WATER

Issue 186. September 2014

Addressing the Renewals Bow Wave – *Water New Zealand* is Getting the Oars Out

Dunedin Rural Networks – Wastewater and Water Modelling

National Party Water Policy

water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

ON TOP DOWN UNDER

Deeco

DEECO SERVICES Ltd

Provider of Water Process Solutions for New Zealand since 1938

METERING

Domestic and Bulk

SENSUS

Electromagnetic Flow Meters

EUROMAG INTERNATIONAL

Automatic Meter Reading Sys-

maddalena

GSM/GPRS Data Loggers

CommCell 4

FILTRATION

Innovative Filtration Solutions

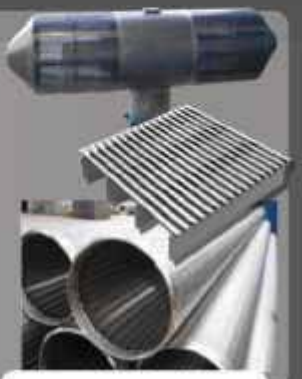
ARKAL

PILTOMAT

AMIAD

amiad WATER SYSTEMS

Vee Wire Screening Solutions



Johnson screens

VALVES

Water Control Solutions

BERMAD

Backflow Preventers

WILKINS a ZURN company

High Performance Air Valves

VENT-O-MAT

Deeco Services Ltd | Water Process Solutions

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

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

Wellington | Auckland | Tauranga | Christchurch

water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

Postal: PO Box 1316, Wellington 6140
Level 12, Greenock House,
39 The Terrace, Wellington, 6011
P +64 4 472 8925, F +64 4 472 8926
enquiries@waternz.org.nz
www.waternz.org.nz

WATER JOURNAL
Managing Editor: Robert Brewer, robert@avenues.co.nz, P +64 4 473 8054
Editor: Bernadette Stevenson, editor@avenues.co.nz, P +64 21 493 564
Advertising Sales: Noeline Strange, P +64 9 528 8009, M +64 27 207 6511, n.strange@xtra.co.nz
Articles: To contribute to future issues please contact Robert Brewer, editor@avenues.co.nz
Design: Avenues, Level 1, 56 Victoria Street, PO Box 10–612, Wellington, P +64 4 473 8044
www.avenues.co.nz
Distribution: Hannah Smith, P +64 4 495 0897,
ISSN 1177–1313

The next issue of *WATER* will be published in November 2014.

WATER

On the Cover

Water New Zealand News

Features and Articles

Cover photo: Mount Cook reflected in Lake Matheson – istockphoto.com

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.

Steve Couper

The Only Constant is Change

Reflecting on the past five years representing you on the *Water New Zealand* Board, it is interesting to note the change that has taken place.

We often talk about change as if it is a one-off event where we are going to go from one state to another in a single step, but in reality, change is all around us all the time, typically through incremental steps – slowly but surely things change, and before you know it suddenly things look quite different. In fact, the only constant is change itself.

In 2009, when I joined the Board, the greater Auckland region had eight local authorities and three Council owned water utilities; Christchurch was not considered an earthquake risk; and Australia was the lucky country.

So what has *Water New Zealand* achieved over the past five years? And how have we measured up to what you, the voting members elected successive Boards to achieve?

We have continued to carry forward the work of the Turnbull Group around the benefits of water sector reform. The implementation of Watercare into an Auckland wide CCO has provided sound evidence around the success of the utility model. We now have 29 Councils in our annual benchmarking study, and we are working closely with Local Government New Zealand on the 3 Waters study to collect further data and develop an evidence base around sector performance and understanding of the issues and funding gaps.

We have continued to engage with our Australian friends with both Presidents and CEOs visiting each other's conferences on either side of the Tasman. AWA is about four times our size and we still have a lot to learn from them.

We have worked closely with CRIs to ensure good science is adopted across the sector through specialist science streams at the conference, and we are working with the IWA to coordinate our conference in 2016 with the World Water Congress to be held in Brisbane.

We have established the Water Utilities Association (WUA) to represent the water utilities and local authorities' advocacy interests in the water space.

We have an engaged a young persons' group of members who are looking to push our younger membership and in particular engaging with universities to show the opportunities in the New Zealand water sector.

We have continued to work with all our SIGs, WSMG, and other groups to maximise the networking opportunities and we have re-invigorated the technical works program.

So after five years and two strategic planning sessions, is the Association in a better place than it was in 2009? I believe that it has certainly advanced and we have a clear picture as to where we are heading. During my time, each Board has continued the relentless task of competing for relevance in the eyes of the influencers in Wellington and the public at large. While we are not there yet, and may not have pleased everyone along the way, we have progressed, and we have increased the understanding of the value that the water services sector provides to New Zealanders. There is still a lot to do, and this will require strong leadership before we fully realise our potential.

I would like to acknowledge the work of the 16 Board members I have served with. All are water sector "lifers" and have provided their time free of charge for the benefit of the Association, in particular, Martin Smith and Clive Rundle. Having just spent two years as President I understand the additional work load.

I would also like to acknowledge the work and energy provided by our CEO Murray Gibb, who retires at the end of this year. Murray who was a veterinarian by trade, dived into water "boots 'n' all" and provided passion and enthusiasm to bring about change. He has been a champion in providing this Association many opportunities to present our case to Ministers and other influencers.

As we work our way towards the 56th annual conference, I congratulate Brent Manning for his election to President. Brent is a leader who understands the issues facing our sector. Coming from a local authority background, Brent is well positioned to work with IPWEA and LGNZ on water initiatives over the coming two years.

In finishing this final column I acknowledge you, the members – the strength of this Association is built around the membership, and the desire to make improvements through sharing our knowledge. This last point is vitally important. Through sharing information we have developed a knowledge base and network of people who have the expertise to drive technological and commercial innovation across our sector. My hope is that *Water New Zealand* continues to provide knowledge sharing opportunities and that our engineering and science graduates see our sector as an exciting career opportunity. ■

Steve Couper,
President, Water New Zealand

New Members

Water New Zealand welcomes the following new members:

CLAIRE DEUTSCH
BRENT KNUDSEN
ALBERT HO
SIMON WANG
NICOLA TAN
EVE MATAMMU
OMAR AL-KARBOULI
PHIL HOUGHTON
JOSEPH HARRIS
THOMAS BOARD
CHRISTIAN GAMST
KAMA SLIEPEN
HAYDEN PIPE
SIDDARTH RAMAN
LYNLEY TOY
ALLISON BAUGHAM
MATT VAN DER PEET
ANNA MARBURG
TIM MORGAN
RODRIGO VILA-SILVA
BRADEN AUSTIN
WAYNE WILLIAMSON
NICK HOUSTON
ANDREA PHILLIPS
LYLE BARKER
MARIE DENNIS
TOM SWINDELLS
JEREMY WILSON
NEIL CHERRY
BILL HOLLINS
AMANDA INGLIS
MICHAEL MUNTISOV
DAVID LOCKE
VILAVAHN SOUVANNAVONG
PETER WILLIAMS
NEVILLE ANDERSON
SIMON ROBB
TREVOR ROBB
CLAYTON FAIRFAIRN
PETER ZEELAND
RYAN FISHER
DANIEL CLIFFORD
FRANK CHEN
MATT DOWDALL
BRETT BEAR
DAVID PERRY
ANDREW MERCER
CAROLINE BOOT
ANDREW STEELE
GEOFF HORLER
MARCELLO BOSSOLA
TONY HOOPER

Murray Gibb

Election Policies and the Revised National Policy Statement for Freshwater Management

It is election time and parties have put out their policies. Improved management of water features high in the offerings, reflecting the community's desire for the resource to be better managed. Declining water quality is consistently rated as our number one environmental concern.

All parties want to see improved management. The most detailed policies come from the Labour, Green and National Parties.

The Labour Party intends to revise the national policy statement on freshwater management (NPS-FM) based on the principles of the original Sheppard version and charge irrigators resource rentals for the use of water.

The Green Party proposes a protected rivers network to safeguard some from any development. It suggests the NPS-FM is too weak and would strengthen it and implement national environmental standards for water quality and river flows. It wants all rivers to be swimmable by 2020.

The National Party offers more of the same. The NPS-FM will be reviewed in 2016. It intends to press ahead with reform of the Resource Management Act including allowing for collaborative processes for making decisions on water and simplifying planning. It would press ahead with the Environmental Reporting Bill which is currently before Parliament.

At the time of writing, a search of the minor parties' websites doesn't bring up any specific policies on water. All have generic environmental policies.

New Zealand First supports 'an evidence based approach to environmental issues which are often complex, challenging with high degrees of uncertainty.' It advocates for government and industry to work together to address pollution.

The United Future Party would continue to 'push for the establishment of national environmental standards on key environmental factors such as water quality that will protect the environment as well as giving local councils, businesses and individuals certainty as to what is required on a consistent nationwide basis'.

The ACT Party suggests New Zealand's environment would be better managed with fewer and clearer regulations, and stronger property rights. 'Property owners would have a greater incentive to be good environmental custodians because they would benefit more from their ownership'.

Editorial writers have added their support for new policies to deal with water. The Dominion Post has argued for more urgent attention than the Government's response to date, labelling it 'lethargic and vague'. The New Zealand Herald has come out in support of the Green Party's proposal to make all rivers swimmable by 2020.

> "The most obvious is that prior to the NPS-FM being implemented in 2011 there were no rules preventing water quality from declining."

The revised NPS-FM has come in for a fair amount of criticism. Specifically it is suggested the bottom lines that have been set will allow for further deterioration of water quality in some water bodies. The reasoning used is that councils are required to maintain and improve overall water quality in their regions and that available freeboard above the bottom lines might be used to achieve the overall objective.

Proponents of this view miss several points.

The most obvious is that prior to the NPS-FM being implemented in 2011 there were no rules preventing water quality from declining. While the stated purpose of the Resource Management Act is to promote the sustainable management of natural and physical resources, prior to 2011 there were no instruments requiring councils to prevent declining water quality. There are now.

Secondly, the NPS-FM sets a national objective specifically requiring rules to be set to safeguard the life – supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water. The proposition that the objectives framework doesn't allow for protection of indigenous freshwater fauna (analogous to coalmine canaries) is therefore incorrect.

Thirdly, the NPS-FM requires regional councils to manage water and land in an integrated way to avoid, remedy or mitigate adverse effects including cumulative effects.

Fourthly, it is for communities to decide on how they want to use the waterways within their regions. If communities want them all to be swimmable it is for them to ensure their councils set attribute states that achieve that goal.

Fifthly, the NPS-FM is designed to be applied as an integrated package. Arguing that specific attribute states are too lax to achieve the objectives ignores this point.

Finally, the proof of the pudding is in the eating. Some argue that regional councils are captive to sector interests and will therefore set minimal standards. A majority of the Otago Regional Councillors are farmers. The Otago Council has already implemented a plan for water. The plan sets limits on water quality well above the bottom lines mandated in the NPS-FM. It goes even further by setting attributed states for water clarity which are not required under the policy. In addition all rivers in the region are required to be swimmable.

Missing from the debate is the cost of meeting community goals.

To date there has been limited economic analysis on the cost of meeting the standards. What has been done suggests that in those areas studied the cost to individual domestic property owners for upgrading wastewater systems will be many hundreds of dollars annually. To this must be added the cost of upgrading stormwater infrastructure. If the intensity of dairying is required to be reduced to meet community goals the cost of forgone production will also need to be added.

Stated aspirations are not always matched by actual behaviour. Most people profess to dislike cage layer egg production. The contents of their supermarket trolleys corroborate their hip pocket preferences. ■

Murray Gibb
Chief Executive, Water New Zealand

IMPLEMENTING REFORM

Water New Zealand's Annual Conference & Expo

Claudelands, Hamilton | 17–19 September 2014

Conference Registration

Registration is still open at waternz.org.nz for the *Water New Zealand* Annual Conference & Expo 2014.

The full programme can be downloaded from the Conference page on the website.

Conference Theme and Highlights

A challenging and interesting programme has been put together for this year's conference with the core theme being ***Implementing Reform.***

This year's conference will offer over 90 presentations covering every aspect of the water environment and its management including ASTT Trenchless Technology, workshops on SCIRT learnings, Asset Management, and a panel led by Nick Walmsley on the *Water New Zealand* Technical Programme.

The programme will include general streams as well as specialist streams of Modelling, Operation, and IWA.

Friday morning at 9.00am in the Claudelands Conference and Exhibition Centre is the *Water New Zealand* Annual General Meeting and this will be followed by a panel discussion on Water Pricing led by Ian McKenzie, Neil Deans, Chris Lewis and Kevin Hackwell.

Conference Exhibition

Visitors are welcome to come along to Claudelands to walk through the Trade Expo. Visitors must register at the registration desk on arrival to be issued with a visitor's pass on both Wednesday and Thursday.

The Friday morning is set aside as an exhibitor visitor morning and will be a great opportunity for exhibitor/client meetings.

Please note that access to the Expo on Wednesday and Thursday is during the times listed below only, there will be no exceptions.

Visitor Access Hours to the Expo Area

Wednesday 17 September
9.00am – 10.15am
11.00am – 12.15pm
2.00pm – 3.15pm
4.00pm – 5.15pm

Thursday 18 September
9.00am – 9.45am
10.30am – 11.45am
1.30pm – 2.45pm
3.30pm – 5.00pm

Friday 19 September
9.00am – 12.00pm

Water New Zealand Modelling SIG AGM

The 2014 Annual General Meeting for the Modelling SIG will be held during the Annual Conference on Wednesday 17 September at 2.00pm at Claudelands, Hamilton.

Water New Zealand AGM

The 2014 Annual General Meeting will be held during the Annual Conference on Friday 19 September at 9.00am at Claudelands, Hamilton.

STILL TIME TO REGISTER

waternz.org.nz

Networking Opportunities

Social functions throughout the conference continue to provide a prime networking opportunity. The Conference Dinner & Awards presentation again promises to be an entertaining evening.

Welcome Reception sponsored by ProjectMax
Wednesday 17 September, 5.30pm
Exhibition Halls, Claudelands

Operations Dinner sponsored by Applied Instruments
Wednesday 17 September, 7.00pm, Bazurk Restaurant & Bar

Modelling Dinner sponsored by Jeff Booth Consulting Ltd
Wednesday 17 September, 7.00pm, Bluestone Steakhouse

Conference Dinner & Awards sponsored by Hawkins
Thursday 18 September, 7.30pm, Claudelands

The following Awards will be presented at the Awards Dinner on the Thursday evening:

- Hynds Paper of the Year
- CH2M Beca Young Water Professional of the Year
- ProjectMax Young Author of the Year
- Mott MacDonald Poster of the Year
- Ronald Hicks Memorial Award
- Opus Trainee of the Year
- Orica Operations Prize

Premier Sponsors

Water New Zealand would like to thank our Premier Sponsors for their continued financial support

Applied Instruments

city care
Our people. Making it work.

Downer

HYNDS

LEIGHTON

xylem
Let's Solve Water

Keynote Speakers

Hon Karlene Maywald

Chair – Australian National Water Commission, Australia

9.40am, Wednesday 17 September

Continuing the Water Reform Journey

Karlene Maywald is the Chair of the National Water Commission in Australia. The Commission is responsible for oversight, assessment, and audit of State implementation of the National Water Initiative and the Murray Darling Basin Plan.

Karlene was a Member of the South Australian Parliament from October 1997 to March 2010 and was appointed as a Cabinet Minister from July 2004 until March 2010.

Her Portfolio responsibilities included The River Murray, Water Security, Small Business, Regional Development, Consumer Affairs, Science and Information Economy, and Assisting the Minister for Industry and Trade.

She is most noted for her significant contribution to progressing national reforms to the management of the Murray Darling Basin and setting the direction for long term water security in South Australia.

Karlene is also the Managing Director of Maywald Consultants Pty Ltd, providing water policy and government relations advisory services.

Mark Enzer

Group Practice Manager for Water and Environment – Mott MacDonald, United Kingdom

9.00am, Thursday 18 September

Global Water Issues – An Overview

Mark is Mott MacDonald's Group Practice Manager for Water and Environment. This role is principally about providing strategic leadership and fostering integration across the water and environment sectors in all the regions in which the company operates.

Mark is a keen champion of improvement and innovation in the context of collaborative delivery models; he is particularly interested in transformational change in infrastructure engineering, including the application of low-carbon sustainable solutions, product-based delivery, lean delivery processes, BIM, and design for manufacture and assembly (DfMA).

Invited Speakers

Mike Brewster

Chief Executive Officer – TasWater

11.00am, Wednesday
17 September

NEW THINKING

Water Industry Reform in Tasmania – 31 to 1: What Really Matters?

Mike Brewster is the inaugural Chief Executive Officer of Tas-Water, the state-wide water and sewerage provider in Tasmania.

He has previously held roles in the Tasmanian Department of Treasury and Finance as Chief Executive Officer of the Tasmanian Electricity Supply Industry – Business Transition Group, Chief Operations Officer – Energy at Aurora Energy, Chief Executive Officer at AETV Power, and General Manager (Consulting) at Hydro Tasmania.

Mike specialises in the leadership of major change programmes, building teams that excel, and mentoring of aspiring leaders.

A qualified Electrical Engineer, Mike has served as President of the Tasmanian Division of the Institution of Engineers, Australia. He holds a Masters of Technology in Project Management, a Bachelor of Technology (Electronics and Computing), and is a graduate of The Executive Programme at Darden Business School, University of Virginia.

Nick Brown

Stormwater Flood Planning Team Manager – Auckland Council

11.00am, Wednesday
17 September

DATA & MODELLING

Modelling – The Language of Prophecy

Nick is the Flood Planning Manager for Auckland Council. Nick works primarily within the catchment planning arena focussing on flood hazard assessment, flood mitigation, generally trying to understand the various mechanisms by which people are flooded, and how to avoid flooding before it happens.

Nick spends a lot of his time attempting to communicate highly detailed information to people who are not detail oriented. Nick has worked across the Three Waters in Australia and New Zealand. He enjoys socialising and is usually keen to chat about a wide range of topics whether stormwater related or not.

Alastair Bisley

Chairman – Land and Water Forum

11.30am, Wednesday
17 September

NEW THINKING

Collaboration Everywhere – How Good is That?

Alastair Bisley has chaired the Land and Water Forum since the beginning of 2009.

From 1967 to 1998, he was a member of the Ministry of Foreign Affairs and Trade, and from 1994 to 1998 was Deputy Secretary and New Zealand's Principal Trade Negotiator.

During his diplomatic career, he was posted in London, Brussels, Sydney (Consul General), and Geneva (Ambassador to the World Trade Organisation, and Permanent Representative to the United Nations Office in Geneva).

From 1998 to 2004 he was Chief Executive of the Ministry of Transport.

He was a member of the New Zealand Meat Board for eight years from 2005 to 2012.

Richard Ward

National Infrastructure Unit – Treasury

12.00pm, Wednesday
17 September

NEW THINKING

A Step Change Beyond the Same Old: Responding to the Evidence Base

Part of a small team, Richard leads the work on the *National Infrastructure Plan*, managing the ongoing implementation of the 2011 Plan and working with infrastructure stakeholders to progress and develop the next version. Based in Wellington, Richard has particular focus within the Plan on the Water and Energy sectors and the workstreams of alternative sources of funding, integrated regional planning and coordination, and the ten-year *Capital Intentions Plan*. Prior to the National Infrastructure Unit, Richard has worked across a number of strategic and operational roles in the education and justice sectors, including Pasifika education, implementing a new regulatory framework for early childhood

education, and modernising the Courts collections and civil enforcement systems.

