

# water



MARCH / APRIL 2018 ISSUE 203

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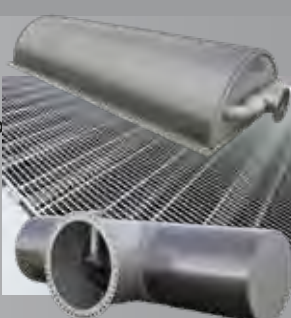
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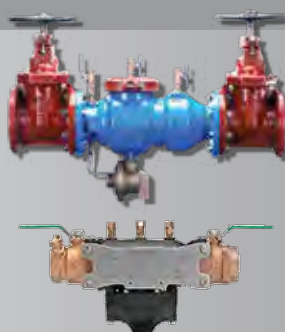
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# water

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*A consistent approach across the 3 waters sector.*



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

# Thirst for inquiry information



**Kelvin Hill,**  
**Acting president, Water New Zealand**

**W**herever you spent your time over the summer, you'll no doubt have enjoyed our scorching weather this season. Record-breaking high temperatures provide the perfect backdrop for holidays by the beaches, lakes and rivers. But along with the heat comes the big dry, bringing challenges for the rural sector and councils, with many having to resort to water restrictions.

Then there's the effect of increased flooding and tropical storms on our wastewater and stormwater infrastructure.

The big rainfalls that hit Auckland and other parts of the country in January and February led to sewage outflows in many popular beach locations. It's not a great look and it's something we're clearly going to see more of as population growth, climate change and ageing infrastructure all come together to create "perfect storm" conditions.

Our wastewater systems will increasingly come under strain and the cost of upgrading to cope with increased and intensive rainwater may be a price tag too big for local ratepayers in many of our regions.

The new government is planning to hold an inquiry into how councils are funded so we are optimistic that we will see moves to address an issue that has until now been put firmly in the "too-hard basket".

As we all know, the government released the findings of the Havelock North Drinking Water Inquiry in December and this is likely to have far-reaching implications for the management and delivery of drinking water in this country.

Water New Zealand has been running a series of roadshows throughout the country during February and March aimed at helping water suppliers better understand what this could mean for them.

Judging by the overwhelming response, there's a huge demand for knowledge about implications of the inquiry. The seminars – from Whangarei to Invercargill – were fully booked out and hundreds of members – water sector managers and providers, as well as local body politicians and leaders – attended.

As this column went to print we had yet to hear the government's response to the recommendations but we would strongly urge it not to delay in implementing the key findings.

There is a real need for major reform in the sector to ensure that all suppliers provide safe drinking water for customers. Make no mistake, unless there are changes there is a serious risk of another contamination outbreak on the scale of Havelock North.

At Water New Zealand we strongly support the establishment of an independent water regulator with the power and ability to enforce drinking water standards and the creation of an organisation to oversee the establishment of the regulator.

We also welcome the call for all publicly supplied water to be treated, including the use of a residual disinfectant, unless there are exceptional circumstances.

The inquiry also identified the lack of capability and training in the sector and called for a mandatory training and qualifications regime to be established for all operators, supervisors and managers working in the sector.

As you may know, this is another initiative Water New Zealand has already been acting on by taking a greater leadership role around industry training. New qualifications will start to be delivered this year and there is a move towards more flexible, blended learning with the ability to do distance e-learning and more on-the-job-training. However, there are a few hurdles that need to be overcome to ensure the new training material can be delivered. Funding for this activity requires support from the water sector.

Another big issue that ties in to capability is the need for a sector workforce strategy currently in development. We're very aware that there is a large cohort of older workers due to retire in the next decade or two and that we need



a strategy in place to deal with workforce planning and attracting the right people into the sector.

Despite the community opposition and pending tax on bottled water for export, foreign investors and local companies have still been applying for resource consent to bottle and export water.

This raises the question of how we reflect the true value of this very precious resource.

It's understandable that the public would support a levy on water bottlers as well as on farmers who irrigate to make profits. But picking winners and losers is not good resource management policy.

To be fair and to value water fairly, it would surely make sense that the government look at a pricing regime where everybody is charged for the water they use. But that's a question that the government is unlikely to address, especially in its first term.

Right now it has to deal with the Havelock North Inquiry recommendations and it is clear there will be significant

**“ At Water New Zealand we strongly support the establishment of an independent water regulator with the power and ability to enforce drinking water standards and the creation of an organisation to oversee the establishment of the regulator. ”**

and long overdue changes in the management of drinking water in this country.

As a sector representative, we are working hard to address and provide advice around these key areas of reform. We need to ensure that the reforms result in safe, effective and efficient delivery of water services into the future. **WNZ**

## What's coming up

**April 9 – 11: New Zealand Trade and Industrial Waters Forum, Auckland.**

**May 9 – 11: Water Industry Operations Group 'Meeting Challenges' Conference, Palmerston North.**



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# water

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



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## **Big birthday bash for Water New Zealand this year.**

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**We've been an association for 60 years and that means there's going to be a whole lot of celebrating at this year's Annual Conference in September.**

**Throughout the year we'll also be digging into our archives to take a look at some of the changes in the water sector over the last six decades.**

**For this edition we've found some water treatment pictures.**

**A reminder of just how things have changed in six decades. These are photos from Fairlie, thanks to Geoff Horley from the Mackenzie District Council.**



Chlorine dosing equipment dating back to 50s and 60s. These have been taken out and replaced with current equipment.

Current dosing equipment in Fairlie.



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### **Do you have any old or historic photos that you want to share?**

In the next editions of Water we'll be looking at 60 years of stormwater, wastewater, dams and pumps and pipes. If you have any interesting and historic photos from that time we'd love to see them and may even be able to publish one or two of them. You can email them to: [media@waternz.org.nz](mailto:media@waternz.org.nz) or post to: Debra Harrington at Water New Zealand, PO Box 1316, Wellington 6140. We'll make sure we return them to you.





## If only they'd listened...

**A**s Water New Zealand celebrates its 60th anniversary, we would be remiss to let this milestone pass without acknowledging the contribution of Dr Michael Taylor, QSO, to our industry.

For years and years Michael was a strong advocate for the introduction of mandatory drinking water standards. Standards that would ensure safe drinking water throughout the country and mitigate the risk of public health crises due to waterborne pathogens.

However, despite his leadership and excellent work, in certain parts of the country the public remains at risk of waterborne diseases.

Much to Michael's frustration, and the frustration of others in the industry, his efforts, which began in earnest some 30 years ago, to mandate the effective monitoring and treatment of public water supplies were roundly ignored by those in local government.

An organic chemist by training, Michael had studied the devastating *E.coli* outbreak in Walkerton, Canada, in May 2000, and could see that New Zealand was not immune from a similar disaster. But it seems the tragedy was too far removed to sway our politicians.

"It was a concern to me that unsafe drinking water was a major risk to the health of the community," he says.

He says much of the problem was the inability of politicians to understand the potential consequences of untreated drinking water, and their subsequent reluctance to spend money in this area.

"Cost concerns stymied plans to improve water quality," he said. "I had many arguments with local government politicians around this, where they insisted that it would be too expensive to guard against future outbreaks.

"I insisted that an outbreak similar to Walkerton could



Dr Michael Taylor, QSO.

easily happen in New Zealand and the costs to clean up would be considerably more expensive than if precautions had been carried out beforehand."

It was Michael's constant pushing of the unwilling politicians that finally resulted in the Health (Drinking Water) Amendment Act 2007. However, much to his dismay, the regulatory procedures laid out in the Act were not followed.

"What happened in Havelock North was almost an exact rerun of the event in Walkerton," he says with sadness.

"I thought the Health Act would cover all problems that may occur. The regulative procedures we built into the Act would have prevented any outbreak from happening, had they been followed."

Michael and his team had used the Walkerton experience as a model for testing the effectiveness of the proposed procedures in the Act and he says events such as Havelock North are entirely avoidable if you follow what's in the Act.

Unfortunately, Michael retired soon after the Act was amended and with that, the industry lost a very necessary driving force.

"The Health Act needed a champion to ensure the regulatory procedures laid out in it were followed," he says.

Michael had set up a "group of good people" who were to continue his work after his retirement, but the group was soon dissolved and the impetus was lost.

Havelock North was a brutal lesson for the public, but an effective one. It has ensured the focus has returned to drinking water quality and the importance of public health.

The continued work of Water New Zealand and those in the industry who share Dr Michael Taylor's passion, may mean his dream for safe drinking water for everyone in this nation may finally be realised. **WNNZ**

# Is the water you're drinking safe?

The stage 2 Havelock North enquiry recommends the use of a residual disinfectant in your reticulated network.

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# Huge interest in Water New Zealand drinking water roadshow

A Water New Zealand initiative aimed at informing the water sector about the implications of the Havelock North Drinking Water Inquiry has had an overwhelming response from members throughout the country. By **CEO John Pfahlert**.

**A**lthough the government has yet to signal its response to the recommendations of the Havelock North Drinking Water Inquiry it's clear that there will be some much-needed changes to the regulatory environment around the delivery of drinking water.

Water New Zealand's Technical Manager Noel Roberts and Principal Advisor Water Quality Jim Graham spent much of February and early March on the road visiting towns and centres speaking to water suppliers and local body leaders about what the drinking water landscape may look like following the inquiry.

More than 800 people attended the 17 events and many others were turned away as the sessions quickly became oversubscribed. In response to the overwhelming level of interest, a video of the Hawkes Bay seminar is available on the Water New Zealand website for future reference for members.

The Inquiry report accurately identified systemic failings in the sector that led to the outbreak and came up with important recommendations – some of them urgent – that need to be adopted if we are to avoid an inevitable repetition of the Havelock North contamination crisis.

First and foremost was the recommendation for the status of “secure bore water” to be removed except in exceptional circumstances. The Inquiry found that, except in exceptional circumstances, untreated ground water should never be regarded as safe to drink.

Improvements in water quality science and a greater understanding of contamination risks in drinking water sources in the decade since the Drinking Water Standards were implemented shows us that the concept of “secure bore water status” is flawed and does not guarantee that groundwater is free of microbiological contaminants. This new information has now changed our understanding of what happens to



Greymouth seminar.

groundwater compared to what we thought 10 years ago.

We now know that in Havelock North, for instance, that water which was thought to have been underground for more than 20 years had in fact been mixing with surface water that was as young as 26 hours old after heavy rain. This is likely to have been the cause of the contamination of the Havelock North supply.

Along with the removal of the bore water status is the inevitable conclusion that all drinking water needs to be treated, including with a residual disinfectant, unless there are exceptional circumstances.

These are measures that need to be implemented immediately.

The inquiry also recommended a new national regulator with the power to enforce Drinking Water Standards – and that the government consider aggregating smaller local authority drinking water suppliers.

It recommended that the decade-old Drinking Water Standards themselves be reviewed. We agree, and while we recognise that the standards are in need of updating, it is also concerning that many suppliers do not comply with the current standards.

Eighteen percent of New Zealanders are supplied with water that does not meet

drinking water standards and has not been shown to be safe. For small supplies (100 – 500 people) this figure is as high as 70 percent. There has been little improvement in the past 10 years. Compare this with England and Scotland where compliance rates are more than 99 percent.

This needs to change. And these changes need to be underpinned by a water sector that has the capacity and capability to meet a modern drinking water supply system.

This Association has called on the government to require mandatory qualifications and training of those involved in supplying drinking water. New drinking water qualifications commence this year. Hopefully this will improve the ability of the sector to deliver on the call for improved standards. A new strategy to deal with workforce planning is also in development by the Association.

Increasing our sector capability is a long-term strategy. We expect a signal from the government about its reform intentions by the middle of the year at the latest.

In the meantime, we urge all suppliers to ensure that you are compliant with current Drinking Water Standards and that water supplied for public consumption has been treated to ensure that it is safe. **WNZ**



# YWP Conference Attendance Award for graduates

This prestigious award has been expanded to provide an opportunity for two recent graduates or postgraduate students to attend the Water New Zealand Annual Conference or the Water New Zealand Stormwater Conference.

It provides the opportunity for participants to broaden their knowledge and gain greater appreciation of the water environment, water management, water engineering and the water industry at large and to meet others involved in all sectors of the water industry.

This is also an opportunity for young water professionals to become better informed, motivated and networked to advance their career and attain their goals in the wider water field and water industry.

The award will cover conference expenses. It has been funded through personal donations from members of the 5S Society (Select Society of Sanitary Sludge Shovelers) – an eminent group of members who hold a Gold Shovel in recognition of their services to Water New Zealand and the wider New Zealand water industry.

Water New Zealand is supporting the award through complimentary tickets to the conferences.

Last year's recipient, Charles Clague, used the award to attend the Annual Conference.

"I thought the conference was incredibly well run," he says.



Gary MacDonald (left) with Charles Clague, winner 2017.

"The presentations were very informative, thought provoking and professional."

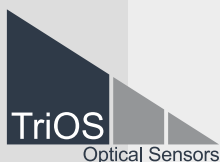
Those eligible to enter include: Tertiary graduates who are in their first two years of graduating and are working in the water environment, water engineering and water management fields or in water-related

research, and students who have obtained an undergraduate degree from a New Zealand tertiary institution in a water-related field and who are studying for a postgraduate qualification.

• For more information go to – [www.waternz.org.nz/5sYWP](http://www.waternz.org.nz/5sYWP).

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## Stormwater 2018

Wai Ora - Rising to the Challenge

23-25 May 2018, Millennium & Copthorne, Queenstown

**Make sure you register!**  
[www.waternz.org.nz](http://www.waternz.org.nz)

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

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

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

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

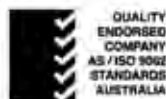
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## Waste Stabilisation Ponds – the new guide

**Early last year** Water New Zealand published an article about the benefits of Waste Stabilisation Ponds (WSPs, still called Oxidation Ponds by some of you) and the WSP Good Practice Guide then being written.

The completed WSP Guide was published last November and can be obtained by free download from the Water New Zealand website library.

The WSP Guide was written by a team of practitioners selected for their experience and knowledge of practical solutions, current research and international practices. The authors are listed in the Guide and have a combined experience covering over 100 projects across New Zealand and overseas.

WSPs are amongst the most commonly used methods for treating domestic sewage in New Zealand as they are elsewhere in the world, both in developed and developing countries. While the direct discharge of pond effluent to waterways is becoming less acceptable, for both cultural and water quality impact reasons, ponds are experiencing resurgence in New Zealand and overseas due to the development of advanced pond systems and retrofit technologies. Understanding how to get the most out of the existing asset is important to all communities.

The WSP Guide covers a wide range of related topics including modern pond classifications, key design parameters

and construction details with substantial sections on pond upgrades covering pre-pond, in-pond and post-pond options and the process performance parameters they improve. Operations and maintenance sections detail what and how to monitor for influent, effluent and sludge including sludge surveys. Substantial information on trouble shooting, should performance go astray, plus advice on appropriate information and performance standards for resource consents is also included.

The WSP Guide is more comprehensive than most that are freely available, specifically focused on New Zealand conditions and what is known, proven and currently available in the market place. It is not a design manual but gives focused advice on what should be considered for a particular situation, achievable performance standards and why upgrades should always start with a performance review based on operational audits before considering any capex based improvement. It is a 'must read' for asset managers, operators, resource consent officers and health professionals involved with WSPs. It will no doubt form the basis of future training modules.

Water New Zealand will shortly be providing introduction sessions on the WSP Guide in regions where existing WSPs are known to exist.

Look out for the detailed notices and book yourselves in.

## Women in leadership summit

**The field of environmental management,** conservation and sustainability is ripe with challenges and opportunities.

Leaders have a critical role to play in the preservation, rejuvenation and governance of our natural resources.

The future of society and business hinges upon those who are able to envision their leadership potential beyond the boundaries of their limitations.

The Women in Environment, Conservation and Sustainability Leadership Summit assembles accomplished women from various backgrounds to share in the vision of environmental sustainability.

Insightful case studies, interactive panels and expert commentaries will empower future leaders to actualise their ambitions.

In reaching for a collective goal, this summit will create a space for emerging leaders to sow opportunities for success and reap the rewards of their endeavours.

Featured speakers include: Jo Tyndall, Climate Change ambassador, New Zealand Ministry of Foreign Affairs & Trade; Carolyn Mortland, director, Social Responsibility, Fonterra; Rachel Brown, chief executive, Sustainable Business Network; Andrew Caseley, chief executive, Energy Efficiency and Conservation Authority (EECA); and Tanya Winter, director Policy Planning and Resource Management, Otago Regional Council.

Women in Environment, Conservation & Sustainability Leadership Summit, 17 – 20 April. Go to [liquidlearning.com](http://liquidlearning.com) or phone 09 927 1500.

# Call for Nominations for papers for the Ronald Hicks Memorial Award

*By Mark Milke, chair of the Ronald Hicks Memorial Trust*

**With the 60th anniversary of the formation** of an association that led to today's Water New Zealand, it's perhaps fitting this year to honour our association's past by nominating a paper for the Ronald Hicks Memorial Award.

The award has been given out since 1985 for some of the most significant innovative work on water pollution and sewage treatment in New Zealand, and to many of the most creative past members of our association.

The Ronald Hicks Memorial Trust Fund was established in 1984 to recognise and commemorate the contribution that Ron Hicks made to water and wastewater management in New Zealand from the mid-1950s until his death in 1983. Ron joined the Auckland Metropolitan Drainage Board from the UK as chief chemist at the time when the Manukau Sewerage Purification Works was under development.

He became widely respected as an international authority on domestic and

industrial wastewater treatment practices, and it was through his efforts from 1957 to 1959 that the NZ Sewage and Industrial Wastes Association, a forerunner of Water New Zealand, was formed.

Ron Hicks' legacy is remembered through the Ronald Hicks Memorial Award made to "the author(s) of an article or paper considered significant in solving or clarifying sewage treatment or water pollution problems in New Zealand".

Nominations come from Water New Zealand members, but non-members are also eligible for the award. Nominated papers and articles do not need to be published by Water New Zealand, and in today's increasingly international and electronic world, the trustees would expect nominations for papers published in international research journals or conference proceedings, and websites both in New Zealand and overseas.

