

# Kaitiaki Wai

Wellington Water's magazine | Winter 2020



**Wellington  
Water**

Our water, our future.





Piwakawaka Storm (Rachel Walker [rachel@walkerillo.com](mailto:rachel@walkerillo.com))



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**Cover image:** *Diving in Taputeranga Marine Reserve. (Photo: Nicole Miller)*

KIA ORA

# Times are changing

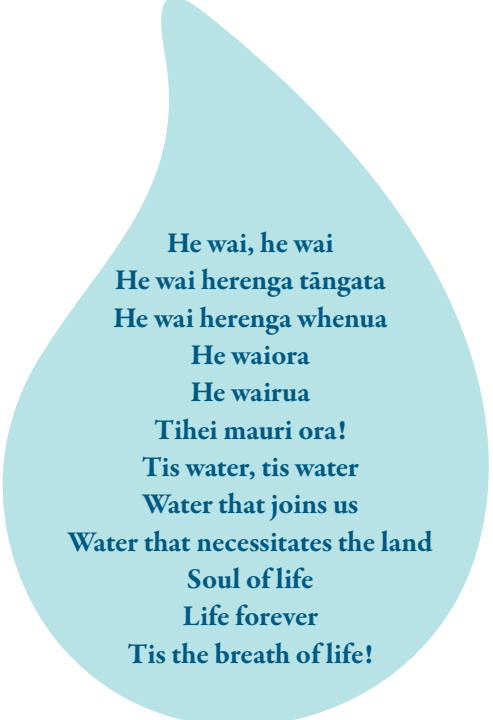
By Colin Crampton, Chief Executive, Wellington Water

Only 25 years ago we thought nothing of discharging wastewater directly into the ocean. This reflected society's view at the time that waterways and oceans were an acceptable receiver for our waste. Our civic leaders decided this was not acceptable and the Moa Point and Seaview treatment plants were built. These plants very efficiently clean our waste, with the leftover sludge going to landfill and the resulting liquid discharged into our oceans. Job done, you might think. Well, no; there are still problems in the pipe networks which convey wastewater to our treatment plants and in pipes within private property boundaries.

This is a problem of the magnitude we faced 25 years ago. While our pipes are getting more watertight (as we replace more of them every year), there are still a lot which are either cracked, broken or dislocated. This means wastewater seeps into the ground around the pipes, eventually finding its way into our streams, rivers, harbours and coastlines. During rain events the opposite can occur. Water enters the wastewater system, mixes with the wastewater, and puts the system under strain. During very heavy rain the system gets overwhelmed and wastewater and stormwater will overflow from manholes, pump stations and sometimes at treatment plants.

All of this is compounded by issues within private property. Residents trying to do the right thing can find that work they carried out results in wastewater inadvertently connected to stormwater pipes, or water from roofs or paved areas concentrated into wastewater systems. This is what is referred to as cross-connections.

This might sound quite depressing but, actually, there is only good news. Firstly, we are understanding the situation more and more—and we don't like it. Society is putting increasing value on water and expects a different outcome. During our recent emergency events in Wellington City the easy option would have been to discharge wastewater into the harbour, but we now have a mantra of 'No wastewater in our water.' During the Dixon Street event we limited the wastewater discharge to the absolute minimum, and during the Mount Albert event no sludge was released into the sea. These might only be small actions so far but they indicate the changed way we all think about protecting our water from pollution by human waste.



**He wai, he wai  
He wai herenga tāngata  
He wai herenga whenua  
He waiora  
He wairua  
Tihei mauri ora!  
Tis water, tis water  
Water that joins us  
Water that necessitates the land  
Soul of life  
Life forever  
Tis the breath of life!**

Recent events at Owhiro Bay signal more change. Here we have a community who deeply value their stream and are more than ready to advocate for it to be healthy and free from E. coli. In working with the community in the Bay, we've seen understanding grow across Wellington that E. coli can enter the environment from both the public network and private property, and that driving sustainable change will require investment, as happened in Auckland with a special rate to improve bathing sites. Our hope is that the broader community will also begin to place an expectation on property owners who, (knowingly or unknowingly), have water pipes on their own property that pollute the environment, to fix up their defects.

Our councils, our communities, our customers, and us here at Wellington Water, can envisage a world where our wastewater systems are watertight and resilient, returning to our streams the mana they once had. It's not going to happen overnight but by keeping our eyes on the prize we will get there. We might not see the fruits of all our labour but our children and grandchildren will. I'm ready, are you?

**ABOUT  
PRINT A.**

As passionate about the environment, as we are about our products and service.

We're proud to print Kaitiaki Wai on behalf of Wellington Water. We take true ownership of respecting and reducing our impact on the environment, by ensuring our product can be recycled and re-used as well as the equipment we use.

This magazine is printed on paper that comes from the only merchant in NZ to have Enviro-mark Gold

certification under NZ's leading environmental certification programme. We align with the Fuji Xerox Product Stewardship Scheme; the first in our industry to be accredited by the Ministry for the Environment, and achieves a re-use and recycling rate of over 99.5% for equipment we use.



# News in brief

## Sludge trucking ends as first stage of Mt Albert repair successfully completed



The 1.8km-long liner was manufactured in Germany and shipped here under urgency for the repair during the Covid-19 Level 4 lockdown.

The first of the Mt Albert sludge pipelines to be repaired using a high-strength liner has been returned to full operation, following a comprehensive testing programme and reconnection to the wastewater network. The high-pressure pipeline is now once again transporting sludge between the Moa Point Wastewater Treatment Plant and the Southern Landfill, enabling the interim trucking operations to be stopped. The liner for the second backup pipeline has also been installed and was being successfully tested at the time of writing.

Meeting the engineering challenges of this project has required a high degree of ingenuity from both local contractors, such as Brian Perry Civil, Hadlee and Brunton and international specialists Amex-Sanivar, as well as skilled work in often difficult conditions from the crews on the ground—all in the context of a global pandemic.

Thanks also for the patience and understanding shown by residents who've had sludge trucks passing their homes while we repaired the pipeline.

## New central Wellington water reservoir given the go-ahead

On June 4 Wellington City Council unanimously approved funding for the Omāroro water reservoir to serve central Wellington, the regional hospital and the Newtown area.

Construction for the reservoir and associated infrastructure is expected to start in August this year. Omāroro will be a huge earthquake-resilient 35 million-litre reservoir built on a hillside above Prince of Wales Park, Mt Cook, on Town Belt land. The concrete tank will be built below ground-level and then buried once completed, to preserve the landscape.



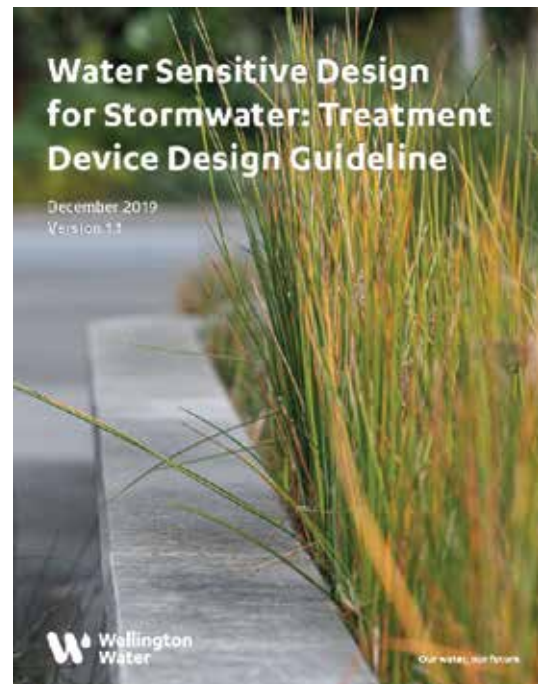
Councillor Sean Rush said Omāroro will ensure the central city and surrounding inner city suburbs have a water supply especially after a major earthquake.

## Water sensitive design guideline

Wellington Water has released a new technical guideline for water sensitive design after working with green infrastructure specialists and holding a series of interdisciplinary workshops. Water sensitive design typically involves using natural processes to mimic healthy hydrological cycles and provides a better way to manage freshwater in our cities and restore the mauri of our regions' waterways, harbours, and estuaries. The new guideline is a tool to ensure standardised and successful design outcomes, which means that green infrastructure devices designed using this guideline are optimised for maintenance, safety, and perform their function over the entire asset lifecycle.