Andrew Newman

Chief Executive – Hawke's Bay Regional Investment Company Ltd

2.00pm, Wednesday
17 September

THE BIG PROJECTS

Ruataniwha – The Journey to Date

Andrew Newman is the Chief Executive of Hawke's Bay Regional Investment Company Ltd. He is currently overseeing the Ruataniwha Water Storage Scheme and other regional investments. Prior to being fully focused on this task he has filled the role of Chief Executive Officer of the Hawke's Bay Regional Council. In this role he has overseen a major refocus of the regional freshwater management strategy, and has initiated a realignment of the Council's investment portfolio to achieve a more active re-investment focus on regionally significant assets. Andrew has, in the past, convened the Regional Council Chief Executive's freshwater sub-group and has represented the Regional Councils in the Land and Water Forum "small group".

Prior to the move to Hawke's Bay, Andrew was based in Sydney and was the Chief Commercial Officer for a trans-Tasman Science Joint Venture between CSIRO and Scion focused on the Forestry and Wood Processing sector in Australasia.

Brian Park

Infrastructure Group – Major Projects, Watercare Services Ltd

2.30pm, Wednesday
17 September

THE BIG PROJECTS

Hunua 4 Watermain – A Major Trunk for Watercare Services

Brian has had a wide range of experience across all aspects of Auckland's trunk water supply and wastewater collection systems in his 36 years with Watercare.

Brian has been involved in design and project management of construction transmission watermains and management, operations and maintenance of the water supply transmission system and, for a number of years, the wastewater transmission collection systems.

For eight years Brian managed the operation, maintenance, and asset management of Ardmore and Papakura water treatment plants and the Hunua Headwork's. During his time at Ardmore and the Hunuas, Brian contributed to defining user requirements and the strategies for a number of significant projects including NZDWS2005 upgrades, the Cosseys Dam rehabilitation and tunnel reconstruction.

This background led him into his next role as Operations Risk Manager. During this time he promoted and championed resilience improvement initiatives across trunk water supply systems including Cosseys dam abstraction capacity increase and seismic upgrades of Otau aqueduct, Richardsons Portal, Redmans Aqueduct. He advocated for increased capacity out of Waikato and the need for the Hunua No 4 watermain.

His role in risk management and infrastructure resilience naturally led to his active involvement with Auckland Lifelines Group, NZ Lifelines, and related projects with the National Infrastructure Unit and GNS Science.

Currently Brian is working in the Major Projects Team of Watercare Infrastructure Group on the Hunua 4 and North Harbour Duplication projects – among other things!

Mike Skelton

Group Manager Transportation, Wanganui – Team Leader State Highway Networks

3.00pm, Wednesday
17 September

THE BIG PROJECTS

Manawatu Gorge Slip Rehabilitation – Why was this a Successful Project?

Mike has more than 30 years civil engineering experience which includes roading, services, sports facilities, CBD redevelopment, and rail facilities.

For the past 14 years he has worked extensively in State Highway network management.

In 2009 Mike was appointed manager of the Wanganui Transportation Group. This group had two networks contracts and has undertaken a significant proportion of the NZTA capital projects in the Manawatu/Wanganui and Taranaki Regions in recent years. Mike retained his role as team leader for the West Wanganui Network until 30 June this year, when the contract ended. Prior to this he held the same position on the East Wanganui Network (2001 to 2008). He was an influential figure in the restoration of the network following the widespread storm damage in February 2004 and of course more recently network consultant for the Manawatu Gorge restoration following the slip of 2011.

Mark Pennington

Senior Water Resources Engineer – Tonkin & Taylor Ltd

4.00pm, Wednesday
17 September

DATA & MODELLING

New Zealand Rainfall and Runoff Guidelines

Mark has 20 years of post-graduate experience, with a distinct focus on hydrological and hydraulic investigations and analyses. His recent experience spans between urban stormwater and regional river systems, where his role has been in conducting assessments, application of methodologies and in seeking mitigation options for a variety of predominantly flood related issues. Mark currently chairs the Rivers Group, a technical interest group of IPENZ, and is a committee member of the *Water New Zealand* Modelling Specialist Interest Group. He is also current chair of a steering group with an interest in establishment of national rainfall-runoff guidance.

Become a *Water New Zealand* Member Today

Start engaging now with other members of the water industry.

Keep up to date with the latest news, events and trends plus get access to event discounts, industry policies and information, and much more.

Join now at
www.waternz.org.nz
or phone +64 4 472 8925

Changed jobs or details? Let us know. Moving jobs doesn't mean you have to resign! Simply let us know your new employer contact details, and your membership will continue uninterrupted.

WATER November 2014

The next issue of *WATER* will be published in November. The themes are **water quality, drinking water standards,** and **demand management**.

Please contact the Editor, Bernadette Stevenson at editor@avenues.co.nz if you have any story ideas, contributions, or photos.

For all advertising matters, contact Noeline Strange on +64 9 528 8009 or +64 27 207 6511, or at n.strange@xtra.co.nz

To view the themes for 2014 visit waternz.org.nz and use the drop down links PUBLICATION/*Water New Zealand* Journal.

The deadline for the November issue of *WATER* is Monday 6 October.

Social Media

Follow *Water New Zealand* on **Facebook** and **LinkedIn**.

From our recent social media survey, members have indicated that they prefer these two media.

Connect **Like Us**

Global Accolade for BECA Project

Contact Energy's bioreactor project, undertaken by Beca, has been named the Global Winner of the IWA Project Innovation Awards Competition in the Design Projects Category.

Water New Zealand congratulates Beca and Contact on this unique, world-first solution to improve the quality of water in the Waikato River.

"It is not every day that a member of the New Zealand water industry is acknowledged on the world stage, competing against projects spanning Europe, Asia, and North America," said *Water New Zealand* CEO Murray Gibb.

The bioreactor was developed to reduce hydrogen sulphide (H2S) by harnessing naturally-occurring sulphide-oxidising bacteria in a low-energy, fixed-film bioreactor.

The IWA award recognises the innovative engineering design by Beca. This includes:

- A tubular biofilm reactor made up of almost 400 kilometres of 100mm diameter pipes creating the environment for the bacteria to absorb and convert the H2S
- Excavated soil and pumice for the site was mixed into low-strength concrete to hold the 1900 parallel pipes in place, allowing the use of thin-walled polythene pipes, which resulted in considerable construction cost savings, and
- The system is configured as a siphon; dramatically reducing energy consumption to treat the 13 cumec cooling water discharge.

This prestigious award is one of many for the Wairakei Bioreactor. These include the Gold Award of Excellence at the ACENZ 2014 INNOVATE Awards, a 2013 New Zealand Engineering Excellence Award, along with Energy Project of the Year and Environmental Excellence awards at the 2013 Deloitte Energy Excellence Awards. ■

"It is not every day that a member of the New Zealand water industry is acknowledged on the world stage, competing against projects spanning Europe, Asia, and North America."

Water New Zealand's
Asia Pacific Stormwater Conference

STORMWATER

20 – 22 MAY 2015, AUCKLAND

Liveable Cities, Liveable Communities

The 2015 Water New Zealand Asia Pacific Stormwater Conference is to be held at the Pullman Hotel, Auckland, 20-22 May, 2015.

Water New Zealand wishes to advise that the call for abstracts for the 2015 Asia Pacific Stormwater Conference closes on 30 September, 2014.

Theme: ***Liveable Cities, Liveable Communities***

Sub-Themes:

- Governance
- Water Sensitive Cities and Communities
- Flood Resilient Cities and Communities
- Rural Water
- Innovation and Technology
- Integrated Catchment Management Planning

Key Dates:

Call for abstracts: Now open

Call for abstracts close: Tuesday 30 September, 2014

Expo goes live: Thursday 9 October, 2014

Final papers due: Friday 27 February, 2015

Conference Sponsorship:

If you are interested in sponsorship opportunities please contact Elizabeth Fesherman for more information.
Email: elizabeth@avenues.co.nz or phone: 04 473 8044

Visit waternz.org.nz for further information on the conference or on how to submit an abstract

FLUID THINKING

Water. It's the world's most important resource.
But with our climate growing increasingly volatile, the way we manage it, treat it, and consume it has become more important than ever.

Fortunately, we understand water's ability to enhance our natural systems better than anyone. From flood risk management to creating water sensitive cities, our specialist water infrastructure and environmental professionals have the global experience needed to help you implement the most effective water management solutions possible.

And we do it for one very simple reason.
To make life better.

HARRISON GRIERSON.
COM

Opinion Piece – "What did Mike say?"

Ian McComb, Civil/Environmental Engineer

Whilst listening to Mike Gillooly, the Chief Resilience Officer from Christchurch City Council at the recent Stormwater Conference, I was struck by his comments suggesting that repeated property flooding was unacceptable in a "first world city". Mike's words were circulated by the attending press. The more I thought about these comments, the greater became my concern that a difficult community perception could be formed. Whilst the earthquakes have exacerbated the flooding, it was always there; as it is in many other cities and towns across the country.

The reason I am concerned is that climate variability presents another game changer and having the community expecting an unrealistic level of service could hamper an efficient response. But what is an acceptable level of service in existing urban areas? We can't simply refer to a *National Rainfall and Runoff Guideline* as it does not exist yet. What about the Building Code requirement that residential and communal buildings shall not flood in the 2% (50 year) event or the NZS 4404:2010 recommended 1% (100 year) event plus freeboard provisions?

NZS 4404:2010 freeboard heights

Building Type	Freeboard
i) Residential Buildings (including attached garages)	0.5m
ii) Commercial and industrial buildings	0.3m
iii) Non-habitable residential buildings and detached garages	0.2m

For new developments this is a reasonable start but my main concern is for existing residential areas. I am not alone in this regard; Tauranga City Council is currently going through a process to set its retrofit level of service. Having suffered large storms in the early 2000s the Council embarked on a $50 million programme in 2006 to retrofit secondary flowpaths and other improvements with some great results.

Tauranga Flood Mitigation Works

However, flooding has continued to hamper the community and hence the current round of action.

Hamilton City had very little stormwater reticulation until the 1980s when the Council invested around $80 million in the central city reticulation. However, this did not address the overland flowpaths as recent modelling has highlighted.

Secondary flowpath in suburban Hamilton

The Council requires a 10 year storm capacity reticulation system for commercial areas but only a two year pipe capacity for residential zones. Is this enough? As Hamilton has not had a major storm for over 20 years, the latent risk is not generally obvious.

Given recent storms, Tasman and Nelson Districts are both looking at the problem as well. Recently Nelson Mayor Rachel Reese has been reported as saying the city will have to pour 'tens of millions of dollars into stormwater reticulation' over the next decade to protect against more floods. She also said, "There should be a reasonable expectation that those one in 100-year events can be catered for." Is this realistic?

I suggest that retrofitting urban stormwater reticulation to a 100 year standard is prohibitively expensive and even providing secondary flowpaths is a very difficult process. Modelling, existing buildings, easements or land purchase, maintenance, safety concerns; the challenges are extensive. It's hard yes, but we still need to respond to community concerns and tailor our solutions to the community willingness/ability to pay. Whilst I believe no floor level flooding and 100 year reticulation goals are too ambitious, my lingering question is – how high should we jump?

Ian McComb lives in Nelson and is a civil/environmental engineer who has worked for local government in New Zealand for eight years. His previous overseas experience was mainly consulting in environmental and engineering planning. Current projects include working on the Steering Group seeking the creation of a New Zealand Rainfall and Runoff Guide. He can be contacted at ian.mccomb99@gmail.com if you wish to discuss this item. ■

Improvements – reverse profile road

Infrastructure Industry Training Organisation Launches as Connexis

The Infrastructure Industry Training Organisation (ITO) created following the merger between InfraTrain and the Electricity Supply ITO is now officially in business as Connexis. Serving the wider infrastructure industry, the new organisation is a 'one stop shop' providing training, qualifications, and support across the whole of the sector.

"We now think we have chosen a new name that is both modern and dynamic and which is reflective of our organisation."

Following the legal merger of InfraTrain and ESITO late last year, Connexis has been combining systems and processes to operate effectively as one organisation for the past few months. The latest step has involved the development of a new brand.

Board Chair Frances Hague says that the merger has allowed a combining of training, skills and resources in the infrastructure sector with the aim of providing even better service to people seeking training and the companies they work for. "We now think we have chosen a new name that is both modern and dynamic and which is reflective of our organisation," said Ms Hague.

"It is an exciting time in New Zealand across all the infrastructure industries, which need to support a growing national economy. We believe the new Connexis brand and our organisation provides us with the necessary framework and critical mass to help deliver this. As we continue to build Connexis our aim is to work with the industry to help provide skill capacity and capability development to add value across the sector," she said.

As well as civil construction and electricity supply, Connexis is also keen to strengthen its current focus on qualifications in the water industry. Pipe laying and water reticulation qualifications are crucial to the infrastructure industry.

Chief Executive Helmut Modlik says the industry grouping that Connexis serves has infrastructure that underpins and enables everything and everyone else.

"Water is clearly a crucial part of this mix," said Mr Modlik.

"By targeting a clear and related group of employers building New Zealand's infrastructure, Connexis is able to be very focused, and to offer synergies to its current and future customers," he said.

Mr Modlik is also committed to ensuring Connexis is known as the ITO that places its customers first. "We will be a valued partner to our industry only if we add value. To do that we must always remember that it's not about us; it's about our trainees, it's about our employers," said Mr Modlik.

The establishment of Connexis has seen the appointment of a new board of directors (including representation from both civil construction and electricity supply). Connexis operates principally from Wellington, Hamilton, Christchurch, and Auckland, with other field staff working from satellite offices throughout New Zealand.

Visit connexis.org.nz for more information.

Election 2014

To give readers of *Water* an insight into Party policies on water we are giving the Maori, Green, Labour, and National Parties the opportunity to describe the issues they see as important leading up to the General Election. In this issue, the National Party outlines its approach to water and its management.

National Party Water Policy

Water quality is one of the most pressing environmental issues this country faces. It is readily apparent that New Zealanders are genuinely united in their desire to ensure that our lakes and rivers are healthy.

For that reason, the Government has made changes to the existing National Policy Statement for Freshwater Management (NPS).

Environmental planning and decision-making on the use and management of natural resources has been in the hands of communities for more than 20 years.

Under the devolved responsibilities of the Resource Management Act 1991, regional councils develop regional plans and make rules in consultation with their communities.

But there have been calls for greater direction and guidance from central government on issues of national significance and where councils are bearing the costs of re-litigating the science that underpins the rules. Water quality is one of those issues, and this is what the water reforms are delivering.

The Government is balancing the autonomy of communities to decide what uses they want their water to be suitable for, with the expectation by all New Zealanders that our lakes and rivers meet minimum standards of health for people and ecosystems.

The national framework for setting freshwater objectives, along with its scientifically-defined bottom lines, is a tool to help councils and communities assess where their water quality sits and where they want it to be. It provides a platform for discussions in a common language on water quality. Water quality standards signal to our overseas markets that New Zealand is serious about its environmental integrity.

The NPS now provides a National Framework that directs how councils are to go about setting objectives, policies and rules about fresh water in their regional plans. They must do this by establishing freshwater management units across their regions and identifying the values (for example irrigation, mahinga kai, swimming etc) that communities hold for the water in those areas.

Councils are then required to gather water quality and quantity information on the water bodies to assess their current state and decide the water quality objective or goal (grouped into A, B or C bands) for each value the community has chosen based on the economic, social, cultural and environmental impact to that community.

The final step is for the community to assess how, and over what timeframes, those goals are to be met.

One of the main benefits of the amendments is to settle the science required to support freshwater objectives for ecosystem health and human health.

Specifying the contaminants or factors that must be managed to achieve national bottom lines, and the amount of each of them that corresponds to each of the A, B or C grading bands reduces the scope of matters that can be challenged through the plan development process.

This is more efficient than every council having to work through, and be challenged on, the science when they develop and review their regional plans.

Environment Minister Amy Adams stands on the bank of Arrow River in Arrowtown

Bottom lines are part of a framework that, for the first time, provides a consistent process and a common understanding of what different measures of water quality actually mean in terms of the ability to support the different activities and uses that New Zealanders want for their water.

Until now, regional councils and the courts have been left to interpret this on a case-by-case basis.

Defined bottom lines for water quality are a significant step forward for freshwater management in New Zealand because they draw a line in the sand for councils managing water quality.

"Ecosystem health" and "human health for recreation" are compulsory national values and must be provided for everywhere. The NPS now includes nationally-set minimum acceptable states for these two values, which are called national bottom lines.

In order for this process to work, the NPS now requires councils to account for all water taken out of rivers, lakes and groundwater, and the sources and amounts of contaminants going into them. This will provide councils and their communities with the necessary information to understand the impacts of freshwater objectives before they are set in the regional plan.

The Government has made these changes to ensure communities are involved from the outset in developing water plans that carefully consider and weigh all community interests in respect of each area to create plans that are enduring and ensure water quality and use is properly provided for over the long term.

Councils and communities are required to consider the costs involved when they make choices about how and over what timeframe they act to get the water quality they want. Where rivers and lakes are below a national bottom line, the council will need to put plans in place to improve the water quality. The methods and timeframes chosen to get water quality above a bottom line will affect the costs on the people using the water resource. These will be decisions for communities to make but it is important they have clear information informing these decisions.

> "Under the devolved responsibilities of the Resource Management Act 1991, regional councils develop regional plans and make rules in consultation with their communities."

The calls for all rivers and lakes to be swimmable are being heard loud and clear. There is a cost involved of course, and in some places it will not be economically or even technically feasible. National limits have to apply for all freshwater. The costs will fall on ratepayers, taxpayers and the businesses that provide jobs and wages.

The effective bottom line in each waterway is the existing water quality state, not the national bottom line. This only applies to water ways that need to be improved to a minimum acceptable state, which is the national bottom line.

Communities can – and will – elect to manage selected water bodies to the higher standards required for swimming. Thanks to the recently updated National Policy Statement for Freshwater Management they will do so with a better understanding of the science and the costs of those decisions for their local economy.

The really hard decisions still sit with the local communities that draw their livelihood, recreation and identity from their environment. The choices – and costs – still sit with them. ■

Confluence: The Democratic and Judicial Meeting of Minds

Helen Atkins – Partner; Vicki Morrison-Shaw – Senior-Associate and Phoebe Mason – Law Clerk, Atkins Holm Majurey

With the 2014 election in sight, eyes are on the Government and opposition parties as policy documents are rolled out and stakes are put in the ground. Come 20 September, the confluence of public opinion will decide New Zealand's next government. In this article, we provide a rundown of water policy from the major parties for easy comparison (noting that not all policy has been released). We also comment on the new National Policy Statement on Freshwater Management 2014, which has been published following a period of public consultation, including with members of *Water NZ*. The new NPSFM may be seen as indicative of future policy in the event of re-election of the current government.

We then provide an update on two appeals to the Board of Inquiry decision which granted resource consent to the Tukituki Dam and Ruataniwha Water Storage Scheme, which seek that the Board of Inquiry be directed to reconsider its decision. Finally, we make brief note of three recent cases of interest – the last of which has attracted a 'we told you so' from the irrigation camp.

National Policy Statement on Freshwater Management 2014

On 1 August 2014, the National Policy Statement on Freshwater Management 2014 came into force, replacing the NPSFM 2011. The NPSFM 2014 provides stronger guidance on the management of freshwater, particularly in directing the goals of management and the methods by which those goals are achieved.

> "Regional councils must identify freshwater management units, then identify the values held by these units and the attributes of these values, assign 'attribute states' in order to maintain the attributes, and formulate objectives with reference to these attribute states."

The NPSFM 2014 introduces a National Objectives framework which requires regional councils to identify freshwater management units, to set up a monitoring system for each unit, and to set up an accounting system for each unit. The policies are to be implemented as soon as possible, and fully completed by no later than 31 December 2025, with an extension to 2030 on grounds of impracticability and quality of planning. The 2030 backstop date was the implementation deadline for the NPSFM 2011.