The Trust Fund is currently administered

by: Mark Milke, Christchurch (chairman); Nick Dempsey, Auckland; and Paul Barter, Nelson.

You can help acknowledge the role that our members have made in reducing water pollution in New Zealand by nominating others' work. We all benefit from the extra exposure the award gives to key pieces of past water pollution work. Consider helping your association by making submissions for the Ronald Hicks Memorial Award.

Any queries regarding this award should be made to the Chairman.

Nominations can be sent via email or post to Mark Milke ([mark.milke@canterbury.ac.nz](mailto:mark.milke@canterbury.ac.nz); Dept. Civil Eng., Univ. Canterbury, Private Bag 4800, Christchurch 8140), or to Water New Zealand, [amy.aldrich@watarnz.org.nz](mailto:amy.aldrich@watarnz.org.nz).

Nominations this year will close Friday, 27 July and any award will be made at this year's Gala Dinner on the 20 September in Hamilton.



## Stormwater 2018

### Wai Ora – Rising to the Challenge

23–25 May 2018, Millennium & Copthorne, Queenstown



## Expert urges chlorination of Christchurch water

**A leading engineer has joined Water New Zealand** in the call for Christchurch City Councillors to vote for permanent water chlorination

Iain Rabbitts, Water and Wastewater manager at engineering and design consultancy, Harrison Grierson, and one of the members on the expert panel for the Havelock North Water Inquiry, says consumers need immediate protection from possible contamination.

Commenting on Christchurch City Council's decision to chlorinate the city's water on a temporary basis, Rabbitts says it is vital for the health and safety of residents that chlorination is permanent.

"Even the smallest crack in a well allows surface water contamination. The contamination



in underground wells was fundamental in the Havelock North outbreak with surface water being able to flood the well head. The right response, the safe response, and the public health response, is to chlorinate."

Commenting on the call in the Havelock North Stage 2 report for an independent regulator and removing political influence from the delivery of water services, he believes it is unfair for councillors to have to decide a critical public health issue. This is a good opportunity for the Ministry of Health to demonstrate leadership, make public health safer, and provide guidance for Christchurch councillors, he says.

The council decided that Christchurch's drinking water will be temporarily treated (for a year) with chlorine while work is fast-tracked on improving the security of the city's well heads. It has resolved that long term it wants to retain the city's untreated water supply system and will oppose any government moves to impose mandatory permanent chlorination.

## \$676,000 for water infrastructure upgrade

**The government is providing \$676,000** to upgrade and replace the water infrastructure in Kaikoura that was damaged in the earthquake.

Civil Defence Minister Kris Faafoi said the funding would allow Kaikoura's council to build a new reservoir to increase the resilience and reliability of the freshwater supply.

The funding is in addition to the Crown's usual contribution of 60 percent of costs of repairing three waters (drinking water, wastewater and stormwater) infrastructure.



Following massive repairs to the region, including a seawall, work is to start on Kaikoura's water upgrade.

## Hamilton's water woes

**Hamilton will require a new water treatment plant** costing more than \$100 million by 2045 and maybe sooner if the city does not improve the management of its water.

The city has been at water alert level two since December due to increased consumer consumption.

Hamilton City Council city waters unit manager Maire Porter says pressure is being put on water assets as the city grows. "We need to ensure we don't over-invest in water treatment infrastructure for the few months of the year when there is particularly high demand," she says.

The council says a new water treatment plant will cost in excess of \$100 million and the current cost to supply the city with water



is around \$28 million in 2017/18.

The city's water shortage wasn't helped by a civil construction company convicted of taking water illegally from a council hydrant

in October 2017. Evergreen Landcare was fined \$1800 plus costs. The company had been warned before about illegally taking water.

## Council welcomes tourism infrastructure funding

The Hurunui District Council is thankful that its application for funding from the Tourism Infrastructure Fund for its Hanmer Wastewater Disposal Project has been approved by the government.

The council will receive \$2.25 million from the first round of funding, which sees \$14.9 million invested in tourism infrastructure around the country.

The council has worked with the

community to develop a wastewater disposal to land option. The prioritisation of earthquake repairs incurred in the November 2016 Hurunui-Kaikoura earthquake sequence put the funding for this project in jeopardy. This tourism infrastructure funding will see the development of this scheme, which will help the council to manage the pressures increased tourism numbers are placing on wastewater infrastructure.

Chief executive officer, Hamish Dobbie, says: "Hanmer Springs Thermal Pools and Spa patronage in the last financial year was 546,000 people, and has increased 1.5 percent per annum over the past seven years. The development of a wastewater disposal to land scheme will allow the township to deal with the continual increase in tourist numbers it is currently seeing, in an environmentally-friendly manner."

## Rejected water pooling causes uproar

After \$1 million and seven years of discussion, Waipa District Council has rejected a cost-saving proposal to form a shared waters management company with Hamilton City Council.

The proposal would have brought the operation and maintenance of water, wastewater and stormwater services in Hamilton and Waipa under one company with the aim of improving cost efficiencies by pooling resources.

Infrastructure New Zealand says the council's decision is a graphic example of the need for central government to be more closely involved in crucial decisions by councils.

"No fewer than four independent expert analyses of water services in the Waikato have agreed that it is in the best interests of residents of Waipa district to combine their wastewater, water supply and stormwater services with Hamilton," says Infrastructure New Zealand

chief executive Stephen Selwood.

"Yet at the political level, these clear, demonstrable and agreed benefits were insufficient to persuade the majority of Waipa councillors to agree to partner with their neighbours in the provision of water services."

Meantime, Waipa District Council may face a judicial High Court review over its decision, which has drawn concern from Local Government Minister Nanaia Mahuta.

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- photograph title • photograph location • photographers name
- contact number and email (for our records only).

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

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

Go to our website [www.waternz.org.nz](http://www.waternz.org.nz) for more information and to see conditions of entry.



## Survey puts spotlight on procurement

A survey released in December 2017 has highlighted the critical need for better regulation of procurement skills and qualifications in public sector organisations.

The survey attracted responses from both sides of procurement, with around half the respondents working within public sector organisations, and the other half being suppliers to government organisations. Some 28 percent of respondents were from large or small council organisations.

Ninety-nine percent of respondents agreed that government should require at least one member of a tender evaluation team on significant (large or complex) projects to be qualified. And there was 98 percent support for development of a generic NZQA procurement qualification suitable for practitioners.

Comments in the surveys covered a range of views, with both suppliers and procurement staff expressing frustration at inefficiencies in procurement processes that undermine value for money.

"We see tender documents put out to the market that clearly have not been thought through," said one supplier. "The questions are irrelevant to what will deliver value; the weightings have clearly been set with little consideration of the potential for quality to drive more cost-effective outcomes; and the evaluation processes are far from transparent."



Council staff agree with this view. "We're under pressure to get tender documents into the market in short timeframes, so we often can't plan the procurement thoroughly.

"Add to that, there are entrenched views in our senior management that are difficult to shift. These mean we are required to follow the same standard RFT documents that our council has used for many years, for all our projects.

"Even when we know the questions or weightings are not appropriate for the project we're procuring, we can't do anything about it."

The 2016 update of the NZQA procurement qualification saw the potential of extending the qualification, which was previously limited to NZTA processes. It broadened the qualification's focus to all of infrastructure, and there is strong support to extend the reach of this qualification so that it becomes the benchmark for procurement in all public sector organisations.

A growing number of procurement staff operating in the water and wastewater sectors are now working through the qualification and finding it applicable to a wide range of maintenance and construction projects with councils and Watercare.



# Temuka water main replacement

**Timaru District Council has approved** the \$3.3 million project to replace 9.1 kilometres of water main supplying Temuka, which involves replacement of the current asbestos cement pipe with a new, larger diameter high density polyethylene (HDPE) pipe. The larger diameter pipe will be more flexible and earthquake resilient and will double the supply capacity to the town.

The project follows the positive identification that the source of higher than normal levels of asbestos in the Temuka water supply were due to the progressive internal failure of the current pipes.

The replacement of the water main between the town and its water source at the Orari River will be a permanent solution to the issue, enabling the removal of the temporary filtration plant and restoration of normal water usage in the town. The project is aimed for completion by Easter.



Following the upgrade of Timaru's sewer system, the TDC is replacing Temuka's water supply infrastructure.

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# Watercare accolade at USA Water Summit



**Watercare has been awarded a gold standard** for utility performance and has been inducted into the Leading Utilities of the World (LUOW) at the American Water Summit held in Austin, Texas.

The award recognises Watercare's achievements in overall utility productivity, stakeholder engagement, as well as wastewater treatment and environmental impact.

Watercare chief executive, Raveen Jaduram, says: "This award really is something to be proud of. It means Watercare is now part of a network of 22 of the world's most forward-thinking water and wastewater utilities."

LUOW is an initiative of the not for profit Global Water Leaders Group. The aim is to create a global network of the world's most successful and innovative water and wastewater utilities to help drive performance

across the sector by recognising achievement, providing a network for sharing ideas, and inspiring others to improve.

Watercare did not apply for the award, LUOW members must first be nominated by other gold-standard utilities and complete a rigorous interview and selection process. Each nominated utility presents three innovation success stories, which are evaluated by the LUOW Advisory Board.



Auckland Council's Watercare has a proud chief executive, Raveen Jaduram, after it was awarded an accolade for its infrastructure projects.



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

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

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

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

## Our leaders

### **Tony Cussins - Technical Director, Hydrogeology**

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

Email: [tcussins@tonkintaylor.co.nz](mailto:tcussins@tonkintaylor.co.nz) Tel: +64 27 705 1368



### **Dr Jason Colton - Principal Process Engineer**

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

Email: [Jason.colton@lutra.com](mailto:Jason.colton@lutra.com) Tel: +64 27 607 0302



## Summary of experience:

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







# Water sensitive urban design

By **Robyn Simcock**, Landcare Research, and supporter of the Water New Zealand Stormwater Special Interest Group.

**A**midst a building boom, many of our towns and cities are at a critical point with water systems. We can continue with ‘business as usual’ urban development and stormwater management – creating piped, drained, highly impervious towns, but this means the health of our urban waterways and harbours will continue to decline.

Alternatively, we can use a water-sensitive urban design (WSUD) approach to transform our urban places in ways that will benefit both communities and their urban waterways, while increasing resilience to natural hazards and social challenges. And given the requirements of the National Policy Statement for Freshwater Management to maintain or improve water quality, WSUD appears to be our only realistic option. Continuing with conventional approaches and retrofitting later is also vastly more expensive and difficult, as seen in the costs of daylighting piped streams or removing properties from flood hazards.

In September 2017 the Building Better Homes Towns and Cities (BBHTC) National Science Challenge ([www.buildingbetter.nz](http://www.buildingbetter.nz)) funded a team of WSUD specialists to ‘Activate Water Sensitive Urban Design (WSUD) for healthy, resilient communities’.

The point of departure for the research team is that we are ideally placed to implement WSUD. Our temperate climate, with generally well-distributed rainfall and moderate temperatures,

## What’s WSUD?

WSUD is an alternative to conventional forms of urban development that aims to integrate urban planning and water management to better manage water supply, security, quality and quantity (flood risk) and amenity values.

While different jurisdictions emphasise different aspects of WSUD, three concepts are particularly evident in this country.

First, WSUD aims to limit stormwater runoff and contaminant generation at source by minimising impervious surfaces, such as roads and roofs.

Second, WSUD maintains natural drainage systems like streams and disconnects them from pipes. Together, these practices help maintain pre-development catchment hydrology (including groundwater recharge and stream flows).

Third, WSUD uses green space to manage stormwater in a way that complements its approach to land use planning. For example, stormwater is passed through raingardens, wetlands and riparian areas that help provide stormwater control, as well as contributing to wider values such as cultural restoration and urban liveability.





supports year-round plant growth and functioning of WSUD technologies.

In addition, WSUD concepts align closely with 'clean green' Kiwi culture aspirations and the kaitiaki values of a growing interest in the 'Maori' development sector. Yet, WSUD is not mainstream practice in New Zealand. Why is this and what can be done to change this situation?

In November and December last year, our WSUD community of practice told the research team about the barriers to WSUD they have experienced through a survey and workshops.

Both the 70 survey responses and over 40 workshop attendees helped researchers with solutions and information they need to break the barriers. The water droplet (Figure 1) reflects the statements of over 40 workshop participants on the burning issues associated with the barriers. Larger words in the droplet indicate they were more frequently used.



Figure 1.

Detailed results from the workshops and survey were reported to the BBHTC National Science Challenge at the end of February. Researchers proposed three, nine – to 12-month projects to enhance and disseminate existing information. The report will be on the Activating WSUD website, which also contains records of workshop discussions and maps of the WSUD walking tours. Each tour takes one to 1.5 hours and reviews 'good and bad, inspiring and sad' WSUD (and nearly-WSUD) features around Latimer Square in Christchurch and the Albany Town Centre on Auckland's North Shore.

They are the kernel of what the research team hopes will be many case studies across the country, supporting the WSUD community of practice throughout New Zealand. The researchers will be presenting a paper on this subject at the 2018 Stormwater New Zealand conference. [WNZ](http://www.wnzc.org.nz)

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# Working for a common goal

After years in the industry, Rob Blakemore believes the model presented by his current employer, Wellington Water, could be the way forward for the management of water throughout the country.

By **MARY SEARLE BELL.**



**R**ob Blakemore has been in the water industry for several decades now. Since beginning his career with the Wellington Regional Council as a graduate engineer in 1978, he has amassed a significant wealth of knowledge and experience.

He spent 20 years with the council in a range of increasingly senior roles. A break in 1995-96 took him to the UK, where he worked as a plant manager for Yorkshire Water at a time that coincided with a very severe drought and water shortage. He later spent 17 years as a consultant with Opus, working on a wide array of projects in New Zealand and overseas.

At Opus he was instrumental in the development of training qualifications and training programmes for the water sector. Building capability in organisations is still an area he is passionate about.

But, in the past three years, since he joined Wellington Water as its chief advisor for service planning, he says he has found a new lease on life.

“I am in a new and challenging workplace that focuses on water,” he says. “Integration of different skills is important. We work in a collegial way. We build on each other’s strengths.

“It’s a great place to be. We have a common cause, a passion about water, and we work to a common strategy,” he says.

“We have people from outside the water industry in leadership, along with those with specialist technical expertise. Together, we can devise a strategy, set objectives and goals, identify gaps and issues, find solutions and then implement them.

“I underestimated the value of this working environment until I became part of it.

“Wellington Water has the strength and technical decision-making ability to advance and drive change to help prevent problems such as the campylobacter outbreak in Havelock North.”

Rob says that while the Havelock North disaster has sparked a public and political interest in water management, the industry has been looking at better ways

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**Rob Blakemore.**



**“ Wellington Water has the strength and technical decision-making ability to advance and drive change to help prevent problems such as the campylobacter outbreak in Havelock North. ”**

for delivering water to the public for years. He believes organisations such as Wellington Water are a good model for the industry.

Wellington Water manages the three waters services for the Wellington metropolitan region – its shareholders comprise the Hutt, Porirua, Upper Hutt and Wellington city councils and the Greater Wellington Regional Council – and operates on a trusted advisor model.

This means Wellington Water is an advisor to all the councils and strives for common service standards for all customers. Money is spent where it is needed, based on priorities which are set for the whole region.

“For example, Wellington had a recent problem which required an \$11 million solution for groundwater treatment that was right for the region,” says Rob. “We also focus on finding solutions where we don’t have to spend money – not all issues require an infrastructure solution.

“We take a holistic view,” he says. “If you take technical expertise and local knowledge and balance these, an optimal result will flow out.”

He says it is unfortunate that it has taken a disaster to bring the issue of water management to the forefront of people’s minds but concedes that maybe this is the way things work.

“I went to Yorkshire in 1995 to understand the implications of privatisation of water in the UK. In other words, we have been looking at better governance options for water services for over 20 years.

“Drinking water quality concerns have also been in the spotlight for a similar time span. Dr Michael Taylor, who worked tirelessly within the Ministry of Health, really did understand what was needed.

“He saw overseas events, such as the Walkerton *E. coli* outbreak, and knew we needed to change. He was right, but when he went to see councils about setting mandatory drinking water standards, he met with significant opposition.

“I would like to think we can expect change in the coming years to protect community water supplies.”

Rob believes that much of the problem is that water is not valued in New Zealand until it is threatened or

compromised, or someone wants to take it. However, he insists that we must protect it for our people and the economy’s sake.

“Everyone in councils is working to the best of their ability. The Havelock North Inquiry has endorsed that attitudes must change to manage risks rather than merely focusing on compliance.

“Our role will be more about mitigating risks. I believe we will see the end of untreated groundwater used for drinking water supplies and see changes to the management of surface water.

“I can see the establishment of a water regulator, which would do all the things Dr Michael Taylor tried to do on his own years ago. The regulator couldn’t just focus on drinking water though, they must cover wastewater and stormwater too – and look at it all as one.”

At Wellington Water, Rob has responsibility for development and advancement of the organisation’s long-term investment plans for water supply, wastewater and stormwater services. His role includes the development of better approaches to improve the long-term provision of water supply, wastewater and stormwater services, that includes asset and non-asset solutions. He must ensure an integrated approach to the provision of sustainable three waters services to customers in the region.

Since joining Wellington Water his job title has changed from asset management to service planning, reflecting the focus shift from the asset to the service: “The solution to a problem may not require infrastructure,” explains Rob.

He says his work at Opus in industry training was driven by a desire to close the communication gap between engineers and operational people – “I got a lot of insight into real challenges that occur every day with our three waters networks.”

Rob is a life member of Water New Zealand, a Fellow of IPENZ and a recipient of the IPENZ Angus Award for his contribution to utilities.

He has also been involved with a number of national initiatives as a board member and president of Water New Zealand, a member of the Ministry of Health sanitary works technical advisory committee and previous Drinking Water Standards expert committees. **WNZ**

# Global recognition for NZ computer flood modelling



Hamilton-based **Dr Alastair Barnett** is a member of a specialist world body advising on flood risk management. He explains how a decision back in 1962 to purchase a computer to assist in predicting the impact of flooding became a catalyst for New Zealand to be regarded as a world leader in computational wave mechanics.

