cases above raise a number of issues including management of stormwater infrastructure, the costs of rehabilitation of buildings and infrastructure, and the capacity of small communities with limited rating bases to deal with major storm events.

In response to the situation, the president of Local Government New Zealand, Lawrence Yule, quite correctly noted that tourism numbers were growing throughout the country and many popular tourism spots were in areas where there was only a small resident population. The local infrastructure had often been built to suit the demands of that population, but not the demands of thousands of tourists.

Previously, in 2015, LGNZ had issued a 10-point funding plan that included canvassing the idea of a 'visitor levy' that would be directed to upgrading and extending infrastructure to cater for seasonal demand.

Central government had previously announced a Regional Mid-sized Tourism Facilities Fund that, with co-funding from local government, would see \$12 million spent over four years on infrastructure in communities facing tourism pressures.

Given the cost of infrastructure and the growing tourism numbers, this will clearly not be adequate. The idea of a visitor levy has not received support from central government and any talk of additional cost applied to individual visitors is vigorously opposed by the tourism industry.

Debate and discussion around roles, responsibilities and costs in reference to flood management is not new. In 2008 the Ministry for the Environment released a report outlining the issues. Meeting the Challenges of Future Flooding in New Zealand, while not specifically addressing the tourism issue, did note the problems facing many lower income and small rating base areas in relation to infrastructure funding.

The report commented on the variability of flood risk management practice across the country, called for greater integration across all areas of decision making, and noted the lack of base-line information and the absence of standard risk definitions. More latterly, the Parliamentary Commissioner for the Environment has released several reports addressing the challenges facing coastal communities in relation to potentially rising sea levels. An extreme rainfall event and particularly high tides in the Wellington region recently highlighted the Commissioner's concerns. North of Wellington City there were several instances of coastal land and property being swept away and in one case a serious pollution hazard could have arisen. A sewer main was exposed right on the coast line. The question does need to be asked why such a line was laid in front of beachside properties – a graphic example of the limitations of current flood risk management practice as outlined in the 2008 report.

As noted above, flooding is this country's most common natural disaster. Perhaps we are now at the point where it is time for central Government to take a far greater leadership role. Tourism is a major, and growing, dollar earner and most New Zealanders live close to the coast.

Arguing about where people live or who pays for the infrastructure is not a productive way to proceed. New approaches are required, most particularly in reference to funding innovative and appropriate infrastructure. **WNZ**

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BRIAN BENNETT – a natural leader

Brian Harry Bennett, a big personality in the water industry, passed peacefully away on 11 August after a long illness

Quiet in nature, Brian was very popular in water circles and his company, Streat Control, has been a premier sponsor of the Water New Zealand conference where his stands were always outstanding interactive displays.

Brian was born in Belstead just out of Ipswich in Suffolk, England, the only child of Eva and Harold Bennett and, after leaving school, completed an electrical apprenticeship at Fisons Fertilisers in Ipswich. In 1969, he moved to British Fermentation Products and here began what was to become a 45-year career in instrumentation.

In 1970, Brian moved to New Zealand, arriving by boat in Wellington where he and family bought a van and headed to Auckland to settle in Titirangi.

Brian's first job here was with Turnball & Jones before he took on a role lecturing in Electrical Engineering at Manukau Tech, something he had a passion for. From there, Brian moved to W. Arthur Fisher, progressing to general manager. In the early 1990s, he was headhunted to ECL where he was instrumental in restructuring the business to set up standalone units that were able to economically survive or be sold. Brian set up instrumental company Paklog NZ (for Rolls Royce Industrial Power) and saw it through to its high days (including a Fiji branch), until it's breakdown by Rolls Royce around 2000.

'Retirement' proved short-lived and Brian took on some overseas contract

work with a close Australian colleague. Around this time, he was offered the Auckland/North Island Territory role with Streat Control, a privately owned company built by founder Garth Streat.

When Garth retired, Brian and Anne Capon bought Streat Control in 2002. Within one month of the purchase, Brian was diagnosed with a serious illness. Despite this challenge, he remained determined and committed to the success of the company, which remains a privately owned family business with partnerships with key manufacturers around the world.

His friends and colleagues describe Brian as "one of the hardest working people you could ever find". This trait was also evident outside of work. A keen badminton player, Brian worked willingly and tirelessly on the Titirangi Badminton Club's new club hall project, for which he was awarded life membership.

Likewise, when help was needed at the Ellerslie Rudolph Steiner school that his daughter Mandy attended, it was Brian who spent his weekends completing electrical work. A keen boatie, fisherman and golfer, Brian loved New Zealand and all manner of outdoors things – "especially BBQ's," his friends recall.

They also mention Brian's charm, humour, humbleness, gift for leadership and "ability to make the most of whatever the situation, exceptional".

Brian is survived by his daughter and son-in-law, Mandy and Matthew, and grandchildren Ryan and Amber. [WNZ](#)

Why we should care about 'backflow'

This year brought some significant changes as Water New Zealand's backflow group joined forces with the NZ Society of Master Plumbers at their Plumbing Conference held in Rotorua this year.

The backflow group presented workshops on a range of topics which related not only to the plumbing industry but to protecting the potable water supply.

Backflow group Chairman Graeme Mills welcomed the 50-plus delegates with the question "What is backflow and why should we care?"

The first presenter was Jon Lewis, a plumber, backflow practitioner and tutor of the NZQA backflow courses. Jon showed examples of how to install devices correctly with an emphasis on compliance and the common mistakes being made. He provided an insight into how things can go wrong hydraulically if an incorrectly sized device is installed.