Regional councils must identify freshwater management units, then identify the values held by these units and the attributes of these values, assign 'attribute states' in order to maintain the attributes, and formulate objectives with reference to these attribute states. The non-exhaustive values set out by the NPS include two compulsory values – te hauora o te wai or the health and mauri of the water and te hauora o te tangata or the health and mauri of the people. The NPSFM also sets out additional values including: te hauora o te Taiao (the health and mauri of the environment); mahinga kai (food gathering); mahi mara (cultivation); wai tapu (sacred waters); wai Maori (municipal and domestic water supply); au putea (commercial development); and he ara haere (navigation). The attributes include: for ecosystem health: – phytoplankton (trophic state), total nitrogen (trophic state), total phosphorous (trophic state), periphyton (trophic state), nitrate (toxicity), ammonia (toxicity), dissolved oxygen; and for human health for recreation – E.coli and cyanobacteria (planktonic).

Policy CA2(f) sets out relevant considerations in setting up the Objectives Framework. These include predictions of the future state of the unit, the spatial scale of the unit, any choices made between values, implications arising from the objectives for communities and resource users, and achievement timeframes. The objectives set by Regional Councils must also be consistent with national bottom lines for all freshwater management units unless in certain specified circumstances.

In order to implement the National Objectives Framework, the NSPFM 2014 requires that every regional council develop a monitoring plan and a freshwater accounting system. The monitoring plan must establish methods for monitoring progress towards the freshwater objectives, identify monitoring sites for each freshwater management unit, and recognise the importance of long-term trends in monitoring results. The accounting system must create records for each management unit, and be kept to a level relative to the significance of the quality and quantity issues in each freshwater management unit. The information collected must be, as far as reasonable, available to the public. The accounting system must be in place by 1 August 2016.

Political Parties and their Water Views

In light of the upcoming election, below is a rundown of the water policies of the major political parties, for easy comparison of confluence and divergence.

Precious.

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

Because Every Drop is Precious.

www.adriley.co.nz

Arthur D. Riley & Co. Ltd.

fieldsmart technology

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

Party (and relevant member)	Freshwater Policies
National Party (Amy Adams)	National's policy of reform is likely to continue, with amendments to the RMA likely in the event of re-election.
Labour Party (Meka Whaitiri)	Labour have strongly criticised the new NPSFM, calling the reform an 'election stunt' and the water standards 'incomplete and weak'. Labour promises a revised NPSFM based on the Sheppard principles, namely that: • Clean rivers and lakes will not be allowed to get dirty; • Dirty rivers and lakes will be cleaned up over a generation; and • Increases in intensity of land use will be controlled rather than permitted as of right. They further add that improvements to farm practice will be required to offset the additional environmental burden caused by more livestock, fertiliser and effluent.
Green Party (Eugenie Sage)	The central tenet of the Green Party's freshwater policy is that New Zealand rivers should be clean, sustainably managed and fairly shared (by humans) with other species. Four specific and detailed policy points are put forward – on water quality, commercial use of water, conservation of water and water as a public good. On the conservation and public good front, they envisage the recognition of spiritual and recreational values of water, encouraging water conservation for all water users, preventing water degradation, and protection of wild rivers. The party encourages the integrated catchment management of water, and for water quality to be managed to specific targets (through reform to the NPSFM), and with a minimum standard for all waterbodies to be suitable for contact recreation. An interesting policy is the mass roll out of biodigesters to manage farm effluent and protect waterways, based on an example in Canterbury. In the commercial sphere, the Greens advocate for retention of public resource-consent-based management of commercial water use rather than water trading mechanisms due to the importance of water to public and environmental well-being.
New Zealand First (Andrew Williams)	New Zealand First's water use and management policies include the production of a National Policy Statement on Water Resource Uses and a National Water Use Strategy prioritising domestic water takes, and then ensuring efficient and RMA-compliant commercial water use, state ownership of all large scale hydro-electricity generators, and a crown entity to hold all water storage facilities in trust for the people of New Zealand, allocating the water resource for irrigation and electricity generation in accordance with the proposed Water Use Strategy.
Maori Party	Maori Party water policy focuses on water management, restoration of water quality and environmentally sustainable land use that does not degrade water systems. Practical implementations include iwi environmental monitoring and evaluation of water quality, iwi involvement in governance, management and decision-making on freshwater within their rohe, expansion of the EPA to include Crown Minerals and freshwater, a stronger kaitiaki role for mana whenua, resourcing of Enviroschools, and subsidies for environmental impact assessments linked to businesses becoming more environmentally friendly.
Act Party	Act's water policy is encompassed by its environment and conservation policy, and involves fewer and clearer regulations and stronger property rights. The party considers that markets are the most important institutions for protecting the environment, and considers that water markets should be implemented.
Internet MANA (Beverley Ballantine)	The Internet Party's freshwater policy includes: • Review of the current water quality reforms carried out by the Office of the Commissioner for the Environment, with public submissions encouraged and hearings held; and • Producing a national 10-year Water Quality Plan by 2016, with a key aim as the resolution of water environment issues linked to agriculture and industry by 2025.
Conservative Party	The Conservative Environmental Policy has not yet been released, but Colin Craig has stated that it includes the principles "fertile soil, drinkable water, breathable air." Mr Craig has also stated, "Where public waterways are polluted as a result of industrial or farming activity, the culprit will be required to pay water cleaning costs."

Update on Tukituki

Appeals against the Board of Inquiry decision granting consent for the Tukituki Dam and the Ruantaniwha Water Storage Scheme (RWSS) have been lodged by the Royal New Zealand Forest and Bird Protection Society ("Forest & Bird") and the New Zealand Fish and Game Council's Bay of Plenty branch ("Fish & Game"). The appeals appear to be in reference to a change made by the Board of Inquiry between the Draft Decision and the Final Decision. This change altered the measurement of the dissolved instream nitrogen ("DIN") limit of 0.8mg/L, providing that where a land-user complies with the land use capability ("LUC") class of their land, they are deemed not to contribute to any exceedance of the DIN limit.

Fish and Game allege firstly that the changes made by the Board between the Draft Decision and the Final Decision were impermissible as they went further than 'technical amendments'. Secondly, Fish & Game allege that the above change fails to give effects to the NPSFM 2011 or the Regional Council's obligations under the RMA, and thirdly that the Board failed to consider the interrelationship of the DIN limits in the Plan Change and the RWSS consent conditions.

The Forest and Bird appeal is directed at the consistency between the plan change which permits the dam structure, and the RWSS consent conditions. Effectively Forest & Bird allege that the two documents do not support each other, and that neither fulfils the requirements of the NPSFM 2011.

A hearing date for the appeals has not yet been set but is likely to occur before the end of the year. At the time of writing it was not known what other parties will join the appeals.

Fluoridation of Municipal Water Supplies: *Safe Water Alternative New Zealand Incorporated v Hamilton City Council* [2014] NZHC 1463

Safe Water unsuccessfully sought an interim injunction preventing the Hamilton City Council from restarting fluoridation of the municipal water supply pending the determination of an appeal against the Council's decision to resume fluoridation.

In June 2013, the Council decided to cease fluoridating the water supply, following a special consultative process which received 1385 submissions in favour of stopping fluoridation and only 170 submissions in favour of continuing. However, upon stopping fluoridation there was considerable adverse reaction. This resulted in a referendum in which a two to one majority supported fluoridation. In *New Health New Zealand Inc v South Taranaki District Council* [2014] NZHC 395, the High Court held that it was not unlawful for the South Taranaki District Council to fluoridate its water supply. Following the delivery of that decision, alongside the referendum, the Hamilton City Council resolved to recommence fluoridation on 27 March 2014. Safe Water's appeal argued that the Council failed to appropriately consult on the March decision, and secondly that the Council failed to consider the reasons for the earlier decision to cease fluoridation in June 2013.

In regards to the interim relief pending the hearing of the appeal, the Court considered that Safe Water's appeal really related to the right to due process, rather than any claim that the Council could not lawfully fluoridate. For this reason, there was no need for an interim injunction to prevent fluoridation as this would not affect the exercise of due process following the appeal. The Court stated "*if Safe Water succeeds in its substantive claim, its best case outcome will be a declaration that the March 2014 decision was invalid and must be made again following a proper decision-making process. The outcome in this case could never be orders that the Council not re-fluoridate the water supply.*"

Water Take Prosecution: *Canterbury Regional Council v Lowe* CRI-2014-003-71

Mr Lowe, a director of Cairndhu Dairy Ltd faced three charges relating to taking water from the Ashburton River while it was on full restriction due to low flow levels in April 2013. However, the charges were dismissed due to delay in the Council officer reviewing the records which disclosed the offences, which meant that the charges were laid more than six months after the date of reasonable discovery of the offending. As the Judge noted, "the defendants escape by a whisker."

Pivot Irrigators are not Buildings: *Haldon Station, the Wolds Station Ltd, Federated Farmers of New Zealand (Inc) Mackenzie Branch, Fountainblue Ltd, Pukaki Downs Tourism Holdings Partnership and Southern Serenity Ltd v Mackenzie District Council* [2014] NZEnvC 136

In a decision which has been no surprise to irrigators, but nonetheless now resolved once and for all, the Environment Court has confirmed that pivot irrigators are not 'buildings' for the definition in the Mackenzie District Plan, rather they are vehicles under exception (e) in the 'buildings' definition of that Plan. ■

Technology for efficient water quality management & control

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

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

Filtomat AMF² Microfibre filters
Innovative self-cleaning microfibre water filter for treatment as fine as 2 micron

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

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

Arkal Spin-Klin Galaxy filters
Unique SpinKlin® disc filtration technology upscaled for high volume handling

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

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

wsp
water supply products ltd

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

Space Restrictions Drive Innovative Design

Ken Mains – Global Principal Technologist, CH2MHILL, Toronto, Canada

As community demand grows and regulatory drivers increase treatment requirements, municipal treatment plants often face the challenge of expanding their facilities within tight site constraints. The option of moving to new sites is often prohibitively expensive due to the reconfiguration of network systems. This challenge spawns innovative approaches to facility design, with the designers finding ways to decrease the footprint of unit processes and minimising the impact on adjacent land users. This article describes how similar challenges were tackled for the expansion of the very large Lakeview water treatment plant in Toronto by progress-ively replacing conventional treatment with high-rate processes such as ozonation, ultrafiltration, biologically activated carbon contactors and UV disinfection.

The Peel Region is a rapidly-growing mid-tier municipality that borders the western edge of Toronto. The approximately 1 million population is served by two water treatment plants along Lake Ontario; with water being pumped successively through six pressure zones. The Lakeview WTP, the largest plant, started operation in the 1950s using Conventional Treatment "CNV" (chemically assisted settling and filtration) and chlorine for disinfection. Fifty years later, (2002) the plant capacity was rated at 560ML/d, and increasing demands necessitated a capacity expansion. The treatment plant site was considered capable of accommodating up to 1080ML/d of CNV capacity. However, the area for future expansion was being used as sports fields, and the 1080ML/d assessment had not included for reservoir capacity to meet chlorine contact time needs for pathogen inactivation. The adjoining properties were residential, institutional, and industrial. The industrial lands were slated for future condominium; no land for further plant expansion was available.

By 2002, several other factors contributed to the Region reviewing its approach to water treatment and expansion at Lakeview:

- The Walkerton Incident, in which contaminated groundwater resulted in fatalities in a small town, prompted the province to regulate water quality (previously there were objectives) with increased emphasis on disinfection.
- A contract with the Region of York, north of Toronto, to provide York with 370ML/d of drinking water. This contract would require an increase in the capacity of the Lakeview site.
- Region decision to improve treatment capability in terms of pathogen inactivation, taste and odour, and ability to deal with contaminants of emerging concern (pharmaceutical and personal care product origins).

It became apparent that insufficient space existed to enhance the CNV process; a new approach was needed to make more efficient use of limited space, and to control costs. A site development plan was created that provided for 1800–2000ML/d of advanced treatment, together with pumping, storage, power and associated needs. Both sports fields are enabled to remain, preserving the adjacent amenities enjoyed by the community. One field will be above a buried storage reservoir.

The site was then developed to meet the short term goal to provide 1200ML/d of capacity:

- The newest portions (1970s–90s) of the CNV plant were retained, with a capacity of 400ML/d. Some 160ML/d of treatment capacity, including decommissioned treatment and pumping facilities were demolished to provide space for advanced treatment. UV treatment will be added to this process in 2015.
- OBM1, completed in 2007, uses ozone, Biologically Active Carbon Contactors (BACCs)' Ultrafiltration membranes (UF), at a capacity of 400ML/d. No coagulant is used.

Pumping station

"It became apparent that insufficient space existed to enhance the CNV process; a new approach was needed to make more efficient use of limited space, and to control costs. A site development plan was created that provided for 1800–2000ML/d of advanced treatment, together with pumping, storage, power and associated needs."

- OBM2, completed in 2014, is a similar stream (Ozone, BACCs, UV, UF) but with UV as primary disinfectant. Its capacity is currently 400ML/d; this can be increased to 480ML/d by the addition of membrane modules and by populating an empty carbon contactor.
- The plan for future capacity increases includes demolition of the CNV units, and replacement with advanced treatment trains. It is estimated that about 500ML/d of advanced treatment can be economically fitted in the space occupied by 200ML/d of CNV.

Plant design to reflect newer technologies and population growth with space efficiency in mind at the early stages is critical to success. Most initiatives face a variety of site constraints. This article discusses two components of the design for Lakeview that resulted in reduced footprint as well as improvements in operator safety and affordability: ozone contactors, and consolidated process area.

Ozone Contactors

Traditional ozone contactor design (fine-bubble diffusion) uses water depths of 6–7m in a baffled (under/over) arrangement. Access to the contactor, through roof hatches and watertight doors, is somewhat difficult. At Lakeview, raw water is ozonated principally to prepare organic matter for assimilation by bioslimes in the BACCs. Dosage is about 1mg/L. Dosage can be increased to provide disinfection should the UV inactivation not be available. Some oxidized material precipitates on the contactor floor, requiring periodic manual cleaning. In OBM2, a somewhat different approach was taken to reduce footprint and improve access:

- The water depth in the contactors was increased to 10m. This reduced footprint by 30%, but required that ozone generators operate at >100kPa, an industry norm. This was not seen as an issue by the ozone equipment vendors. As the source of ozone is liquid oxygen, there was no impact on energy costs associated with the increased pressure.

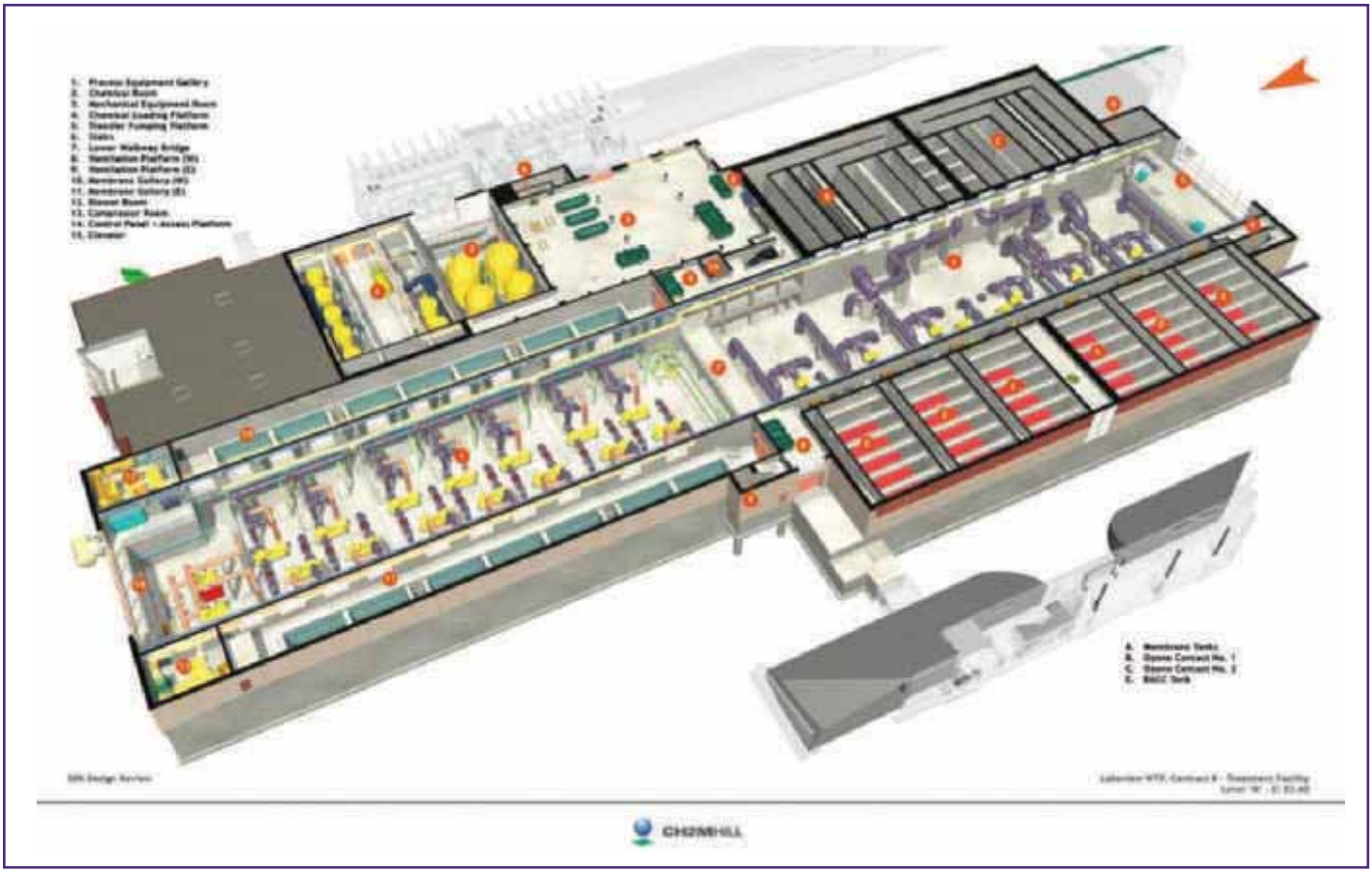
"The approximately 1 million population is served by two water treatment plants along Lake Ontario; with water being pumped successively through six pressure zones."

- Traditional contactors have a headspace (1200–1500mm) above the contactor water surface to provide a buffer volume for ozone off-gas collection and destruction. At OBM2, the intent was to mount ozone equipment (Power Supply Units, Generators [2@600kg/d], off-gas destructors etc) in a room above the contactors; this approach would have caused issues with maximum building height. Instead, the headspace was reduced to 300mm for much of the contactor; and a 4m high off-gas "penthouse" constructed over the fine-bubble diffusor sections, where the majority of off-gas is generated. This is working well.
- To reduce the issue of staff entering restricted spaces, as well as the risk of flooding, the only access into the contactors is from above, using concrete stairs. The stairs are located on the outlet of the contactor, downstream of ozone-quenching. Stainless-steel access doors thru baffle walls are provided to facilitate inspection and cleaning. The provision of stair access was endorsed by both the general contractor and the ozone equipment supplier/installer as simplifying safe access.
- Perforated baffle walls; downstream of ozone diffusion, and downstream of quenching, are used to reduce the contactor volume; a baffle factor of >0.75 has been attained.

Consolidated Process Areas

In typical plant layouts, process areas are divided into individual spaces. This approach stems in part from the desire to limit the

Lakeview water treatment plant



Lakeview water treatment plant

propagation of fumes, noise, and humidity. Often, hallways or corridors are provided for access around these areas. In climates such as Canada's this separation increases capital cost as well as footprint. At Lakeview, a concerted effort was made to treat the four processes (Ozone/BACC/UV/UF) as an integral unit insofar as possible. In conjunction with the O&M staff, several goals were established:

Noise levels:

1. Motors, pumps, blowers, compressors, etc. were specified with noise levels <80dbA. Generally, this meant larger, slower rotating equipment. Which often means higher quality equipment, with simpler maintenance protocols. The premium in equipment cost is offset by an improved working environment, and a reduction in sound attenuating equipment as well as the elimination of corridors and walls.
2. All exposed piping (predominantly stainless steel) is insulated and jacketed to reduce noise, and condensation. Dehumidification is not provided. Areas with open water surfaces, such as BACCs and immersed membrane tanks are isolated from equipment areas: valves and meters etc have been relocated from these areas to the process equipment gallery.