In May 1962 a computer was installed at the University of Canterbury Engineering School. This was the first installation in a New Zealand University and only the third computer in the country.

I was then in my first professional year, so was lucky enough to join one of the earliest cohorts worldwide of students to be trained from the beginning in applying computers alongside other methods of solving engineering problems.

Canterbury students were equally fortunate to be taught by the inspirational Frank Henderson, an internationally respected leader in flood analysis. He had also been a prime mover in the purchase of the new computer following his experience with this breakthrough technology during an exchange visit to the University of Iowa in the United States. His classic 1966 textbook even included many problems demanding a computer program as the answer, one reason why “Henderson” is still in current international demand as an Ebook.

Another important Henderson advance was analysis predicting that during extreme floods, flow could advance as a vertical step (often described by eye-witnesses as a ‘wall of water’), and that a vertical water surface should also be expected at release points such as the top of a waterfall. Any numerical flood models produced since then should have allowed for such cases.

Yet even today computer models constructed outside New Zealand still regularly base analysis on differential calculus, which will fail where such challenging flow conditions develop during a solution.

Certainly I was left in no doubt about the implausibility of treating channel flow profiles as continuous as soon as I began my engineering career. My first assignment was to manage the final connections of the Haast Pass highway link,

and most New Zealanders will know that in those mountains, an extreme rainfall is almost an everyday occurrence.

My first flood emergency came within six weeks of my arrival, when I was confronted with a torrent of water moving house-sized boulders under our new Gates of Haast bridge.

After the new highway was opened, I returned to university for further research into hydraulic design problems, and was awarded a Ph.D for my discoveries on instability in numerical wave solutions.

This aroused the interest of the Ministry of Works, which was looking for computer solutions to control flows through the proposed Upper Waitaki canal network. These canals were to connect the succession of hydropower stations then proposed for the dual purpose of expanding generation capacity and storing most of the renewable energy reserves in the country.

On Ministry advice, I was then awarded a National Research Advisory Council fellowship for three years post-doctoral research in Europe, which I spent studying with three world leading figures in computational hydraulics: Dr Abbott in The Netherlands, Dr Preissmann in France and Professor Engelund in Denmark. When I returned to New Zealand, I was immediately re-engaged on the Upper Waitaki canal design studies, which had by then reached an advanced stage.

Since strong surges could be anticipated when gate controls were operated, it was important to test that the control software continued to work without instabilities throughout such events. In 1977 gate opening flow tests produced “walls of water” up to one metre high in the Rangitata Diversion Race, then the largest controlled canal in the country. The software solution was shown to give a valid reproduction of these conditions.







Later the mechanics of a tsunami front were shown to be exactly the same in a channel. Therefore these experiments could also be seen as investigating a tsunami surge travelling up the Avon River, along which the channel dimensions through the centre of Christchurch are comparable with the experimental canal scales. This meant the Ministry of Works software solution was also validated for such conditions.

In 1988 the New Zealand government decided to construct a National Museum, later known as Te Papa. Knowing of my work in modelling tsunami waves, I was commissioned to undertake a design study which resulted in the report “Prediction of Seiching and Tsunamis in Wellington Harbour” issued in 1989.

This took the 1855 West Wairarapa earthquake (still the greatest recorded New Zealand earthquake) as the design event, and based on geological evidence made a computer generated reconstruction of the resulting tsunami through Wellington Harbour. This model was verified against the harbour tide gauge record of the 1960 Chilean tsunami, and again during the 2013 Seddon tsunami and the 2016 Kaikoura tsunami computer and the prediction of a double peaked harbour resonance every half hour was found to be valid.

In both 2013 and 2016 these tsunami waves coincided with collapse of the foundations under major Wellington waterfront structures.

Neither the 2013 nor 2016 tsunamis threatened Te Papa along the same waterfront, because the 1989 report concluded that, after allowing half a metre for sea level rise resulting from climate change, buildings at city downtown street levels would be at unacceptable risk from tsunamis. Therefore raising the entry floor level 1.3 metres above the adjacent Cable Street had been recommended, and accordingly a compacted artificial mound was constructed to raise the whole building to that level.

A further tsunami hazard to harbour edge buildings was identified as the immediate wave generated by lateral seismic ground movement of the waterfront itself. This horizontal movement was deduced by the (1989) New Zealand Geological Survey to have been almost five metres for the 1855 earthquake. Modelling translated this into a local surge rising over four metres above quay level, so the main (first) floor of Te Papa was raised to 4.3 metres above entry floor level.

This raised floor is now taken for granted by visitors, but after extensive peer review IPENZ (now Engineering New Zealand) awarded the description of the new waterfront tsunami design logic their Fulton-Downer Gold Medal for Best Technical Paper at the 1998 Annual Conference.

Of the Wikipedia “Ten deadliest natural disasters since 1900” six are floods, two of which were caused by cyclonic storm surges in the Bay of Bengal. In 1996 I was commissioned by the World Bank to investigate port redevelopment in Chittagong, the centre of the area devastated only five years earlier with nearly 140,000 fatalities. The photograph shows the project group inspecting one of the few port buildings which was strong enough and high enough to withstand the 1991 cyclone winds plus the concurrent surge overtopping of the dykes.

Such surges are also regular events in the Firth of Thames,

most recently in the January 2018 flooding of Kaiaua. In February we also had ex-Cyclone Fehi surges in Nelson, Westport and Dunedin. Closely following that was ex-Cyclone Gita. In all these cases, if the events had coincided with king tides, the surges would have been even more damaging.

Fortunately these have been on a much smaller scale than in Chittagong, but the computational wave modelling relies on the same logic, and it is clear that sea level rise will only aggravate the flooding problem.

Sea level rise is also a major concern in Tarawa, the main island in Kiribati. The photograph shows preparations for field measurements of tidal flows into the Tarawa Lagoon we carried out in 1996 under an assignment by the Asian Development Bank to develop computational models of currents inside and outside the atoll.

(Note the pictured bridge, page 23, connects two of the highest islets in the whole atoll!)

During this period, I was also developing the ex-Ministry of Works software package (now renamed AULOS) so that, as well as rivers and canals developed for hydropower, it could deal with international problems associated with the wide range of commissions received. Of the six deadliest floods worldwide, three were river floods, and three were coastal floods.

Apart from the two storm surges in the Bay of Bengal, the third coastal flood was generated by tsunami action. All of these problems are now regularly addressed using AULOS by universities and consultants in 35 countries.

Further, a series of accuracy benchmark standards for flood software is now being produced under the auspices of the International Association for Hydro-Environment Engineering and Research (IAHR), the world body for flood engineers. The first of this series has now been published on its Beijing website, featuring flood flow measurements from an urban reach of the Opanuku Stream in Auckland.

As well as passing the tough IAHR accuracy benchmark test, AULOS has proved able to run such models some 50 times faster than models based on differential calculus. This means a year of flows can be computed in the time previously required for a week. This obviously allows far more extensive testing of conditions within the time limits of a normal design investigation.

With this international practical experience in computer modelling of river floods, storm surges and tsunami floods plus the effects of sea level rise, I was chosen to join a specialist world body advising on flood management.

The IAHR agrees: They have now set up a new Task Committee on Flood Risk Management and I was elected to be a member of the committee by worldwide vote of specialist peers. This makes me the only representative from an island country, as the other elected members are all based in the United States, China, and the European Union.

It also demonstrates that our 1962 engineering computer purchase enabled New Zealand to establish and maintain international respect in computational wave mechanics.

This technology will soon be needed as never before as imminent water management problems test our very civilisation. **WNZ**

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**Kristin Aitken**, sector manager,  
Local Government.

**T**here has been much media coverage in recent years on New Zealanders' concerns about the state of our water resources and how well they are managed.

We all rely on public organisations – including local authorities and central government – to safeguard our water.

These organisations, which are funded by our rates and taxes, are responsible for managing this precious resource – from supplying clean drinking water, to addressing the effects of climate change. The amount of public money spent on managing water is not insignificant, which is why the Office of the Auditor-General has made it a focus of its work programme this year.

### **Who is the Auditor-General?**

The Auditor-General is an independent officer of Parliament who audits all of New Zealand's public organisations, including local authorities and government agencies. The Auditor-General's independence is what makes the role unique: it means that they can take a long-term view and look at the whole public management system.

The primary role of the Auditor-General is to provide independent assurance to Parliament and the public that organisations funded by taxes and rates are operating, and accounting for their performance, in keeping with Parliament's intentions. Most of the Auditor-General's work is carried out by the Office of the Auditor-General and Audit New Zealand, with support from private auditing firms.

Annual financial audits make up the bulk of our work. The

Auditor-General also has the discretion to carry out other work into matters of high public or parliamentary interest through performance audits and inquiries. Each year, the Office details this discretionary work in its Annual Plan, on which it consults with Parliament and the public. This year, the Office has made water management the theme of its work programme.

### **Why is the Auditor-General looking at water management?**

Our water management theme reflects Parliament's and New Zealanders' growing interest and concern in water. Many of our overseas counterparts have also looked at water-related issues in their jurisdictions.

Public organisations are facing significant challenges associated with managing water, including addressing the impacts of land use (both urban and rural), ageing infrastructure, the increasing costs of meeting environmental standards, responding to changes in community expectations, and climate change.

We are interested in how public organisations are addressing these challenges from a public management and accountability perspective: How are they meeting their obligations; are they spending taxpayer and ratepayer funds wisely; and how well are they communicating with New Zealanders on what they plan to do, how they intend to achieve their plans, and how well they are performing?

We don't have a role in shaping the policy of water management or second guessing the science. What we do



bring is a different perspective to the challenges facing the stewardship of water resources. With our overview of the entire public sector, we are well placed to examine how effectively public organisations in local and central government are managing their responsibilities for water, and to contribute to conversations about how to manage this critical resource over the long term.

We've been keeping an eye on water-related work being carried out by others so that our work is complementary where possible and does not duplicate their efforts – such as the inquiries following the Havelock North drinking-water contamination and the flooding of Edgecumbe, and the review of the “three waters” services being led by the Department of Internal Affairs.

### **Our previous work on water management**

This isn't the first time we've looked at water:

- In 2010, we reported on how eight local authorities were planning for the likely future demand for drinking water, and the strategies they were using to make sure they could meet that demand.
- In 2011, we reported on how effectively Waikato, Horizons, Southland, and Taranaki regional councils were managing land use for the purpose of maintaining and enhancing freshwater quality in their regions. This included looking at compliance and enforcement approaches.
- In 2014, we reported on the funding and management challenges for water and roads.
- We have also looked at a sample of co-governance arrangements, some of which arose from Treaty settlements and several involved water (the Waikato River, Rotorua Lakes, and Te Waihora).

### **Our water work programme**

For water, we wanted a programme of work of wide interest to central and local government, Parliament, and the public.

The overarching question that is guiding our water work is: How well are publicly funded organisations managing water resources and delivering water-related services, for the benefit of New Zealanders now and in the years to come?

We launched our water work with our report *Introducing our work programme – Water management*, published in October 2017. We are looking at the performance of a range of public organisations in carrying out water management activities, focusing on freshwater, stormwater, drinking water, and the marine environment.

#### **Freshwater: irrigation**

We'll shortly be reporting on how well five regional councils (Canterbury, Otago, Hawkes Bay, Bay of Plenty, and Northland), along with Marlborough District Council, put in place water metering, with a focus on irrigation, and whether this has created opportunities for more efficient use of freshwater.

#### **Freshwater: quality**

We are looking at the progress of Waikato Regional Council, Taranaki Regional Council, Horizons Regional Council, and Environment Southland in managing impacts to their freshwater quality.

We last looked at these four councils in 2011. We expect to publish our report later this year.

#### **Freshwater: clean-up**

Since 2004, the Government has invested millions of dollars to improve the water quality of New Zealand's freshwater bodies, through funds administered by the Ministry for the Environment. We will be looking at how effectively the Ministry is achieving measurable and sustainable improvements to freshwater quality through its funding of Rotorua Te Arawa Lakes, Fresh Start for Freshwater, and Te Mana o Te Wai.

We'll also be considering how effectively water quality outcomes are being achieved, with a likely focus on the activities of the Waikato River Authority.

#### **Stormwater: Managing flood risk**

We will be considering how well Porirua City/Wellington Water, Thames-Coromandel District Council, and Dunedin City Council are managing their stormwater systems to reduce the risks from urban flood hazards.

#### **Marine: Hauraki Gulf Marine Spatial Plan and marine reserves**

Our two marine performance audits will consider how public organisations make decisions to balance competing interests and priorities by looking at the process to develop and implement the Hauraki Gulf Marine Spatial Plan, which was the first attempt at a marine spatial plan in New Zealand, and the decision-making processes to consider whether to designate marine reserve status for a body of water.

#### **Drinking water: Optimising demand and supply**

This performance audit will consider the challenges councils face in meeting consumers' needs for drinking water in a financially sustainable manner. This will include looking at how councils are managing water demand to reduce pressure on the drinking water network and supplies.

#### **Water management in councils' long-term planning**

As well as our performance audits, we will also look at how councils have considered and addressed infrastructure resilience in their long-term planning processes and the costs associated with delivering water services and meeting environmental standards. We'll be looking at their consultation documents, infrastructure and financial strategies, and long-term plans.

### **What impact do we want from our water work?**

At the end of our work on water management, we will produce a report that draws together our observations and recommendations.

Through our work, we intend to provide independent assurance to Parliament, the organisations that we audit, and New Zealanders about the state of water management. We will highlight any improvements that are needed in the public management of water, and in the accountability and transparency of organisations for their decision-making and performance.

Keep an eye on the water management page on our website over the coming year to read our water reports as they are published. [WNZ](http://www.wnz.govt.nz)

- If you have any questions, you can get in touch with Kristin Aitken, Sector Manager, Local Government – [kristin.aitken@oag.govt.nz](mailto:kristin.aitken@oag.govt.nz).



# Internet of Water

## Revolutionising water asset management



The Internet of Things (IoT) is creating new opportunities in our industry and may even revolutionise the way that water is managed.

By **Stephen Westwood**, (left) senior marketing & communications manager, Beca and **John McDermott**, founder IoT Auckland Meetup.

Innovations in sensor devices and long range, low power communications enable technology deployments to locations not previously viable.

These new systems create rich data sets that can be interrogated by artificial intelligence (AI) techniques to extract intelligence and can be combined with augmented reality (AR) to provide better analysis, forecasts and responses.

IoT is primarily a 'big data' generator, but data alone has no great value. After analysis data becomes information and creates insights that generate action for driving outcomes. Ultimately data becomes intelligence, influencing water strategy and policy.

In this article we explore the impact of these technologies and describe some of the applications available to our water industry allowing it to respond to the advantages that IoT offers.



## The internet of rivers

A New Zealand example of a remote sensing device to monitor river water quality is Riverwatch; a local social enterprise that is developing an IoT device that measures to laboratory grade performance pH levels, temperature, conductivity, turbidity, and dissolved oxygen. Its stated ambition is to safeguard the country's freshwater with a low priced unit (estimated at \$2000) that can be deployed at large numbers in diverse locations.

This involves a large number of deployed IoT devices and using AI algorithms to validate data and analyse trends or anomalies, to indicate environmental issues.

Take major river contamination for example. We need to know when it occurred, where the source may be, and the impact potential. A remote sensing system can identify the contamination location to within a few kilometres, tell us when the incident occurred, its severity and how it is changing over time as the contamination travels downstream. The responsible authority is alerted automatically and can determine the originating cause and the response required. Augmented reality and video capture can also aid the understanding of conditions and predictions.

## The internet of drinking water

The contamination of the Havelock North water supply indicates current methods of supply monitoring and regulation are not necessarily sufficient to meet public expectations, and led to the recently published *Government Inquiry into Havelock North Drinking Water*.

A further concern is whether current regulations and implementations for small and minor communities are fit for

purpose, and this affects over 500,000 of our population. IoT technologies and solutions such as the Ministry of Health's Drinking-Water Online have the potential to address the problem by replacing time-consuming, manual sample and compliance processing with more efficient and intelligent systems that can analyse and publish data, and offer new opportunities to engage with the public to increase awareness and confidence in systems and their water quality.

## The internet of adaptive discharge consents

IoT applications have the potential to support adaptive discharge consents by measuring the assimilative capacity of surface waters to enable and support Resource Management Act (RMA) adaptive discharge consents.

Major industries, such as dairy factories and breweries, have a high degree of risk exposure in their discharge consents. Resource consents have occasionally been granted with adaptive conditions to reflect the changing capacity of surface waters to accept discharges. Sensors can capture data from rivers in real time from upstream and downstream of a plant discharge point and in the ultimate receiving water. This provides for the development of a model of the assimilative capacity of the surface waters – that is able to predict response to specific plant events, and therefore support adaptive consents.

These models might even be able to advise on optimal plant operation, by generating alerts for plant managers prior to exceeding consent thresholds for example. This would allow adaptation of plant settings without significant impact on productivity, while simultaneously meeting RMA obligations.

## What is IoT?

The New Zealand IoT Alliance describes the Internet of Things as a collection of real life things that are connected to the internet.

These connected things collect and exchange data. Data from a connected world enables us to make better decisions, problem solve and improve productivity.

The development and uptake of IoT devices and applications is due to a number of technology trends:

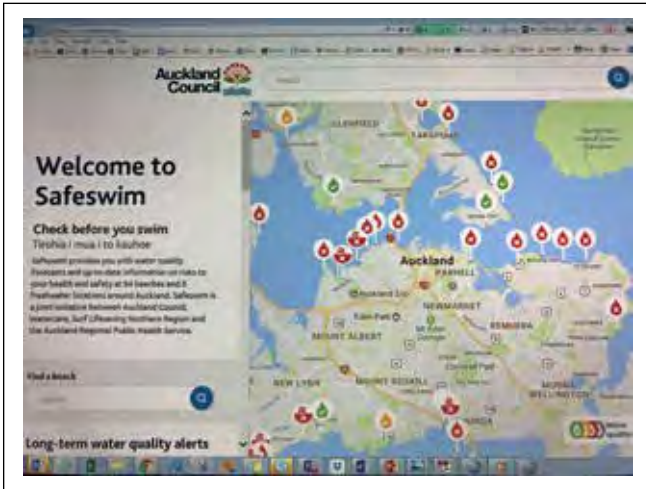
- Low cost electronics – 'system on modules' combine processors, communications, sensor interfaces into single devices that can be rapidly built into complete products.
- Long range, low power, wide area networks (LPWAN) – networks such as Sigfox, LoraWAN, NB-IOT enable applications to be deployed at low cost and quickly to in-service.
- Integration with software technologies – Cloud processing, platforms-as-a-service, artificial intelligence (AI) and augmented or virtual reality (AR/VR) technologies provide deep insights and highly accessible data intelligence to build advanced solutions.
- Sensor technologies – developments in optical, electronic and biological methods of measuring key parameters that disrupt existing solutions.
- Data analytics and insights – using AI and trend analysis for

## If your assets could talk



insight and intelligence that changes the way water assets and operations are managed.