After morning tea, Kevin Healy presented the next session on the legal obligations regarding backflow prevention. The NZ Building Code requires backflow to be installed as near to the potential source of contamination yet, under section 69 of the Health (Drinking Water) Amendment Act 2007, the opening statement of section 69 is: *The purpose of this Part is to protect the health and safety of people and communities by promoting adequate supplies of safe and wholesome drinking water from all drinking-water supplies.*

Furthermore, section 69ZZZ states: *This section applies if a networked supplier considers that there is a need to protect the networked system from risks of pollution caused by water and other*

substances on properties connected to the networked system.

Is there a conflict – or is one area of legislation not sufficiently robust and installations so suspect that boundary protection is necessary?

Usually at full-day workshops, it is difficult at the first session after lunch to try and keep delegates awake. Graeme Mills drew the short straw. He presented on 'backflow prevention programmes, what they should look like and where to get assistance in developing one of these'. Tauranga City Council has a fairly robust backflow programme where they test the boundary devices (their choice) and have an independent audit applied to 10 percent of the tester work. They also carry out five-yearly property surveys to ensure that their water network is still protected – we can't rely on Change of Use.

Aaron Rink presented the final session for the day. Aaron is a Flow consultant and Backflow Practitioner and his presentation related to the Hamilton City Council's 'Backflow Philosophy' which really changes the whole dynamic on backflow when Building Consents are applied for.

The Backflow group's view is that if every Regulatory Authority took the Hamilton City approach, it would reduce the confusion and uncertainty around protecting the potable drinking water.

In parallel with our afternoon sessions, the Master Plumbers run a Continuing Professional Development (CPD) course. This may have reduced the numbers in our afternoon sessions but we are sure this will be addressed in future joint events. Overall, this was a good initiative and we will be working with the Master Plumbers with a view to carrying on this joint venture in 2017. [WNZ](#)

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Championing a new model



A new model of training for Water Industry professionals will have far-reaching benefits for the industry - as Connexis CEO **Helmut Modlik** explains.

Skills requirements in all sectors of the Infrastructure Industry are evolving at a rapid pace. Training delivery methods are also evolving, with a growing consensus among the Water Industry for a change in the way water professionals are trained. While the successful traditional training model (block off-job courses, followed by on-job consolidation of learning and assessment) has been used for many years, a new approach for the future is emerging.

This model centres around three key components: online deployment of theoretical learning; off-job practical workshops; and the continuation of on-job consolidation and assessment.

Innovation and collaboration are keys to success in the water as well as the wider Infrastructure Industry. The new model for Water

Industry training has both of these things in spades, having arisen out of a collaboration between the diverse industry representatives on the Connexis Water Industry Group.

This Group is convinced that the new model will have huge and far-reaching benefits for the industry. Here is why Connexis is also excited to support it.

Firstly, digital content already pervades almost every aspect of our daily lives. Why should learning be any different?

One of the biggest benefits of delivering theoretical learning online is that it can be accessed more flexibly to fit in with the learner's lifestyle. People can progress at their own pace, with a level of independence, yet still benefit from a peer and tutor support network comparable to that on a block course.

Online learning can take place anytime and anywhere, making it more accessible to a wider range of learners. There is no need to take weeks off work to attend a course, or to pay expensive travel and accommodation costs. The digital platform also offers limitless opportunities for innovation, with smart interactive technologies enhancing the user's learning experience and engagement.

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Watercare women rule at Infrastructure Awards

Female leaders in the Water Industry were in the limelight at the recent Connexis Celebration of Women in Infrastructure event, with Watercare Services dominating the Awards.

Watercare Northern Networks manager Suzanne Naylor was crowned winner of the Inspirational Leader Award, which recognises women who are demonstrating outstanding leadership in their chosen field. Service Delivery Water Supply manager Nolwenn Lagadec was also selected as a finalist in the same category, while Water Supply manager Shannon Palmer was a finalist for the Aspiring Leader Award.

Suzanne says: "Watercare is fortunate to have so many fantastic and talented women working across its operational business units. The existence of the Women in Infrastructure Awards demonstrates the huge changes which the industry is seeing in terms of diversity. Women in our industry are no longer limited to supporting roles. We can take on challenges and responsibility – and hold our own."

The Celebration of Women in Infrastructure event marked the end of Girls with Hi-Vis month – run by Industry Training Organisation Connexis as part of its Ultimit initiative. Despite women making up more than half of the New Zealand population, they account for only four percent of Connexis trainees.

Ultimit aims to address this imbalance by increasing female participation in trade and technical roles in the industries it serves.

Following its successful launch with the Energy Industry in 2015, Girls with Hi-Vis was expanded this year to include the Water, Civil Construction and Telecommunications Industries. The event proved extremely popular, with more than 50 women rolling up their sleeves and 'giving the industry a go'. **WNZ**



Women in Infrastructure – Suzanne Naylor of Watercare pictured with her award.

Be a 'Girls with Hi-Vis' host

Girls with Hi-Vis will return to the three waters in 2017.

If your company is interested in hosting an event please email:

ultimit@connexis.org.nz or call the Connexis team on 0800 486 626.

one of the essential components of the current water training model is the requirement to gain and build skills on the job. The new model continues this, but goes one step further by introducing off-job, practical workshops to augment on-job skills acquisition.

In days gone by, water trainees got to practice a full range of scenarios, including 'breaking' assets to gain experience in dealing with serious failures. Nowadays, the only time people get such experience is when failures actually happen. The new model reintroduces the opportunity for water operators to undertake 'real life' situation simulations. Support from employers has been so significant for this component of the new model that key industry players have offered their facilities and equipment for use in these practical workshops going forward.