The guideline can be found here:

<https://www.wellingtonwater.co.nz/assets/Uploads/WSD-for-Stormwater-Treatment-Device-Design-Guideline-December-2019.pdf>



Wellington Water's new water sensitive design guideline.

# Keeping things flowing in lockdown

How our essential services responded



A Ministry for the Environment survey found that 50 per cent of respondents purchased wet wipes during the lockdown. Ross, who operates a mini combo flusher truck out of our Rongotai depot, became one of the faces of the Ministry's campaign to educate the public around the danger of blocking pipes with flushed wet wipes, and making essential workers leave their bubbles to fix them.

During the heightened national response to Covid-19, our top priority was providing clean drinking water and safe wastewater treatment to our community. We concentrated our resources on these essential services and on keeping our frontline teams, who maintained them, safe and healthy.

For additional resilience we redeployed staff to bolster our frontline numbers. This included creating duplicate teams that could step in for those people operating essential services if need be, and providing training for current and former staff, along with members of our supply chain.

We prioritised our work programme to focus on the most critical projects. As network faults occurred, our customer response teams focussed on those which directly affected customers' drinking



*We created strict safety guidelines for our crews and provided them with the personal protective equipment they needed to stay safe while doing essential work during lockdown.*

water supply or wastewater services. All other work was scheduled when possible.

Our services rely on electricity (e.g. to power water pumps), so we worked

closely with Wellington Electricity to ensure that we were prioritised in their planning.



## Keeping our people safe

As for the general population, practising 'social distancing' was a key element of managing risks. For example, our two-person service crews didn't meet at depots but went straight to work in the field from their homes, and connected virtually instead.

On jobs where 2-meter distancing wasn't possible, risk was mitigated by the use of personal protective equipment (PPE) such as masks and gloves.

We introduced new hygiene and sanitation routines, cleaning schedules for gear and vehicles, and contact tracing on sites and at depots.

We prioritised our work programme to focus on the most critical projects.



The pandemic delayed the manufacture and installation of the liners made in Germany to repair the Mt Albert sludge pipes.

## Water quality monitoring and response during lockdown

Our top priority was providing clean drinking water and safe wastewater treatment to our community. In this context, our water quality monitoring and response activity was temporarily scaled back.

In the case of an event causing a significant risk to public health or the environment (e.g. a blocked wastewater main overflowing into the stormwater network) our crews responded urgently. However our work to investigate sources of background contamination (e.g. private cross-connections) within the network was paused while under Covid-19 lockdown conditions. This was both to ensure we had additional crew resources to respond to any urgent issues, and because it was inappropriate for our crews to be entering private property and approaching residents to investigate cross-connections at this time.

## Working in a global context

As lockdown approached, our suppliers were able to guarantee the continued delivery of chemicals critical to the operation of our water and wastewater treatment plants.

However, the global response to Covid-19 had a big impact on some of our planned work, such as the delivery of the material for the Mt Albert sludge pipes tunnel because of production delays in Germany where it was made, transport delays due to reduced air traffic, and a 14-day quarantine for the German engineers who came to New Zealand to oversee the liners' successful installation.

The pandemic delayed the manufacture and installation of the liners made in Germany to repair the Mt Albert tunnel sludge pipes.



Our suppliers continued to provide the critical chemicals needed for water treatment and other services. Lime is used to adjust the pH, or acidity, of treated drinking water.

## Project work through the alert levels

As we moved through the national Covid-19 alert levels we were able to bring more of our projects back up to speed, according to urgency, as crew members kept in reserve were able to return to frontline work. However, strict safety measures were kept in place including our workers keeping to their 'bubbles' on site and carefully controlling movements in and out of work sites.

# Virtual diving

Explore the ethereal seaweed forests of Wellington's south coast and discover a taonga worth protecting

By Jim McNaughton



*Dr Nicole Miller of Friends of Taputeranga Marine Reserve viewing a 360 dive video.*

When Nicole Miller sat down opposite me in a busy café and said that scuba diving in the marine reserve off Island Bay was great, I was sceptical. It sounded like something the chair of the Friends of Taputeranga Marine Reserve and president of Wellington Underwater Club would say. And although I'd been told a while back of a monster cray wandering out of the reserve into the arms of an astonished diver, the tale had come from the diver himself ....



*The reserve features a diverse range of seaweed. (Photo: Nicole Miller.)*



I thought of the south coast's cold water as I sipped my flat white. I imagined the odd drab fish. "Seaweed?"

How thick, bitter and strong that crowded café coffee was.

"Seaweed," Nicole said, with a gleam in her eye, "looks really good! It's so diverse in the reserve. It's like diving in a rain forest. A rain forest that bubbles when it photosynthesises. And it's very important for the marine environment. It creates a habitat for small fish and critters and is also a key food source, directly and indirectly—and again when it disintegrates. It also buffers wave action to prevent erosion. And seaweed absorbs carbon too, and produces a lot of oxygen.

"Check it out," she said, as she handed the VR headset and hand controller over the table. It was cued to a 360 degree diving video in Taputeranga on her website: <https://adventure360.co.nz/360tmr/> "The videos are good on a laptop or even a phone but the headset is more realistic."

I put the mask on and the café disappeared. I had become an eye rolling freely on the end of a scuba diver's extended selfie stick. The diver released a climbing cloud of bubbles. Another cloud climbed towards the undulating sunlit surface. Seaweed swayed gloomily below. Suspended, weightless, I drifted through the blue toward a shipwreck festooned with seaweed of green, brown and gold. The eye of me stopped rolling on the end of the selfie stick as I drew nearer to the wreck and focussed on a small dark square in the hull that grew larger and larger.

"Try the next one," came Nicole's disembodied voice. "Push the trigger to bring up the menu."

I was at the foot of a steep



*For such an important and atmospheric plant, seaweed is unfortunately named. (Photo: Nicole Miller.)*



*The reserve's snorkel trail can also be dived. (Photo: Nicole Miller.)*

It's like diving in a rain forest. A rain forest that bubbles when it photosynthesises.



*Taputeranga Marine Reserve extends from Houghton Bay to Red Rocks.*





seaweed covered cliff. At the top, ropes of bull kelp trailed black against the sun. School of trevally and jack mackerel arrived, close enough to reach out and touch as they nosed through the weed forest with sudden muscular bursts.

I drank some more coffee.  
After three videos my

appreciation for the marine reserve had changed dramatically. For one thing, I had a different perspective on seaweed, which now seemed an unfortunate name for such a diverse, ecologically important and visually atmospheric plant. The Māori name is rimurimu. Let it be known.

I understood why Nicole is working to raise awareness of the reserve, with 360 tours on her website, school visits—when not in lock down—and a collaboration with Mountains to Sea on a rimurimu kaitiaki project: <http://mountainstoseawellington.org/love-rimurimu/>.





*The reserve was established in 2008 (Photo: Nicole Miller.)*

Nicole would like people to become divers and snorkelers and, ultimately, conservationists who understand the key importance of rimurimu as a marine resource and the pressure it faces through temperature increase, exotic

invasion, sedimentation from runoff and pollution.

"Wellington is so lucky to have the reserve on its doorstep in Island Bay," Nicole said. "It's a taonga—we just don't realise it yet. Please check out the site. If you like it, you

could go on the snorkel trail, learn how to dive. Or if you've learned to dive overseas on holiday, go on a refresher course and try diving locally. You'll be really surprised at what you see!"

# Water sensitive design

– an interview with **Tony Wong**



**Tony Wong:** *A global authority on water sensitive urban design.*

Tony Wong has been Professor and Chief Executive of the Cooperative Research Centre for Water Sensitive Cities in Melbourne, Australia, since its establishment in 2012. The research centre is a social enterprise that supports the ongoing adoption of water sensitive principles and practices through broader services.

A Civil Engineer, with a PhD in Water Resources Engineering, Tony is internationally recognised for his research and practice in sustainable urban water management. He has led a large number of award-winning urban design projects in Australia and overseas. His many honours include the prestigious Sir John Holland Award as Australia's 2010 Civil Engineer of the Year and the IWA Global Water Award in 2018 for his leadership and lifetime achievements in developing the concept of Water Sensitive Urban Design, a unique socio-technical approach which addresses the social, environmental and economic challenges of traditional urban water management.