In combination, these system components create new IoT solutions with (relatively) low development and deployment costs. Legacy systems can be upgraded and integrated with IoT platforms and aligned with strategies to deliver greater value and purpose.



### The internet of stormwater

Flooding is a significant, and frequent, natural hazard in the Auckland region with 137,000 buildings potentially affected by flooding. Changes to our future climate could increase the frequency and magnitude of high intensity rainfall events. Auckland's old combined stormwater and wastewater pipes in some areas of the city are a huge problem, with overflow from 41 points around the inner city suburbs flowing into the Waitemata Harbour every time there is more than five millimetres of rain.

In response, Auckland Council has recently released to the public its Safeswim website app [www.safeswim.org.nz](http://www.safeswim.org.nz) (pictured). This has generated significant press and public attention and resulted in greater awareness of stormwater outflows that are affected by waste contamination. Although Council and Watercare have an overall strategy to invest in improved infrastructure there is, meantime, demand for improved public information and council response. Low-cost IoT water level meters and quality sensors powered from batteries and connected via LPWAN wireless network, can monitor stormwater flows in near real time at key locations, and can operate reliably for many years without maintenance.

### The internet of water consumers

Water is a very emotive issue as was highlighted in last year's general election with debate around 'who owns water' and a major impetus to clean up our rivers.

Publicity around droughts in Australia and the USA (California in particular) and irrigation use in this country has led to increased public awareness about water use and consumption.

In the residential water market, the deployment of IoT for residential smart water meters has reduced the costs of manual meter reading and provided more accurate billing and insights for consumers to control their water consumption.

We advise utilities and councils

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# IoT business questions and challenges

The impact of IoT in the water sector raises a number of business questions and challenges that organisations need to address.

1. It is vital to start any IoT strategy with the business need – what do you want to do and achieve? Don't get caught up in data for the sake of data. Trial an IoT solution and evaluate the initial outcomes, insights and actions generated so they are well understood by the business – then scale up rapidly and cost effectively.
2. Insight and intelligence is generated from patterns that are not always obvious or familiar – how does this change the way organisations manage their assets and operations?
3. Data volumes can become vast and overwhelming – what should be retained, cleansed, analysed and reported versus what is discarded?
4. IT and data security – how secure is the data transmission from the IoT device, how secure is the aggregated data and who is responsible for data integrity and security?
5. Does the management team of a water sector/industry organisation have the expertise, structure and resources to implement and manage IoT solutions?
6. What is the IoT vendor landscape now and in the future and how to select the best-of-breed solutions that are the best fit for legacy systems and water assets?
7. What are the investment options required to take advantage of IoT and what does the business case require?
8. How does an IoT solution deliver against strategy and what is the downstream impact on water operations, legacy systems and infrastructure?
9. How is corporate and government water policy affected by the intelligence generated by deploying IoT and what is an effective policy response to changes that may be required?
10. Data alone has no great value, how can data sets be reused/ repurposed, aggregated and correlated creating more insights for other stakeholders and external parties? ie, government agencies, industry bodies and private companies.



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### The internet of pipes

Water utility companies use thousands of kilometres of piping to deliver water to their customers. In some rural areas, many pipes are controlled through manual valves and rely on manual inspections. Without telemetry and information on whether these valves are open or closed, it's impossible to know whether water is flowing through a particular pipe.

By using IoT technology, it is possible to affordably detect water flow and pressure through any remote rural pipe and provide useful telemetry on the operation and condition of the network, saving manual effort and associated costs.

Data insights also allow water utilities to optimise power consumption, reduce water losses from leakage in the reticulated water networks, allow the network operator to optimise the water grid, and extend asset lifetime while achieving supply targets.

### The internet of predictive maintenance

With IoT and predictive analytics, utilities can foresee mechanical system and equipment failure, with predictive maintenance (PM), or condition-based maintenance (CBM).

IoT can create data sets to monitor equipment performance and combine this data with machine learning (ML) algorithms that are trained to identify failures results in a system that can indicate where, or when, failure is predicted.

The result is that early life failures can be predicted and identified before they happen, reducing downtime. Scheduled maintenance is replaced by predictive maintenance in the form of servicing, or replacements can be scheduled according to need.

### The internet of citizen science

Young people are growing up with constant connectivity and technology in schools and by putting data out into the public domain you can engage and empower school kids, or any member of the public, to help you analyse information to create solutions.

For example, you can place water quality sensors into a stream and provide a live data feed to a local school, and they can start projects on stream water quality.

If we extrapolate that level of digital citizen engagement into the future, citizen science will be an everyday experience and have an impact on issues affecting water.

Advances in visualisation techniques enable specialists and the non-specialist to understand a large volume of data, its meaning and predictions. The Augmented Reality Sandbox is an example that allows interaction with a landscape to control and visualise a changing environment.

### Security of IoT devices

There have been horror tales in the media about the insecurity of IoT devices, eg, printers that have been drawn into botnets, or baby cameras that are streaming for anyone to view.

The underlying cause of such issues is: These devices have little or no security; are not under control of a knowledgeable manager; are not connected to a management platform; do not

## Low power, wide area network (LPWAN) communications

LPWAN systems are relevant where small amounts of data are generated from remote locations and operate from batteries, with target service life of several years without maintenance. Testing has shown a range of 200 kilometres in ideal conditions and costs are offered as low as \$1 per month per device.

The Sigfox service is provided by independent operator Thinxtra and has been an early mover in deploying LPWAN. The technology is especially effective at long range and low power. It claims 88 percent of the population covered across the country.

LoraWAN, deployed by KotahiNet and underway by Spark, provides greater data throughput than Sigfox. KotahiNet claims coverage of 80 percent of the population and Spark is aiming for 70 percent of the population covered by mid 2018.

Vodafone and Spark have also announced an upgrade to 4G/LTE networks to NB-IOT and CAT-M1 protocols. These use existing cellular base stations to connect IoT devices at lower power and lower costs than existing 2G/3G/4G technology.

have security updates provided etc; and and they have been connected with access to the unrestricted internet.

Best practice is to connect IoT devices via secure networks to managed platforms, such as Microsoft Azure, AWS, PTC Thingworx, GE Predix, IBM Watson and others. The actual communication link can be secured by encryption and IoT LPWAN systems to provide secure connections.

Security and data privacy of IoT systems should not be an 'add-on' at the late stage of a project, or added after deployment. Security architecture is fundamental throughout all system components, and implemented according to application requirements, operating environment and the risk profile to be achieved.

An IoT platform at the core of an application ensures that security aspects such as authentication, encryption, data privacy, user privileges, archives, updates and patches, and threat events are correctly managed throughout a system lifetime.

### The internet of conclusion

The Internet of Things is a disruptive emerging technology, and will offer significant advantages, opportunities and challenges for our water industry and consumers.

The new data insights from advanced analytics can revolutionise the management of our water assets and how stakeholders engage in the world's most precious resource. **WNZ**



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# Lessons from Scotland

on a national water utility







Loch Turret Perthshire.

**Ken Hutchison**, the managing director of Scottish Water International, has been working in Scotland's water industry, at senior management level, for over 30 years. He talks about the development of Scottish Water as a national, publicly owned utility, charged with delivering improved high performance services, at the lowest possible cost. These are highlights of a presentation he made at the Building Nations Symposium 2017.



**T**he political landscape and challenges may be different in New Zealand to Scotland, but I hope to draw out some sufficient parallels with Scottish Water's transformational journey that might resonate with you and add to the debate on what's right for New Zealand.

To this end, I'm going to cover Scottish Water's role in providing vital services which are essential to daily life, while continuing to deliver excellent value for our customers. I'll talk about our transformational journey, touch on our performance improvements, and also highlight the benefits of having a larger, efficient organisation delivering clear value for its customers, the environment and the economy.

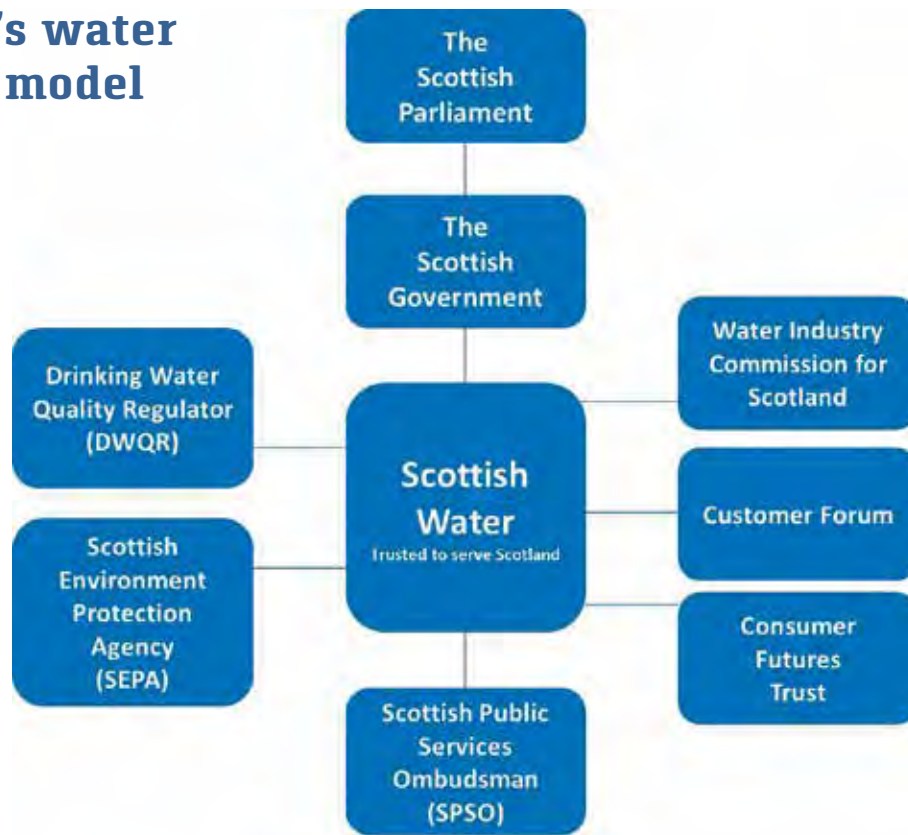
As a background to Scottish Water – we provide water and wastewater services to over five million customers and maintain and continue to improve 245 water treatment works and 1800 wastewater works. We supply roughly a third of the area of Britain, including major cities such as Edinburgh, Glasgow and Aberdeen. We also supply very rural communities in the northwest of Scotland and even to some dispersed 'rocks' in the middle of the Atlantic with as little as six inhabitants!

Our purpose is to provide continuous high-quality water, protect and enhance the environment and support Scotland's economy – but all undoubtedly with the customer at the heart of our business.

This is the Scottish Water industry landscape and how we're regulated (see Scotland's water industry model diagram). Unlike England and Wales where there are multiple companies with a small number of regulators, Scottish Water is unique as it has multiple regulators focusing on just one company.

We are owned by the Scottish government, and we are accountable to a Minister of the Scottish Parliament. The independent Drinking Water Quality Regulator (DWQR) ensures that we supply high quality water every day to the whole population and that we are constantly driving to improve our water quality. The Scottish Environment Protection Agency (SEPA) does the same on the environmental side, ensuring that our consents from our wastewater treatment plants and our discharges are to the right level.

## Scotland's water industry model diagram



The Consumer Futures Trust and the Scottish Public Services Ombudsman (SPSO) provide independent advice to customers and help them with any escalation of issues.

The Water Industry Commission for Scotland sets prices for water and sewage services that deliver ministers' objectives for the water industry at the lowest reasonable overall cost. They also carry out comparative benchmarking against other companies to help to set efficiency levels and ultimately set what we need to achieve.

The real game changer for us has been the creation of the Customer Forum. It has been given the task of bringing customers' voices to the table to seek to agree with Scottish Water's business plan for 2021-27, which will determine future service levels, investment priorities, and how much we all should pay for water and wastewater services. Having agreed all this it is finally subject to the approval of the water regulator.

The Customer Forum is made up of a group of nine bright people taken from business, boards, company bodies and retailers, and they bring a new dynamic into the relationship between customers and Scottish Water. They ask questions like 'Is the service providing value for money?' and 'What are our priorities as customers in trying to make the service better?'

So, all things considered, it's a lot of regulation focused on one company, but it does keep us right and actually truly benefits Scotland. It has driven us from being a high cost business (we used to be the most expensive water utility in the UK) and taken us down to one of the lowest. There can

be no doubt that the regulatory framework has ensured that this has happened.

Our customers can now enjoy as much water to use every day as they like and they can flush the toilet as many times for less than £1 a day – compare that to what you would pay for a bottle of water!

The majority of our funding comes directly from customer charges which puts us on a sustainable footing. This covers all operational and capital maintenance costs and pays for a large part of the capital programme with the rest being made up from some limited funding from borrowing from the Scottish government.

### The transformation journey

In the Victorian era, the water service was delivered by numerous small municipalities; in the 1960s, there was some slight amalgamation into regional water boards with the sewerage being run by councils. In the early 1970s, there was a major council reorganisation and water and sewage services were amalgamated back into larger regional councils. In the 1990s, in an effort to drive improvements and efficiency, three large water authorities were created – North, East and West – and then driven by further efficiency and performance improvements finally a single national utility, Scottish Water, was formed.

So what were the drivers for the more recent changes? In 1986, water services were run by 12 regional councils in Scotland. Scotland was faced with a large number of EU regulations and these regional councils struggled to address



all the legislation due to financing and conflicting priorities. They were also responsible for roads, education waste and social services. Prior to the introduction of EU legislation, there was little consequence for failing as a local authority. You had to supply wholesome water ... but what did that mean? Does it have less lumps in it? The introduction of EU directives forced the regions to up their performance with prescriptive water quality parameters which required larger investments.

Also there are 'no votes in sewage!' was often a call from councillors. Money was spent on education, on roads, on highways, but less on building sewerage sites. At this time, England and Wales were privatised and their performance improved – while Scotland lagged behind.

So, the first game changer was the introduction of legislation. The Scottish government lost patience, stepped in and withdrew water and wastewater services away from councils and placed them in three new large water authorities focused solely on water and wastewater to ensure that legislation was met and Scotland was not subject to large European fines.

The second game changer came in 1999, when the Water Industry Commissioner for Scotland arrived and introduced economic regulation. The Water Industry Commissioner said that the only way to achieve efficiency and performance improvements was to form three large water authorities and compare them with the English companies using the Water Services Regulation Authority (Ofwat) comparative benchmarking models. Ofwat is the body responsible for economic regulation of the privatised water and sewage industry in England and Wales.

The North of Scotland Water Authority, however, had a low population and could not afford the large capital investment improvements to meet the new EU legislation at treatment works without raising customer charges to an unacceptable level. The model was not sustainable, so a plan was hatched to share the burden across the wider population by forming one national utility which kept customer charge rises to a minimum.

Scotland is quite a socialist country and was quite happy to pay the same charge across the whole of Scotland for the same service. So, Scottish Water became a single entity. It was formed because of new laws on water and wastewater from Europe. It was formed because the regulator came in and drove efficiency levels that were unachievable by the smaller companies.

Scottish Water's primary objectives were merging with the three authorities, reducing off-heads by 40 percent, delivering £500 million worth of capital savings (over a four-year regulatory period) from capital programmes, and improving every measure possible.

And at the start of the journey, there were lots [of measures] to improve. We had customers who couldn't see their legs in the bath, we had leakages flowing down roads, and we were polluting our rivers and water courses.

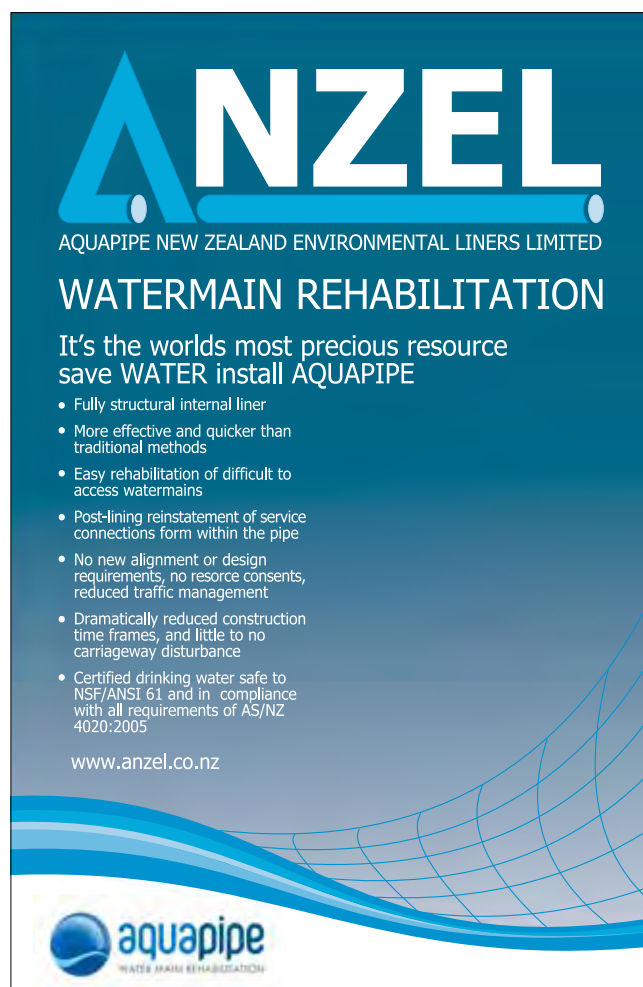
## Putting the customer first

The third game changer was listening and engaging with our customers. Our reputation was poor at the start because there were problems with water quality, problems with flooding – and it's a big catalyst for change when customers are disgruntled with your service.