Finally, the new model will not only retain but strengthen the current on-job skill building and assessment component. With the introduction of online learning and an increased focus on off-job practical workshoping, trainee on-job skill development should improve. And as a result, the whole process of preparing evidence, as well as the assessment itself, should be less of a burden.

So where do we go from here? Well, actually things are already well

underway. The Connexis Water Industry Group recently completed a successful proof-of-concept project, focused on the digital aspect of the model. The next step will be to prepare a detailed business case to capture the costs and benefits of the new model, and clarify specifically who will be involved in its rollout and what is required to make it a reality.

It is important to note that the incumbent training provider, Opus Environmental Training Centre, is not only aware of the model, but is supportive of the new direction and is keen to participate. The new model will still require a team of experts to develop and deploy the learning, as well as to provide on – and off-job mentoring and support. Opus is keen to continue supporting the industry and to play a key role.

However things progress in the future, one thing is certain – a competent, qualified 3 Waters workforce is essential. The potential and value of the new training model is exciting and so far, there has been unanimous and enthusiastic support from Industry. For our part, we say "bring it on". **WNZ**

For further information, go to www.connexis.org.nz or call 0800 486 626.



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Students sample the water industry

A group of secondary school students enjoyed a behind the scenes taste of the water industry recently experiencing what it takes to provide Auckland with clean, safe drinking water. The students were taking part in a five-day "Water Taster" programme – an initiative of Industry Training Organisation Connexis. The programme was designed to show young people how the industry works and to encourage them to take up a career in Water, and was supported by host networks Watercare, Downer, City Care and Safety 'n Action.

Connexis Water Industry Manager Annie Yeates says: "It was a joy and a privilege to introduce the group to the teams behind providing Auckland with clean safe water to drink, and treating the wastewater before it is discharged back into the environment, and those that look after the maze of pipe networks in-between."

She adds: "The programme was a real highlight for me, getting young people enthused about a vital industry that offers amazing careers that the vast majority of the population never think about – until something goes wrong!"



Water Taster – Keith Barnett, Technical Manager at Safety 'n Action talks to school students at the Connexis Water Taster course.

The 'Water Taster' programme forms part of a wider careers initiative by Connexis, which aims to attract more school leavers and career changers to all of the Infrastructure Industries it serves – the Three Waters, Civil Infrastructure, Energy and Telecommunications. Connexis Chief Executive Helmut Modlik explains: "We have some large skill shortages looming in the Water Industry, particularly in the area of water reticulation, where there are presently more

than 50 vacancies in this area in Auckland alone. It is vital to attract more staff and these open days are a perfect gateway." **WNZ**

How you can get involved

Connexis is seeking host companies for further 'Water Taster' programmes in 2017. To find out more please email: careersandevents@connexis.org.nz or call Connexis on 0800 486 626.

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Expiry information for Water Qualifications

A number of Water Industry qualifications are expiring and will be replaced with new versions. The current qualifications below will continue to be offered in 2017 for completion by December 2018.

Current Water Reticulation qualifications

- Open for enrolment until 31 December 2016; Last date for assessment 31 December 2018
- National Certificate in Water Reticulation (Planned and Reactive Maintenance Technician) with strands in Water and Wastewater – Level 3
- National Certificate in Water Reticulation (Supervisor) with strands in Water and Wastewater – Level 4

Current Water Treatment qualifications

- Open for enrolment until 30 June 2017; last date for assessment 31 December 2018
- National Certificate in Water Treatment – Level 4
- National Diploma in Water Treatment with strands in Drinking Water Assessment and Water Treatment – Level 5
- National Certificate in Waste Water Treatment – Level 4
- National Diploma in Waste Water Treatment – Level 5

What this means for current candidates

Current candidates working through their qualification have ample time to complete before it expires at the end of 2018. Candidates wishing to enrol in the existing qualifications in 2017 will also have the time to complete before the expiry date.

Opus Environmental Training Centre will continue with delivery of Water Treatment qualification off-job courses as usual during 2017. Book now at: www.opusetc.co.nz or contact Janet Bengree direct on 0800 678 738.

Replacement Water Reticulation qualifications

The expiring Water Reticulation qualifications are being replaced by:

- New Zealand Certificate in Utilities Maintenance (with strands in Water, Wastewater and Stormwater) – Level 4 (Civil Trades qualification)
- New Zealand Certificate in Pipe Installations (with strands in Trenched and Trenchless) – Level 4 (Civil Trades qualification)

The Recognition of Current Competence (RCC) pathway is open for enrolment for both qualifications. The sector qualifications and NZ Apprenticeship pathways will be available shortly.

New Treatment qualifications will be open for enrolment by late 2017. **WNZ**

• For further information please contact Annie Yeates at Connexis on 0800 486 626 or email anniey@connexis.org.nz

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Do we really understand our water systems?

Have Kiwis lost the plot when it comes to valuing or even understanding the country's vital water infrastructure? Water New Zealand's technical manager

Nick Walmsley urges more connected thinking.

All the recent issues in the media makes me realise how little most of our community know about their water systems. The tragedy in Havelock North, comments about agricultural effects on rural river quality, the forthcoming Rivers Day celebrations, a recent workshop I attended on 'Healthy Waters' (the new name given by Auckland City council to their stormwater programme), all had aspects of singularity. But media questions and talkbacks I've experienced have shown little comprehensive understanding that these issues are all linked – whether we like it or not.

Keep it simple stupid (KISS) has been a philosophy for getting your message across for some years, so I guess that could be a good place to start. Simplistically we can show our water use as noted in the figure below.