## **What are the main principles of water sensitive design?**

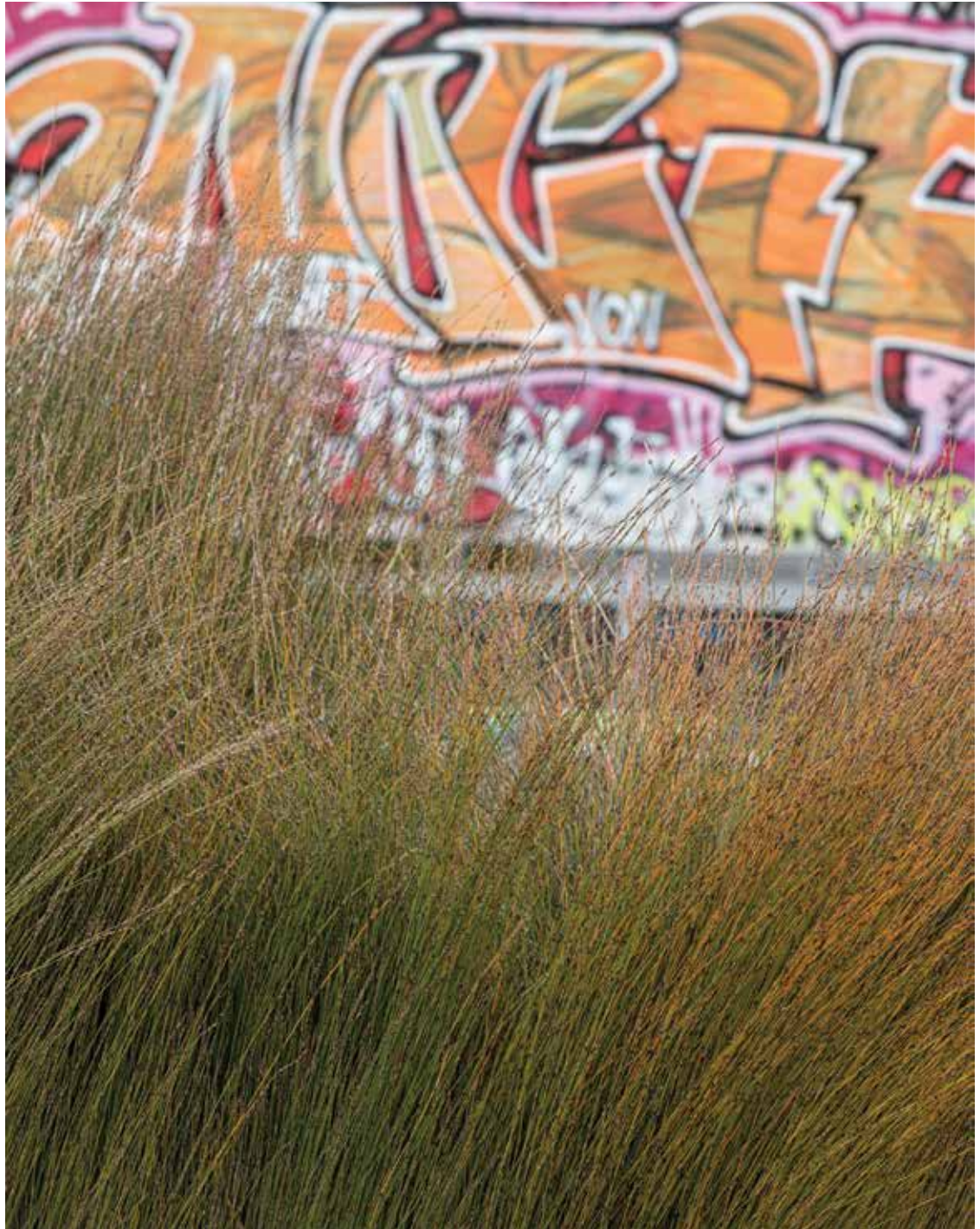
Our cities and towns have always been the platform of 'social-technical experiments' and the intersection of competing and complementary objectives. Urban water-sensitive design is the discipline that integrates emerging and expanding urban water objectives. What is clear is that water sensitive urban design is the process, and water sensitive cities are the outcome. A water sensitive city of the future is a place where people want to live and work. It is a place that:

- serves as a potential water supply catchment, providing a range of different water sources at a range of different scales, and for a range of different uses.
- provides ecosystem services and a healthy natural environment, thereby offering a range of social, ecological, and economic benefits.
- consists of water sensitive communities where citizens have the knowledge and desire to make wise choices about water, are actively engaged in decision-making, and demonstrate positive behaviours such as conserving water at home and not tipping chemicals down the drain.

“A water sensitive city of the future is a place where people want to live and work.”

A water sensitive city will be a collection of interconnected water sensitive precincts. In each one, site-specific plans will be developed to respond to local opportunities and constraints. These precincts will: efficiently use the diversity of water resources available; enhance and protect the health of urban and





*Water sensitive design brings greenery into urban spaces.*

natural waterways; and mitigate against flood risk and damage. Public spaces are green infrastructure that harvest, clean and recycle water, increase biodiversity, support carbon sequestration and reduce urban heat island effects.

Water Sensitive Cities may be characterised by the following three key pillars of practice which must be seamlessly integrated into the urban environment, including:

1. **Cities as Water Supply Catchments:** access to a diversity of water sources underpinned by a diversity of centralised and decentralised infrastructure.
2. **Cities Providing Ecosystem Services:** provision of ecosystem services for the built and natural environment.
3. **Cities Comprising Water Sensitive Communities:** socio-political capital for



sustainability and water sensitive decision making and behaviours.

Read more about the three pillars of a water sensitive city at [watersensitivecities.org.au](http://watersensitivecities.org.au)

**Water catchments are typically thought of as large rural or forested areas from which rainwater in rivers is dammed and/or extracted for treatment and piped to a city. You describe cities as water catchments areas too. What do you mean by that and what are the benefits?**

Many cities typically almost exclusively depend on water resources derived from the capture of rainfall run-off from largely rural or forested catchments. With global warming and a changing climate, continuing the conventional approach to securing water supply security, e.g. to build another dam, is often not the most effective option. Although in many regions the effect of climate change on rainfall remains uncertain and may not necessarily lead to any consistent trend of reduced rainfall, it is more likely that climate change will increase the global temperature and thus have a more certain effect on soil moisture in traditional water supply catchments

(i.e. a drier catchment). This will reduce the catchment run-off during storm events.

A strategy built around diverse water sources and a mixed water infrastructure will allow cities the flexibility to access a portfolio of sources at least cost—with cost including environmental impacts and other externalities. Each of the alternative water sources will have its own reliability, environmental risk and cost profile. Each source can be optimised (even on a short-term basis) through the availability of diverse infrastructures associated with water harvesting, treatment, storage and delivery. This would include hybrid systems consisting of centralised and decentralised water supply schemes, from a simple rainwater tank for non-potable use to city-scale indirect potable reuse schemes and a pipeline grid linking regional reservoirs.

Typical features harnessing a diverse portfolio of water sources will include rainwater tanks integrated to building architecture, streetscape stormwater cleansing and storage, wetlands and lakes in public spaces, localised wastewater treatment and recycling units, managed aquifer storage and recovery schemes.



*Green infrastructure harvests, cleans and recycle water, increases biodiversity, supports carbon sequestration and reduces urban heat island effects.*



These are features of cities as water supply catchments.

**Do we need to be taking a broader collaborative approach to water?**

Transforming cities into water sensitive cities requires a collaborative approach, cutting across many government departments and also integrating multiple public and private sectors.

Another key principle for practice in water sensitive cities development is “Cities providing ecosystem services”, that is, through embedding technology and green infrastructure into the urban design of our cities, water sensitive urban development can provide ecosystem services to the built and natural environment including water quality improvement and the management of stormwater as a resource, safe detention and passage of flood waters, improved waterway health through flow and water quality management, increased aquatic and terrestrial biodiversity within the urban environment, etc. These are management issues currently vested in many different government departments.

Contemporary stormwater management is a good example of this highly diffused and inter-disciplinary nature.