In the 2002-2006 regulatory period, the move to one authority allowed us to take 40 percent of operating costs out. We went from 6600 employees down to 3400. We achieved this by massive productivity improvements, through improved business process mapping, operational task scheduling, and we looked at spans of control. We only had one head office, not three. All of these changes dropped money out of the business.

In the next period from 2006-10, we had to look at improving the performance of our assets. The development of a large authority allows you to have centres of excellence in water, in wastewater, in process science, and in engineering. This drove improvements in all assets performance.

Between 2010-15, we really looked at closing the performance gap and using a mechanism called the Overall Performance Assessment (OPA), which involves




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13 comparative measures. We drove the performance and started to narrow the gap between our performance and those of our comparators. During this period, we also woke up to the customer and realised customer satisfaction needed to be measured.

From 2015 onwards, our focus has shifted further towards the customer and moved from customer satisfaction to customer experience and better service at lower cost, and in some aspects on the customer side, we are now becoming world leaders.

### **The regulation journey**

Regulation was a key aspect of our journey. Back in 2002, we had a very confrontational relationship with our economic regulator.

We thought, ‘Who is this economist coming in and telling engineers how to run the water supply?’ It wasn’t a good relationship and frankly it didn’t benefit Scotland.

Between 2006 and 2010, it became an almost parent-child relationship – as we kept trying to prove that we were different from anyone else – more islands, more rural areas, longer coastlines!

However, we have learned from this and from 2010 onwards, we woke up to the real benefits of regulation, fully aligned behind it, and really started driving and spending more management time on improvements – and not on trying to prove the regulator wrong!

And from 2015 onwards, we started looking at ‘customer-led business planning’ with the introduction of the Customer Forum.

Now we’re looking from 2021 onwards at something called ‘ethical regulation’. This is a ‘collaborative open book’ approach with the regulator, stakeholders, and companies, so that we all align to what’s best for Scotland and ultimately what’s best for the customers of Scotland.

That transformational journey has allowed us to put the customer at the heart of the business. We shifted from talking about asset risk and we now talk about service risk, and looking at how we can invest intelligently to ensure it is always the least cost investment.

We’re working more collaboratively with supply chains, and we’re building the benefit of their knowledge and innovation into our plans.

We’re looking at improving resilience as only 15 percent of our population have got a dual supply, so we want to improve that to 100 percent by 2040. And we’ve got real insights as to what the customer priorities are – sewer

flooding and long-term interruptions into drinking water quality are the highest on the list. Our business plan is their business plan – made up from their priorities and at charges that the customers of Scotland are willing to pay.

We are really pleased with the position we’re in at the moment, but not complacent and the Customer Forum continues to ensure that!

### **So, what does this all mean for New Zealand?**

Is a publicly owned national utility like we have in Scotland applicable to the New Zealand context?

Well, a national utility drives efficiency. The size and scale allows you to introduce procurement efficiencies; it allows you to rationalise the number of employees; it allows you to develop core capability to focus on water and wastewater services; it allows you to create centres of excellence; it allows you to make a strategic approach to risk, to look at strategic regional schemes and resilience; and it also allows you to spread the cost of investment across more customers. Competence can be built everywhere in the organisation.

Fundamentally in Scotland we had real drivers for change. We had the European legislation and the threat of massive fines for non-compliance; we had economic regulation coming in that placed a mirror up to us and said, “you’re inefficient and you’re not performing”. And thirdly, we had customers giving us insight into their priorities. These three catalysts of change formed Scottish Water and transformed it into the successful utility it is today.

So, what are the drivers of change for New Zealand? Is it the Havelock North incident? Is it the cost of meeting the new improvements?

Whatever the driver of change, it must be compelling and, after that, you need bold leadership to make it happen.

Bold leadership from a political level to make structural change and inspirational leadership from a company level. You need effective regulation and through all of this, you need to take employees with you and engage with them.

This transformation is not a short journey. Everyone must stay committed, resolute and resilient to keep on the improvement pathway.

I can only comment from a Scottish perspective, it is your water, your environment and only you can decide to take the first steps.

However, from my personal experience it is a journey worth embarking on. I hope by telling this Scottish Water story it will help with the debate on future water services in New Zealand. **WNZ**



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# A PRIVATISATION MODEL for water

Andrew Chesworth, director of risk and return at Ofwat (the economic regulator for the water and wastewater sector in England and Wales), spoke about his experience with privatised water structure at the Building Nations Symposium, hosted by Infrastructure NZ last year. By **Alan Titchall**.

**W**ater was privatised in England and Wales back in 1989 under the Thatcher government.

Water in Scotland remained in public hands, after local opposition against privatisation, and their story is on page 34 as delivered by Ken Hutchison, managing director of Scottish Water International at the same symposium.

Ironically, England and Wales are having a government/public debate about whether water and sewage services are best delivered under a private or a re-nationalised structure.

This comes at a time when this country faces the challenge of what to do with its localised piecemeal system of water infrastructure operated independently throughout the country.

Our water infrastructure is operated by 67 different water management organisations that are mostly local councils.

We have no national water body and industry regulatory compliance rests with 11 regional councils and five unitary councils (drinking water compliance is overseen by 20 District Health Boards). Add loose investment guidance, shrinking rates collection in many rural areas, and 'local politics' and the scene looks to be begging for intervention.

Andrew Chesworth basically says the UK regulatory model

operates in a similar legal and cultural environment to New Zealand. However, at the beginning of his presentation in Wellington he made a disclaimer.

"I'm here today to talk about outcomes of regulation to privatise the water sector in England and Wales. I'm not here to sell you privatisation, as an economic regulator we are not a political body."

His role at Ofwat relates to the financial aspects of the price controllers and the overall balance of risk and return.

"So my role is to ensure we align the interest of companies of our investors with those of customers."

He also noted that his talk came at an interesting time for the national water body as a debate about whether water and sewage services are best delivered under a private or a nationalised structure is happening right now in the UK.

"It's a debate that we don't directly contribute to other than to correct facts where they are wrong."

The original privatisation of water in 1999 was a reaction to underfunded, inefficient and poor-performing public sector placed water boards.

"They, like other government funded services, were at the





Andrew Chesworth,  
director of risk and  
return at Ofwat.

mercy of a politically driven set of decisions,” says Andrew.

“Prior to privatisation, the investment in the water sector competed with other pressures from the public purse, so investment was inefficient, rivers and bathing waters were polluted, there was a lack of accountability and transparency. The theory behind privatisation was that shareholders would respond to the incentives they faced to create value and shareholders would instil private sector management disciplines.

“To succeed a robust governance model was required and separate government drinking water inspectorates and an environment agency were set up to determine drinking water and environmental quality standards, and help companies to account for compliance against those obligations.”

Ofwat, as an independent economic regulator, was set up, and charged with securing the interest of water customers in England and Wales, and to promote among regulated private water companies efficiency and competition (where reasonable to do so).

This body grants licences and enforces company obligations against those licence requirements. As the ‘competition’ authority for the water sector, Ofwat is responsible for setting

price control, which includes an efficiency challenge for companies to scope, outperform and reveal new efficiency frontiers.

“Our powers include the application of financial penalties where companies do not comply with the terms of their licence,” says Andrew. “We expect companies to deliver for their customers and, where they fall short, we’ve reclaimed more than £750 million from companies for customers.”

Ofwat was set up as a non-ministerial department, independent from day-to-day government intervention, but accountable to parliament.

“This gives ministers a mechanism to convey their views about what regulators are doing and what they are delivering, while avoiding undermining the benefits of independence from government.”

Ofwat’s regulatory decisions can be subjected to additional review and companies can appeal any price determinations set to the Competitions and Market Authority, which has the power to override its decisions.

Ofwat currently regulates 17 regional monopoly companies and 10 of these provide water and sewage services, and seven provide water only services. These companies operate under a variety of ownership structures.

“While companies are free to choose their own corporate structure they must maintain an investment grade credit rating, that’s essential for them to access the finance they need to deliver to customers in a cash flow negative industry.”

After opening the retail market for business customers last year (where business customers are able to choose their supplier) Ofwat also regulates 24 retailers and two self-supplied customers under this regime, and this is an area that’s evolving.

Andrew says Ofwat has also carried out the review of potential benefits of extending competition to residential customers. “Final decision on that will be made by government, but if that’s the route the government decides to go it will be for us to make the market effective.”

Since privatisation about £150 billion has been invested in water services, and £70 billion of this has been raised from investors, who are provided with a certain degree of predictability and certainty that the net value of investment will be remunerated.

As water and wastewater services are vital public services, the bar for legitimacy is high, arguably it’s higher under a privatised model, says Andrew.

“So we expect the companies we regulate to have the highest levels of transparency, meet the highest standards of UK governance and disclosure, and have effective boards containing significant independent membership.

“Each year, companies must publish information to show they are meeting our principles, and a drive for better quality performance information has led companies to deliver their own information platform to report performance data. It’s a website called ‘discoverwater’.”

And the customer is always foremost, Andrew iterates.

“We are encouraging companies to engage more than ever before with customers. We expect them to see customers as

## UK water model challenged

The UK Labour party (currently in Opposition) says it will renationalise the water industry if it gets in at the next election.

Shadow chancellor John McDonnell reportedly called the existing water structure situation in recent years a “national scandal” that includes a 40 percent rise in water bills in real terms since the industry was privatised in 1989 based on figures from the National Audit Office. He also claims water companies have paid out a total of £13.5 billion to their shareholders since 2010.

“It is a national scandal that since 2010 these companies have paid billions to their shareholders, almost all their profits, whilst receiving more in tax credits than they paid in tax.

“These companies operate regional monopolies which have profited at the expense of consumers who have no choice in who supplies their water.

“The next Labour government will call for an end to the privatisation of our public sector, and call time on the water companies that have a stranglehold over working households. Instead, Labour will replace this dysfunctional system with a network of regional, publicly owned water companies.”

Labour also wants to renationalise the energy and rail sectors.

Meantime, UK Environment Secretary Michael Gove has said he is prepared to give Ofwat greater powers amid concerns over “excessive profits”.

“The use by some water companies of opaque financial structures based in tax havens and high gearing is deeply concerning,” he says.

“I also share your concern that some water companies have for many years been making excessive profits.”

At the same time he thanked Ofwat for “pressing companies hard” to change behaviour. “Not least where it has a direct bearing on their corporate, financial and operational resilience.

“If the current regulatory framework does not provide Ofwat with the powers necessary to tackle these kinds of behaviour properly, then the government will consider what changes could be made.”

Water UK chief executive Michael Roberts has defended the private ownership model.

“It’s wrong for Labour to suggest that our water system is broken. Water companies secure capital provided by lenders and shareholders, who need water companies to make a return in order to finance significant improvements to the industry.

“Under public ownership, the water sector in England was starved of cash and standards were poor. Private companies have instead invested heavily to reduce leakage, improve drinking water quality, and protect the environment – and they continue to invest £8 billion each year in even better services. In real terms, bills are roughly where they were 20 years ago and will be falling over the next few years.”



active participants rather than end users of services. We expect companies to do more to protect the interests of vulnerable customers – those who are more sensitive to the requirement for safe and reliable services, or require help in the payment of their bills.

“We are seeking opportunities to give customers choice, either directly or through forms of indirect competition and we are engaging companies to focus on the long term. Companies must already develop a five-year business plan within the context of 25-year resilience plans.”

### The result

Andrew says the water sector in England and Wales has come a long way towards meeting the promise of privatisation.

And a key factor to success is that many companies were keen to embrace change, albeit after some hesitation.

“The privatised sector has been successful at delivering service improvements at a low cost. We provide the regulatory tools, but private companies have the responsibility to really step up, innovate and to find new and better ways of doing things.

“Customer satisfaction stands at around 90 percent, environmental quality has been transformed and, despite the dense population, two thirds of our beaches are classed as having excellent quality and wildlife is returning to water that previously was too polluted.

“Leaks are down by a third, customers are five times less likely to suffer supply interruptions, we’ve had a massive reduction in low pressure (customers are 100 times less likely to have low pressure today than prior to privatisation), drinking water quality stands at 99.96 percent against national standards, and there’s been huge increases in resilience and connectivity in water networks and huge improvements in the health of the assets.”



Customers are eight times less likely to suffer from sewer flooding, he adds.

“All of this is being delivered at a cost of about £1 a day. Average [household] bills are £395 per annum, which I understand is broadly comparable with customers of Watercare in Auckland.”

Water bills are at about the same place as they were about 20 years ago and are decreasing by five percent in real terms by 2020, says Andrew. “And we see scope for bills to continue to fall by 2020-2025.”

### Future challenges

Ofwat faces new challenges and cannot afford to stand still, stresses Andrew.

“Like New Zealand, we face population increases. There’s estimates that the population could increase by 20 percent over the next 20 years and this will put pressure on water resources in areas such as the dry South East of England where water resources are already stretched.

“We’re facing predictions of a 20 percent decrease in summer rainfall and a 20 percent increase in winter rainfall by 2050.

“In addition the sector faces an ongoing challenge of legitimacy as the recent Labour Party manifesto, for example, contains a proposal to renationalise the water sector,

along with a number of other sectors.”

Meantime, Ofwat is about to publish its methodology for the 2019 price review that aims to strengthen company ownership of the relationship with customers and the ownership of the plan even further, he says

“We are enabling more effective engagement of customer and consumer representation groups by improving the availability of quality of data of comparative performance.

“We expect more outcome performance commitments and more powerful outcome delivery incentives.”

Ofwat is also encouraging the trading of water resources between companies to enable movement of water from where it is plentiful to where it is scarce.

“By ensuring we set the conditions to encourage water companies to trade between themselves and with third parties we could see smarter use of water reserves in the future. And as part of the same work, we are also encouraging the efficient management of supply by promoting a market that improves demand management and tackles leaks.

“We’re also looking for companies to outsource, or directly procure infrastructure projects, to third parties. There’s no reason why the existing incumbents should be the ones that deliver new infrastructure such as reservoir or large transfer schemes. It’s possible for third parties to come in and deliver those schemes at a lower life cost to customers.” **WNZ**

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# When you're in a **TIGHT SPOT**

A water treatment plant engineered in Australia should be of interest to municipal and industrial users of water plant in remote and ecologically sensitive communities.

**A**ustralian company CST Wastewater Solutions says it has the answer to wastewater solutions in smaller, remote and ecologically sensitive communities throughout the region, including popular remote tourism locations.

The two-stage system uses a combination of coarse and fine screening and advanced dry compaction technology to produce a hygienic and compact output that is said to be easier to handle and transport. The system is also economical, using less energy and minimal water compared to alternate systems, says the supplier.

The new system has been selected for use by the Island Board of World-Heritage listed Lord Howe Island (Australia), after extensive testing to determine the best

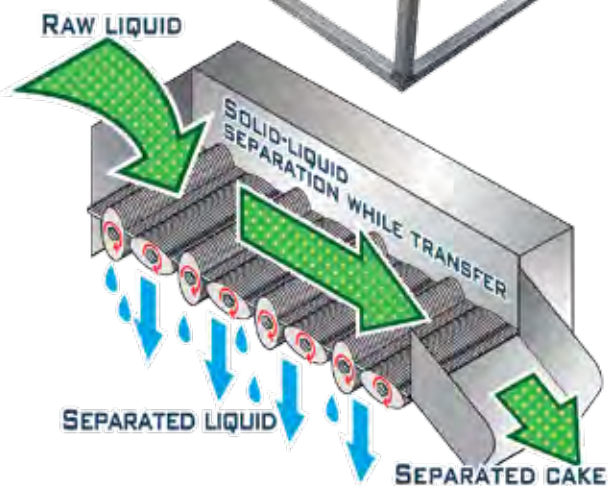
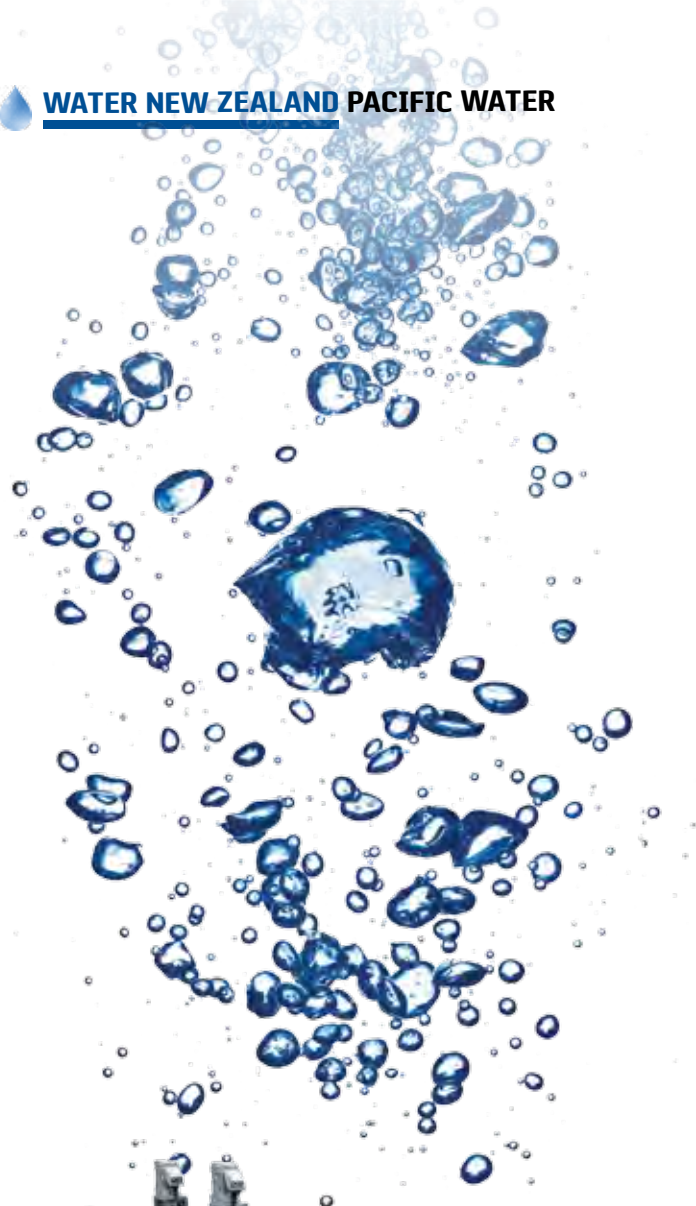




answer for the management and disposal of waste generated on the island, which has a restricted visitor population.