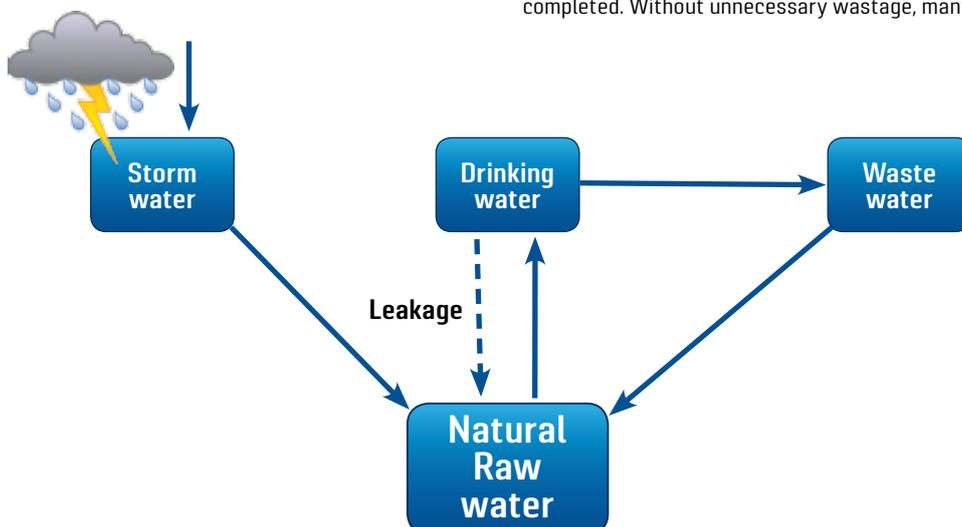
The rains come and fill our rivers, lakes, dams and groundwater reservoirs. We take that water and, with varying degrees of treatment, use that water to drink, wash and make products that we sell for a profit. The drinking water gets 'dirtied' and discharged to the sewer as wastewater, whether that is sewage (from people) or other forms of wastewater (from other human controlled activities) doesn't really matter. The point is, it is not fit to be discharged into the natural environment without treatment first.

We treat the wastewater to suit the political view of what is suitable for the local natural environment. Over the years, this level of treatment has markedly changed. Initially it was treated to protect people (remember public health engineers?). This changed to a level that protected the environmental standards of the day (now we are called environmental engineers) and then we added a layer of risk protection where we wanted barriers 'in case' of an event that may or may not occur.

Over the years, communities have become more risk adverse but, unfortunately, often without the necessary education to fully rationalise that risk. With the increased ability to communicate, (wireless media, IT systems etc) we now make, or at least influence, decisions en masse through public media, often without full or even any real knowledge of the contributing facts.

We often forget that our wastewater will eventually contribute to our drinking water. We reap what we sow, or something along those lines. How many folk flush the toilet and think that is the end of the matter? How many people realise that the 'flushable wipes' we happily buy to wipe surfaces, whether sink tops or baby's bottoms, are not actually 'flushable' in the sense of disintegrating in the sewer without causing harm? The wipes clog and tangle to cause operational problems for the stalwart folk that have to dive in to these murky waters and remove them; and the cost of this is paid for by our local body rates. The next time you complain about your rates ask yourself, "How much of that money did I cause? Did my family minimise that cost?"

Water supply also has losses, whether from a leaky piped distribution system, that constant drip from your tap at home, or the wastage when you don't turn off the cleaning hose in the workshop or factory. It is not just a matter of extra cost, although leakage of treated drinking water is certainly like putting money down the drain, but that water needn't have been taken from the river and could have allowed better flushing of sediment, better quality for the fish or more irrigation for the crops that feed the nation. There are several rivers that are likely to be seen as over-allocated when implementation of the National Policy Statement for Freshwater Management is completed. Without unnecessary wastage, many societal pressures



could be avoided or at least minimised.

In New Zealand, we are fortunate. Nationally we have enough water, although not necessarily in the correct place or time, given the increased demands from our growing population and intensified farming. Other countries have much bigger pressures with reducing rainfall and much bigger demands. We do not yet have to tap the sea for water to drink (desalination) which gradually increases the local salt concentration in the nearshore oceans at the same time as they warm up (global warming) and negatively affects fish life.

There are many disparate groups with their own agendas – for instance, promotion of waste disposal units even though it is well known that they are an inefficient way of dealing with solid wastes, or removal of chemicals from drinking water when the science clearly shows the health benefits. They may be well meaning but they do not see the issue within a balanced agenda. Life is a balance. If we do not recognise this now, we will ruin our own environment, but only future generations will know.

We, and our environment, are complex biological entities that need to live in harmony. There is no point in having laws and policies that label micronutrients as contaminants (and hence considered evil) when the reality is we need them to survive. Nature needs a small amount of many 'contaminants' to function efficiently. You will indeed be a very sick puppy if your body has either too little or too much, so labelling them as an absolute contaminant gives a false message.

Somehow we have lost the plot. We live in an environment that needs balance yet we selectively legalise and prohibit in isolation,

according to the uninformed whim of the day, or the zealots that get the most public attention. Fewer and fewer of our technical advisers have a wide range of relevant technical experience and seem more focussed on pleasing their political masters or pressure groups.

Have we lost the plot?

The value water imparts to society is immense. It is the single most important thing for our lives, yet we value and use it as if it means little. Remember, no water means no life as we know it.

The 2014-15 median charge across New Zealand to supply drinking water equated to less than 0.20c/L (National Performance Review). This compares to our increasing purchases of plastic bottles of water at \$3.50-4.50/L with throw away mentality i.e. 2000 times the bulk water cost!

In many areas, it is difficult for the community to know what they pay for water and there are few regular discussions on the levels of risk to their health. Equally, there is little public education on this topic. While Havelock North events are awful, it may have happened to the same people who wanted their rates, including charges to receive drinking water, reduced. They may well not have understood what their demands meant. Will those same residents now be willing to pay more to remove health risks from the system?