Fumes:

1. All chemicals are stored and metered in a common room. Compatible chemicals share spill containment walls. Bulk usage chemical tanks are of carbon steel with a replaceable bag liner, in order to separate structural and corrosion issues. The bulk tanks have trapped overflows to prevent fume migration. Tank vents are routed through dry drum scrubbers prior to discharge to the exterior. Chemical odours are not evident inside of the chemical room nor outside at the chemical delivery area.
2. All chemical metering pumps are of non-pulsating type (Lakeview uses magnetic-coupled gear pumps). And each pump's discharge is connected to either a mass or magnetic flow meter. Non-pulsing pumps are easier on plastic piping joints and fittings, which can develop leaks over time, and their connection to a flow meter eliminates calibration columns and allows SCADA system to alarm issues more quickly than routine operator walk-throughs.

Accessibility:

1. A considerable effort was expended in providing a single area housing virtually all of the process piping connecting the four processes. Membrane systems, in particular have complex process systems involving pumps, meters and multiple valves for filtering, backwashing, and chemical cleaning. These valves cycle quickly and frequently, such that valve refurbishment/ replacement is expected within a decade. Thus, all valves greater than 200mm diameter are located in horizontal piping and accessible from above by a travelling bridge crane. The general contractor made extensive use of this crane during construction, which contributed to attractive capital cost and schedule. A scissor lift can access all areas of the main process hall as well as ancillary areas.
2. Ladders have been eliminated from nearly all maintenance areas. Water storage tanks have stair access. Chemical storage tanks have platforms to access equipment on the roof of the tanks. The vast majority of equipment is accessed from a single floor elevation. While ladders may have a lower capital cost than stairs and platforms, the improved constructability likely results in negligible premium paid by the owner.
3. The OBM2 treatment plant was designed to facilitate tours by school groups. A tour route was developed early in design, and an elevator for freight and handicapped allows access to most areas of the plant. Openness of layout, natural lighting, and quietness should allow the educational experience to be improved.

The OBM2 facility (excludes low and high lift pumping) was completed in 2014 at a total cost of $150M.

New Zealand Situation

These principles and approaches are not unique to overseas locations and are readily transferred to the New Zealand industry. Taupo District Council faced similar challenges to bring its un-filtered water supply for Taupo up to the Drinking Water Standards for New Zealand. The lowest cost solution was to construct a new microfiltration plant at the existing treatment site on the lakefront within a site many thought was impossibly small for a fully functioning treatment plant. Drawing inspiration from a similar facility designed by CH2M HILL in Ammerstview, CH2M Beca developed a concept for a 'stacked' two storey treatment plant straddling the turning circle for delivery vehicles and providing for public access to the roof as a viewing area and access around the foot of the building for lake-side strollers. ■

Fairview water treatment plant

International.

Interplan™ mobile

Maintenance Made Easy

Introducing the Interplan™ Mobile Service from AkzoNobel, the next generation in corrosion surveys

- Providing a customized site specific condition survey to prioritize corrosion maintenance work
- NACE qualified technical service providing expert advice and assistance
- Risk based year-on-year maintenance schedule to help budget more efficiently
- Dynamic online survey reports optimizing asset management
- Detailed coatings specifications and procedures
- Extended life cycles to reduce overall maintenance costs

NZ Toll free no: 0800 808 807
specificationNZ@akzonobel.com | www.international-pc.com

AkzoNobel

Our Water, Our Future

Bruce Franks – CEO, DataCol Group

To prosper as a country, we must all accept the responsibilities of water management. The Government has identified that fresh water is one of New Zealand's key economic assets. It is the foundation of some of our primary industries such as farming, horticulture, and tourism, which generate at least 22 percent of the country's GDP.

DataCol recently held a series of seminars in Auckland, Wellington, and Christchurch to create discussion around an alternative future for the New Zealand Water Industry. Water infrastructure is currently the second highest infrastructure cost, behind roading in New Zealand, and there is a growing need for greater innovation to manage water smarter and more effectively.

Speakers included Murray Gibb, Chief Executive of Water New Zealand; David Brooke Smith, Director – Sales Australia and New Zealand (Water & Heat) at Itron; Gavin van Tonder, President of Itron's Water business line; and Bruce Franks, CEO of DataCol Group.

Making Inroads

David Brooke-Smith highlighted the myth that some people believe that water doesn't cost much to provide and that it should be free. "The danger of this thinking is that it does not match reality – networks cost billions, consumption based billing drives efficiencies to reduce those billions. Unlike electricity networks, water networks supply water via a network infrastructure and require additional infrastructure to take the waste water away – this is expensive. At the end of the day the costs for water have to be recovered, and they are recovered from the water consumers."

There are some parts of the country that have more of a handle on recouping some of this cost. Murray Gibb, Chief Executive of Water New Zealand, was a speaker at the seminar in Wellington. He praised the Auckland governance reforms, which provided an opportunity for scale economies to be demonstrated in the delivery of water services. "The stunning economic benefits that rationalisation of water services have brought to customers in the region remain largely unsung."

Mr Gibb also pointed out that the Government was beginning to take a more active role in water management by enacting a number of new initiatives over the last few years.

"Will these initiatives deliver improved water management in New Zealand? It has been a slow journey so far, but as the saying goes, the only way to eat an elephant is one bite at a time. There is a long way to go but we've started eating."

The More you Know, the More you See

One of the biggest things to come out of the seminars was the need for more data and information on water use and the health of water networks around the country. However, as Gavin van Tonder pointed out, "Data itself does nothing; it is people using data that makes a difference."

Everyone involved in the water use cycle, from the public who consume it to the managers and analysts that monitor the network and plan for the future, need to push for access to more information. "We miss how important consumer engagement is," stated van Tonder. "Empowering consumers with data on their water use will not only provide greater confidence and interaction between utilities

Figure 1 – Benefits using a single source of truth

"Will these initiatives deliver improved water management in New Zealand? It has been a slow journey so far, but as the saying goes, the only way to eat an elephant is one bite at a time. There is a long way to go but we've started eating."

and the public, but will also give them more control of how they use water."

An example of where this works is in the electricity industry; there are a number of power retailers that are providing usage information to their customers which then allows them to make conscious decisions to reduce their use or use more efficient appliances.

Plan Ahead

To achieve the aim of creating a standardised and valuable data set there needs to be a concerted effort to ensure there is value for all stakeholders.

"Data means nothing without analysis and action – if the data sensors are indicating high pressure in a specific part of the water network, utilities will have the ability to make decisions around whether to adjust pressure or perform remedial maintenance to avoid potential damage. When data arrives, there must be processes and steps in place to ensure relevant utility staff are kept informed," said Mr Van Tonder.

A co-ordinated approach is essential – just implementing metering without knowing how all the information will be utilised, will not succeed.

Bringing it All Together

Bruce Franks emphasised the potential to implement a system that is the 'Single Source of Truth' with the potential data that could be collected. "If you're using meter consumption data for billing purposes only, or not all, chances are you are missing out on valuable information. Instead, use the increased range of readily available data metrics from one common 'Single Source of Truth' across the entire organisation and make quality customer-centric decisions on water networks. If you do this, it will improve service delivery and potentially reduce costs for you and your customers."

"An example of where this works is in the electricity industry; there are a number of power retailers that are providing usage information to their customers which then allows them to make conscious decisions to reduce their use or use more efficient appliances."

The adoption of Smart Metering provides an excellent opportunity to transform the business from a straight 'collect the meter read and bill', to one that is data centric with all aspects of the organisation being able to draw upon one Single Source of Truth data repository. This means that decisions can be made based on actual timely data rather than data from numerous sources. Figure 1 shows at a high level how the whole business can benefit from a Single Source of Truth dataset.

The overall benefit isn't just to the utilities, but to all New Zealanders. We cannot just carry on in the blind belief that clean healthy water will always be available at the twist of a tap. We have to work together to ensure our water will be available at the highest standard and the lowest cost. If we can do this, then we all win. ■

Addressing the Renewals Bow Wave – *Water New Zealand* is Getting the Oars Out

Rob Blakemore – Water Asset Management Sector Manager, Opus International Consultants Ltd

Infrastructure renewals expenditure is widely predicted to create financial pressures on communities within the next thirty years. These pressures will occur in New Zealand and in other nations where infrastructure construction waves occurred at the start of the 20th century and after the Second World War. These concerns are particularly true for buried water infrastructure (ie. water supply, wastewater, stormwater).

***Water New Zealand* and its training venture NZWETA acknowledge that they have a key role to support asset owners make difficult expenditure decisions. Some important initiatives are planned.**

Whenever the potential for funding gaps or issues over affordability are raised publicly, inevitable pressure goes on utilities to validate their decisions to spend money. Inevitably, difficult choices will have to be made by utilities to ensure priority is attached to asset renewals of greatest risk and to validate decisions to defer renewals. As a first step towards addressing this problem, there has been increased emphasis on risk based renewals planning and a number of tools have been developed to assist optimised decision making. There has to be balance between appropriate and affordable levels of service. The impact of misalignment could be an unfair burden on future generations or an unwelcome requirement to lower levels of service.

Planning renewals simply on the basis of installed age and standardised asset lives can no longer be acceptable.

In order to use advanced risk based tools there is inevitable dependence on information about the assets and information about the impacts of failing to deliver levels of service.

Any process to assess the failure risk of buried assets for condition, operability, and external vulnerability risks is dependent on the confidence of the information that is used to determine these risks. It therefore follows that definition of data confidence must provide the foundation for risk assessment tools. Data confidence should be assigned to asset condition, operability, external vulnerability as well as asset criticality parameters that are linked to the consequences of level of service failure.

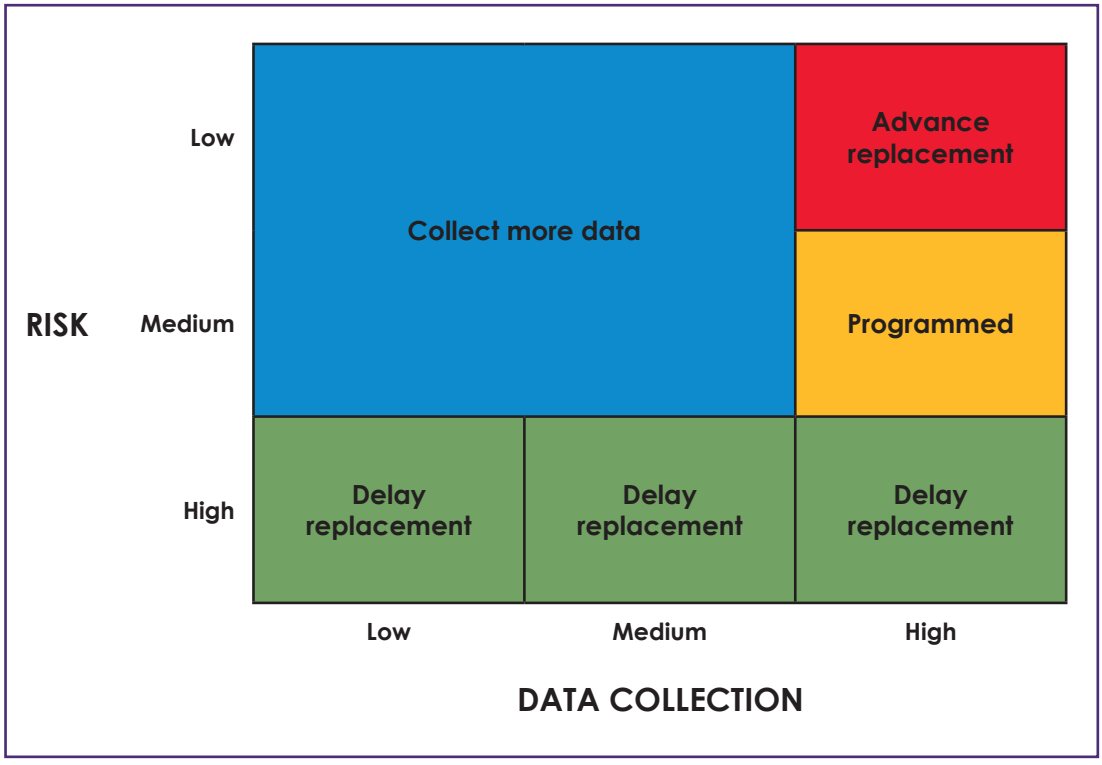
"Any process to assess the failure risk of buried assets for condition, operability, and external vulnerability risks is dependent on the confidence of the information that is used to determine these risks."

The diagram shown forms the foundation of an approach to the use of data for renewals planning. While the principle behind the diagram is simple, it is the application of these principles that takes effort and work. Nevertheless, the diagram is a convenient way to show where effort can be focussed to ensure meaningful data is collected to justify priorities for asset renewals.

1. In simple terms this diagram makes a few, possibly obvious points:
2. If you have a high risk asset and are confident that it is high risk then consider advancing its renewal from its theoretical date to ensure it doesn't fail at an unacceptable rate before it is replaced
3. If you have assessed an asset as low risk why not delay its renewal – even if you have low data confidence
4. If you have assessed an asset as medium to high risk but have low to medium confidence in the data used to assess this risk then it would be wise to get more data before programming its renewal

The assessment of asset condition, asset vulnerability, operability and criticality is dependent on knowledge of the assets, the customers they serve or the environment they are in. This requires collection and interpretation of data.

However the amount and quality of data required is dependent on the assessed risk profile of the asset. A decision as to whether to collect more data for an asset that is considered for replacement, make changes to its operating regime or to



advance or delay its replacement can be assisted through a consistent approach to knowledge of risk of failure and confidence of the data used to assess the risk.

Water New Zealand has committed to informed debate and training programmes that are intended to help utilities lift their confidence in data they are using to plan renewals.

The Upcoming Forum at the *Water New Zealand* Conference

On Thursday 18 September (1.30 – 3.00pm) a forum to discuss the renewals bow wave problem will be held as part of the conference programme.

The intention of the workshop is:

- To draw attention to the importance of consistent asset data for decision making
- Agree on the best way forward for *Water New Zealand* to contribute to helping utilities confront the perceived bow wave

The format of the workshop will be for invited presenters to present short case examples of where lack of data has inhibited decision making on renewals programming.

They will then direct questions to the audience to identify future projects that *Water New Zealand* should commit to. Some initial ideas are:

- Data collection standards for different asset types
- Common asset data bases for NZ infrastructure
- Definition of condition assessment standards
- Training in condition assessment
- Priorities for new guidelines (e.g. Gradings Guidelines)
- Specific focussed forums

If you want to be part of this discussion, mark the Forum in your diary.

Proposed Training at NZWETA

NZWETA is developing a training course to be rolled out in late October 2014 that is entitled *"Data collection for buried pipelines in water supply, wastewater and stormwater networks"*

The training objectives are:

1. Provide awareness of how to gather field information to support condition assessment of buried pipelines used for water supply, sewerage and stormwater services
2. Reinforce methods for the correct techniques to sample pipes for testing

The one day course is intended to help field personnel who are required to collect data for water supply, wastewater and stormwater pipe networks.

The course will address:

- Uses of condition data in asset management
- The reasons for consistent and accurate data
- How different pipe materials change in service
- What data to collect, how to collect it and in what format to present it – pressure and gravity pipes
- Comparison of planned and opportunistic sampling
- Recording and reporting
- Use of practical examples to identify key asset data

If you are interested in this course or have field operators who should be interested please send an email to nzweta@nzweta.org.nz Attention: Brett Marais, Subject: Pipe Condition Data Training. ■


An innovative solution for your water applications.
gfps.com/nz


+GF+

WaterLoss 2014 – International Water Loss Conference

Richard Taylor – Principal Engineer, Thomas Civil and Environmental Consultants

The International Water Association (IWA) Water Loss Conference 2014 was held on 30 March – 2 April 2014 in Vienna. A pre-conference workshop on intermittent water supplies was also held on 30 March as were meetings of the IWA Water Loss Specialist Group (WLSG). The latter comprised a WLSG committee meeting and an 'open' meeting of the group which was attended by interested conference attendees. Approximately 360 delegates from 62 countries attended the conference. I found the pre-conference workshop on intermittent water supplies informative and I have summarised some key points in this article. The WLSG made a special announcement, which I have also outlined along with some topics I found particularly interesting at the conference.

Intermittent Water Supplies

At the pre-conference workshop the focus was on the challenges faced by water suppliers when addressing intermittent water supplies. Intermittent water supplies are defined as those where the supply is not continuous (i.e. not available 24 hours a day, seven days a week).

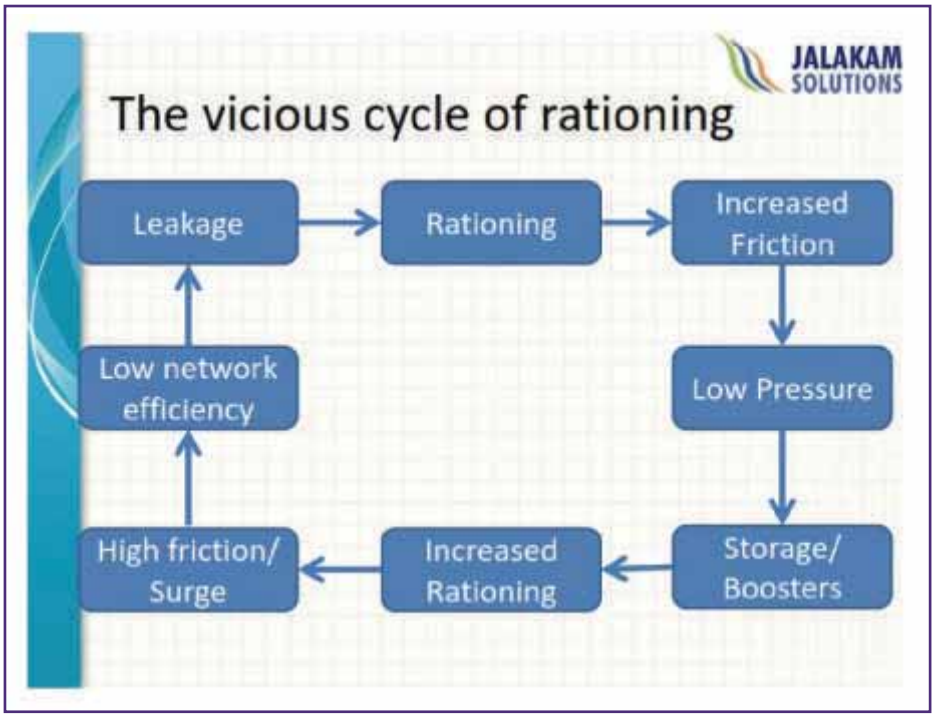
Intermittent water supplies are prevalent in India, common in Africa and Asian countries, and also occur in the Pacific Islands. The workshop provided a context to discuss the challenges faced by these countries. In India, for example, I was surprised to learn that of around 1.2 billion people, 25% of which are now urbanised, none of those on a public water supply have continuous supply. Customers therefore install tanks and pumps and other 'coping mechanisms' if they can afford to, in order to mimic 24/7 supply.