Stormwater runoff comes from a diffuse source and the transition to Water Sensitive Urban Design (WSUD) in stormwater management over the last 10 to 15 years has been quite remarkable, especially when considering that in this short timeframe we have seen the philosophy, technology and language of WSUD developed to industry standards and

referenced in policies across all levels of government in Australia, and across multiple governmental departments. Stormwater treatment technologies such as constructed wetlands and bio-retention systems (commonly referred to as rain gardens)



*Brylee Reserve, Auckland: A recently completed constructed wetland integrated with a public park and houses.*

Transforming cities into water sensitive cities requires a collaborative approach, cutting across many government departments and also integrating multiple public and private sectors.

are implemented at a range of spatial scales, from buildings and allotments to regional public open space and multiple use corridors. Bioswales as part of road infrastructure is another example of integrating these ecological landscapes into the urban form.

These are essentially “kidneys in our cities” to cleanse urban stormwater pollution of receiving waterbodies. Once cleansed, stormwater can be utilised as a resource and/or its flow rate attenuated for downstream protection of the natural environment.

Stormwater runoff from roads carry a disproportionately higher pollutant load compared with other urban forms, and also a high volume of runoff since the catchment is almost entirely impervious. By fitting bioswales along roads, we present the opportunity to introduce WSUD features for drainage and flood management, water quality improvement, appealing landscapes along

road verges and micro-climate management. In steep terrain, these systems could be designed as a series of cascading bio retention ponds.

Studies have been able to define key design procedures that ensure these systems deliver their ecosystem services effectively.

**Due to growth Wellington will need a new drinking water source in the next 10-20 years, unless we significantly reduce per capita usage. Could our small city transition into a catchment area that produces as much water as another traditional source?**

All cities transition to water sensitive cities progressively as they undergo urban renewal. The key enabling factor is good planning policies and principles for practice.

It is not simply about comparing the total volume of water harvested but about capitalising

Contemporary stormwater management is a good example of this highly diffused and inter-disciplinary nature.

the opportunities to diversify the water sources and introducing flexible local solutions that can respond quickly to changing future circumstances and development timing and patterns. Therefore this approach is relevant and appropriate for cities of any size.

A study undertaken to assess the security of existing water supply for the City of Melbourne recommended a strategy to transition to a more diverse portfolio to hedge risks between the rainfall-dependent water sources and with the optimal share of harvested stormwater of between 11 to 14 per cent of the total water supply. The assessment revealed potential cost savings of between \$43 million and \$463 million per year, depending on the three future climate scenarios evaluated.

Redevelopments at a precinct-scale are often the best starting point for catalysing city transition to a more balanced portfolio of water sources. In Melbourne, the inner-city redevelopment at Fishermans Bend, adding up to 80,000 residents into the new precinct, is one such example.

**There are lots of variables and it's impossible to make an accurate guestimate but, broadly speaking, do you think it would it cost significantly more to transition a small rainy city like Wellington into a catchment area, rather than source a new water supply by traditional means? Would environmental and social benefits offset increased financial cost?**

We need to explore the 'economic return on investment' rather than the traditional financial benefit-cost assessment when asking the cost of transitioning into water sensitive cities. We also should not simply look at the transition as one of converting cities into a water supply catchment. There is also the ecosystem services that such cities can provide to the built and natural environment, and the broader whole-of-water cycle sustainability and resilience.



Waitangi Park is Wellington's first water sensitive urban design.



From a water supply security perspective, the recycling of wastewater and harvesting urban stormwater through the use of green infrastructure provides added water security. These actions deliver a range of ecosystem and social services that are highly valued.

- For example, stormwater harvesting using nature-based solutions such as bioswales and wetlands have increased property value owing to their proximity to green spaces.

A study undertaken by South East Queensland Healthy Waterway's Water by Design Program estimated that the potential property premiums to be around 90 per cent of the capital cost of WSUD assets. Also, figures from the Commission for Architecture & the Built Environment (CABE) in the United Kingdom show that property values increase near green spaces, with houses close to parks averaging 8 per cent higher prices than similar properties further away. These types of studies show the community's willingness to pay for the amenities associated with green infrastructure.

The health costs related to the effects of urban heat on community morbidity and mortality can be broadly quantified. A study by the Monash University in partnership with the National Climate Change Adaptation Research Facility (NCCARF) on identifying threshold temperatures above which mortality and morbidity increases in all Australian capital cities provides a good base. The reduction in surface and air temperature attributed to WSUD and green infrastructure can be broadly extrapolated to corresponding reductions in community morbidity and mortality.

There are other economic benefits that are widely acknowledged as being positive but difficult to monetise. These include increased biodiversity and ecological health of the aquatic ecosystem, improved physiological health of people who are more connected with green space by being more physically active (such as walking through green corridors in their suburbs).



*Waitangi Park combines several water sensitive design features.*

Thus, water management influences many elements of a city's productivity and liveability, not all of which are necessarily directly tangible or market-driven economic values. It is for this reason that the CRC for Water Sensitivity embarked on a major project to develop a framework and accompanying database to document the non-market values derived from a water sensitive approach.

#### **What water opportunities do you see for Wellington?**

Wellington's first water sensitive urban design is the development of Waitangi Park. That project was a good example of seizing the opportunity to introduce ecosystem services to cleanse stormwater conveyed in a main drain (what was formally the Waitangi stream). For as long as a city is growing, re-developing and undergoing renewal, there will be opportunities at a range of scale, whether it is about the fit-for-purpose recycling of grey and wastewater, to rain and stormwater harvesting, groundwater replenishment and micro-climate management or the incorporation of water sensitive building design with landscape design.

Community participation and co-design can create unique places that reconnect community with the intrinsic value of water, its cultural and environmental significance—beyond just a commodity. Achieving water security does not have to be mutually exclusive from recreating a more harmonious balance between the social, environmental and economic values of society.

# Kids help save stream

Hard work returns life to local waterway



*Environmental Group spokespeople Aaron Moe (L) and Ezra Crawshaw (R) with teacher Jacqui Watts-Pointer at the Wellington Airport Regional Community Awards.*

The Environmental Group at Porirua's Brandon Intermediate made a bit of a splash late last year, bringing life to a local waterway. Time has passed since then and with it a conspiracy of events that prevented us telling their story, but now we can and we think it's a story still worth telling.

Two years ago, a group of students at Brandon Intermediate found a clear common purpose. They identified themselves as "proud kaitiaki of the Cannons Creek Lakes and waterways near our school". This guardianship included composting, recycling and planting 600 trees over two years in Cannon's Creek Park to develop a better environment for fish, aquatic creatures and birds.

Their work included taking ownership of applying for a \$500 grant from Porirua City Council for the tree-planting. The council awarded them \$1,000.

Teacher Jacqui Watts-Pointer was clearly very proud of her students in the Environmental Group, and also keen to give thanks for the support they received. "The council have been amazing. They are very supportive. And their own work around the

waterways is making a big difference. Two years ago there was nothing in Kenepuru Stream. Now there's life."

A surprising amount of life. An Environmental Group survey noted long and short-fin eels, giant kōkopu, and even a few inanga which had migrated up from the harbour.

There was a problem though. A fast-flowing three-stepped culvert—about three storeys high in total—was hindering stream access and migratory routes for these regenerating species.

The Environmental Group didn't want fish being stopped by this barrier. So, after doing some research and getting advice from experts, they installed rope baffles in the culvert to slow the water and give aquatic creatures a place to rest in the pipes.

“Two years ago there was nothing in Kenepuru Stream. Now there's life.”





*Surveys noted a surprising amount of life, including giant kōkupa.*



*Releasing fish back into the lake. The students are thinking of future generations.*





Students planted a range of native species.



Sprat ropes give small fish something to wriggle up.

Sprat ropes were attached to lips of the culverts, which gave baby fish something to wriggle up on their journey upstream to the lakes. A "fish hotel", providing shade, shelter and a safe place to rest, was also installed.

Jacqui was impressed by the students' dedication. "They put a lot of their own time in. Lunchtimes and morning breaks too."

Last year they won the Education & Child/Youth Development award in the Wellington Airport Regional Community Awards for Porirua; the group's spokespeople, Aaron Moe and Ezra Crawshaw (both in Year 8 at the time) gave a slide presentation at Mountains to Sea Guardians Group celebration at Whiteria in November; and the group's work was included in New Zealand Nature Heroes (Potton and Burton, 2019), by Gillian Candler. Last but not least, Aaron and Ezra said that friends and families like what they've done, too.

The spokespeople gave a modest and factual account of the Environmental Group's achievements when interviewed, but there were plenty of smiles. Deflecting praise, they preferred to express their gratitude for help from the council, Zoe from Mountains to Sea, Ashif and Rachel from Partners Porirua, and the fish experts, Kelly and Tim from ATS Environmental in Nelson. Not to mention their awesome teachers!