It is time that we assisted communities to understand more about some of life's basic values. Let's value water properly and understand how it underpins our basic existence. In today's world, part of valuing something includes funding for it to be managed properly. Life is our responsibility not something to be sold cheaply to others. **WNZ**



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A view into the kaleidoscope

Local Government and Resource Management



By **Helen Atkins**, partner, **Vicki Morrison-Shaw**, senior associate; and **Phoebe Mason**, solicitor – Atkins Holm Majurey

There is an old adage that the only thing in life that is constant is change. Never has that seemed truer than in the field of local government and resource management at the moment where it feels a bit like a shifting kaleidoscope.

Just when you think you understand the way it all works, along comes a further proposal for change, which turns that understanding on its head. In this article, we provide an overview of the Water New Zealand submission on the Local Government Bill which notes issues of particular concern to the water sector, as well as some general reactions from other submitters.

We also outline the findings and recommendations of the Productivity Commission in its draft Report on Urban Planning¹ and express our view that the acceptance of those proposals would mean the end of the RMA as we know it. We then go on to note the proposal for an inquiry into the Havelock North water issues, an issue we will likely report on more fully in further issues.

Finally, we provide an overview of two recent cases of note: the final chapter in the case of the cousins at war over water consents; and an interesting case discussing defences to prosecutions for unauthorised works within a stream bed.

We hope you enjoy the read!

LOCAL GOVERNMENT AMENDMENT BILL

In our last article, we commented on the release of the Local Government Bill and some of the high-level issues we foresaw with the Bill in its present form. Submissions on the Bill closed on 28 July 2016 with a significant number of submitters taking issue with the changes proposed.

The key issues with the Bill for the Water sector were highlighted in the Water New Zealand submission on the Bill. These included:

- Lack of uniformity – the complexities that may arise with different degrees of horizontal and vertical integration between organisational structures that may apply in different areas;
- Cross boundary issues – the challenges that may arise for the fulfilment of separate local authority obligations where organisations span boundaries;
- Funding/resourcing – the lack of recognition of the funding/

- resourcing which will be required from local authorities and council-controlled organisations (CCOs) to implement new structures;
- CCO's – the need for the legislative regime to be fit for purpose and allow for transparency, accountability and effective public participation;
- Taxation – the lack of detailed consideration given to the tax implications of the proposals in the Bill and the need for further clarity around these matters;
- Ministerial powers – the extent of proposed Ministerial powers introduced and the need for some criteria/restrictions;
- Development contributions – whether enabling CCOs to collect these directly would be more efficient and/or confirming how the other development provisions in the Act apply to CCO's; and
- Procedural matters – the need for some criteria to guide the Commission when determining proposals, to provide a right of objection against the refusal of a bylaw proposal, to allow local authorities to act in the event of non-performance by a CCO (amongst others).

Water New Zealand spoke to these and a number of other wording-specific issues mentioned in its submission, when it presented to the Select Committee on 18 August 2016. A copy of the Water New Zealand submission is available on the organisation's website.²

A number of local government submitters and commentators have taken particular issue with the Bill, with some even calling it the "death of local democracy."³

Given how controversial some of the changes in the Bill have been, we expect the Select Committee to recommend significant changes to the Bill – if indeed it recommends that it be passed. The Select Committee report is due on 28 October 2016.