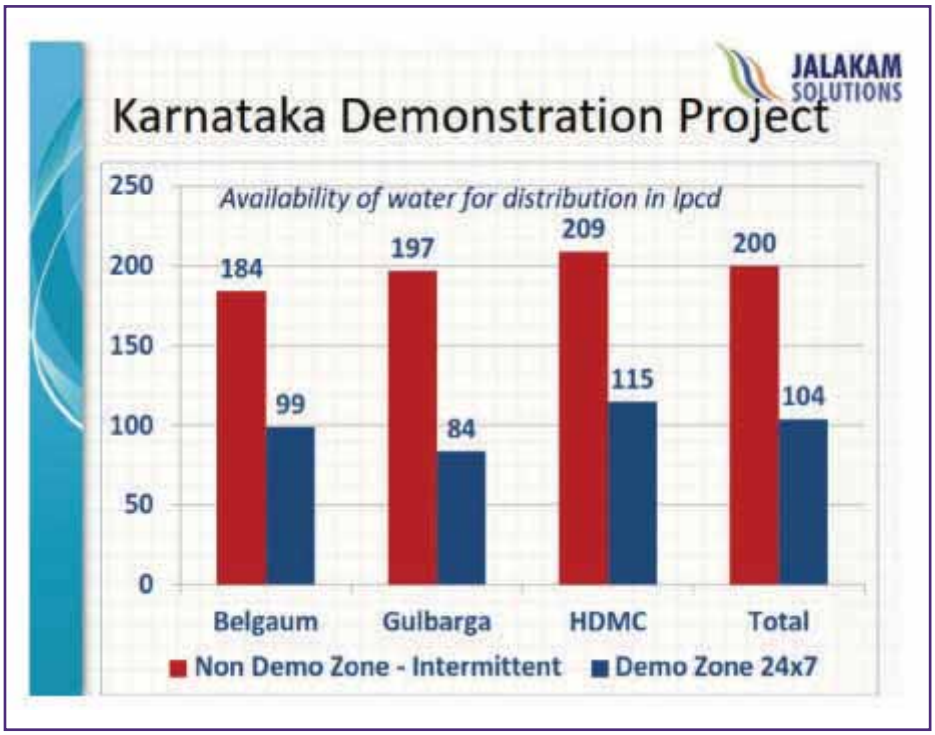
Intermittent supply is damaging to the network because of the entry and exit of air, and high water velocities when the mains are refilling. This results in high water losses from the network due to increased leakage and mains bursts. Water quality is also adversely affected. There was reference to the 'vicious cycle' of a water supply system: one initially designed to operate as a 24/7 supply, subjected to increased water demand and unaddressed leakage giving rise to rationing and an inability to supply 24/7. The result is an intermittent supply, which in turn causes additional demand through increased leakage etc, creating a vicious cycle as illustrated in Figure 1.

There were also success stories from India and Manila. In South West India, for instance, three pilot areas (supply zones) supplying around two million people have been transformed from high water loss/intermittent water supply zones to continuous supply zones. This has mainly been achieved by replacing the majority of the water network and even though this has been at considerable expense, the benefits have been significant. Water supply is now continuous in these pilot areas and the total water requirement to supply residents is about half of that required in similar original zones with intermittent supply (refer Figure 2).

"Intermittent supply is damaging to the network because of the entry and exit of air, and high water velocities when the mains are refilling. This results in high water losses from the network due to increased leakage and mains bursts. Water quality is also adversely affected."

WaterLoss 2014 Presentation slide courtesy of Anand Jalakam, Jalakam Solutions, Bangalore, India





WaterLoss 2014 Presentation slide courtesy of Anand Jalakam, Jalakam Solutions, Bangalore, India

In Manila, a large scale non revenue water project for Maynilad Water Services (which supplies the western side of Manila and greater area) is in its final stages of implementation, and the results are impressive. In 2007 water losses were 1.506 billion litres per day (67% of production) and over 50% of customers had intermittent supply. Today 98% of customers have continuous supply (with average supply pressure also increasing from 5m to 18m head of water), water losses have been halved, and an additional 2.3 million people are being supplied from the network. The finance and resources employed have been significant:

- US$26.6mill operational expenditure
- US$284mill capital expenditure
- 450 engineers employed
- 1,372 District Metered Areas (DMAs) established
- 1,360km of pipelines replaced
- 446km of trunk mains inspected
- 833,000 customer meters replaced

The IWA plans to set up a taskforce to focus on intermittent water supplies. The aims of this group include gaining a better understanding of the root causes and issues relating to intermittent water supplies, and to develop a manual of best practice for managing non-revenue water for intermittent supplies.

IWA Water Loss Specialist Group

The IWA Water Loss Specialist Group (WLSG) met during the conference where it announced an initiative it has been working on to better manage the activities of members around the world. This has involved establishing 12 regions across the globe, providing a better structure for the WLSG to understand and monitor what is happening worldwide. Delegates from several regions gave updates on activities in their region. New Zealand falls under the Australasia and South Pacific region, and Tim Waldron from Australia (who is also the current chair of the WLSG) has been selected as the lead representative for our region.

> "Apparent water losses arise from under-registering water meters and from unauthorised consumption. They contribute to the level of non-revenue water and are an important aspect of managing water losses."

Conference Presentations

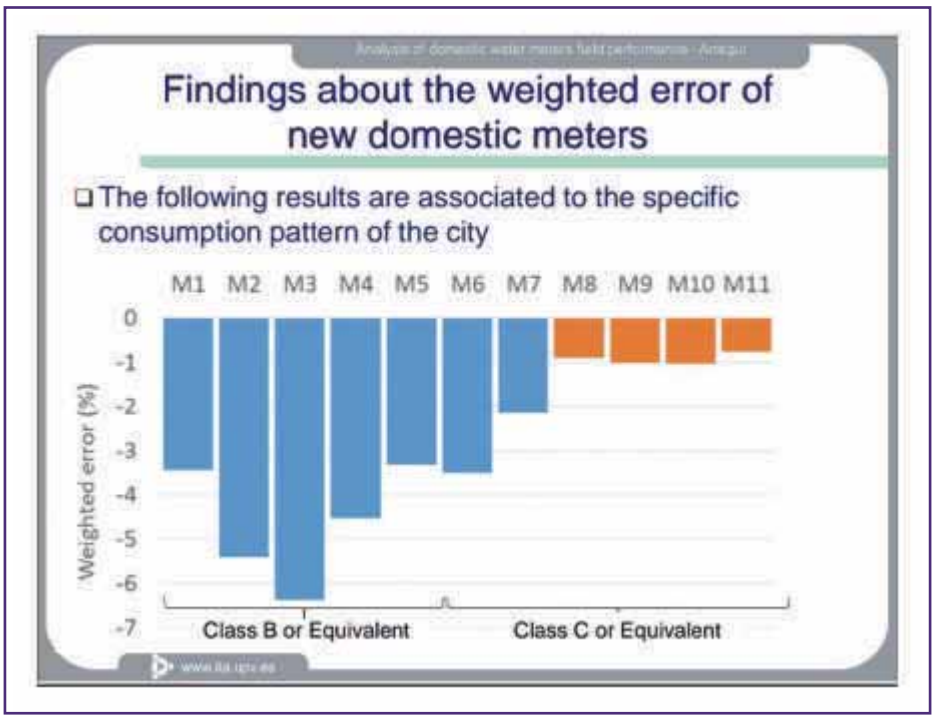
There were 110 papers presented at the conference in three concurrent streams. These were grouped under the following session themes:

- Major projects, apparent losses, district metering, innovative concepts, asset management, 'Focus on Asia', smart technology, sustainability and efficiency, new trends and ideas in leak detection, performance indicators, modelling to find leaks, financial considerations, leakage and pressure – theory and implementation, software-modelling and water loss assessment, pressure management, operation and change management, trunk mains, the importance of hydraulic models, interesting case studies, new analytical tools, national initiatives, new analytical tools

Some of the topics I found particularly interesting at the conference are summarised here.

One of the sessions was on 'Apparent' water losses. Apparent water losses arise from under-registering water meters and from unauthorised consumption. They contribute to the level of non-revenue water and are an important aspect of managing water losses. In some countries apparent losses can account for more than half of total water losses.

One presentation on apparent water losses dealt with an analysis of domestic



WaterLoss 2014 Presentation slide courtesy of Francisco Arregui, University of Valencia, Spain

water meter field performance carried out in Spain, where both brand new and used meters were tested using a weighted error method. This method utilises the measured error of the meter occurring at various selected typical flow rates, and weighted for the volume actually used by the customer at the various flowrates, giving an overall figure for meter performance. 11 different models of new water meters (30 meters of each model) were tested at 10 different flow rates. The results were very interesting.

Of the six Class C (or equivalent) models, the weighted error ranged from -0.07% to -3.4% (negative indicates meter under-registration) while for the five Class B (or equivalent) meters, the meter under-registration ranged from -2.0% to -6.3% (refer Figure 3). The testing of used meters was limited to one particular model of Class B meter in use in the area of study, and the weighted error of the used meters deteriorated from -8.5% for a near new meter to -20% when the accumulated volume of the meter reached 5,000m^3.

The study of used meters confirmed that both age and accumulated volume affects meter accuracy. This study also confirmed the fact that one cannot assume a new meter has a weighted error of 0%, and that field performance depends strongly on meter make and model. The study highlighted the importance of meter selection, and that the impact on revenue from inaccurate water meters can be significant.

Another session presentation that I attended was on the integration of Automatic Meter Reading (AMR) data with

"The study of used meters confirmed that both age and accumulated volume affects meter accuracy. This study also confirmed the fact that one cannot assume a new meter has a weighted error of 0%, and that field performance depends strongly on meter make and model. The study highlighted the importance of meter selection, and that the impact on revenue from inaccurate water meters can be significant."

SCADA data and network models for a pilot site in Israel. AMR data (hourly data) is being used to provide alerts for meter tampering, private leaks, backflow, stopped meters, negative consumption, above average consumption and high daily consumption. The systems are still being developed but the aim is to combine AMR data with SCADA data within a District Metered Area (DMA) to enable 'on-line' water balances to be calculated, detailed analysis of minimum night flows, and for pipe bursts to be identified early. They are also planning to utilise a calibrated hydraulic model (with real time data input) to provide 'virtual' DMA data, which can be compared with 'real' network monitoring to provide alerts where there are anomalies – potentially caused by meter malfunctions or an unexpected event.

Other interesting points from the conference included:

- Internal watermain (under pressure) CCTV, noise logging and MRI 3D scanning of pipelines. The latter provides full wall thickness, internal and external pitting measurements and the system is also capable of measuring lining thickness present on pipelines
- Highly developed software for managing large numbers of DMAs
- More sophisticated monitoring of water supply networks (such as monitoring vibrations, noise)
- The move to 'smarter' systems, such as i2o 'self-learning' pressure reducing valve controllers

The conference was a great opportunity to catch up on what is happening around the world in relation to water loss management, and to meet the key people and organisations involved. The issues are the same around the world but the stakes are getting higher as water scarcity, population growth (mainly in third world regions), and the effects of climate change combine to create tensions globally. The importance of water loss management in this context cannot be underestimated, and the pressure on water utilities worldwide to manage their supplies well and bring real losses (and non-revenue water) under control is becoming intense in some regions. ■

Richard Taylor is a Principal Engineer with Thomas Civil and Environmental Consultants, Auckland. He consults mainly in the area of water loss management and asset management.

Dunedin Rural Networks – Wastewater and Water Modelling

Louisa Sinclair, Dunedin City Council

This paper placed 2nd for the SIG best paper of the year 2013.

Abstract

This paper discusses the contributing factors which led to the development of hydraulic models for small rural communities and the benefits that council believes these models will bring.

Three rural wastewater treatment plants are nearing resource consent renewal and a strategy to improve current discharge arrangements was required. Modelling these areas was the first stage in this strategy. In tandem a treated water model was developed to replicate the network servicing these rural communities. Network planning to ensure economic renewal of these assets is the desired outcome. An additional water model was built for another rural community where sustainable accommodation of growth was the main driver.

Building these models in-house has virtually removed consultant fees. The council's hands-on approach has highlighted data inadequacies and their consequence, including information availability, accuracy and integration across applications that may otherwise not have been discovered.

When model builds are undertaken internally, staff acceptance is generally quicker due to direct involvement and a sense of ownership of the entire journey. Like any project, communication is key and early definition of data requirements and model outcomes keeps all staff expectations consistent through the model build, calibration and end use.

Keywords

Hydraulic modelling, Rural networks, Wastewater, Water, Development

1. Introduction

Dunedin City Council (DCC) is working to improve its understanding of current levels of service provided in non-metropolitan areas of the city. The 3 Waters Strategy Project was fundamental to the development of a long term plan for the management and delivery of Dunedin's metropolitan water, stormwater and wastewater (3 Waters) systems. The total cost of the Project was approximately $5M over 3 years and the development of decision support tools, particularly hydraulic network models was a key output of the Project. The DCC has established hydraulic modelling capabilities in-house to make best use of these tools and now continues to develop these tools and models to encompass the non-metropolitan areas of the City.

The hydraulic models developed during the 3 Waters Strategy Project are used in-house daily by the Hydraulic Modeller and a number of other staff. Outputs of the hydraulic models are used across the business by Asset Planning, Water Production, Wastewater Treatment, Network Operations and Network Management. Hydraulic modelling work is also carried out in association with City Planning and the local fire service. The benefits of having hydraulic models of the main city are widely accepted and subsequently there is a growing interest to expand the coverage. It is anticipated that all of Dunedin's three waters networks will be hydraulically modelled in the near future.

To align with the work previously completed during the 3 Waters Strategy Project, expansion to rural schemes aims to continue the integrated asset management approach to determining the capital and operational needs required to sustain or modify current levels of service. The key objectives of the work are therefore:

- Develop a greater understanding of the three waters network operations through targeted asset, flow and pressure data collection and the development of hydraulic models. This includes identification of any data integrity issues and the determination of the existing levels of service for each area.
- Examine consistency of existing levels of service across the city and determine the required future levels of service for each area, considering predicted growth, development and changing service needs.
- Use calibrated hydraulic models to determine the required capital and operational needs (and costs) of meeting these levels of service.

The work is already at a relatively micro-scale, with each service area modelled discretely. Subsequently, delivery is in the three phases highlighted in Figure 1.

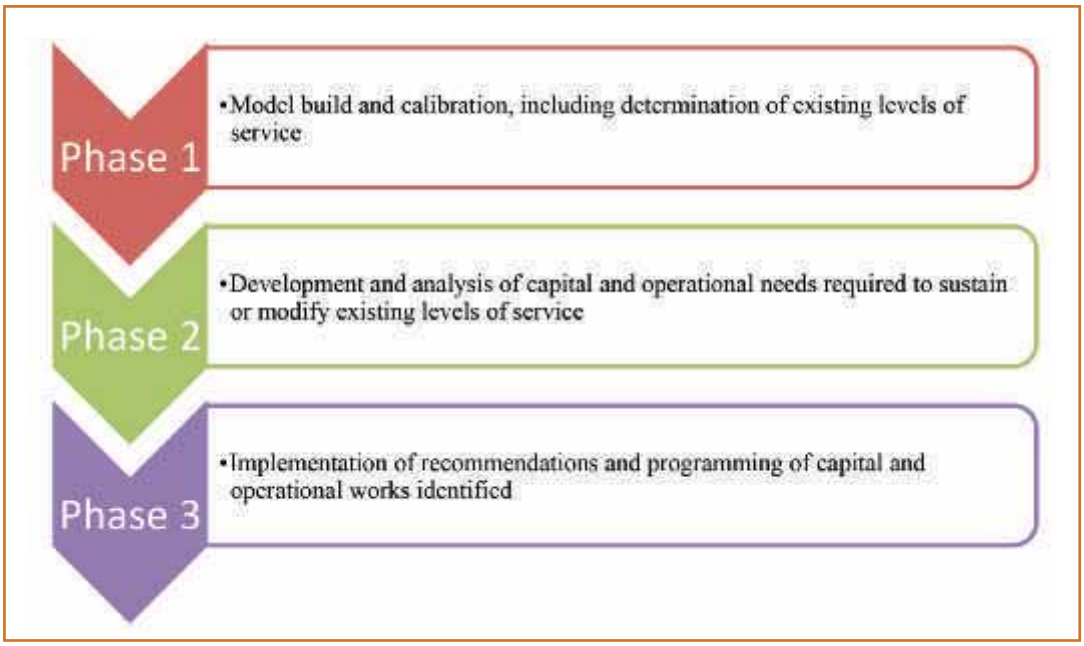


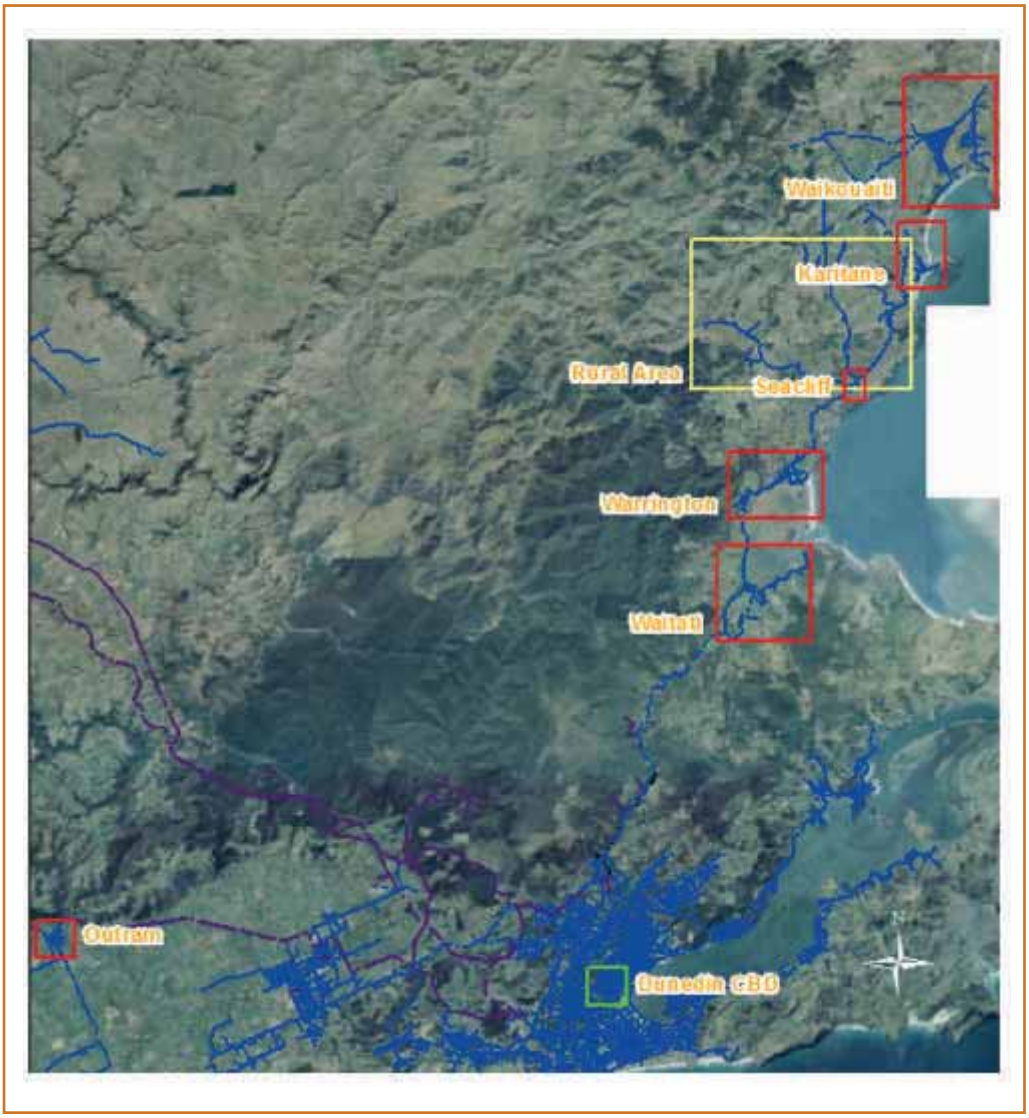
Figure 1 – Strategy Phases

This paper discusses the strategy process outlined above for the following rural communities and services. These locations are indicated geographically in Figure 2.

- Outram water reticulation
- Waitati water reticulation
- Warrington water and wastewater reticulation
- Seacliff water and wastewater reticulation
- Karitane water and wastewater reticulation
- Waikouaiti water and wastewater reticulation

- Rural water reticulation
- With the exception of Outram, these areas are collectively known as the 'Northern Schemes'.