"I enjoy doing this stuff," Ezra said. "I like to help the fish. Help bring them back. It's for future generations."

Aaron said he liked to see the environment clean and healthy. "I'm also thinking of future generations."



# Community connections

## On the ground in Dixon Street

Following the wastewater tunnel collapse in Dixon Street in mid-December 2019 it was important to build relationships with everyone affected, provide communication around our ongoing work in the area and rectify any issues raised. We decided that the most efficient and effective way to begin this process was to base ourselves onsite in a small project site office at the intersection of Ghuznee and Willis Streets.

Being at the heart of the project helps us understand what issues residents and businesses face every day. Many of their concerns are around traffic management: road closures; parking for businesses, customers, delivery drivers and residents and access to private parking spaces. It's a fluid situation due to the ongoing construction and the onsite office enables us to pop in and visit people and provide up to date information.

We've also been holding fortnightly community meetings at St John's in the City in Willis Street. They've been a useful forum for sharing information from the project team with local businesses and residents, addressing issues or concerns, finding solutions and getting to know each other.



*Traffic Controller Roni and STMS Taani help keep things moving.*

Many of their concerns are around traffic management.



*Karen of St Johns has had been working closely with Wellington Water while their steeple is being built.*



*Kama from GHD explaining project work.*

## Te Marua Water Treatment Plant Open Day

The weather gods smiled on Sunday 1st March and the free public tours of our water treatment plant at Te Marua, near Upper Hutt in Wellington, took place in bright sunshine. From 10am-3pm, groups no larger than twenty were taken through the plant on one-hour guided tours, beginning with a video presentation on the history of Wellington’s drinking water infrastructure since the city became the nation’s capital, and an overview of the plant’s operations. Following a Q and A session, groups were then guided through the plant, inside and out, learning about its various operations, from collection at the water source, to treatment and then supply throughout the Wellington metropolitan region.

Around 200 curious members of the public took the free tour. Many were locals who had driven past the plant for years and wondered what was going on. “Great tour, really awesome,” said one. “The guides had fantastic knowledge and were willing to answer all our questions.” Some were surprised by the complexity of the processes—one pleasantly. “I’m pleased to see it’s so complicated –that it’s not just a sieve! It looks very rigorous and robust.”



*Te Marua Water Treatment Plant typically treats around 60 million litres of water daily.*



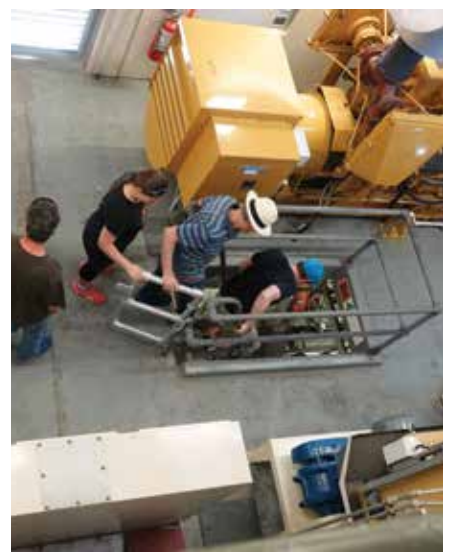
*Te Marua supplies water to the Hutt Valley, Porirua and as far south as Karori.*



*Production from Te Marua accounts for just over 40 per cent of Wellington Water’s supply in a typical year.*



*The public were curious and asked lots of questions.*



*Raw water from the Hutt River undergoes a number of treatment processes.*



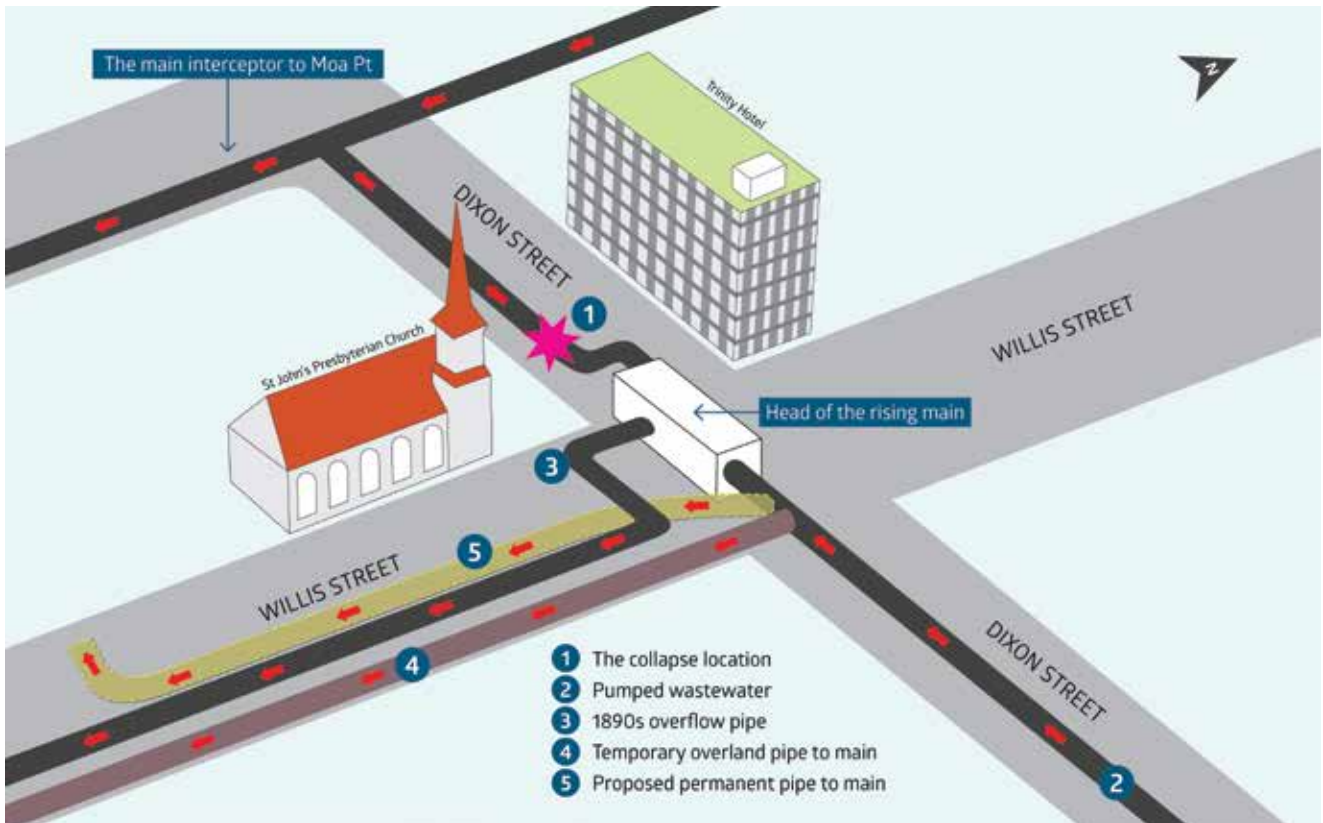
# WET WIPES

**block  
pipes!**



**Put wet wipes in the bin, not the toilet.**

Learn more at [wellingtonwater.co.nz/wastewater](http://wellingtonwater.co.nz/wastewater)



The situation in January 2020: The proposed permanent underground pipe shown at 5 has now been completed and Willis Street is fully open for business again.

# Willis Street's road to recovery

## A large-scale emergency renewal in Wellington's CBD

In the early hours of 20 December 2019 the adit (wastewater tunnel) in Dixon Street collapsed (see location 1 in the diagram), blocking the flow of wastewater to the main interceptor bound for the treatment plant at Moa Point. Wastewater began to collect around the site of the collapse.