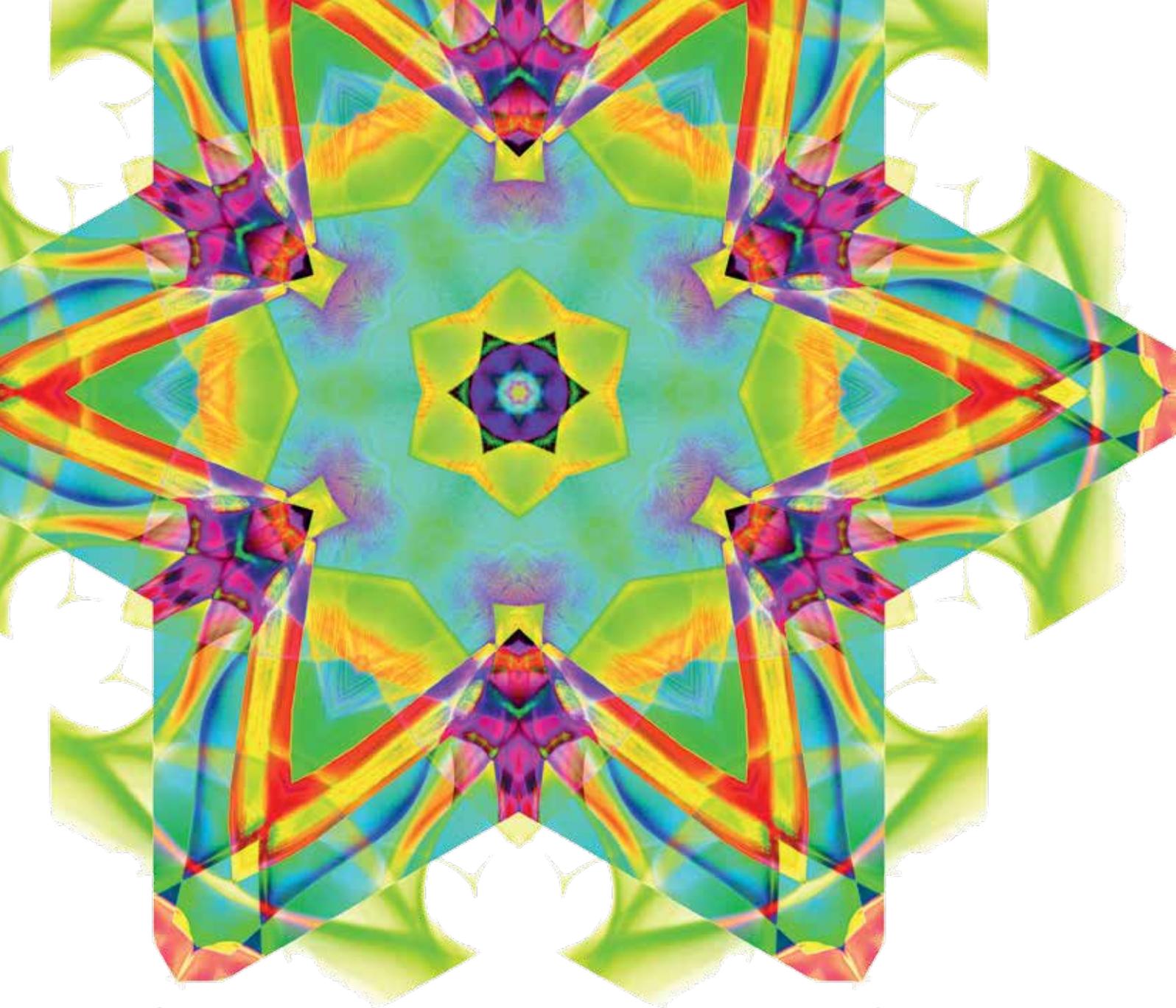
PRODUCTIVITY COMMISSION REPORT

The New Zealand Productivity Commission released its draft report on Better Urban Planning on 19 August 2016 (Report).⁴ The purpose of the report is to "review New Zealand's urban planning system and to identify, from first principles, the most appropriate system for

² Refer: https://www.waternz.org.nz/Category?Action=View&Category_id=930.

³ Comment made by Waimate Mayor Craig Rowley, as reported in an article in the *Timaru Herald* by Tess Bruntton and Daisy Hudson, dated 15 July 2016; <http://www.stuff.co.nz/timaru-herald/news/82141846/Local-Government-Amendment-Bill-could-be-the-death-of-local-democracy-Waimate-mayor-says>.

¹ *New Zealand Productivity Commission. (2016). Better Urban Planning Draft Report. Available from www.productivity.govt.nz/inquiry-content/urban-planning.*



allocating land use through this system to support desirable social, economic, environmental and cultural outcomes.”⁵ And the aim of the Report is to “set out what a high-performing urban planning system would look like.”⁶

In developing the proposals set out in the Report, the Commission considered and investigated matters such as: what makes a high-performing city; how planning can contribute to well-being; urban trends in New Zealand; and how well the current system is performing for urban issues. The Commission identified a number of priority areas for change. These are:⁷

- Clearer distinctions (and different regulatory approaches) between the natural and built environments;
- Greater clarity around priorities – especially at the national level and regarding land-use regulation and infrastructure provision;
- More responsive infrastructure provision including a clearer statutory framework for water services, better funding mechanisms and procurement practices and tools for councils to manage pressures on existing assets;

- A more restrained approach to land-use regulation – in other words, only imposing rules where there is a need for those rules, a clear link to externalities and alternative approaches are not feasible;
- Stronger capabilities (and a change of culture) within councils and central government to support the new planning regime – this would include both technical analytical skills as well as “soft” skills such as communication, mediation, facilitation skills and a greater understanding of Maori world views.

The Report then goes on to outline what the Commission considers a high-performing planning system would look like:⁸

- A presumption that favours development in urban areas, subject to clear (biophysical and other) limits;
- A clearer set and hierarchy of priorities for the natural environment;
- More and more robust environmental management tools;
- Infrastructure pricing and funding that more accurately reflects actual costs, use and impacts;
- Rezoning and regulatory change that adapts more rapidly to circumstances;

⁴ New Zealand Productivity Commission. (2016). *Better Urban Planning Draft Report*. Available from www.productivity.govt.nz/inquiry-content/urban-planning.

⁵ *Terms of Reference for the Inquiry*, reproduced at page iii of the Report.

⁶ Report, Overview, page 1.

⁷ Report, Overview, page 6.

⁸ Report, Overview, page 7.

- A focus on those directly affected by change – not third parties;
- A permanent independent hearings panel to scrutinise the proposed rules against the legislative purposes and consequently a different (and reduced) role for the Environment Court;
- More representative, less rigid consultation;
- Continued recognition and protection of Maori interests;
- Spatial planning as a core and fully integrated component;
- Central government as a more active partner in the planning process.

Two issues are noted as not being resolved and on which specific feedback is sought to help the Commission finalise its recommendations. These relate to the legislative separation of planning and environmental protection and the centralisation of environmental enforcement or greater oversight of regional councils.

While there is not space to go into the full details and likely issues arising with each of the Commission's proposals (the entire report is almost 400 pages!), suffice to say that if the Commission's proposals were adopted, it would be the end of the RMA (at least as we know it). In particular, the proposals to limit public participation in urban planning processes (especially appeal processes), contrasts starkly with the RMA framework which has long been based on giving the public a voice in such decisions. We imagine that submitter interest in the Report will be high, and for anyone wishing to make a submission we note that it has a very helpful 12-page overview section, and a summary section (section 13) which sets out all the findings and recommendations made throughout the Report.

Submissions on the draft Report are due by 3 October 2016 and the Commission's final report is due to the Government by 30 November 2016.

HAVELOCK NORTH WATER INQUIRY

As most of you will be aware, the contamination of the Havelock North drinking water supplies, the significant number of people affected (over 4100) and the significant number of confirmed cases of campylobacter poisoning as a result [523]⁹ made quite a splash in the news in mid-August.