Figure 2 – Rural communities' locations in relation to Dunedin CBD



2. Outram Treated Water Model

2.1 Overview

Outram is located 30km west of Dunedin city center on the Taieri Plains. The scheme supplies approximately 680 people in the Outram Township. Outram is built on a flood plain with fluvial soils that generally drain freely. Large lot size and a dry climate means that summer water usage is higher than other Dunedin areas.

Photograph 1 opposite displays the main township and the Taieri River in the background.

Strategy Phase 1:

The Outram water reticulation network has not historically been modelled. The requirement for a hydraulic model was driven by the need to understand, both the raw and treated water network in Outram and develop 'whole of life' asset management plans. The model was built, based on GIS and Hansen data, with additional information taken from paper reticulation plans, as-built plans, SCADA and operator knowledge. In March 2013 field equipment was installed in the Outram water network and data collected for three weeks. This actual data along with historic SCADA and metered customer data was used to calibrate the Outram water model.

Strategy Phase 2:

The calibrated Outram water model provided the basis to analyse a number of scenarios. These included present and future predicted demand scenarios during average and peak demand periods, fire-flow analysis, water age, modelling of proposed developments and population increase to 2033.

A series of options were then modelled to address any inconsistencies in levels of service and rough-order costing was developed for each of these options.

Strategy Phase 3:

Recommendations from the model build and options analysed were prioritised and subsequent renewals and upgrades will be programmed for capital expenditure.

2.2 Outram Water Supply and Drivers

2.2.1 Raw Water

The raw water supply for the Outram Township comes from a single bore located in the Taieri borefield. The 1998 bore pump generally performs well. Water is pumped from here along the Outram raw water pipeline. This pipeline is approximately 600m of 100mm diameter steel. The 1973 pipeline generally performs well and is in relatively good condition.

Outram

"The modelling of Outram would also provide an understanding of winter and summer consumption patterns and enable the analysis of available fire flows and corresponding pressure reductions. The model outputs would also inform a 'whole of life' asset management plan for Outram, enabling the efficient balancing of renewals based on age and condition with infrastructure required for proposed growth."

The Outram Water Treatment Plant (WTP) receives a peak daily flow of approximately 688m³/day if the bore pump runs continuously. Treated water demand, can exceed raw water flow rate at times during summer. The treated water reservoir is kept at 85–90% full to provide mitigation for this, but there is a limited buffer for 'downtime' of the plant during peak periods. With a water treatment plant capable of treating a greater volume than the raw water supply, and water use exceeding treatment volume at times, it was determined necessary to examine the source of raw water supply restriction.

2.2.2 Water Treatment

The Outram WTP currently consists of limestone filtration to correct the pH level and chlorination.

A number of changes to Drinking Water Standards New Zealand (DWSNZ) come into effect from 1st July 2014. Subsequently, in May 2012 DCC Water and Waste Services put a report to the DCC Executive Management Team (EMT) detailing 3 broad options that were considered for the Outram Water Scheme to ensure compliance with these changes. These were:

A. Do nothing; continue to supply water to the scheme at current quality and accept that a permanent boil water notice will be required from 1 July 2014 due to legislative change.
B. Upgrade the Outram WTP utilising one or more of the upgrade options with costs that varied from $480K to $1.1M. Each option carries unique residual risks of non-compliance and subsequent temporary boil water notices.
C. Construct a pipeline from Taieri Industrial Estate to supply Outram with treated water from Mount Grand WTP in Dunedin central. This option carries negligible risk of non-compliance, however this option has the largest net present value and up front capital cost at $2.8M; and may not have been deliverable by 1 July 2014.

Option B was recommended and accepted by EMT which consisted of a $577K upgrade of the Outram WTP, considered a 'basic' upgrade option, utilising UV on a duty/standby arrangement.

It was recognized that the 'basic' upgrade of the Outram WTP could result in periodic non-compliance with DWSNZ during poor raw water quality events (caused by dissolved matter in the raw water). Water produced during these periods of non-compliance will be of equal or greater quality than that currently supplied with the existing plant and therefore presents no increased health risk, rather a non-compliance with the amended drinking water standards.

2.2.3 Reticulation

Following treatment, water is stored in a distribution reservoir at the WTP site. The treated water storage reservoir provides 2,273m³ of storage. This reservoir should be able to provide approximately eight days of storage based on average consumption of 200L/capita per day plus 1,080m³ of firefighting storage. However, given the high water use in Outram the reservoir provides only five days storage during average demand and as little as two days storage during peak demand (plus firefighting storage). A water meter is present at the WTP and records the water usage demand.

From the treated water reservoir the water is distributed to the township by gravity via a single 150mm diameter watermain. The network consists of approximately 35km of watermain predominantly of 100mm diameter pipelines in a grid format. There are four small diameter pipelines predominantly to metered customers ranging from 25 to 50mm diameter.

2.2.4 Drivers

In 2012 the need for a hydraulic model was identified as the Outram network had not historically been modelled. The model would enable a better understanding of both the raw and treated water network in Outram, a review of the current network capabilities and aid in the review of proposed developments in Outram.

The modelling of Outram would also provide an understanding of winter and summer consumption patterns and enable the analysis of available fire flows and corresponding pressure reductions. The model outputs would also inform a 'whole of life' asset management plan for Outram, enabling the efficient balancing of renewals based on age and condition with infrastructure required for proposed growth.

Reviewing historical customer complaints with operations staff indicated no issues in the network with the exception of isolated low pressure complaints.

2.3 Model Build and Calibration

The Outram water model was built in-house using InfoWork WS. The model is fairly simple consisting of both raw water and treated water networks based on council asset data and operational knowledge.

Initially the raw water system was modelled in order to determine the location of the raw water restriction. A close match was achieved to the conditions seen on SCADA; where during peak summer periods demand temporarily outstrips raw water supply resulting in a relatively modest lowering of the treated water reservoir level. The reservoir level recovers overnight but this highlights that during peak demand periods 'headroom' may be reduced to as little as one to two days of treated water supply (plus firefighting capacity).

In this context it is worth noting that water use in Outram is exceptional. Average daily demand is estimated at approximately 820l/connection/day compared to 540l/connection/day in the metropolitan area. Average day peak week demand in Outram is estimated to be as high as 1800l/connection/day.

Field logging for the reticulation was completed over a dry three week period in March which following several months of sustained dry weather. It was decided that the field testing should be carried out by an external contractor and Jeff Booth Consulting Ltd were awarded the tender. In total the Outram field testing consisted of six pressure loggers deployed for a period of three weeks and flow-testing of five fire hydrants to measure the network under stress. Figure 3 highlights the fire hydrant locations used for both pressure logging (red) and fire flow testing (green). The SCADA meter data from the WTP was also captured using the same polling time step. This actual data along with historic SCADA and metered customer data was used to calibrate the Outram water model.

New Zealand...
We've got you covered.

Christchurch
64 39644860

Auckland
027 5308352

- Valve size range:
  10mm - 1200mm
- Product Expertise
- Industry Experience
- Manufacturing
- Local Inventory
- Field Service

Wellington
027 7209254

CLA-VAL® PACIFIC™

45 Kennaway Road
Woolston Christchurch 8023 New Zealand
Phone: (64)39644860 • Fax: (64)39644876

www.cla-valpacific.com

Figure 3 – Outram field testing March 2013 sites

Of the 406 customer points represented in the model, 63 are metered. Some of these metered customers are businesses whilst some are residential properties used for water usage data collection. This Phase highlighted that the four small diameter mains extending to rural areas could benefit from meters to confirm water usage in these locations.

The hydraulic model was calibrated against the field test pressure and flow data. Assessing the current level of service through pipe headlosses and low pressures during an average day in a peak summer week, concluded Phase 1 of the Outram Strategy.

2.4 Model Output and Outram Strategy

Phase 2 of the Outram Strategy used the calibrated model to assess future growth scenarios (2033) to determine pipe headloss and pressure. Water age and network fire flows were also reviewed. This analysis was then extended to investigate the effect of a single fire hydrant open at a strategic point in the network. Figure 4 provides an example of this analysis.

One of the main drivers for the calibration of the Outram water model was to analyse the effect of proposed residential developments. During Phases 1 and 2, two proposed developments were pending a hearing decision regarding private plan changes. In order to make a fair assessment, each development was added separately to the model to provide an understanding of their individual impact on the network.

Once an understanding had been gained of the effect of each development and the impact of its location and number of connections on the network, the most satisfying element of modelling, 'optioneering' was explored.

It was obvious from Phase 1 that the Outram water network had a number of age-related deficiencies. New developments that require network upgrades can be funded through development contribution. A calibrated hydraulic model is the perfect tool to establish the staged network upgrade requirements and costs associated with achieving appropriate levels of service. The optioneering process focused on older watermains that in most cases were undersized when compared to current standards, specifically 100mm diameter asbestos cement pipes recorded as being installed in the 1950s.

The optioneering outputs for the 2033 Outram model will in reality be staged as renewal funds are available and as developments in Outram progress. It was decided that three options achieved the best outputs. The first stage will be the upsizing of the watermain from the WTP to the township, to 200mm diameter. When the development to the west of Outram is included it was found that a new 220m connection allowed an additional flow path. The longer-term renewals plan is to increase the ring main in the south west of the catchment from 100mm to 150mm diameter. Figure 5 indicates

Figure 4 – Outram Average Day Peak Week (ADPW) Demand for future growth scenario (2033) model predictions with fire hydrant active

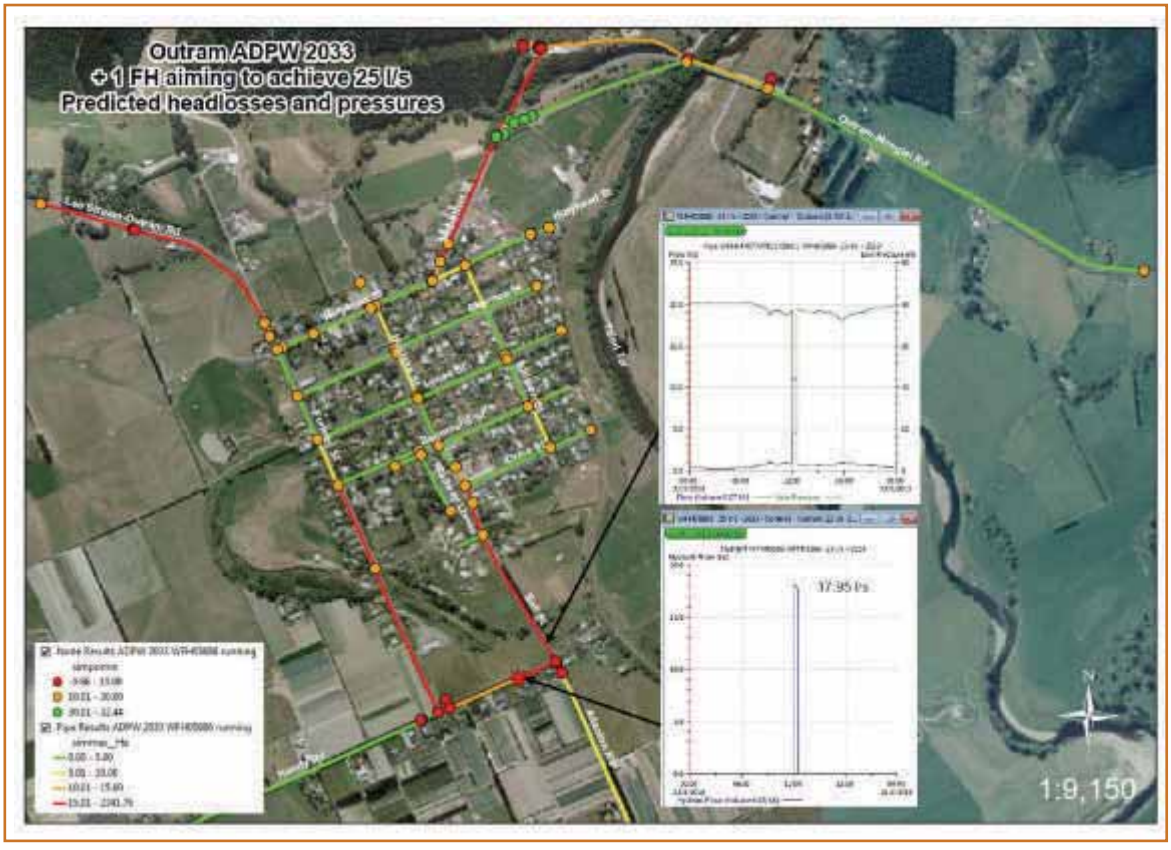


Figure 5 – Outram ADPW 2033 model predictions with network upgrades and fire hydrant active

"The model outputs were documented and a complete model build and calibration report was kept as a 'current state' reference document."

the model outputs with these options in place. Comparing this to Figure 4 shows a marked increase in the fire flow achieved and also the pressure level is kept above 30m and the headloss in the pipes is decreased.

These model outputs feed into the Outram Strategy as a renewals programme and Phase 3 of the strategy is the implementation of these recommendations.

The model outputs were documented and a complete model build and calibration report was kept as a 'current state' reference document. The model outputs were discussed across the 3 Waters Team. The outputs were also presented to City Planning staff and the consultants representing the developers. This wrap up was an important part of the strategy as many people had been involved through the model development.

3. Northern Schemes

3.1 Overview

There are a number of rural communities to the North of Dunedin's city centre that are provided with water and wastewater services. Figure 2 in Section 1 highlighted their location in relation to Dunedin CBD.

Strategy Phase 1:
The Northern Schemes water reticulation network and the three wastewater catchments have not historically been modelled. The models were built based on GIS and Hansen data with additional information taken from paper reticulation plans, as-built plans, SCADA and operator knowledge.

In March 2013 pressure loggers were installed in the Northern Schemes water network and data collected for three weeks. This actual data along with historic SCADA and metered customer data is being used to calibrate the water model at the time of writing. In July 2013 rain gauges, flow and conductivity monitors were installed in the three wastewater catchments and data is currently being collected. This field data along with historic Wastewater Treatment Plant (WWTP) flow data and outputs from the calibrated water model will be used to calibrate these wastewater models.

Strategy Phase 2:
Once calibrated the Northern Schemes water and wastewater models will provided the basis to analyse a number of scenarios. For water supply these include future predicted demand scenarios during average and peak demand periods, fire-flow analysis and modelling of various options for watermain renewals. In relation to wastewater these include future predicted flows, surcharge, flooding and constructed overflow analysis and modelling of various options for network and WWTP renewals.

A series of options for each of water and wastewater can then be modelled to address any inconsistencies in levels of service and rough-order costing can be developed for each of these options.

Strategy Phase 3:
The recommendations from Phase 2 will be prioritised with subsequent renewals and upgrades can be programmed for capital expenditure.

"Currently the high level and low level zones of Waikouaiti are separately metered."

3.2 Northern Schemes Water Supply and Wastewater

The rural communities of Waitati, Warrington and Seacliff receive water from Dunedin's Mount Grand WTP via the 'Northern Pipeline' commissioned in 2010. The Waitati zone has two metered connections from the Northern Pipeline. The Warrington and Seacliff zones both have single individual connections although only Warrington is metered. A number of customers are metered and all other connections are charged a standard fixed charge water rate. These properties are classed as rural connections and under the water supply bylaw require 1m^3 of onsite storage. Fire hydrants are included in the system although the New Zealand Fire Service Code of Practice requirement of 25 l/s from two hydrants is not practical in some areas due to the rural nature of the schemes.

Karitane and Waikouaiti are supplied from the Waikouaiti WTP via the Waikouaiti River. Currently the high level and low level zones of Waikouaiti are separately metered. However the zone interaction point and the Karitane zone are not metered. The largest water user in Waikouaiti is a poultry farm.

Prior to the commissioning of the Northern Pipeline, the Waikouaiti WTP fed both Waikouaiti and Karitane and also supplied the Seacliff Reservoir which in turn fed Seacliff and Warrington. If required, the Waikouaiti WTP can still feed these rural communities.

The Warrington, Seacliff, Waikouaiti and Karitane rural communities have wastewater services consisting of mainly 150mm diameter gravity sewers and three WWTPs. The WWTPs consist of oxidation ponds and land application systems.

Table 1 summarises the Northern schemes' areas and networks.

Table 1 – Northern Schemes' Network Summaries

Location	Services	Population	Water Network Summary	Wastewater Network Summary
Waitati	Water	500	7.9km <100mm 4.3km 100mm 2 meters, 1 PRV	N/A
Warrington	Water & Wastewater	430	4.6km <50mm 5.3km 50 to 100mm 1 meter, 1 PRV	1.8km 100mm 3km 150mm 1.8km 200mm 11m 300mm Oxidation Pond, land disposal
Seacliff	Water & Wastewater	80	450m <60mm 1 PRV	10km 150mm Sand bed & trickle irrigation
Karitane	Water & Wastewater	350	4.1km <50mm 3km 50 to 100mm	2.1km 100mm 6km 150mm 2.8km 200mm 3 pumping stations Karitane & Waikouaiti Oxidation Ponds, land disposal
Waikouaiti	Water & Wastewater	1,100	7.3km <50mm 14km 50 to 100mm 12.5km 150mm 5.5km 200mm 1 pump station, 1 reservoir, 2 meters	953m 100m 13.7km 150mm 1.4km 200mm 1.7km 225mm 627m 300mm 15m 900mm 4 pumping stations Karitane & Waikouaiti Oxidation Ponds, land disposal
Merton Rural Area	Water	75 Customer Points	21.8km <100mm 1.8km 100 to 150mm 4.4km 150mm 2 pump stations, 2 reservoirs	N/A

3.3 Wastewater

3.3.1 Drivers

The resource consent for Waikouaiti WWTP has recently been renewed with a short term 15 year consent which expires in 2027. The resource consents for Seacliff and Warrington WWTPs are due to expire in 2018 and 2024 respectively. The Northern Wastewater Strategy seeks to establish the most cost effective long-term options for dealing with wastewater from these communities. The calibrated hydraulic models are the first phase in the strategy, beginning with an assessment of the network levels of service with regards to surcharging, flooding and pump station emergency overflows.

3.3.2 Model Build and Calibration

The three wastewater models have been built in-house using InfoWorks CS. Hansen and GIS data was used as the base data and as-built plans used to model the pump stations correctly. SCADA data for the pump stations within the catchments have been used to confirm historic high and low flows and general usage patterns.

The wastewater field work was all carried out by DCC Network Maintenance staff. Twenty percent of manholes were surveyed to provide missing data and check accuracy of the data already held. The opportunity was also taken for the Appraisal Engineer and Hydraulic Modeller to visit all the pumping stations and carry out a condition assessment survey which fed into the renewals plan. In addition to condition information, the existence and location of emergency overflow, wet well sizes and pump on and off levels were confirmed. Furthermore, discussions were had with pump station operators to ensure the model correctly represents what is actually happening on site during rainfall events.

Minimal historic CCTV data was available for most of the rural areas however the entire Seacliff network was filmed in 2009. A review of this data showed a number of minor issues and some filming was repeated for comparison. In total 2.5km of sewer (less than one percent) was filmed across the three catchments to assess the condition and aid modelling.

"The opportunity was also taken for the Appraisal Engineer and Hydraulic Modeller to visit all the pumping stations and carry out a condition assessment survey which fed into the renewals plan."

Since 2011 DCC has purchased a number of portable flow monitors to be used in various applications around the city. Initially it was debated whether flow monitoring equipment should be hired or purchased. The flow monitoring equipment is now considered a valuable tool. For the Northern Wastewater Strategy it was determined to install flow monitoring equipment at various points in the networks and gather data over the winter period of 2013.

In addition to the flow monitors, DCC-owned conductivity loggers were also installed at various locations. The conductivity loggers enable seawater intrusion to be identified. Typical sewage is estimated to have conductivity no greater than 3,000 µS/cm; so any readings over this concentration will be investigated further.