The existing waste management facility for the island destination, 900 kilometres off the coast of eastern Australia, sorts various waste streams including food waste, paper and cardboard, green waste, recyclable materials, re-usable materials and general waste. Septic waste from residential and commercial systems is also treated at this facility, and drawn from about 220 waste water systems on the island,

Lord Howe Island.



(25 are commercial operations). Currently pumpouts are delivered to the facility via an 1800-litre wastewater tanker.

“CST Wastewater Solutions was tasked to review a ‘best fit’ sludge dewatering system for the septic waste, because the current infrastructure is becoming outdated and the existing drying beds are to be decommissioned,” says CST Wastewater Solutions chemical engineer and managing director Michael Bambridge.

He and his brother Peter Bambridge worked with the Lord Howe Island Board’s project manager to find a solution that combined good environmental performance with strong OHS performance – and which has a much smaller footprint than the drying rack system that had been used in the past on the island.

CST eventually proposed a new two stage system. The first stage is a CST Screen Extractor with coarse screening at 6mm up front to remove plastic, rags and other disposals typically found in community, commercial and industrial wastewater treatment plants.

The second stage employs CST’s new KDS Separator technology for fine screening and dewatering of the fines. The clog-free automatic liquid-to-solid waste separator is being introduced to the Asia-Pacific by CST Wastewater Solutions for compact dewatering applications ranging from food



Top left: The new clog-free automatic liquid-to-solid KDS Waste Separator, Above: the more hygienic and easily handled output obtained in the Lord Howe Island application.

Left: The unique self-cleaning action of the KDS Separator, which is available in hydraulic capacities from 264-4092 gal/hr (approx.1000-15,490 litres) with input solids content of two percent.



processing, food waste, grease trap and waste oil through to municipal wastewater sludge, livestock manure and agribusiness processes.

This KDS system was developed in Japan.

“CST completed successful trials on Lord Howe Island under the supervision of the Board’s project manager, getting impressive results from the pilot plant KDS Separator, with high screening capture and effective dewatering of the fines from the wastewater delivered by the tanker servicing the community,” says Michael Bambridge.

The compact KDS multi-disc roller separator features a self-cleaning dewatering and conveying system with oval plate separation and transfer structure that prevents clogging and permits automatic continuous operation that handles oily and fibrous material with ease.

“This simple-to-maintain separator offers a high throughput within a small body, with the smallest model being just under 350mm wide and weighing 50kg.

“It is ideal for applications such as Lord Howe Island and other smaller communities and industrial applications throughout the Asia-Pacific, including coastal, remote and ecologically sensitive areas.

“It is more hygienic and produces an output that is twice as light and half the cost to transport for disposal, compared to

other systems. It is also extremely compact, energy efficient and uses minimal water.”

The energy-efficient KDS Separator is said to consume as little as 0.06kW hr of electricity and uses no wash water, adds Michael.

“The KDS separator uses a fraction of the power of a centrifuge and involves no water usage during operation, unlike a belt press or a screw press.

“For a relatively low investment cost, it offers a high-performance alternative for example to sludge drying beds and geobags.”

The KDS technology can also be used for thickening of dissolved air flotation sludge – a very common application throughout wastewater operations – in which role it achieves solids capture of 97 percent thickened sludge at a dryness of 17 percent. Waste activated sludge dryness levels are typically 15 to 25 percent.

Typical applications for the separator include raw wastewater (primary screening) and sludge; sewage treatment, including raw wastewater (primary screening) and sludge to landfill; pig farm raw manure and sludge, with cake dryness of 20 to 30 percent; barrel polishing water, water-based paint wastewater, grease trap waste, dyeing wastewater, waste oil, and plastic recycling; and seafood processing. **WNZ**



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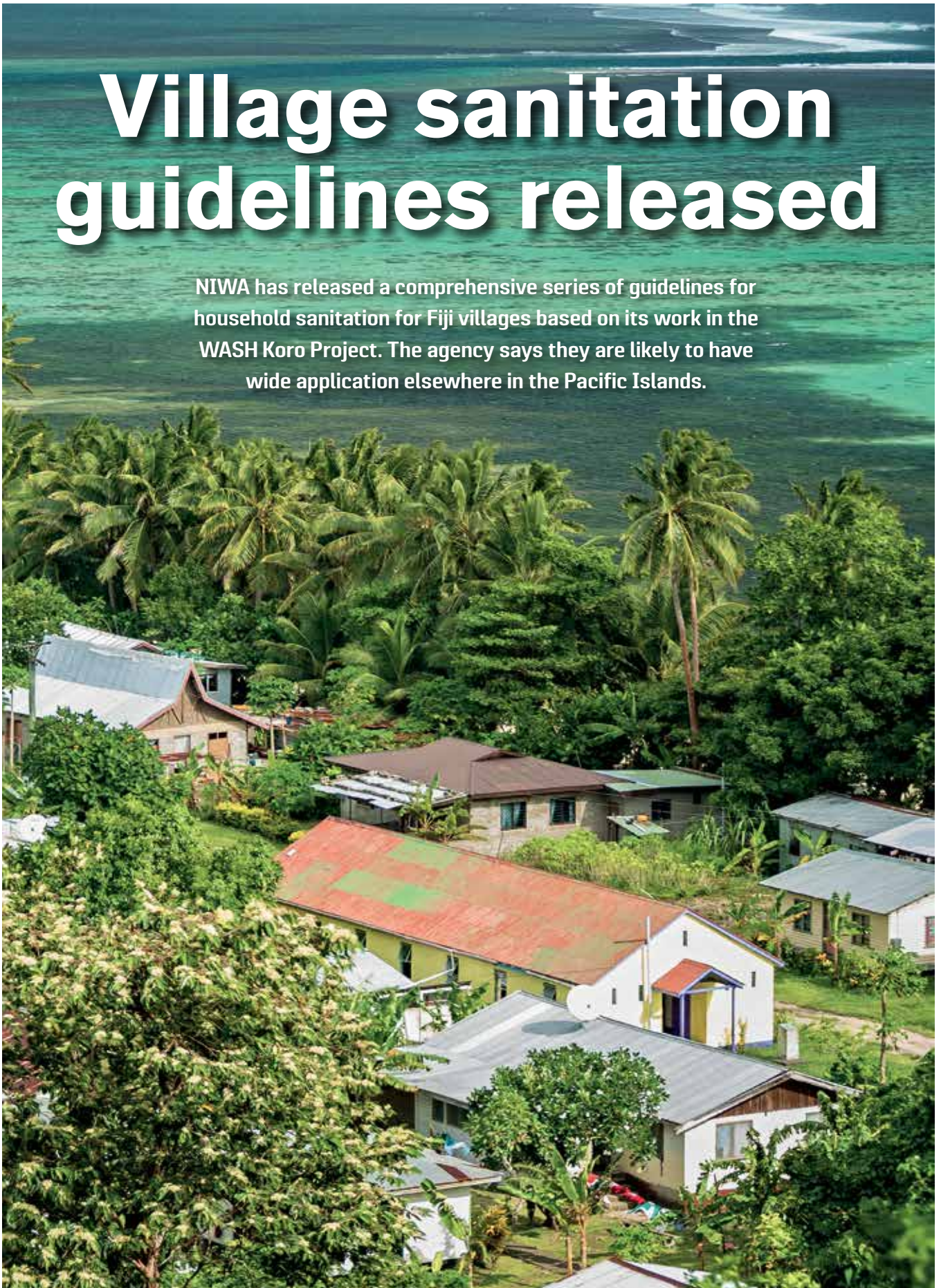
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# Village sanitation guidelines released

NIWA has released a comprehensive series of guidelines for household sanitation for Fiji villages based on its work in the WASH Koro Project. The agency says they are likely to have wide application elsewhere in the Pacific Islands.





**A**imed at improved sanitation services in Fijian villages and settlements, seven of the guidelines provide technical information for water-flushed and dry toilet options.

The eighth guideline addresses participatory approaches to engage communities to build knowledge and capacity to mobilise and support water supply, sanitation and hygiene (WASH) improvements in their villages and settlements.

The guidelines were developed and field-tested with three partner villages in Viti Levu in consultation with the Fiji Department of Water and Sewage and the Ministry of Health.

The WASH Koro project is a collaborative participatory project that aims to provide self-help tools to mobilise communities to recognise and address their own water supply, sanitation and health/hygiene needs.

The project team was made up of Chris Tanner and Rebecca Stott (NIWA), Andrew Dakers (EcoEng)



PHOTO COURTESY OF CHRIS TANNER.

and Ann Winstanley ESR/ Creative Questions from New Zealand, alongside the in-country knowledge and skills of Viliame Jeke (JecoEng), and the Institute of Applied Science at the University of the South Pacific.

The project builds on the learning and capacity developed in its predecessor Wai Votua Project (which involved the implementation of WASH in a coastal



village of 300 people), but works on a smaller house-by-house scale.

The project was supported by the New Zealand Aid Programme through the Partnerships for the International Development Fund of the Ministry of Foreign Affairs and Trade.

The KoroSan guidelines can be downloaded for free from [www.niwa.co.nz/korosan](http://www.niwa.co.nz/korosan). **WNZ**

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# WASH

## in Papua New Guinea

### Fresh approaches to persistent challenges

Oxfam has been working on water and sanitation projects  
in Papua New Guinea for over a decade.

**W**ith the backing of many people across the Pacific and New Zealand, we've supported over 220,000 women, men, girls and boys in Papua New Guinea to gain access to clean water and dignified sanitation facilities.

Yet in a country of over eight million people, more than 60 percent of the population still lives without access to clean drinking water and improved sanitation.

Papua New Guinea ranks lowest among Pacific countries for health statistics related to water and sanitation, and while access to safe drinking water has improved slightly since 1990, access to improved sanitation has actually worsened.

It's difficult not to get disheartened by this, in light of the hard work we've all put in. But we need to acknowledge the complexity of water, sanitation and hygiene (WASH) work, and of the environment we're working in. There are many reasons why enduring and reliable access to water and sanitation remains such a challenge, only a couple of which can be unpacked here.

One reason is scale. Due to the enormity of the challenge and Papua New Guinea's rapidly increasing population, it isn't feasible for Oxfam, or any non-governmental organisation, to deliver water systems for all. We all need to be contributing to a nationally-led WASH strategy, which has the buy-in and leadership of the government.

Another challenge is sustainability. Projects are, of necessity, funded for a discrete period of time. Yet WASH systems need ongoing operation and maintenance by people with the necessary skills and expertise. This requires ongoing investment, and in a context where limited funds are stretched across many pressing and worthwhile priorities, there's no easy solution to that.

So what can we do differently to improve our impact?

First, we can start by understanding that WASH is a human right, and that access to clean water and sanitation is determined by power, poverty and inequality – not just physical availability.

While strong technical solutions are critical, a lack of





PHOTO COURTESY OF OXFAM NEW ZEALAND.

good governance and accountability will prevent our WASH projects from achieving the scale and sustainability we are seeking.

In Papua New Guinea, Oxfam is now proactively supporting the duty-bearer – the government of Papua New Guinea – to deliver on its responsibility for developing and maintaining WASH infrastructure. We're also helping local communities to understand that they have a right to water and sanitation, and to hold their government to account for providing them.

It's an exciting time to embark on this work. The government of Papua New Guinea recently released a National Water and Sanitation Policy, and some of the local governments in areas where Oxfam works have expressed a strong commitment to taking on greater responsibility for WASH services.

Oxfam's work over the past decade in delivering WASH solutions has earned us credibility among communities and with local, district and national governments, and we are active in national-level discussions on water governance.

This doesn't mean we've stopped working with non-government partners. Because Oxfam believes that civil society organisations also play a critical role in good governance, we will always work with local organisations on WASH construction and education.

Putting these elements together, our long-term vision for WASH work is to:

- Collaborate with local authorities to clarify specific functions and responsibilities around WASH, so there is ownership of different areas of WASH services, and deeper coordination

among government, local NGOs and other stakeholders;

- Support greater transparency on how government funds dedicated to WASH are allocated and spent;
- Help local communities understand their rights, so that they are in a more powerful position to discuss their WASH needs with government in a constructive way;
- Make sure people know about the new National WASH Policy, so that local government is aware of its pivotal role in meeting community WASH needs, and is prepared to deliver;
- Provide technical assistance to local government officers, so they are more able to manage and maintain WASH facilities; and
- Strive to provide the space for women to have a greater role in accessing and managing safe water and dignified services, recognising that women and girls experience different WASH needs from men and boys, and shoulder the greatest burden for the WASH needs in their families.

Working in this space is not easy, and there will be many challenges ahead. Progress will demand partnerships, expertise and resources from all kinds of players, and multiple approaches at different levels.

It won't be achieved by Oxfam alone, but we will be standing alongside and supporting the network of actors committed to providing safe drinking water and dignified sanitation and hygiene in Papua New Guinea.

Because we believe that this approach has the greatest chance of ensuring sustainable and equitable access to WASH for all. [WNZ](#)

This paper was presented at the Water New Zealand annual conference in Hamilton.

# URBAN HOUSING

## ALTERNATIVE APPROACH TO PROVISION OF WATER & WASTEWATER INFRASTRUCTURE

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*Grant Pedersen, Chris Baker & Abu Hoque (Harrison Grierson Consultants, Auckland).*

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### ABSTRACT

There has been much in the press in recent years about the provision of new infrastructure being a significant constraint to growth in major New Zealand cities, notably Auckland. There have been frequent outcries for government or council funding of this necessary bulk infrastructure to open up further areas for residential and commercial development to accommodate the demand for housing and industry / commerce.

In many cases, the provision of water and wastewater infrastructure has been challenging, especially for the development of special housing areas (SHAs) and other areas earmarked for development. While the arguments about equitable funding for this infrastructure run thick and fast, there are examples where alternative approaches have yielded more sustainable and fairer outcomes.

The [previous] government's recent billion-dollar housing fund offers some assistance, but only in certain high-profile areas.

There are innovative, sustainable technologies for providing water and wastewater infrastructure, including water reduction techniques, alternative wastewater systems, smart sewers (reduced inflow and infiltration) and wastewater reuse. These alternatives can lead to significant benefits across New Zealand.

Some developers have expressed a desire to be proactive in developing alternative and innovative water and wastewater infrastructure solutions. The current planning and regulatory framework does not favour such initiatives and there appears to be a reluctance to depart from traditional approaches.

Yet the potential benefits are large – not only in terms of reduced infrastructure costs but also reduced loads on downstream infrastructure.

Is it time to rethink our traditional approach to peak flows for new developments? Is a per capita peak flow really still applicable to modern developments? It may be appropriate for different rules to apply to greenfield high-density developments than for traditional developments with medium-sized lots. Many new developments are multi-storey or high density, with less infrastructure in the ground per person than with traditional developments.

### THE CHALLENGES

- Existing assets – infrastructure sized for historical density and growth predictions
- Planning and growth – outstripped capacity
- Costs – high costs of incremental growth

- Funding – sources of funding and cost distribution
- Delivery mechanisms – developer-led growth
- Asset ageing – inflow and infiltration (I&I).

### SOME SOLUTIONS

#### 1 Utility organisations to take a leading role

To prevent ad-hoc and haphazard development leading to poorly planned water and wastewater infrastructure, someone has to take the lead. Ideally, this would be the local authority or utility service provider.

It can be challenging for utility provider organisations to influence good outcomes for water and wastewater infrastructure when competing with other infrastructure spending pressures.

By requiring each individual developer to finance all of the cost of building local infrastructure, the utility provider often loses some ability to dictate infrastructure construction to serve the wider master plan area, rather than the local area being developed.

A change in approach nationwide to enable (and require) utility provider organisations to take a more prominent role in the master planning of infrastructure is required. This needs to be coupled with an equitable and fair process for distributing costs in a manner that does not disadvantage or advantage individual landowners.

In relation to this, current urban boundaries may be less relevant in the longer term. In the long term, at the infrastructure master planning stage, it would be wiser to consider what works from a practical sense to benefit network performance and environmental outcomes.

Many urban boundaries have been enlarged in recent decades. With the value of hindsight, infrastructure development could have been more appropriately carried out, if the future boundaries had been thought out from a practical viewpoint, rather than relying on the current zoning, as regulation requires.

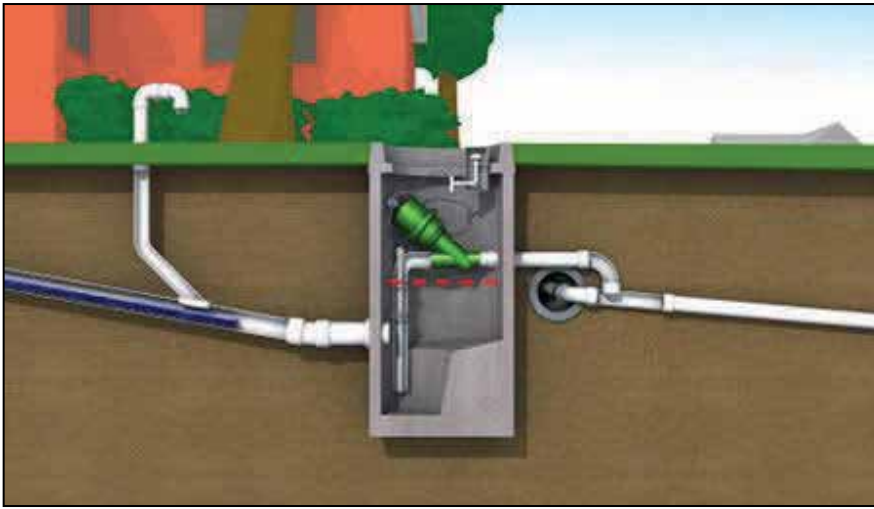
The issue is how to do this without favouring one landowner over another. The key is to allow flexibility, so that infrastructure is planned and growth can occur in one area or another, with at least scope for expansion. This could entail making sure adequate land is reserved or identified for future upgrading and expansion of infrastructure such as pump stations, pipelines and reservoirs.