On 22 August 2016, the Government announced it had decided to establish an Inquiry to investigate: what caused the contamination; how it was handled; the subsequent response; and any lessons and improvements that can be made in the management of the water supply network in Havelock North and across New Zealand.

It is understood that the Inquiry will be led by the Department of Internal Affairs using powers under the Inquiries Act 2013 and that the Department will report to the Attorney General. At this stage, no timeframes are known, however, as we suspect this inquiry will be of interest to most within the water sector, we will maintain a watching brief on this and report further in future articles.

RECENT CASES

Hampton v Canterbury Regional Council [2016] NZSC 50

You may well remember from previous articles the case of the warring cousins who were involved in a dispute regarding water-take consents.

The dispute has a complex history but, in essence, the case was about the legitimacy of the Council's decision to grant a resource consent to Robert to use water which was already allocated to Simon (Robert's cousin and neighbour), although Simon was not in a position

to use the water at the time.

The dispute went to the High Court and Court of Appeal and after failing in the Court of Appeal, Simon recently sought leave to appeal to the Supreme Court. The grounds for seeking leave were that Simon's consent variation application should have been given priority over Robert's new consent application; that the Court of Appeal erred in finding that Robert's consent did not derogate from Simon's; and that granting Robert's consent breached Simon's legitimate expectations.

The Court did not consider that any of the grounds justified granting leave. In particular and in relation to the priority ground, the Court noted that:¹⁰

"On appeal, Simon would have to argue that his application should receive priority despite the fact that he lodged the application after Robert, had no ability to use the water allocation at the time the application was made and voluntarily placed the application on hold for several years...

...we do not see the facts of the present case as directly engaging the Fleetwing principle and for that reason we do not consider that granting leave for the purpose of allowing that issue to be argued would be in the interests of justice in this case."

The Court determined that it would not be in the interests of justice to grant leave in respect of any of the grounds. This means that Robert's consent remains valid and can be exercised according to its terms.

Phillips v Wellington Regional Council 2016 NZHC 1266

This case was an appeal against conviction on three charges under the Resource Management Act 1991. The charges related to work Mr Phillips performed depositing soil and rock into a stream and diverting the course of that stream without resource consent. Mr Phillips did not dispute that he undertook the works, but contended that he was able to as he considered there was a risk to life and/or property if the works were not undertaken. The Court considered whether there was a defence available under two separate heads:

- s 341(2)(a) – whether the works necessary to save life/health, prevent serious damage to property; or avoid adverse effect on the environment; and
- s 330(1)(a) – whether the works were a public work and immediate remedial action was required or there was a sudden event causing likely loss of life or serious damage to the property.

The Court found against Mr Phillips on both grounds. In relation to the first ground, the Court agreed with the District Court that the defence was not available as "the stream had been in the same or similar position for some time, and there is no coherent evidence at all that urgent and unconsented work was required to save life or serious damage". While Mr Phillips sought to introduce new evidence on appeal about the necessity for the works, the Court noted that the evidence did not state erosion was imminent or likely to occur in the near future. The Court therefore held that the evidence did not change the conclusion that the defence did not apply.

In relation to the second ground, the Court found that the defence did not apply as there was no public work involved. The work that was performed was a private work and therefore could not avail itself of the defence.

The appeal against conviction was therefore dismissed. **WNZ**

⁹ Refer: <http://www.stuff.co.nz/national/health/83426335/government-announces-widereaching-inquiry-into-havelock-north-water>.

¹⁰ Refer paragraphs [8] and [9] of the Supreme Court decision.

Integrated Intelligence

A wastewater pump system breakthrough

More precise control, reduced clogging, less energy and more data are among the benefits offered by the latest wastewater pump breakthrough, says Xylem's director, project management, Stefan Abelin.

Tomorrow's wastewater pump station will require more functionality, higher reliability and advanced data communication. Owners and operators ask for this and flexibility, lower costs and better performance. To meet such demands, new thinking and new engineering must be used to create products and an offer that is higher on the value scale, yet that will prove to be more economical over time.

An answer to these challenges is the creation of integrated intelligence in wastewater pumping. This is made possible by innovation and adaptation of components in a submersible wastewater pump. By integrating power electronics, a processor, software, sensors, a synchronous electric motor and a start-of-the-art self-cleaning wastewater pump inside a submersible shell, intelligent wastewater pumping with integrated intelligence has been made possible.

The word 'Intelligent' in wastewater pumping is a result of factors that together contribute to a new level of operational autonomy and efficiency, a pumping system designed to automatically deliver the

desired performance at minimum energy consumption while reducing the total cost of ownership. Intelligence refers to a pump system that can sense the environment it is working in as well as the load it is subjected to and adjust its behavior to meet the end-user optimization targets. By collecting and analysing relevant data, the pump system can make smart decisions about how it operates and what feedback it will provide the user, resulting in precise process control, a reduced risk of clogging, clean and odor-free pump sumps, substantial reductions in energy consumption, comprehensive data reporting and lots more. In short, it delivers end user peace of mind.

The word pumping is used to describe that the affected operational area has been expanded from the pump itself to include hardware, functionality and customer values that today reside both in a wastewater pump, pump controls and external communication means.

TODAY'S SCENARIO

A typical submersible wastewater pump station consists of two pumps and a control panel that operates a sewage lift station based on varying liquid levels and an on/off controller. They are frequently found in duplex sewage lift stations serving municipal and private wastewater collection systems.

The pumps consist of a submersible enclosure containing an

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induction motor with a close-coupled hydraulic end and a seal unit. This pump type was originally developed in the 1950s and is now, 60 years later, considered a mature product that is globally available from a multitude of manufacturers. Some designs have been on the market for some 10-20 years with little or no innovation added.