Flow and conductivity monitor installations

In order to monitor rainfall in the three catchment areas it was decided that the two existing rain gauges would suffice; these were already installed and being used by water production and wastewater treatment. One rain gauge was relocated to provide more accurate readings and enable data to be collated on SCADA. A second rain gauge already on SCADA was adjusted to poll at the required frequency.

In order to plan the location of flow monitors and conductivity loggers a desk top analysis was carried out. Based on modelling requirements and likelihood of saline intrusion, eight flow monitors and eight conductivity logger installation sites were planned, but like all desk top exercises, on-site reality caused locations to be adjusted. As all equipment is owned by DCC and frequently used, installation was a smooth process and feedback from the staff installing the equipment on the expected results from selected locations came from firsthand knowledge of the system.

A workshop with staff was held to discuss the rural schemes, installation requirements, expected data issues and sharing operational knowledge. The workshop and subsequent correspondence ensured all parties had the same knowledge and understanding with regard to the aim of the strategy.

"In addition to the flow monitors, DCC-owned conductivity loggers were also installed at various locations. The conductivity loggers enable seawater intrusion to be identified."

The flow monitoring period is due to end in October 2013 or once a significant rainfall is recorded. Initial downloads are as expected and model calibration will be undertaken following the conclusion of the flow monitoring. A review of predicted surcharging, flooding and overflows compared to historic complaint records and operational knowledge will help to confirm model calibration. This will enable the existing level of service to be determined and therefore complete Phase 1 of the strategy.

3.3.3 Model Outputs

Once the existing level of service is established for each catchment, mitigation options will be modelled to remove confirmed areas of surcharge, flooding and emergency overflows for a 1 in 10 year rainfall event. These solutions can be costed and prioritised for capital expenditure.

3.4 Water

3.4.1 Drivers

In part, timing drove Phase 1 of the Northern Schemes water model. In order to achieve a reasonable price for field testing such small networks it was decided that Outram and the Northern Schemes could be logged simultaneously. Furthermore whilst the Northern Wastewater models were being built to meet wastewater discharge consent timeframes, water supply assets in the area could be also be assessed to provide a complete Northern Schemes Strategy and 'whole of life' asset management plan.

An additional requirement was to establish a renewal programme for specific assets. An example of this is a long small diameter

watermain over rural property supplying 15 customer, which has experienced a large number of bursts (shown as red stars in Figure 7). The cost of each individual repair was considered low, due to the small diameter, however this has continued over time, reaching a trigger point and it is now considered timely to plan a renewal. The model can aid in the sizing and appropriate alignment of the new main.

Figure 7 – Rural Northern Schemes water reticulation and bursts (red stars)

3.4.2 Model Build and Calibration

The Northern Schemes water model was built as a single system with two discrete water sources and various zones representing the rural communities. Fortunately a number of water zones are currently metered which allows for a much easier calibration.

The Northern Schemes field testing consisted of 22 pressure loggers deployed for a three

week period and flow testing of 11 fire hydrants to measure the network under stress. The SCADA meter data (where available) was also captured using the same polling time step. Figure 8 indicates the pressure logger sites (green) and fire flow hydrants (red) for Waikouaiti high and low levels. Standard fixed charge water rate billing data in conjunction with water meter billing data was used to add assumed and known demand to the model.

The Northern Schemes model is currently being calibrated as a staged process as time allows. Each zone with a discrete meter is assessed for daily pressures and fire flow. The remaining zones will have assumed demands in the model until meter data is available.

Figure 8 – Waikouaiti field testing March 2013 sites

3.4.3 Model Outputs

Although Phase 1 calibration is not yet complete at time of writing, a number of elements have already been identified for Phase 2 of the strategy. One of the recommendations is the installation of zone meters at Seacliff and Karitane. In addition a meter between the high and low level in Waikouaiti would confirm the nature of their interaction.

An important anticipated output of the calibrated model is an understanding of the fire flow availability across the Northern Schemes. Currently these rural areas are associated with the 25l/s category however it is accepted that this target is overly optimistic for these zones.

Phase 2 of the strategy will provide renewal options for the aforementioned small diameter watermain with numerous breaks whilst addressing other level of service defects in the network.

4. Conclusion

Overall the modelling work and anticipated outputs of the Outram and Northern Schemes water and wastewater strategies are considered highly valuable. Although calibration will be ongoing in certain zones as additional data is collected, the outputs will be well-used across the business for a number of years to come. The development of these models has enabled DCC to review asset data in a new format and use various sources of data to check consistency. Taking asset data and visually looking at long sections has identified a number of historic mistakes. Using LiDAR data, a ground model has been generated for the city which has highlighted significant anomalies such that Seacliff ground and invert levels were all 100m too low.

The models are used as a tool to assess the current levels of service and the renewal/upgrade requirements for changes to levels of service, new developments and consent conditions. Being able to define the predicted effect on the network of various developments enables equitable development contributions to be established. The phased process of the strategy ensures level of service requirements and development contributions are separately identifiable. Level of service decisions based on various costed options enables informed decisions to be made. Developer contributions are clear-cut and transparent.

"Projects like this bring teams together with a common end goal. Using mainly in-house resources achieves an ownership element to the strategy outputs. Documented outputs can be tailored; for instance a modelling guide was produced alongside the strategy document. A simplified version was provided to City Planning and developers. Informed discussions with the fire service can confirm the expected available fire flows in rural areas and any plans to improve levels of service."

In the case of Outram it is anticipated that the model outputs will be used to educate the Outram community of their high water use during summer months. The capital upgrade to the WTP did not need to involve increasing the capacity, providing excessive water use can be managed.

"DCC believes having in-house modelling capability is cost effective and brings many additional benefits. The most important benefit of in-house modelling capabilities is the ability to fully utilise the models and outputs readily. In addition to the Hydraulic Modeller, a number of other key staff use the water models to varying degrees."

The benefits of hydraulic modelling are now widely recognised within DCC and there is now an expectation that all water and wastewater networks are eventually modelled.

The decision to purchase flow monitoring equipment was a significant advantage to this project and provided the flexibility for installation, download and removal of flow monitoring when required. The financial savings realised by not using a specialist flow monitoring contractor are significant.

Informed decisions from these strategies will enable DCC to better plan for future renewals. In the case of the Northern Schemes WWTPs the answers are not yet apparent and the hydraulic modelling is just part of the strategy.

Projects like this bring teams together with a common end goal. Using mainly in-house resources achieves an ownership element to the strategy outputs. Documented outputs can be tailored; for instance a modelling guide was produced alongside the strategy document. A simplified version was provided to City Planning and developers. Informed discussions with the fire service can confirm the expected available fire flows in rural areas and any plans to improve levels of service.

DCC believes having in-house modelling capability is cost effective and brings many additional benefits. The most important benefit of in-house modelling capabilities is the ability to fully utilise the models and outputs readily. In addition to the Hydraulic Modeller, a number of other key staff use the water models to varying degrees. Updating the models as changes occur, enable the models to be considered a current tool.

In conclusion, modelling, whether carried out in-house or by a consultant is a valuable tool in asset management and renewals planning. The modelling work for Outram and the Northern Schemes has been an effective tool and a stepping stone in the process of the strategies for each of these rural communities. Overall the modelling work and subsequent output of the Outram and Northern Schemes Strategy is considered beneficial and will be used for a number of years to come. ■

Acknowledgements

Jeff Booth and Vicki Koopal – Jeff Booth Consulting
Jeff McLean – Opus
Tom Osborn – DCC, Water and Waste Services, Asset Strategy Team Leader

References

MWH (2012) 'Outram Water Treatment Plant Treatment Options Assessment'

Freshwater Challenges in Post-Cyclone Tonga

Oxfam

The Kingdom of Tonga is a remote, low-lying archipelago with a small, scattered population. The country was hit by Cyclone Ian on January 10th, 2014. The category four cyclone brought winds of up to 270km/h as it passed over the Pacific nation, causing much destruction in the northern islands of Ha'apai and affecting the lives of around 6000 people.

"I've never seen anything so fierce and so scary in my life. In some areas I can see the path the cyclone cut through the trees, its complete destruction – every house has been destroyed and every family affected," said Matelita Blake-Hour, from Oxfam's partner organisation in Tonga, The Tongan National Youth Congress (TNYC).

With the help of the New Zealand Aid Programme and the New Zealand public, Oxfam responded quickly, ensuring people had sufficient clean water to drink and their basic sanitation needs met. This provision of necessities gave the people of Ha'apai stability from which they could rebuild, boosting the recovery of those who were hit the hardest. Oxfam has a long term partnership with the Tonga National Youth Congress (TNYC). Together, we are continuing to work hard to ensure that the people of Tonga recover quickly and become more resilient as they rebuild their lives.

Access to clean, safe water is essential in the aftermath of a disaster to prevent the breakout of potentially life-threatening waterborne diseases such as cholera, typhoid, and diarrhoea. After Cyclone Ian, Oxfam installed 13 water bladders to provide emergency drinking water. But with the damage to infrastructure, water needs in Ha'apai were severe and needed ongoing solutions.

Almost all residents in Ha'apai reported that their drinking water sources were contaminated with seawater. One of the islands in Ha'apai, Ha'ano, has long been faced with contamination of the groundwater supply, which Cyclone Ian exacerbated. Going forward this means rainwater collection and desalination will be Ha'ano's best sources of uncontaminated fresh water. Throughout Ha'apai, Cyclone Ian devastated most rainwater collection systems (gutters to household tanks), as well as contaminating and damaging many of the storage tanks.

Oxfam sent desalination units to Tonga to provide a reliable source of drinking water for whole communities while infrastructure damage could be assessed and repaired. Oxfam installed three desalination units in Ha'apai, which filtered and distributed more than 42,000 litres, benefitting an estimated 1,400 people. The units are powered by a petrol generator and require regular monitoring and maintenance, invaluable in the aftermath of a disaster, but not ideal as a long-term solution. In consultation with local communities, Oxfam and TNYC will ensure the desalination units are ready for deployment in future Pacific emergencies. TNYC and the communities are now trained in use and maintenance of the units, enabling them to have a fast, independent response in any future disaster. As part of their back-up infrastructure, this enables them to be a more resilient community.

The long-term solution to the freshwater problem in Ha'apai is the restoration of simple but effective roof-to-tank rainwater harvesting. Most of these collection systems were destroyed by Cyclone Ian, and many of the storage tanks were damaged and contaminated. Plastic Rotomould tanks fared better than the older concrete tanks in the cyclone, making them a better option for the community (despite reports that taps on some of the plastic tanks have been chewed off by pigs – easily mitigated by protecting taps). Oxfam and TNYC worked to clean and repair the collection systems and damaged rain water storage tanks. Much of the materials needed

Children collect freshly desalinated water

Damaged water tank and debris

"Cyclone Ian did not spare the residents' waste systems either. Many people in Ha'apai have traditional concrete septic tanks, most of which were damaged or contaminated with seawater – interfering with the necessary breakdown of the waste."

were salvageable, and the experience will leave the communities and TNYC better equipped in future post-disaster situations.

Cyclone Ian did not spare the residents' waste systems either. Many people in Ha'apai have traditional concrete septic tanks, most of which were damaged or contaminated with seawater – interfering with the necessary breakdown of the waste. Also, given the lack of fresh water available in the aftermath, residents had taken to flushing toilets with seawater. These septic systems will need to be flushed and repaired before they operate properly again. Composting toilets in the area fared better and present a more sustainable long-term option for waste management. Oxfam continues to work closely with TNYC to finish the toilet repairs in the affected areas. Careful waste management is very important in the aftermath of a disaster like Cyclone Ian to prevent the spread of disease.

Oxfam responded quickly to Cyclone Ian by providing one of life's basic necessities – clean water. We worked in stages, according to need and resource: first providing 13 emergency water bladders; followed by three desalination units while we helped to repair roofs and tanks, which will provide fresh drinking water in the long-term. We also addressed basic sanitation needs, with hygiene kits and by helping to repair waste management systems, preventing the spread of disease. Through our hard work with TNYC, the communities of Ha'apai are enjoying sustainable fresh water systems and a newfound resilience. ■

Following the two Stormwater articles in the July issue, we present the third and final paper selected from the 2014 Stormwater Conference for publication in WATER.

Flood Risk and Spatial Planning Regulations – Lessons from the UK

James Reddish, Opus International Consultants Ltd

Abstract

Every year we hear news reports in New Zealand of significant flooding events in England causing widespread damage and putting people's lives at risk. A society built around the use of rivers and coastal resources, for a long time England developed with limited understanding or consideration of the risk of flooding. High profile, widespread flooding across England in the early 90s, again in 2000, and then again in 2007 each time led to changes in planning policies and guidance related to flooding. In each instance lessons were learnt regarding the role of spatial planning in flood risk management.

This paper outlines some of the lessons learnt regarding managing flooding in England, such as understanding the full costs of land use planning decisions, planning tools used in England, and the importance of defining terms such as 'safe' with respect to flooding. Although there are some marked differences in both catchments and development pressures between New Zealand and England, this paper also considers how this knowledge and some of the lessons could be applied in the local context.

Keywords

Flood Risk, Land Use Planning, Lessons, England

1. Introduction

Like New Zealand, many English towns and cities have developed around rivers and the coast, usually through the need for water for consumption, agriculture, or transport. Towns were often built as 'bridging points' over rivers, expanding into nearby floodplains. In many cases English town and city drainage has remained largely unchanged since early settlements (White and Howe, 2002).

Due to these location factors, flooding was not a new phenomenon to early Britons. Flooding on the River Thames was recorded as early as 1099 (Environment Agency, 2014). An awareness of the impact of flooding and the need to manage it is recorded in 1531, when an act

"Like New Zealand, many English towns and cities have developed around rivers and the coast, usually through the need for water for consumption, agriculture, or transport. Towns were often built as 'bridging points' over rivers, expanding into nearby floodplains."

of parliament affirmed the powers of the Sewer Commissioners, in the context of increasing incidences of flooding (Wynn, 2005).

Over the following centuries, and particularly following the Industrial Revolution, the urbanisation of Britain resulted in expansion of towns and cities and increased development density, with limited foresight into the impact of flooding. The traditional approach was 'protective'. Johnson & Priest (2008) noted that 'In the decades following the Second World War through to the late 1970s, flood management focused on land drainage and flood defence dominated by the structural 'hard engineering' solutions with little regard for environmental impact' as people sought to control flooding and keep the water out.

Protection was particularly focussed on preserving rich agricultural soils on floodplains to improve productivity, with the Government under pressure to protect farm profitability (Johnson & Priest, 2008). The 1953 storm surge along the east coast of Britain, was a trigger for significant expenditure on coastal flood defences, then through the 1980s and into the 1990s flood defence increasingly moved from protecting agricultural land to protecting urban environments (Johnson & Priest, 2008).

The percentage of new houses being built in 'high flood risk' areas has steadily risen from 7–8% in the late 1980s to 9–11% in 2008–2010 (Porter and Demeritt, 2012). Restrictions on available, unencumbered land, mean the number of people at risk of flooding is likely to continue to rise. Today there are approximately 5 million homes (1 in 6 of all homes) at risk from flooding in England (Environment Agency, 2013).

2. The Planning Context

Historically flooding has been perceived as being something that happened relatively rarely (White & Howe, 2002), however a series of flooding events since the late 1990s has put the spotlight on land use planning, development control and, more generally, how England manages its increasing risk of flooding.

Since 1947 the British Government, supported by river authorities (now in the form of the national Environment Agency), has sought to discourage development in flood risk areas through regular introduction of new, revised, or refined planning guidance; however, it has left local authorities to ultimately make decisions on local land use planning (Howarth, 2002 in Wynn, 2005).

Some felt that the Town and Country Planning Act of 1947 would put a halt to the unrestricted development on floodplains by controlling urban sprawl (Penning-Roswell, 2001). It was not until the late 1990s that evidence began to build that this was not the case (Parker, 1995).

Flooded High Street, Bristol, 1968 courtesy of Peter Townsend

"From the 1950s to the 1990s England's local authorities have believed intensive development in flood risk areas was undesirable, however they have generally not precluded it."

From the 1950s to the 1990s England's local authorities have believed intensive development in flood risk areas was undesirable, however they have generally not precluded it. Some adopted a policy of low density development in floodplains (Parker, 1995). Development control and flood warning were not important flood risk policy matters and insurance was not considered important in regulating development (Johnson & Priest, 2008).

Although local authorities had often identified flooding as an environmental consideration within Local Plans, practical policies to 'restrain floodplain development had been missing' (Parker, 1995). The major floods in 1998 and 2000 saw a recognition of the need to tighten expectations regarding development in floodplains. Flood risk planning policy has evolved rapidly since (White & Richards, 2007). Lessons have been learnt throughout this period of accelerated policy change, with the spotlight placed again during the 'Summer 2007 floods', and we can expect the same again in the face of Christmas flooding, and January 2014 being the wettest start to the year in southeast England since 1910 (Met Office, 2014).

This paper seeks to set out some of the lessons learnt through England's accelerated flood risk policy changes and examines their potential application to land use planning in New Zealand.

3. The Hidden Costs of Developing in Flood Risk Areas

The first, and probably most obvious, lesson to come out of flood risk planning is regarding not locating development in flood risk areas in the first place. English experience has shown that this is easier said than done, and often impractical.

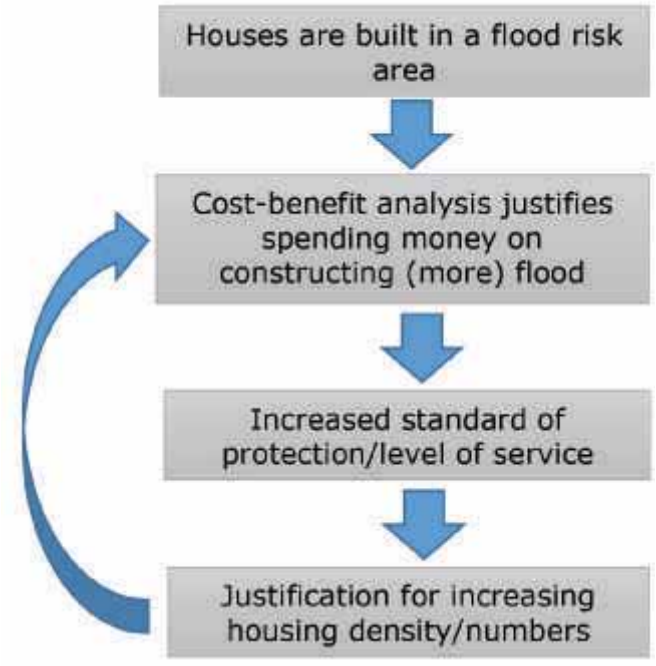
Often wider planning or other environmental constraints divert development towards floodplains (Parker, 1995). There is pressure in many local authorities to release land for development to deliver other Government targets (such as housing, regeneration), or enable wider land use benefits. Consideration of flooding has often received a lower relative weighting (White & Howe, 2002). For example, where floodplains are also greenbelt land, development has not occurred, demonstrating the relative weighting given to greenbelt (Parker, 1995). Often the consideration of flood risk in planning is only given due weight on the local (or political) agenda after flooding has occurred, and generally only for a relatively short period of time (Richards et al., 2008). These competing priorities, which apply to land use planners in New Zealand to a greater or lesser degree, have limited the English planning system from realising its full potential in protecting communities from flooding, 'whilst simultaneously allocating it the blame', often driven by the press. In the aftermath of each flood event, the UK Government and local authorities have been on the receiving end of severe criticism for allowing inappropriate development in flood risk areas (White & Richards, 2007; White & Howe, 2002).

In many cases it is unrealistic to think all development on floodplains can be excluded. A UK House of Commons Select Committee referenced an Ernst and Young report noting that local authorities generally stood to gain more from permitting floodplain development than prohibiting it (Wynn, 2005). However, what has not been given full weight in the past in England is the 'whole of life' cost of allowing development in flood risk areas.

England has suffered from a well-documented 'Escalator Effect' of development in flood risk areas, under the Government's overall 'protective' approach to managing flood risk.

Constructing infrastructure to protect existing people and properties often only encourages more development (described in Figure 1 and Figure 2).