While providers are spending public money, with no mandate to allow for growth that is currently not zoned, it is clear that, where there is a need, zoning has been changed. There is no reason to doubt this will occur in the future, as need arises.

#### 2 Alternative methods of determining peak flows

Traditional approaches to urban development specify high peaking factors, assuming a new wastewater network will become 'leaky' over time to degenerate to the citywide average.





Left: A vacuum pit. Vacuum sewerage systems are completely sealed from outside air and water, and as a result there is a very low risk of infiltration of stormwater into the vacuum system.  
[www.flovac.com](http://www.flovac.com)

Below: A vacuum pit and vacuum sewer line being installed. The vacuum sewer can remain at a relatively shallow depth below the ground surface through a series of "lifts" which consist of two 45 degree bends.



Connections to existing infrastructure typically add the new peak flow to existing flows, creating the need for major or extensive upgrading to existing networks.

An alternative approach is required to reduce overloading of infrastructure on many fronts.

Most local authorities and water utilities dictate the design flow allowances for water supply and wastewater flows based on traditional water networks and gravity-based wastewater conveyance systems as part of 'compliance' to their required standards.

Many alternative systems – such as pressure sewer systems, vacuum sewerage systems, fully-sealed sewer systems and smart sewers – record lower inflow and infiltration data than conventional gravity-based wastewater systems. Thus it is reasonable that different design criteria should apply. Peak wastewater design flows could be closer to the peak dry weather flows.

### 3 Alternative servicing systems

A number of alternative wastewater collection systems exist that could reduce overall costs and peak wastewater flows. These include pressure sewer systems, vacuum sewerage systems, and smart sewers with intelligent reduction of pumped flows during adverse weather events.

Emerging technologies to reduce water use and wastewater generation can also be considered. These may include fully-sealed gravity wastewater systems, sewer mining, greywater reuse, and recycling and effluent reuse.

### 4 Flow balancing infrastructure

Due to necessity, an increasing number of developments in highly-urbanised areas where the existing wastewater infrastructure is under extreme pressure during peak wet weather flows, can only proceed if the wastewater is stored, then drip-fed into the network at off-peak times, ie, at night, when wastewater flows are normally much lower.

This mechanism has advantages in terms of better utilisation of existing

trunk infrastructure. But it creates the issue of ageing or septic sewage in the network, leading to greater prevalence of hydrogen sulphide issues and reduced wastewater treatability.

Harrison Grierson is installing or designing several systems for new developments from 240 to 1000 units where flow balancing tankage has been utilised either to reduce peak flows, or to allow pumping into the wastewater system at off-peak times, usually at night. In all cases, the development could not have proceeded if this approach had not been taken.

### 5 Recycling reuse reduction

Cities in New Zealand currently utilise 'fresh' water from natural sources, and treated wastewater effluent is discharged to the environment with very little being reused in any form, even for low-level irrigation purposes. Water has always been relatively plentiful in New Zealand, except for a few locations during drought periods.

However, critical water shortages have occurred before, both in cities and in agricultural / horticultural areas. If we focus on municipal water and wastewater, critical water shortages could occur again for Auckland in particular, as our largest city. Growth will eventually outstrip supply, especially during dry years, and alternative water sources will be required.

In May last year, the CEO of Watercare said the organisation was looking at the possibility of reusing treated sewage for either human consumption, industry, agriculture or reinjection into the aquifer.

Various forms of wastewater reuse will inevitably be required. While public attitudes are currently firmly against any form of potable reuse, attitudes can change over time. Beside direct potable reuse, the 'softer' forms of reuse include aquifer recharge, reservoir supplementation, sewer mining and industrial reuse. Most people don't realise some soft water reuse has been happening in New Zealand and most other countries for many decades, in the form of raw water extraction from a river downstream of another city's effluent discharges to land or water.



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A recently-installed pressure sewer chamber on private property.

## 6 Sewer mining

Sewer mining is another form of wastewater reuse. This technique is already used in some cities overseas, including Canberra. It involves a small localised wastewater treatment plant extracting a constant flow of wastewater from a wastewater interceptor and producing a supply of very high quality utility water for irrigation or other non-potable reuse.

A combination of biological and either membrane or reverse osmosis treatment processes is used to ensure water quality. This can not only reduce potable water demand by reducing park irrigation requirements or industrial water use, but also reduce base load wastewater flows in interceptors by the wastewater extracted. For outlying areas, this saving could be considerable in that water flows through many kilometres of interceptors on the way to final treatment.

An advantage for New Zealand cities, including Auckland, is that peak irrigation demand would coincide with summer drought conditions. However, peak wastewater flows occur in winter. The challenge would be in finding genuine water uses that would substitute potable water use for recycled water.

## 7 New Zealand planning system legislative changes

The New Zealand planning system is currently going through a number of legislative changes, but these changes can't be implemented appropriately for new urban developments if our infrastructure delivery mechanism is not being changed at the same time.

Suggestions for improvement of the infrastructure delivery mechanism are:

- Allowing self-sufficient decentralised (not connected to main infrastructure network) local infrastructure which is small in scale, requires less investment and can be implemented by private developers.
- Providing a financial mechanism to guarantee that private infrastructure developers will be reimbursed for upfront investment for that portion of the cost which other private developers will be using later. Currently, there is no mechanism to reliably achieve this, as the assets once fully vested in the local authority have no connection to the original developer.
- Allowing private implementation and management of small scale infrastructure facilities under the monitoring of a local authority.
- Encouraging more private-public partnership in infrastructure facilities.
- Allowing infrastructure authorities to be more proactive in making the most appropriate decision on a case-by-case basis for innovative solutions outside the current regulatory framework. **WNZ**

• To read the full paper go to: [bit.ly/WaterNZ\\_Urban\\_Housing](http://bit.ly/WaterNZ_Urban_Housing)



# Water engineers ace NZQA procurement qualification

The latest graduates of the NZQA Level 6 Certificate in Infrastructure Procurement are engaged in council water departments – a significant shift from the qualification's past emphasis on transport procurement.

**T**he latest graduates of the NZQA Level 6 Certificate in Infrastructure Procurement are engaged in council water departments – a significant shift from the qualification's past emphasis on transport procurement.

When the NZQA qualification was broadened in 2015 to cover a comprehensive range of procurement skills, it was hoped that it would provide a practical means for busy procurement specialists in a wide range of sectors to develop and prove their skills.

Recent graduates Fiona Pratt, of Whangarei District Council and Nicola Marvin of Gisborne District Council, both noted significant improvements in their procurement practices as the direct result of working through the qualification.

“We have much more robust processes in place now, says Nicola. “Across our department, there's far greater awareness of what's required, being thorough, recording everything, writing better documents.”

Fiona adds: “The whole procurement process is now much easier and more cost-effective. What's more, I believe that it's

much fairer and more transparent for our suppliers.”

Both graduates acknowledged that they had to invest time and effort into working on the qualification, but most of the evidence needed for the assessments was based on procurement projects that they were working on with their councils.

The qualification now attracts council and government procurement staff from a variety of sectors, including a growing number of water engineers, as well as procurement specialists engaged in areas such as facilities maintenance, IT, construction, and even education.

The assessment process takes between 6 to 18 months, during which time expert review and feedback is given to candidates on their procurement plans, RFT documents, and evaluation reports, to bring them in line with the latest in government procurement compliance and best practice. [WNZ](http://www.wnz.co.nz)

- To find out more about the NZQA Procurement qualification, visit [www.cleverbuying.com](http://www.cleverbuying.com).



Nicola Marvin.



Fiona Pratt.

# Supply risk calls for new **WATER TREATMENT PLANT**

With an ageing water treatment plant at one of the Southern Hemisphere's largest dairy processing sites, a solution was required – and fast.

**B**uilt by Kiwi Dairies in 1972, the Whareroa Fonterra site has the capacity to produce 13.8 million litres of milk per day.

However, its ageing treatment plant posed a serious risk to the manufacture of what amounts to nearly 20 percent of Fonterra's production output.

The solution – a \$17 million project of a new water treatment plant – was awarded to Beca and Fulton Hogan, and they were then faced with the task of meeting an extremely tight deadline.

The first water had to be supplied by August 1, 2016, giving the contractors 11 months to plan and construct a plant that was capable of producing up to 30 million litres of water per day.

In addition to this, there was also the inclusion of a new water intake in the Tangahoe River, and the difficult site location provided an extra set of challenges for the designers and engineers.

## Setting up the project

For the treatment plant, the construction included a concrete clarifier structure and mixing chambers. The clarification was provided by stainless steel lamella plates – supplied by MRI Technologies in the USA – and the concrete filter structure is comprised of a Cadar Monolithic Filter Floor System with conventional media filters.

The plant is fully automated, including fire systems that tie into the systems at the main Fonterra Whareroa plant.

Aside from landscaping, fencing and a booster pump station upgrade, the final task for the treatment plant was the design and construction of a 4.5 million litre treated water reservoir. For this a stainless steel product was selected as it provided the

best option in terms of capital and ownership costs.

For the Tangahoe River raw water intake, the task required the excavation of a three metre diameter, 12 metre deep wet well. There was the construction of new intake screens – Johnson Screens Passive Intake Screen – and a stainless steel manifold in the river bed.

Pipework then needed to connect the intake screens to the wet well, including raw water pumps and controls, and an airburst screen cleaning system. Of significant note was the unusual site conditions, in that work in the riverbed, and the wet well (which was situated on a steep river bank), created a variety of constraints for both the designers and engineers.

Hand-dug by a team of specialists, the well holds two new submersible pumps, which pump water to two new hydrocyclones that remove much of the silt, ahead of treatment in the new plant. The pumps are on guide rails, which improves safety for staff involved in maintenance or repair of the intake, and the provision of a 30mm grating at the clearwell is protecting fish life.

## Mitigating risks

There were three key risks identified for this project, including procurement of imported long lead equipment, design progressing ahead of construction, and meeting the programme deadline (where there would be significant consequences if delivered late).

To deal with the issue of procuring a stainless steel pipe – as time did not allow for design to be completed enough to obtain subcontractor offers – a solution to engage subcontractors to procure pipe early and price packages of work as they became available was created.





Whareroa Fonterra,  
Hawera.



Backwash pumps.



Clarifier filter  
plant building.

A concrete casting bed was constructed onsite to cast the precast wall panels for the clarifier and filter structure panels on. The site manufacture of precast panels also provided several advantages such as direct control of production rates (timing) and quality, and plant casting on site allowed the manufacture of larger panels, thereby reducing insitu concrete ‘stitches’ and risks associated with leaks at joints. It was also more cost effective than precast sourced externally.

Once casting was complete, the slab was utilised as the foundations for the chlorine building, and it also provided paved areas around it – a further benefit was that the slab didn’t require demolition.

To improve speed of construction, bespoke steel formers were designed for the corner stitches. And while initially more expensive, these forms were significantly quicker to erect and strip than conventional forms.

### Reducing environmental impact

A site-specific Environmental Management Plan detailed all environmental procedures – most specifically, sediment control.

For the work carried out on the river bed, which involved exposing the ground to install piping, the construction was isolated from the river itself by using a cofferdam, built from one tonne sandbags. Any water that got into the vicinity of work was directed away to a sediment site controlling the possibility of a contamination.

The new plant has been in use for more than a year now, and has improved the efficiency of the site’s processing plants by increasing onsite water storage by 50 percent (as the existing reservoir has been retained). **WNZ**





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# Communicating the value of quality public drinking water



By **Clint Cantrell**, Water Sector Director, Tonkin & Taylor

**T**he Havelock North drinking water contamination issue is general well understood by most in the water industry in terms of science, risk and appropriate risk mitigation measures.

Beyond the realm of efforts to better address water security issues with good science and engineering, we need to use events like Havelock North, the Christchurch earthquakes and Cape Town's Day Zero to galvanise stronger community and political awareness of the importance of a secure and resilient potable water system.

It is fair to say that most first-world cities take water for granted, unless they have experienced a recent catastrophic event, which quickly reminds everyone of just how important these systems are, and the fact we cannot manage these systems in a reactive manner.

It is worth noting a few salient facts about how little value is placed on a well-functioning and resilient public water supply system.

In most communities the price we pay for public water is far less than what we pay for a smartphone plan, Sky TV or our daily supply of good coffee.

Yet in terms of our ability to live, survival experts will tell you the three most important things for any human are air, shelter and clean drinking water. In spite of this there are multiple examples of community and political uproar over increasing water rates, or even the concept of metering and asking people to pay for public water they consume.

In this day and age, it's hard to believe that we can live without a smartphone, Sky TV and yes, even coffee. Somehow we need to do a better job of shaping community and political views on the value of clean, safe water.

The Havelock North Water Inquiry was completed prior to Christmas and central government is currently considering its recommendations. The implications for local authorities and their CCOs will become clear within the coming weeks.

It is likely that new measures will be required to ensure communities are adequately protected against waterborne illnesses, with the initial focus placed on systems which rely on untreated groundwater sources similar to Havelock North's.

The investigations around Havelock North have provided a wealth of key lessons learned, which in themselves provide a means to reduce the risk of contamination to other communities. Central to the inquiry, and the ongoing debate amongst qualified professionals and communities, is the potential for compulsory treatment and disinfection of all public drinking water systems that rely on groundwater sources.

It is difficult to estimate the risk present in existing systems throughout New Zealand, but what we do know is that risks differ substantially based on a number of key variables that require site specific assessments to confirm.

We also know that the risk of potential contamination can change as a function of catchment modifications in the zone of groundwater influence. Even though public water supply treatment and disinfection systems are likely to be mandated, this does not alleviate the need to carefully understand and manage catchment risk imposed to groundwater systems.

It is already common practice to treat and disinfect most public surface water systems, as the community health risks are far too high to do otherwise. In the past, groundwater was considered a safe source of untreated drinking water if it was drawn from confined aquifers that precluded any contamination from external sources, and the systems used to extract and distribute the water were monitored and maintained. But recent scientific experience has made it clear that it is not possible to provide absolute security of an untreated groundwater source.

The decision to mandate treatment and disinfection of all public groundwater supplies is substantial and technically complex by anyone's measure. At a high level, the following



**“ In short, we need to sell treated water as essential to good health and make it desirable and even ‘cool’. ”**



points need to be carefully considered in forming an opinion on this important issue.

There is a huge amount of long-term national and international experience with operating public water supply systems that include treatment and disinfection. This provides a wealth of factual information on what to expect at your tap if treatment is implemented, including taste, smell, long-term health benefits and common concerns.

This information and evidence can be technically complex in nature, and it is important to seek highly reliable sources provided by qualified experts. More recent technology has allowed us to further optimise how we treat and disinfect to improve the aesthetic value of drinking water.

The potential cost of treatment and disinfection is substantial. For some large communities it will run into hundreds of millions of dollars and, proportionally, the cost and financial burden can be even greater for smaller communities.

There are certainly some challenges and issues to be addressed as to how this will be funded, but we can say that current charges communities pay for safe treated water today represent excellent value.

For example, Auckland's Watercare charges just \$1.48 for 1000 litres of treated drinking water supplied to your tap. An average Auckland household pays far less for treated drinking water than it pays for mobile phone plans or internet access.

Meanwhile, the bottled water industry has, with a bit of clever marketing, convinced people to pay more than 2000 times the average cost of public water to purchase a product that generally comes from the same source. Although the bottled product is marketed as "fresh, pure New Zealand water", it can in fact be less regulated for quality than tap water, which is also conveniently delivered to your home. What other industry in the world has successfully done this?

The obvious lesson learned is that we need to do a better job of communicating value for our public water supply systems to consumers so that we will have the political, community and financial support to ensure these systems are resilient and will perform as needed.

In short, we need to sell treated water as essential to good health and make it both desirable and even 'cool'.

From a public health protection perspective we cannot absolutely eliminate all risks, even with treatment systems in place. Nonetheless, it is vital that we never lose sight of the dramatic consequences of a single contamination event and continue to promote the benefits that come with mitigation of contamination risk through treatment and disinfection.

Only when we can communicate these benefits and the value of 'safe drinking water' will we be able to convince our communities and regulators into taking lasting actions to improve our water safety and security. **WNZ**



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# How SMEs can win game-changing contracts



With major plans to upgrade or build three waters assets over the coming years, there are many opportunities for SMEs to get a piece of what is an ever-increasing pie. By **Heather Murray, Plan A.**

**O**ne of the best things about being a bid writer is helping a client win that ‘game-changing’ contract. What is even better is watching them grow off the back of that win, providing more people with jobs and the market with more options.

Unfortunately, many SMEs are reluctant to bid. There are a number of reasons why – ranging from the belief that government organisations are only interested in working with the ‘big guys’, to being daunted by the process, or simply under-resourced.

Bidding is not as hard as you think. It’s about understanding the process, finding the right opportunity, resourcing appropriately and appreciating the risks.

## It starts early

Most government tenders have mandatory requirements especially when it comes to health & safety, quality and the environment. These requirements are often eliminators for SMEs that are ideally suited to the contract.

Identify what upcoming contracts you are interested in so you can address any barriers to entry. The Australia & New Zealand Infrastructure Pipeline (ANZIP) website is a good place to start as it provides a forward view of public infrastructure activity across both countries. Watercare, Wellington Water, the NZ Transport Agency and a number of councils publish their pipeline of work on their websites.

This is also the time to start building those relationships and letting your future customers know you’re ready and keen to work with them.

## Get your foot in the door

Most government agencies rely heavily on your past performance when awarding a contract. Start by tendering for smaller contracts which will place you in a stronger position for the ‘big’ win. This is about getting your foot in the door and building those relationships and credibility.