At 22m below street level where Dixon Street rises steeply, the damaged pipe was not easily accessible for repair. We had to turn off the pumps moving wastewater uphill (through the pipe shown at location 2) towards the main Moa Point interceptor to prevent it overflowing in the street. The wastewater backed up in our pump stations and quickly filled the emergency wastewater storage tank under the Michael Fowler Centre car park. By early afternoon wastewater began to

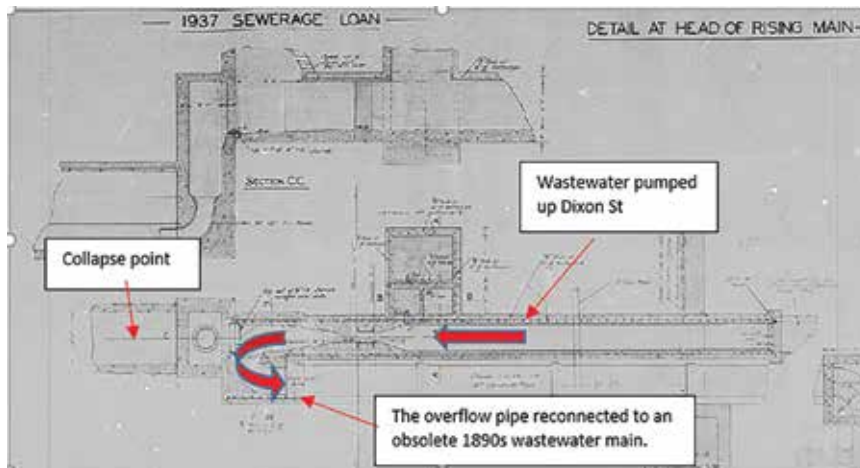
overflow into the harbour at the estimated rate of 50 litres per second. We reduced this by taking wastewater from our pump stations with sucker trucks and transferring it to nearby pump stations that were still able to operate.

By 1am on Sunday 22 December, we successfully recommissioned a disused 1890s-era pipe beneath Willis Street (at location 3). This meant we could begin to pump wastewater uphill again through the pipe and stop wastewater flowing back toward the harbour. The recommissioned pipe conveyed the wastewater to a manhole further up Willis Street, where it was pumped through large over-ground hoses into the main wastewater interceptor, bound for Moa Point situated near the Terrace tunnel off-ramp.



On 23 December a rāhui was placed on Wellington Harbour and we began installing a temporary overland pipe on Willis Street (location 4) to replace the old recommissioned underground pipe, which had limited capacity and required continuous monitoring. At 1pm on 24 December, we connected the new overland pipe laid between Dixon and Ghuznee Streets and began pumping wastewater to the Moa Point main at full volume.

However, this was a temporary solution that required the road to be closed to through traffic and affected access for local residents and businesses.



Detail of the head of the rising main at the intersection of Dixon and Willis Streets. This 1937 plan shows the head from side-on and above. After the collapse prevented wastewater flowing to the main interceptor, we were able to re-connect an obsolete overflow pipe as a temporary emergency measure.

In the New Year Wellington Water and the team from Ramsbottom committed to having the street reopened by 31 March. Work began on installing the permanent wastewater pipe beneath Willis Street (location 5). Trenching operations and installation of the new pipe in sections from Dixon Street up to Ghuznee Street were going according to plan when Alert Level 4 lockdown was announced. The renewal was declared a critical project and work continued.

On 30 March 2020 Willis Street fully reopened after the successful connection of the new underground wastewater pipe to the main interceptor, the removal of the temporary over ground pipe, resealing work was completed and road markings restored.

Wellington Water Group Manager Tonia Haskell said she was pleased the project came in on time and within budget.

“We want to extend a big thankyou and commendation to the contractors and the team involved who have completed work that would

normally take at least 12 months of planning in three months,” she said.

“We also recognise that, while this work was essential, it has been a difficult time for residents and businesses in the Willis Street area and we greatly appreciate their patience throughout this period,” said Ms Haskell.

The next stage of the work will be on the old State Highway 1 slipway, to replace the remaining overland pipe from Willis Street to the interceptor.

“This has been put on hold due to the national lockdown,” said Ms Haskell, “and we will be letting

the community know when this work is scheduled to recommence, though it will not be disruptive to businesses or residents.”

Work to renew wastewater and stormwater pipelines is currently underway in Dixon Street. This is expected to be completed by the end of June and Dixon Street will then open to uphill traffic.

Ground injection work to stabilise the old adit under Dixon Street is expected to take about two weeks and our aim is for this to be undertaken in July. We will provide a further update once we have confirmation from our contractors.



Sections of the temporary pipe situated above ground on Willis Street were welded together on site.



Kate Brooks and Mikey Gibson of The Body Shop in Kaiwharawhara check one of their adopted 360 Stormwater litta traps.

# Catching litter before it reaches the sea

The Body Shop in Kaiwharawhara has adopted three stormwater 'litta traps'—traps that catch litter in stormwater sumps (drains) before it goes out to sea— for a research project run by NIWA. Once a month (before lockdown temporarily suspended the project they emptied their traps across the road, analysed the contents and sent them to NIWA, which is enlisting businesses and private citizens to help investigate the effectiveness of litta traps and outlet nets for public and private use. The project is set to resume in Level 1.

The Body Shop Manager Kate Brooks said their trap off the main road

caught almost entirely organic matter, while the other two traps on the main road— a commercial and residential area—collected a lot of rubbish.

"Cigarette butts were surprisingly plentiful, she said.

"I guess one smoker chucking a butt or two every day adds up over a month."

Food wrappers, cans, rubber bands, and plastic fragments are also common. "We get a lot of polystyrene beads, too—one big bit breaks into thousands of pieces."

Kate said she was keen to participate in NIWA's study upon learning that the beach at the bottom of Kaiwharawhara Stream, across the motorway from The Body Shop, was the most densely

“One smoker chucking a butt or two every day adds up over a month.”

plastic-polluted beach in New Zealand. "It's a wind funnel down here. And with a commercial area being right next to the





*Kaiwharawhara Stream before...*



*...and after tree planting.*

stream, rubbish that doesn't go out with the stormwater ends up blown into the stream, and it's a very short journey under the road to the beach."

As well as helping with NIWA's study, The Body Shop does general litter clean-ups as well and plants trees along the stream. Kate said she'd like to give local business Wood's Waste a shout-out for supplying a free skip during clean-ups. "The stream's way better than it used to be. It'd be great to see lots of businesses get involved in this kind of thing."

## People power

Angus Napier and his family adopted three stormwater traps in residential Ngaio for the study. As with The Body Shop, analysis involves removing inorganic matter for sorting and classifying once a month and sending the results to NIWA.

Angus described the job as exercise with a bonus. "The traps are all in walking distance, so we just combine emptying the traps with a walk. It takes about five minutes to empty a trap. Sorting the litter from the organic matter back at home takes more time. It can be a bit soggy and tends to stick together"

He said their traps aren't in high-polluting areas. "It's mostly organic matter. We usually collect about three times more litter on the streets while



**It's a family affair.** *The Napiers at home sorting through the contents of a litter trap.*



*Calum Napier enjoys trap adoption.*



‘ We’ll focus on commercial areas like Jackson Street, Hutt City CBD, and Naenae and Wainuiomata shops. ’



**A three-week catch:** David Fahey, Sandy Beath-Croft and Gordon George of HCC with the stormwater outlet net at Fraser Park.

walking. There’s more on recycling days, especially if it’s windy, but people are obviously just chucking stuff out of car windows, things like fast food wrappers and cigarette butts. They don’t think it could end up in the sea.”

## Hutt City Council steps up

In an exciting innovation that promises to make a significant reduction in the amount of litter going into the harbour (an estimated ten tonnes from Lower Hutt annually), Hutt City Council is looking to install litta traps across the region.

Gordon George, Manager, Trade Waste for Hutt City Council, says that ideally the council, who are working in conjunction with NIWA and WelTec, would like to install about 500 traps. “We’ll focus on commercial areas like Jackson Street, Hutt City CBD, and Naenae and Wainuiomata shops. That’s where we’re finding the most litter is being produced.”

There are a few barriers though, with the state of existing sumps and grills being one of them. “We need to replace cracked and broken grills first. And clean out sumps that have been repeatedly missed by cleaning trucks because of parked cars.” Another issue is the varying shapes and sizes of the region’s sumps, some of which are not compatible with litta traps. However, Gordon doesn’t see these challenges delaying the project for too long, although the pandemic has definitely complicated things. “We’re really keen to make this happen.”

In a further innovation, Hutt Council is also trialling an outlet net—a net over the end of a stormwater outlet pipe—in Fraser Park, and is looking at other potential outlet pipe sites with easy access for installation and regular emptying.

The outlet net had been filling for three weeks on the day it was emptied and contained roughly one third litter. The big items were cans, plastic bottles



and wrappers; the rest was a mix of cigarette butts, polystyrene beads and a multitude of plastic fragments—stuff we want to keep out of the sea and on our beaches.