The pump station's control panel is often fitted with simple relay logic or basic 'black-box controllers' that operates standard contactors in an on-off pumping mode. Pump station monitoring and protection is often limited to thermal overload and pump leakage. Universal pump-station design codes lead to a significant pump oversizing which in turn results in excessive energy usage and unnecessarily high equipment wear and thus operational costs. On top of this, many pump designs suffer from frequent clogging making the operation unreliable, unpredictable and overly energy intensive.

Recent attempts to improve pump efficiency, other than using self-cleaning hydraulics, has been realized by replacing standard induction motors with premium efficiency motors, a very minor improvement that results in only a few percentage points better pump system efficiency.

BREAKTHROUGH INTELLIGENT WASTEWATER PUMPING

An integrated intelligent wastewater pump system consists of a submersible wastewater pump with integrated control and power electronics and a pump station controller unit that operates the sewage pump station.

The in-pump processor controls the power electronics to achieve

variable pump performance, always meeting the demand at hand. A single impeller size per volute size minimizes the need for multiple spare impellers and yields maximum hydraulic efficiency as the impeller is optimized for the volute. Instead of having to remove the pump to trim or change an impeller, a different duty point can simply be met by the touch of a button.

Instead of discrete pump performance curves the new system offers an unlimited choice of performance curves within a large field. The specified duty point can always be met, yet easily changed to actual site conditions, if needed.

The intelligent wastewater pump system in total uses very few unique parts which drastically reduces the need to stock spare parts or spare pumps whether at the end user level or at a supplier's warehouse.

A new, simpler and more compact high performance synchronous motor further improves pump system efficiency allowing operation at reduced pump capacity with maintained high motor efficiency. The concentrated winding synchronous motor does this and meets the proposed future super-premium motor efficiency standards [IE4].

The integrated intelligent system offers functionality such as soft-start, pump clog detection, pump cleaning, advanced motor protection and 'always correct' impeller rotation. These are features that increase pump system life, reducing downtime and gives users peace of mind. The pump station controller can handle up to four pumps and provides pump system management functions such as pump energy minimizer, sump cleaning and pipe cleaning function, pump sequencing and alternation.

Successfully seeking system leaks

The SewerSerpent is the fastest way to detect leaks and access immediate, on-site diagnosis of sewer, stormwater and water pipelines. Using safe, extra-low voltage (ELV) electric signals, SewerSerpent accurately locates leaks in all types of insulating pipelines (PVC, concrete, vitrified clay, terra cotta, and asbestos cement).

SewerSerpent can be deployed as a stand-alone system to collect quantitative pipe leak/ infiltration location data, or it can work in a complementary way with other subjective inspection systems, such as CCTV, laser scanning, pressure test and acoustic inspection methods.

SewerSerpent is used to conduct quality audits and positively identify leaks in existing pipe systems (sewer, stormwater and water). It can be used to verify leak-free relining work and new installations and collect data as well as assessing asset health, eg. for infiltration programmes. SewerSerpent provides data to enable asset owners to inspect, assess and prioritise the deployment of resources for maintenance and to manage infiltration programmes.

Using SewerSerpent, water authorities, municipal authorities, contractors and plumbers can accurately determine locations of pipe leaks and infiltration defects – essential for any cost-effective pipe repair, pipe installation, renewal or replacement project. Eliminating those defects can considerably decrease the operations costs and capital expenditures of authorities.

SewerSerpent scans can be performed cost-effectively at the same

time as CCTV inspections or independent of CCTV inspections as suits operational needs.

Electronic leak detectors enable the location of leaks and infiltration of wastewater pipes using detection of Extra-low Voltage electric signals (<50 Vac) through leak sites in the pipe wall. These systems introduce a more sophisticated level of engineering that provides a solution beyond cameras that will detect an issue if there is a non-visual problem. Even where pipes are fully re-lined, they may appear perfect and clean, however there can be imperfections in the lining material itself which would not be seen by a camera, but can be electronically detected.

The advantages of using an electronic leak detection system include:

- Objective location of leaks not relying on operator interpretation;
- Rapid scan completion;
- Easily understood scan reports; and
- Scan data can be easily stored to form a database

UVS Trenchless www.uvstrenchless.com.au will demonstrate SewerSerpent225 on Stand 105 at the New Zealand Water Conference in Rotorua.



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An integrated and intelligent pump station system can operate a sewage pump station with 1-4 intelligent wastewater pumps. The powerful and patented energy minimizing software algorithm assures the lift station is always operated at the minimum specific energy level (kWh/m³), given the prevailing head and flow requirements. The pumps are soft started and soft stopped; the integrated pump clog detection function will protect the pumps from clogging by triggering a pump cleaning cycle, preventing unnecessary service calls. The sump and pipe cleaning functions will assure that the pump sump is kept free of sediment, floatables and fat. Power and motor protection functions will protect the motor from supply grid issues and thermal overloads.

Additionally the system will assure complete knowledge of what's going on with the pumps and the system. Local and remote operational data such as pump and station status information, warnings and alarms are readily available and user configurable to suit different system requirements. **WNZ**

About the Author

Stefan Abelin is director of Marketing Project Office for wastewater pumping at Xylem and has 35+ years of experience in the wastewater pump industry.



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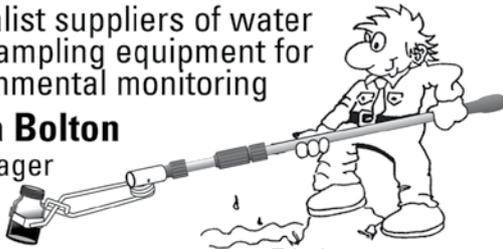
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