## Partnerships and subcontracting

Aligning with a large player is a good way to get some bigger projects into your portfolio. If an opportunity comes up that you are ideal for, but don’t stack up for in terms of experience and track record, then consider a partnership.

If you’ve got a working relationship with a company that is already involved in government contracts, try to secure as much

of their subcontracted works as possible, which will provide you with some ‘big’ contract experience.

If it’s possible, use those opportunities to build relationships with end clients such as councils. A quote from a member of the public on the great work your team did can be very valuable.

## Go for industry awards!

Once you have a project under your belt, it can be extraordinarily valuable to you if it is entered into regional or national awards, such as the Water New Zealand annual awards. There are categories for all kinds of contracting jobs, even small, private jobs – and the publicity if you become a finalist can really put you on the map.

Tender scoring systems today often place award-winning past projects at the top; so they could launch you into winning future contracts.

## Invest time and money

Government tenders require time and effort. Large companies often have entire bid teams whose sole purpose is to win work. For SMEs, this is seldom the case. You have to find time alongside your day job to put what is often a very complex document together – and still find the time to make it compelling.

An independent bidding expert who works with SMEs all the time, helping them to develop a win strategy which is interwoven into the document, can help you to determine ‘what good looks like’, and push your team to deliver a bid worthy of contract selection.

This means not only answering all the questions, but knowing what the answers ‘*should*’ look like from a best practice perspective.

Importantly, the right investment in bid preparation can reap ongoing benefits. Having an ‘attribute library’ of base material (that can be used in the next bid) can significantly reduce time and cost for subsequent tenders.

## Even if you lose, it’s not all lost

While you may not win your first bid, your potential client now knows you’re ready and able to step up so keep at it. They will have read your attributes and learnt essential information about your business that simply cannot be achieved through traditional marketing avenues. And if you win, the next tender is yours to lose as you’re now in the game! **WNZ**



# Water under fire



By **Helen Atkins**, partner, **Vicki Morrison-Shaw**, senior associate, and **Rowan Ashton**, solicitor, of Atkins Holm Majurey.

**H**appy New Year! 2018 has stormed in, bringing with it the prospect of significant changes to both water policy and legislation.

Foremost amongst these are the changes recommended in the Stage 2 Report for the Havelock North Water Inquiry. We provide an overview of the recommendations and (some) of the proposed legislative changes below. We also provide a brief update on the RMA reforms, and the current Hawke's Bay Water Conservation Order process.

We conclude the article with a brief overview of three cases – one, the latest in the ongoing fluoridation debate, and two others which provide good summaries of sentencing principles for breaches of discharge consents.

## Havelock North Water Inquiry – Stage 2 Report

The Havelock North Water Inquiry was established to investigate what went wrong following the gastroenteritis outbreak in Havelock North in August 2016. The Inquiry issued its Stage 1 report in May 2017; and in December 2017 it released its Stage 2 report, which set out the myriad of problems with the existing systems and processes as well as the changes the Inquiry considered were necessary to fix them.

The Inquiry's findings are damning – almost 800,000 people are supplied water that is not safe to drink, drinking water standards are not being met or enforced, risks to drinking water sources are not being appropriately mitigated, the regulatory regime is not fit for purpose, the lines of responsibility are unclear, there is a complete lack of leadership and a lack of collaboration between those within the sector, there are insufficient qualified staff, and there is inadequate training, monitoring, auditing and resourcing in all areas. Overall the Inquiry found that there was “a widespread systemic failure among water suppliers to meet the high standards required for the supply of safe drinking water to the public”, and that “the administration of the present system of regulation does not ensure that water suppliers comply with the law and the [Drinking Water Standards New Zealand].”

Given the failings it is clear that there is a lot of work to be done to get New Zealand's drinking water supplies up to international best practice standards.

The two key recommendations are for the mandatory treatment of all water supplies and the establishment of a dedicated drinking water regulator in order to ensure that water is safe to drink and that the

industry is properly regulated. The recommendations also include:

- adopting six principles of drinking water safety;
- abolishing the secure classification system;
- encouraging and (later) mandating universal treatment of water supplies;
- establishing a drinking water regulator;
- improvements at and by the Ministry of Health – including the adoption of a clear and effective enforcement policy and the removal of the health protection officer qualification for drinking water assessors;
- amendments to the Resource Management Act 1991 (RMA) to expressly recognise drinking water source protection;
- accelerating and expanding the review of the National Environmental Standard for Sources of Human Drinking Water (NES Drinking Water);
- encouraging and (later) mandating joint working groups;
- urgently amending the Health Act 1956;
- establishing a licensing and qualifications system for drinking water suppliers and operators;
- reviewing the drinking water standards;
- creating dedicated and aggregated drinking water suppliers;
- improving resourcing and capability of drinking water assessors;
- implementing and providing guidance for the amended NES Drinking Water;
- requiring reviews, and strengthening enforcement of Water Supply Plans (WSPs);
- updating guidelines for emergency response plans (ERPs) and boil water notices in light of international best practice;
- requiring WSPs to include ERPs;
- improving the testing and laboratories regime;
- reviewing New Zealand Standard 4411 (Drilling of soil and rock) in relation to bores; and
- prohibiting any new below ground bore heads.

Many of the recommendations are expressed as requiring urgent implementation and a number of the recommendations will also require legislative change.

The changes proposed to the RMA involve the addition of a new matter of national importance in section 6 and the addition of a new function for regional councils in section 30 relating to the protection and management of drinking water sources.

Given the discrete nature of these changes the Inquiry recommends that these changes be effected by way of the Statutes Amendments Bill process.

In terms of the NES Drinking Water, the Inquiry has found that a comprehensive ‘clean sheet’ review is required. The revised NES needs to ensure that:

- any activity (including land use activities) which could affect drinking water sources is captured;



- trigger levels for existing treatment are changed and clarified;
- existing activities that might be adversely impacting drinking water sources are addressed;
- it extends beyond regional rules and permitted activities (to district plans and controlled and restricted discretionary activities and to smaller supplies);
- preventative measures to reduce the likelihood of emergency events are implemented;
- there is notification of any resource consent applications with the potential to affect a drinking water source; and
- a user friendly guide is updated and finalised.

Reactions to the report have predictably been a mixed bag. While most agree that (at least some) change is necessary, the extent of the required changes, and the cost of implementing the changes – particularly given the ageing water infrastructure – is a key concern.

The government, while assuring the public that drinking water is a priority and that it intends to move quickly to address the issues, has not yet (publicly) provided any substantive response to the issues or recommendations. Given the scope and magnitude of the issues raised, we suggest that addressing these may be some time in the making.

## Update on RMA reforms

In our last article we noted that a raft of changes to the consenting provisions in the RMA came into force in October 2017.

While the changes were introduced with the intention to remove unnecessary red tape and speed up consenting processes, the Labour-led government has clearly signalled its view that some of these changes go too far.

In particular the Environment Minister, David Parker, has indicated that the government intends to restore the public's right to participate in discretionary activity processes and to appeal discretionary resource consent decisions.<sup>1</sup>

Whether there is sufficient cross-party support to push through these changes and the timing of any such changes is not yet known.

The government has also signalled an intention to create a new National Policy Statement for Freshwater.

While any new statement would keep the "good things" from the existing policy statement, it would go further and impose clearer (and more) rules on pollutants. One example given was that resource consents may be required for increases in stocking intensities given the impact these can have on waterways.

It is expected that a formal consultation document will be available by the middle of the year.<sup>2</sup>

## Water conservation order

As we noted in earlier articles, in December 2015 six parties applied for a Water Conservation Order (WCO) over the Ngaruroro and Clive Rivers.

The application was accepted and referred to a special tribunal for consideration in July 2016. Stage 1 of the hearing, relating to the upper reaches of the Ngaruroro River was completed in November and December 2017. Stage 2 of the hearing, for the lower reaches of the Ngaruroro River and the Clive River, will be heard in July 2018.

The adjournment is to allow further scientific information (TANK) to be finalised, and for the parties to analyse and collaborate on

the information. A second draft WCO was provided by the applicant following the Stage 1 hearing and it is expected a third draft WCO will be provided prior to the Stage 2 hearing commencing.

## Cases of interest

### New Health New Zealand Inc v South Taranaki District Council [2017] NZSC 162

In February last year, the Supreme Court granted New Health New Zealand Inc leave to appeal the Court of Appeal's decision regarding fluoridation of water. The hearing was set for 16 and 17 November 2017.

In October leave was sought to adduce new evidence – namely two reports regarding the benefits and costs of tooth brushing and water fluoridation respectively. The Supreme Court refused leave for the tooth brushing report on the basis that it did not meet the guidelines for admission – it was not fresh, it would not assist the Court and its late admission would prejudice the Council.

The Court indicated that it was not clear whether the parties still wished to introduce the water fluoridation report but stated that this could be addressed at the hearing.

At the time of writing the Supreme Court's substantive decision on the appeal had not yet been released but is expected within the next month or two. We will report further on this, and the implications that the Stage 2 Havelock North Inquiry Report may have on these issues, in our next article.

### Waslander v Southland Regional Council [2017] NZHC 2699

This case is interesting as it confirms the Court's approach to sentencing and penalties for unlawful discharges.

Mr Waslander, a dairy farmer, pleaded guilty to three charges of unlawfully discharging contaminants into the environment. He had a history of poor environmental management, with abatement notices for similar issues going back to 2004. He had suffered a stroke in 2014 and although his physical/mental capacity was less than it had been pre-stroke, he could still operate his farm.

The District Court imposed a fine of \$60,000 and issued an enforcement order requiring remediation work to be completed to address identified areas of risk.

Waslander appealed the quantum of the fine on the basis that it was manifestly excessive. No appeal was brought in relation to the enforcement order or Court costs.

In terms of the approach to liability, the High Court confirmed that liability for discharging a contaminant into water is not based on the damage done, but the potential for damage to occur. Whether damage has actually occurred or not does not determine liability but will determine the severity of the sentence imposed.

A wide range of factors are considered in determining the severity of the penalty for an unlawful discharge. These include:

- the impact on the environment;
- whether the incident is a 'one off' or has occurred more than once;
- whether it is intentional;
- the level of carelessness that led to the discharge;
- whether the offender has been proactive in addressing/fixing the problem, and to managing environmental impacts in general;
- whether the discharge has occurred from a one-off 'system failure', or whether it has been caused by multiple parts of the system failing due to severe neglect.

Further, and contrary to the District Court, the High Court considered that it was appropriate to take into account Mr Waslander's personal circumstances (difficulty in recovering and

1. <https://www.stuff.co.nz/national/politics/98853157/david-parker-plans-to-reverse-nick-smiths-resource-consent-notification-law>

2. <https://www.stuff.co.nz/environment/100641348/fresh-start-for-water-quality-standards>



operating farm post stroke).

The High Court stated that while the duties to comply with the requirements of the Act are strict, "ill-health has always been recognised as a circumstance personal to an offender which may properly be taken into account in mitigation of sentence".

The Court also found it was appropriate to recognise and encourage the recent efforts Mr Waslander had made to improve his dairying operation. The Court accordingly allowed a limited deduction on these bases. In the end, the High Court considered a total overall fine of \$54,000 – a 10 percent reduction of that imposed in the District Court – was justified.

### **Otago Regional Council v Queenstown Lakes District Council [2017] NZDC 28767**

What are the consequences of discharging sewage into an iconic river? Well if you are the District Council, a not insignificant fine.

The District Council operated the wastewater and stormwater systems in Frankton. A blockage in the Council's wastewater drain led to around 43 cubic metres of sewage being discharged into the Kawarau River near Frankton.

The discharge took place over a period of two days and was reported by a jet boat operator. The site was subject to a disinfection process but the wastewater residue and sludge remained on the riverbank for around three months. The District Council pleaded guilty to the discharge.

In considering the impacts of the discharge, the Court took into account:

- the significance of the river – demonstrated by the water conservation order that required the river to be managed to contact recreation standards;
- the high recreational use of the river by swimmers, divers, kayakers, rafters, jet-boaters and fishers;
- the offensiveness of discharging sewage into rivers for both Māori and the wider general public;
- the smell and visibility of the plume of untreated sewage;
- the length of time the residue of sewage toilet paper and other products remained on the riverbank; and
- the effect on water quality and the risk it would have presented to swimmers and recreational users.

Key factors in determining the level of fine to be imposed were:

- the sensitivity of the environment due to the statutory protection afforded the river;
- the deliberate engineering of the wastewater pipe to overflow into the river in the event of a blockage (while acknowledging this was a historic fact and not reflective of the District Council's current approach);
- the level of fines imposed in other cases;
- the early guilty plea; and
- the impact of the fine on ratepayers.

The Court determined that a fine of \$37,500 was appropriate but indicated that it was supportive of a proposal that the fine (or a portion of it) was directed to a local environmental project or organisation – at the discretion of the Regional Council. **WNZ**

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# Anolyte success in Raro

For the past year New Zealand company Envirollyte NZ has been supporting a school pool in Rarotonga, as part of the Kiwi Pools in Schoolz charity managed by Ian Calhaem.

The project is sanitised solely by Anolyte Electrically Activated Water – a site-generated alternative to chlorine which is said to be 100 percent safe for both humans and the environment.

The success of the pool project led to the formation of a local branch of Envirollyte to manufacture Anolyte in Rarotonga and enable the local community and various tourist outlets to sanitise the water they use in food preparation and for kitchen hygiene.

Late last year Envirollyte was asked if it could examine the drinking water situation in Atiu, one of the southern group of the Cook Islands, about 45 minutes flight from Rarotonga.

This island has water supplies made up of multiple community water tanks as well as a large number of private tanks capturing the water from roofs. Some of the community tanks had been fitted with UV

units but concerns around the quality of the water had some of the locals questioning the choice of this method of sanitation.

## Water tanks at the community hall – Atiu, Cook Islands

Envirollyte examined the state of the water tanks at one of the community halls. There were two older concrete tanks that were connected to a UV disinfection system and three new plastic tanks that were separate and had no disinfection.

The ability of water to remove pathogens can be measured with an ORP meter (Oxidisation Reduction Potential). ORP is an easy, cost effective test and an important consideration as even if water has been disinfected by UV radiation, it can easily get recontaminated as it passes through water distribution pipes or is put in non-sterile containers.

The two concrete tanks had an ORP level of 208mV, whilst the new plastic tanks had an ORP of 322mV.

The water quality in all tanks did not meet

recommended ORP standards of 600mV for disinfected water and 800mV for sterilised water.

To further test the water quality in the water supply tanks Envirollyte used bacteria testing kits provided by the Cook Islands Ministry of Health. These kits allow bacteria to grow in a sealed tube. If the tube turns black after two days then pathogens are present in the water and it is not safe to drink. All water tanks failed this test and even the UV treated water was starting to turn black after just 24 hours.

Envirollyte then isolated one of the new plastic tanks and added three, two litre containers of neutral anolyte. The ORP of the water was immediately raised to 695mV, an acceptable standard for drinking water. The sanitised water was also tested in another of the Ministry of Health testing kits. After two days there was still no colour change in the kit and the ORP of the water when retested was still 695mV.

"Neutral anolyte manufactured locally provides a cost effective and safe option for sanitising water supplies in remote parts of the world like Atiu," says Envirollyte general manager Richard Hanna. **WNZ**



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# Excavating with water

**Peter Owens talks with Blair Skevington**

about his success building a large hydro excavator for use in civil contracting.

Skevington Contracting was formed in 2004 and is based in the township of Palmerston, which is situated between Dunedin and Oamaru.

It is now a well-established excavation and heavy machinery operator owned by Blair Skevington who found a niche with a large hydro excavator he had made in Canada.

Until the Christchurch rebuild started after the 2011 earthquake, the company operated almost exclusively around Otago and the West Coast of the South Island, mostly for the local mining industry. This contractor has enjoyed a long-term relationship with Oceana Gold at nearby Macraes, a company Blair worked for before setting up his own company. Its work in this area did not go unnoticed. In 2014 Skevington's was named in the Deloitte New Zealand Fast 50 Awards as the 'Fastest Growing Services Business in Otago and lower South Island'.

With the opportunity to work on the Christchurch rebuild after 2011, Blair saw the need for specialised extraction equipment and while hydro excavators were already available in this country he saw the opportunity to use a larger machine on larger, sensitive ground works.

In 2012 he had discussions with a number of manufacturers before ordering a large hydro excavator from Canada where hydro excavation was long-established. Larger than other hydro equipment used here, the excavator was built to Skevington's specifications by Supervac, a Canadian



**Skevington's hydro excavator.**

company based in Levee, Quebec, and with over 30 years' experience in hydro excavation manufacturing.

It took the manufacturer nine months to build the machine under the supervision of the company's hydro excavator manager, Steve Hall. It had to be specially designed for our roading conditions, with the trailer unit built in a way that dispersed its weight to meet our heavy vehicle regulations.

It took another three months to transport it here before being put to immediate work in the mining sector and doing pole foundation work for line companies before it was sent to Christchurch, where it proved ideal for delicate excavation work of underground pipes and cables in Christchurch's rebuild. The actual operation is quite simple. Hydro excavation equipment combines high-pressure water with air vacuum to break up the targeted material and then a vacuum lifts the slurry from the excavation area. The

debris is transferred to a debris tank.

Hydro excavation is said to save time and causes less congestion and traffic in the excavation area because the equipment can be positioned at a distance.

The company will not disclose what it paid to buy and transport its hydro excavator, but Blair says that while it was very expensive indeed, he does not regret the acquisition of this unit. Depending on the type of material it is working, the company charges its operating costs between \$480 and \$550 per hour. When it is working, the unit uses up to 40 litres of water per minute and the cost of buying water varies considerably throughout the operating areas.

Blair concedes hydro excavation can work out to be more expensive than other types of excavation, but it significantly lowers any risk of damage or personal injury, which are invariably expensive and time consuming.

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In the United States, the hidden champion produces large-scale polyethylene pipes with diameters of up to 3.5 metres and lengths of up to 600 metres. These large pipe strings, weighing up to 1000 metric tonnes, are then shipped across the world's oceans to their deployment locations. One major driver of success in the development of an industrial empire spanning several continents was extensive application engineering expertise, combined with a comprehensive premium plastics engineering portfolio.

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