## Education is the key

Sandy Beath-Croft, advisor waste minimisation and sustainability for Hutt City Council, says litta traps first came to her attention in 2016 from an unexpected quarter, when Wilson School in Petone asked the council for permission to install two in Jackson Street for a student-led science project supported by Mountains to Sea.

The students went on to collect 2,680 pieces of rubbish over 12 weeks, and won an education award for science innovation. Since then, science projects for schools using litta traps have become popular. Mountains to Sea, Wellington Water and NIWA have litta traps available for loan to schools, courtesy of Stormwater 360.

Sandy thinks education is the key. "The traps are great but there are about 10,000 stormwater drains in Lower Hutt and we can only afford traps for a small proportion. The Hutt Valley acts as wind tunnel, which doesn't help. We're going to introduce clips for our rubbish bin lids and new lidded wheelie bins for recycling. But the main problem is human behaviour. People need to stop dropping stuff in the street and in other public places."

NIWA's Dr Amanda Valois, who is leading the litter capture research project, said that NIWA have installed 18 litta traps and two outlet nets in Ngaio and Kaiwharawhara, and there is growing interest.

"Porirua City Council are also getting traps as part of their wider strategy to improve the harbour. And now people have begun to adopt litta traps. I think this is a real opportunity for citizens to take responsibility."

Dr Valois would also like to see



*NIWA's Dr Amanda Valois in the field.*

behaviour change around litter. And she thinks that litter is being mismanaged in our windy environment. "Too much gets away on rubbish and recycling days. It's good to see Hutt City Council acting on that and I hope other councils follow suite." She would like to see the contents of litta traps continue to be analysed once installed by councils and businesses. "This is part of a bigger story. It would be great to combine our findings with those of Sustainable Coastlines, who are researching litter on beaches all around New Zealand. An app that showed the

amount of litter being picked up in drains and on coasts in real time would be really useful. I think it would galvanise people into action. And that action would hopefully include changing the way we use plastic."

If you would like to join NIWA's study and adopt a litta trap, please contact Dr Valois at [Amanda.Valois@niwa.co.nz](mailto:Amanda.Valois@niwa.co.nz)

# Rehabilitation at Moa Point

Critical asset inspection leads to durable solution



An above-ground demonstration of the pipe lining machine by Adam, a foreman for our contractor, Interflow, showed how the plastic compound spirals forward and is glued into place as it advances through the host pipe.

In a trenchless operation, a section of wastewater pipe near Moa Point Wastewater Treatment Plant has been lined to increase resilience and maintain reliability.

The project was fast-tracked after an inspection of a section of the main pipe which carries Wellington's wastewater to Moa Point for treatment—known as an interceptor—revealed internal corrosion exposing reinforcement bars.

The inspection was part of Wellington Water's standard ongoing review of critical assets that we make to understand the condition of our assets and prevent failures that impact people and the environment. Had the damage gone unnoticed until the pipe failed, there could have been a significant impact on the environment, or, as we saw with Dixon Street, a very expensive diversion operation to keep wastewater out of the sea.



A CCTV view of the interceptor's reinforced concrete interior revealed corrosion caused by hydrogen sulphide.





Wellington Water's team included Interflow's Project Manager Saadia Ali (left) EN Ramsbottom's Project Leader Michelle Hoffmann (centre) and Graduate Civil Engineer Kirstin Woods (right) from Stantec.

Before the damaged section of the tunnel could be fitted with the new corrosion-resistant lining, it was over pumped, which means the wastewater flowing through the interceptor was diverted in order to allow the lining machine to operate within the pipe. The over pumping was undertaken on behalf of Interflow by local contractor EN Ramsbottom.

Michelle Hoffmann, project leader for EN Ramsbottom, one of Wellington Water's contract panel, said that getting the diversion pipes in place before lock down was a challenge.



Pumps and temporary piping were used to by-pass the corroded section of pipe.

“The priority was to put a contingency plan in place in the event of the interceptor failing. Once that was in order, we trialled and fine-tuned the pumping before Interflow put in the new lining.”

“We had to act very quickly to get everything on site before the lock down took effect. The priority was to put a contingency plan in place in the event of the interceptor failing. Once that was in order, we trialled and fine-tuned the pumping before Interflow put in the new lining.”



*Michelle Hoffmann on site with Wellington Water's Chief Advisor Wastewater, Steve Hutchison.*

She said that while the working environment during lock down had its challenges, there was an upside. “With the airport being so quiet, our work with large machinery hasn’t been restricted between 1 and 6 am. And we have not had to contend with vehicles parking in the long-term car park, where we have set up our pumps. Silver linings, you could say.”



*A durable, long-term solution: Saadia Ali with a section of the PVC used to line the interceptor.*

Interflow’s Project Manager, Saadia Ali, said the material used to line the interceptor was PVC. Concrete grouting was then injected between the original pipe and the new liner. “PVC has a proven service life of 70-plus years in aggressive sewerage conditions, so this is a durable, long-term solution.”

Due to the trenchless re-lining process, digging up the road was not required, leaving service lines in the area undisturbed and minimising disruption. The interceptor is now fully operational.



# We need to talk about change

At a climate reality presentation



*Follow the Leaders, Berlin, Germany, 2011. (Isaac Cordell.)*

Wellington Water's Rob Blakemore has been talking about climate change. And people are listening! After attending Al Gore's Climate Reality Project training in Brisbane last year, he became a climate reality leader and has presented to a variety of different audiences, including Energy Management Association of New Zealand, Upper Hutt City Council Sustainability Group, and the Sustainability Trust in Wellington (the meeting shown in the photo), an event hosted by the Institute of Public Works Engineers Australasia and Water NZ. This was co-



*Wellington Water's Rob Blakemore presenting at the Sustainability Trust.*

presented with Frans Plugge— founder of ECOsystems and a fellow climate reality leader.

The Climate Reality Leader slide deck that certified leaders like Rob and Frans present to audiences makes for a powerful experience.

The combination of striking images, video and very worrying data, combined with insights from the presenters delivered a powerful story on the science, extent and urgency of the climate crisis.



*More sustainable energy is needed to reduce greenhouse gas emissions.*



*National boundaries and politics disappear when looking at the big picture.*



*Global temperatures are rising: A truck stuck in melted asphalt.*

Part one of the presentation was very sobering. The cumulative effect of the slides (of which only a few are shown here) and the stories told around them vividly depicted the scale of the climate crisis and the brief amount of time we have left to make the changes necessary to avert a global catastrophe. The urgency of the call to action was undeniable but at the same time—as anyone who has engaged with the climate crisis knows—the size of the problem can be intimidating to the point of becoming paralyzing. The presentation offered unexpected hope when Rob turned to the dramatic rise in renewable energy creation and consumption—which has been much faster than predicted and rising.

Given that the presentation described was at the Sustainability Trust and co-hosted by engineers, it probably wasn't surprising that the audience accepted the science. There was, however, lively debate following the presentation around prioritising individual or collective responsibility. And then on the climate crisis being just one symptom of the core problem of global throw-away consumer culture—and therefore something that carbon reductions alone cannot fix.

Rob reports that being with people who hold differing opinions on a climate change issue yet continue to engage in constructive conversation may have been the greatest surprise of the evening—it hit home how little we talk about the climate crisis in real life. For most of us, it's a story played out on screens, one issue among many delivered in bite-sized pieces among a flood of competing information.

Agreements were reached: that both individual and large scale change is being supported by green technology; incremental change is more likely to be accepted, but these small changes need to be quick and



coordinated; fossil fuel subsidies need to end, for the good of the planet and to encourage consumers to invest in sustainable energy; and on the fundamental importance of people connecting and having conversations that lead to change.

Following the meeting, Water NZ decided to form a climate change special interest group. Before lockdown, Rob presented at the Hutt Valley Chamber of Commerce and now, with lockdown ending, he is keen to present wherever there is an opportunity. So if readers are members of organisations or groups that would be interested in debating or learning about climate change, please feel free to contact him at [Robert.blakemore@wellingtonwater.co.nz](mailto:Robert.blakemore@wellingtonwater.co.nz)

#### **Rob**

#### **Blakemore**

Rob is Chief Advisor, Service Planning for Wellington

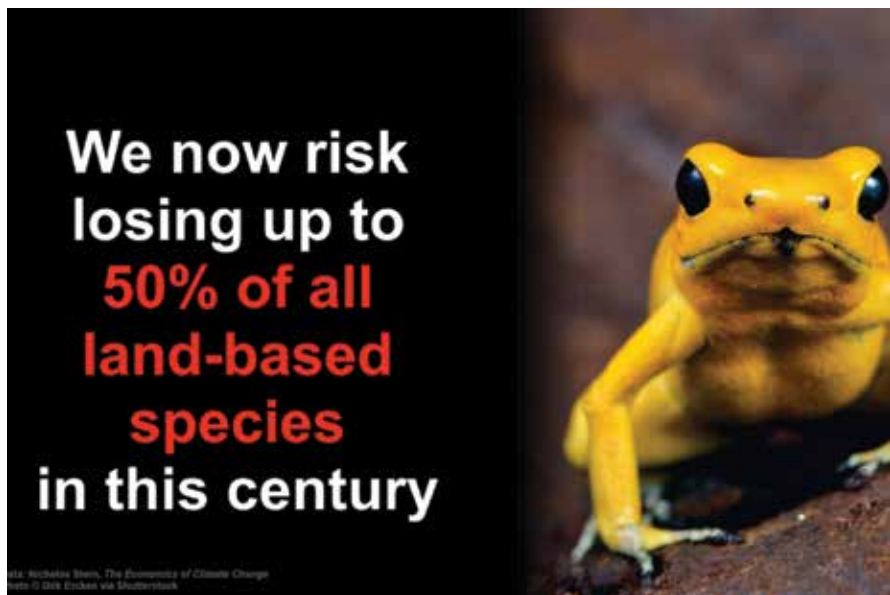


Water. His team prepares water investment plans for the Wellington metropolitan region, with increasing emphasis on sustainable services, rather than asset solutions, which encourage people to be aware of the impact they have on the environment.

Rob has 41 years of experience in the water industry here and overseas. He is a former Board member and President of Water New Zealand, and is a member of the Ministry of Health Drinking Water Advisory Committee. He is a life member of Water New Zealand and a Fellow of Engineering New Zealand. He is married and has three children and four grandchildren.



*In the US, extreme downpours are now happening 30 percent more often than in 1948.*



*Climate change, along with other factors such as ecosystem loss, is contributing to the worst extinction event since the disappearance of the dinosaurs 65 million years ago.*



*Experts project that two-thirds of the world's population will be living in water-stressed countries by 2025.*

# Leak sniffer dogs

## Sniffer dogs help find leaking water mains

Scottish Water is deploying a team of specially trained dogs to help locate leaks in pipes in rural areas where the water does not always show on the surface or can be hard to distinguish from rain water.

Two spaniels, called Snipe and Denzel, aged two and three, have been trained by ex-military dog handlers to detect the smell of chlorine in treated water.

The dogs' sense of smell is about 40 times greater than humans' because they have up to 300 million olfactory receptors in their noses compared with our six million. Tap water consists of one part chlorine per million parts water - with a dog's nose calculated as being able to detect one particle of an odour or scent in a billion. They are trained by scent association and rewarded for smelling chlorine, which rises to the surface from pipes, with prizes of balls, toys or treats.

Snipe, a cocker spaniel, and Denzel, a springer, are finishing a trial programme in parts of Dumfries & Galloway and Ayrshire surveying Scottish Water's trunk mains and searching for leaks before the utility decides whether to use them on an ongoing basis.

During the trials, the dogs found leaks on a 24-inch steel main in the Dalmellington area and on a nine-inch main near Lochmaben.



**On trial:** Scottish Water's Craig Garment and dog handler Luke Jones with Denzel (Photo: Scottish Water/SNS).



Denzel with his dog handler (centre) and Scottish Water staff. (Photo: Scottish Water/SNS).

Some bursts in rural locations are difficult to pinpoint and we are always looking for innovative ways to do the job more effectively and to continue reducing leakage.

"That's where these sniffer dogs come in and we are hoping that Snipe and Denzel can continue to demonstrate during the trial period that their sensitive noses can detect treated mains water at very low concentrations.

"When the dogs help pinpoint the exact locations of leaks we then come back to that point, investigate, excavate and repair the bursts. If their work in certain rural locations helps us achieve that then they could prove to be great assets to Scottish Water."

*This article was previously published by Scottish Water's magazine WWT.*

They have up to 300 million olfactory receptors in their noses compared with our six million.

Craig Garment, a Scottish Water network analyst in leakage delivery who has been working with Cape SPC, said: "We use modern technology such as ground microphones, correlators, hydrophones and other devices to pinpoint the exact location of underground assets and leaks.

"However, Scotland gets a lot of rain and it can be hard to distinguish surface water from leaks.



# Restoring the mauri of Te Whanganui ā Tara

By Maiora Dentice, Te ao Māori Capability Advisor



*Kura Moeahu from Taranaki Whānui placing a rāhui on Wellington Harbour on 23 December 2019 after the failure of a wastewater pipe.*

In te ao Māori (Māori worldview) we understand that the environment has natural processes in place that allow it to sustain itself and can therefore be suitable to the needs of all living things (animals, humans, plants etc). Sometimes our actions make it difficult for the environment to manage this process, especially when there's an unnatural addition into the environment. Examples of this are oil spills, discharges of chemicals from factories into waterways as well as discharges of

wastewater into waterways.

Māori have come to understand this process through the relationship that they have with their environment and can be summarised through an understanding of cultural concepts.

**Mauri** is something's life force. It can be measured through indicators of quality of life. It can be impaired and restored naturally (i.e. through illness) and can also be impaired and restored unnaturally (i.e. impacts of the

actions of others).

In people, their mauri is measured by all aspects of their health (physical, mental, social and spiritual).

In the environment, mauri can be measured by the visual quality and quantity of life within the environment (e.g. that there is life living within the environment and how much). Mauri can also be measured by the way in which something sounds (e.g. wind through the trees, flow of a stream).

Additionally, mauri can be measured by something's ability to provide and sustain life to others.

**Mana** is the power/authority something has. The mana something has is not decided by the thing itself, rather it is recognised by others.

Māori have given a lot of mana to water as it is the source of life for everything and therefore needs to be respected as such.

**Tapu** is a restriction placed on something to keep other things safe. In contrast, noa is something that is free from the restrictions of tapu. Typically, a process of whakanoa can be undertaken to remove the restrictions of tapu.

**Utu** is another concept that is important to understand in this event. Utu in its simplest form relates to reciprocity. When someone does something bad to someone, utu allows for the other person to



*The extent of the rāhui placed on the inner harbour 23-27 December 2019.*

Additionally, mauri can be measured by something's ability to provide and sustain life to others.

do something bad in return to that person. Similarly, if someone does something good for someone else then the other person is expected to do something good in return. Ultimately this process is to maintain **ea**, which is balance. Utu also works if someone does something bad to someone else, acknowledges they

did something wrong and tries to maintain balance by doing something good to help right their wrong.

The wastewater overflow into Te Whanganui ā Tara impaired the mauri of the harbour and has therefore had an effect on the mana of the harbour in its ability to sustain life for all that lives in and around the harbour. The increased contaminants from the overflow into the harbour has made it tapu which is why a rāhui was placed on the area by Taranaki Whānui to allow the harbour to continue its natural cycle to cleanse itself and restore its mauri.

We need to help the harbour restore its mauri. To do so, we first need to stop the overflow into the harbour. This means initiating the best practicable option on land to eliminate any risk of wastewater overflow into the harbour. Once the overflow has stopped, the harbour can then follow its natural processes to flush the wastewater out to sea.

To help this process, we need to employ people to remove solids from the wastewater overflow and continue to monitor the quality of the water going into the harbour from our networks.

These actions don't help to restore balance to the impaired mauri of the harbour and impact on mana. However, there are other actions we can undertake to right our wrongs. For example, we can clean up around the harbour and the waterways that enter into it. We can contribute resources to a wider project to help improve the harbour environment. Ultimately, for us to restore balance from this wastewater overflow, we need to leave the harbour in a better condition than it was before the overflow.



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Kia Reretahi Tātau

Our vision is to create excellence in regional water services so communities prosper. Our customers, the residents of the metropolitan Wellington Region, and South Wairarapa, use the services we provide: drinking water; wastewater; and stormwater in their homes, businesses, and communities every day.