Figure 1 – Flood protection justifying development



Development in flood risk areas creates a demand for flood risk infrastructure, whether it be flood defences, coastal walls or below ground infrastructure. This then increases the attractiveness and safety of these flood risk areas, encouraging further development (White & Howe, 2002).

The cost of providing flood infrastructure is not just the cost of its construction, and the cost of maintaining it, but also the cost of upgrades to manage:

1. Increased consequences of flooding (i.e. more people in the flood risk area)
2. Increased probability of flooding (e.g. the effects of climate change)
3. Increased public expectation for protection

Life's good here.

As New Zealanders, we are mighty proud of this country and all it has achieved. What excites us most though is where we're going. Because history has proven that as a nation we get a lot done; we know that the years ahead are going to be exciting and inspiring. Are you looking forward to what's ahead, New Zealand? **We are...**

Downer
SINCE 1870

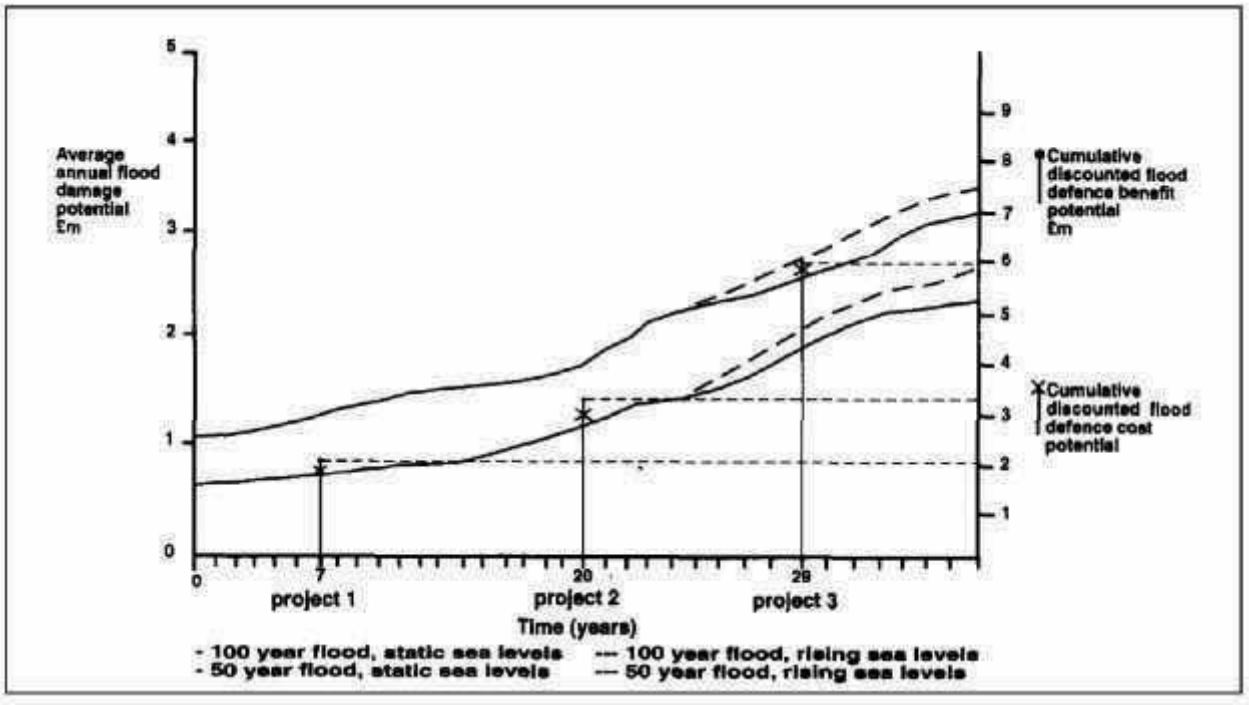


Figure 2 – Flood Protection 'Escalator Effect' (source: Parker, 1995)

This Escalator Effect has contributed to spiralling flood defence costs in England. The Environment Agency currently spends £570 million per year (2010–2011) on building and maintaining flood defence infrastructure. The required funding is expected to rise to over £1 billion annually (plus inflation) by 2035 (Environment Agency, 2009). This excludes the risk of managing stormwater or groundwater flooding. At the same time Central Government funding is being reduced (Bennett, 2014).

Taken to the extreme, a local authority that allows one house to be constructed in a currently undeveloped, unprotected floodplain has the potential to set in motion a similar 'escalator effect' where the costs of avoiding flood damages 'escalates' over time, far beyond what was originally envisaged. Particularly when planning appeals in England have regularly approved development on the basis of "you let my neighbour do it" (Parker, 1995).

"Taken to the extreme, a local authority that allows one house to be constructed in a currently undeveloped, unprotected floodplain has the potential to set in motion a similar 'escalator effect' where the costs of avoiding flood damages 'escalates' over time, far beyond what was originally envisaged."

An indirect cost not often considered is the cost of insuring properties that may be protected now, but may not be in the future (e.g. through improving flood risk information, or increased risk). The UK Government has recently reached a new agreement with the insurance industry to ensure high risk homes (not businesses) can still receive insurance. Although this is not a direct cost for the local authority, it is a cost to all households through additional premiums to cover the highest risk households, and an additional cost to taxpayers where the Government needs to support the fund in extreme flood events. Homes built after 2009 are not supported by the fund, so any built in high risk areas are unlikely to be insurable.

Currently flood insurance is available to New Zealand households regardless of location through the Earthquake Commission (EQC) with private insurance 'top up'. It is reasonable to expect changes to insurance for households in the future, and the insurance industry has warned of this risk following the release of the report on the risk of sea level rise to Christchurch (Conway, 2014). EQC premiums may rise; areas may become subject to 'blight' if unable to be insured; or the local Council may come under pressure to protect the 'at risk' properties (the 'Escalator Effect' of investment). None of these are good options and all can be mitigated to a greater or lesser degree through appropriate land use planning.

Another indirect cost is the potential burden on emergency services during a flood event by locating additional development in flood risk areas. Even where development is raised above flood levels, people may not be able to safely exit their home due to the surrounding floodwaters. Although appropriately skilled for such action, the general infrequency of their use means they are usually under-resourced for large-scale flooding.

Avoiding development in undeveloped floodplains is critical. Once development occurs, it is likely to continue. Although many of New Zealand's towns and cities have less development pressure at present than their English counterparts, it remains important that Land Use Planners are mindful of the recent lessons from England in development of flood risk areas and are fully aware of the costs before zoning land – particularly where there is a drive for intensification of development. When weighed against the benefits a development may bring to a community, planners might have arrived at a different decision if all costs had been considered, or at least been able to better prepare now for the future costs.

4. Tools and Techniques for Land Use Planners

The accelerated change in English flood risk policy over the last decade has introduced numerous national strategies, reviews, policy statements and guidance documents that English planners are expected to take into consideration in local plans and development

"The UK Government has recently reached a new agreement with the insurance industry to ensure high risk homes (not businesses) can still receive insurance. Although this is not a direct cost for the local authority, it is a cost to all households through additional premiums to cover the highest risk households, and an additional cost to taxpayers where the Government needs to support the fund in extreme flood events."

control decisions. Amongst the overload of information, a few key aspects are highlighted below that appear to be having the biggest influence in the consideration of flood risk in English land use planning, and which have applicability for the robust consideration of flooding in our District and Regional Plans:

1. The precautionary approach
2. Strategic flood risk assessment
3. The Sequential Test
4. Defining safety in a flood

4.1 Precautionary Approach

The precautionary approach applied in flood risk policy is based on the precautionary principle set out in the Rio Declaration in 1992:

"Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." (DTLGR, 2001)

The New Zealand Government has already recognised the importance of the precautionary approach with respect to flood risk (MfE, 2010) and importantly it notes 'there is a social responsibility to minimise the exposure of your community to harm as much as possible…', placing a burden on the shoulders of land use planners to adopt a precautionary approach to flood risk.

The UK approach suggests four ways the precautionary approach can be applied to flood risk:

1. Lack of available information on flood risk – Improvements in flood mapping covering all sources of flood risk in England demonstrates the lack of information planners historically had to make land use decisions. The significant advancements in hydraulic modelling technology mean broad scale hydraulic modelling can often be produced relatively cheaply over a large spatial scale so planners can apply the precautionary approach in the absence of detailed data. This approach was applied in production of nation-wide, broad scale 'Flood Zones' in England and Wales. Some have argued there is a case for flood risk mapping, at least for land use planning purposes, to only be defined indicatively, to avoid over-confidence in their accuracy (Wynn, 2005). Expensive flood modelling or lack of data can no longer be used as an excuse for not considering flood risk.
2. Climate Change – Research in the UK suggests that a flood defence against a 1 in 100 year flood in the 1990s may only protect against a 1 in 60 year return period event by 2050 (Price

& McInally, 2001). Many New Zealand councils are integrating currently predicted climate change increases in sea level and rainfall intensity into flood mapping, where information is available. It is worth noting that predictions on the effects of climate change are regularly being refined by the International Panel on Climate Change (IPCC) as understanding improves – a recognition of the current uncertainty. It would be naïve to expect predicted effects will not change again. Councils can consider different climate change scenarios as part of a precautionary approach.

3. Uncertainty – there is inherent uncertainty in flood estimation, regardless of whether flood mapping is broad scale or highly detailed. What becomes critical is the scale of the mapping (e.g. not providing small scale mapping for broad scale modelling approaches), and understanding the sensitivity of the modelling and mapping. There is tendency to take the 'line on a map' approach to flood extents – where one side of the line is at risk and the other isn't. In reality there is usually a 'grey area'. The precautionary approach could be applied with consideration of this sensitivity 'grey area'.
4. Precautionary approach in design – The NZ Building Code apply a precautionary approach through requiring a 'freeboard' for floor levels above flood levels (for a 1 in 50 year storm event). However development outside of existing flood maps or overland flowpaths, may currently not trigger this requirement. When flood extents change (e.g. as a result of climate change or improved information), the houses may now be below the new flood level. A precautionary approach in design may account for uncertainty in the specific flood data available, but may not be sufficiently precautionary for more fundamental uncertainty regarding the quality or extent of information available, or the impacts of climate change. As an example, prior to the Summer Floods of 2007, there was sporadic information available on the risk of surface water flooding, compared to good quality and coverage of risk from rivers and the seas). The introduction of national surface water risk maps in the UK increases the quoted number of residential properties at risk from flooding from 1.7 million to approximately 5 million.

4.2 Strategic Flood Risk Assessments

The historically piecemeal approach to development in flood risk areas is a significant factor in England's flood defence construction 'Escalator Effect'. However, even with appropriate development control policies for flood risk areas, there have been significant challenges in restricting development. Up until the late 1990s the focus in England was trying to apply the UK Government's national flooding guidance at a development control level (Parker, 1995). Notably, the cumulative effect of development on flooding, whether in or outside of the flood risk areas, has been difficult to implement due to the single site emphasis (White & Howe, 2002).

A single house raised above flood levels will usually have negligible impact on overall flood levels in a floodplain, however when applied to all development across a wide area and over multiple plan periods, the effects can cumulatively be significant.

Similarly, converting a small area of front garden to impermeable cover (e.g. a driveway), may have negligible impact on overall runoff generated, however when applied across a catchment can have a significant cumulative effect on runoff generated. Unfortunately where a planning permission was refused on grounds such as these (e.g. cumulative flood risk effects), the appeal process has generally favoured the developer (White & Howe, 2002).

In the New Zealand context, these effects are likely to be considered 'less than minor' at the single site level, or if development occurs in a catchments not currently intensively developed, however cumulatively the effect is retained in the system for perpetuity – it is rare for a surface currently impermeable to be converted back to permeable. The true effects are measured in the following generations.

Cumulative flood risk effects are very difficult for development control personnel to consider on an individual site basis, particularly if catchment modelling is not available and with a focus on planning application process speeds. Cumulative effects can only practically be considered at the strategic scale (e.g. catchment scale, across a whole Plan Area, or for large developments).

"In England, like in New Zealand, the Local Plan (NZ: Regional or District Plans) is the primary reference in determining planning applications (consents in New Zealand) (White & Richards, 2007). If flood risk has not been given appropriate consideration at the strategic level in Local Plans, it is unlikely to be (able to be) given due consideration at the single site level (Richards et al., 2008). Enabling this requires a strategic assessment of flood risk to be carried out as part of the evidence base informing the Local Plan."

Additionally, some English local authorities became severely limited in their ability to grant planning permission where large parts of their developable land was located within flood risk areas. Individual sites would be brought forward, and potentially refused on flood risk grounds.

In England, like in New Zealand, the Local Plan (NZ: Regional or District Plans) is the primary reference in determining planning applications (consents in New Zealand) (White & Richards, 2007). If flood risk has not been given appropriate consideration at the strategic level in Local Plans, it is unlikely to be (able to be) given due consideration at the single site level (Richards et al., 2008).

Enabling this requires a strategic assessment of flood risk to be carried out as part of the evidence base informing the Local Plan. Strategic Flood Risk Assessments (SFRAs) began to be produced in the mid 2000s in England as a tool to be used at the beginning of the Local Plan process.

There are some similarities with Catchment Management Plans (CMPs) in the New Zealand context, however a number of critical differences (Table 1) – most notably the scale of assessment, where a 'local authority boundary' assessment of risk is more useful to land use planning than a 'catchment boundary'. This enables sites to be weighed against each other in terms of flood risk, and wider planning considerations. This has begun to facilitate more locally specific flood risk policies in Local Plans, rather than regurgitating national policy, and incorporate 'closer linkages' between water and development over a larger spatial scale (White & Howe, 2002).

Over the following decade best practice has emerged with SFRAs fulfilling a broader function in not just providing information for

decision makers to assess one site against another, but also assessing flood risk to key development sites in more detail across a planning authority. This enables the local authority to more clearly understand the likely mitigation requirements, strategic solutions/policies for flood risk, and importantly the 'flood risk costs' if they decide to proceed with allocating vulnerable land uses in flood risk areas. However, it could still be argued that in many cases the full, long term, costs, as described early in this paper, are only really just starting to be realised.

Assessing key development sites also facilities the development of policy guidance that is prescriptive, whilst seen to be deliverable in combination with other policy drivers as it has been demonstrated to work on a site-specific basis.

As a result local policies in England are becoming more detailed and wider in scope as the implications of development and flood risk is understood (White & Richards, 2007).

Table 1 – Strategic Flood Risk Assessment (UK) and Catchment Management Plans (NZ) – Similarities and Differences

Content	SFRA	CMP
Main End User	Land Use Planners, Development Control, Developers, the Public	Engineers and planners
Scale?	Local authority boundary – enabling decisions across multiple catchments	Individual catchment decisions
Considers Flooding?	Yes – all forms sea, rivers, stormwater, groundwater, and their interconnection	Yes – usually focussed on streams and rivers
Flood Mapping?	Yes – all forms This is important to distinguish (where possible) as different bodies are responsible for different forms of flooding and pre-Summer 2007 there was no national or local body in England responsible for planning for surface water	Depends on date produced. From mid 2000s more likely to include reasonable mapping of river/ stream floodplains
Assessment of Risk?	Yes – all forms	Yes – but not usually from the sea
Options for managing flooding	Depending on extent of risk Often considers 'strategic' solutions across multiple catchments (such as coastal solutions or the location of development)	Usually – focussed on catchment specific solutions
Water Quality, Erosion and Ecology	No – focus solely on flooding	Yes – considers wider implications of water
Policy Guidance?	Yes – provides strategic planning as well as development control policy recommendations in the context of local authority scale flooding issues	Indirectly – implementation is left to Capex programmes and statutory documents

4.3 Sequential Test

England's Local authorities are required by national planning policy to apply a sequential risk-based approach to determining the suitability of land for development in flood risk areas (DCLG, 2006). The aim is to steer new development to lowest probability flood risk areas – on the basis that the most appropriate way to manage a risk is to avoid it.

Where there are no reasonably available sites in areas at low probability of flooding, land use decision-makers should consider reasonably available sites in higher flood probability areas, whilst taking into account the vulnerability of proposed land uses.

The key term applied here is "reasonably available". Not all land in low probability flooding areas may currently be available for development. Land use planners might then need to consider higher flood probability areas, or alternatively alter the land use classification of the low probability land to enable development.

Undertaking this process, using information contained in a SFRA, provides a robust evidence base that enables land use planners to ensure development is sustainable and safe and, where development is exceptionally required in flood risk areas, the 'whole of life' costs are understood and balanced against other development drivers.

4.4 What is Safe?

England's national flood risk planning policy also states that development in flood risk areas 'must be safe, for the lifetime of development' (DCLG, 2006). Similar wording is represented in some local policies in New Zealand.

Flood hazards are often mapped showing areas of 'low', 'medium', and 'high' hazard, however this is usually based on depth and velocity and does not define which category is 'safe'. Many planning appeals in England have been argued through a lack of definition on what 'safe' means, despite policy guidance becoming more prescriptive and detailed.

Emergency Services rescuing the vulnerable with no safe access in Tillicoultry (Source: John Chroston)

This contributed to the emergence of a national 'Practice Guide' in which the Department of Communities and Local Government (DCLG) clarified the definition of 'what is safe'. Safe development is not just considered to be keeping floor levels above flood levels, but also includes:

- Safety of people in and around the development
- The structural safety of the building
- Impact on services provided to the development

And importantly, safety considers safe access and egress:

"Access considerations should include the voluntary and free movement of people during a design flood, as well as the potential for evacuation before a more extreme flood" (DCLG, 2009).

In the English context, raising floor levels above flood levels in isolation is not sufficient if people cannot safely exit from their home during a flood. 'Waiting out' a flood may not be acceptable if the flood is long duration, or an emergency occurs that requires the person to leave the property. In England it is generally not considered appropriate for new development to be reliant on the emergency services for escape. Emergency services are often already overloaded dealing with trapped people in existing developments. In New Zealand it is less common for safe access to be considered in District Plans, however there is a strong case for its inclusion in avoiding additional pressure (an indirect cost) on emergency services.

5. England's Changing Approach to Flooding

Allowing development in England's flood risk areas has led to construction of ever increasing structural flood mitigation over the last century. This in turn has encouraged further encroachment into flood risk areas, an expectation from the public regarding protection and a false sense of security regarding the level of risk.

The 'traditional' approach to flood risk areas 'has emphasised economic efficiency rather than wise decision making' (Penning-Roswell, 2001), with emphasis on the role of Government to provide protection, rather than individual responsibility (Johnson & Priest, 2008). Increased flood risk due to climate change and the pressure of development limits the capacity of structural flood infrastructure (Butler & Pidgeon, 2011). This realisation began to dawn in the early 1990s (Parker, 1995), however it was in the wake of the Global Financial Crisis in the late 2000s, and despite the recent flooding, that the British Government advised it was unable to continue to increase funding for 'flood defence' (Defra, 2014). However, with falling approval ratings (Wintour, 2014), the British Government has come under significant public and media pressure to take action regarding the recent January 2014 flooding. It is likely the UK Government will again have to make expensive promises in the coming weeks and months regarding future investment.

In the context of a fiscally-constrained economy, an alternative approach is taking shape in England – loosely titled "Flood Risk Management" – that is likely to place increased pressure on land use planners (Figure 3).

"Flood Risk Management" is a change in emphasis from managing flood water, to managing the citizens at risk (Butler & Pidgeon, 2011) – encouraging people to 'live with floods' (ICE, 2001). It is also a shift in policy away from defence to an approach with increased emphasis on spatial planning and development control (Turnstall, et al., 2009). In his review of the Summer 2007 floods, Sir Michael Pitt identified that "current legislation provides for a bygone era of flood defence, not modern flood risk management" (Pitt, 2007).

Some Local authorities have come to realise that the Government cannot continue to build walls to keep the water out, but at the same time acknowledge there isn't scope for stopping to defend some areas due to the potential for significant flooding risks putting lives in danger or regular flooding/insurability resulting in urban

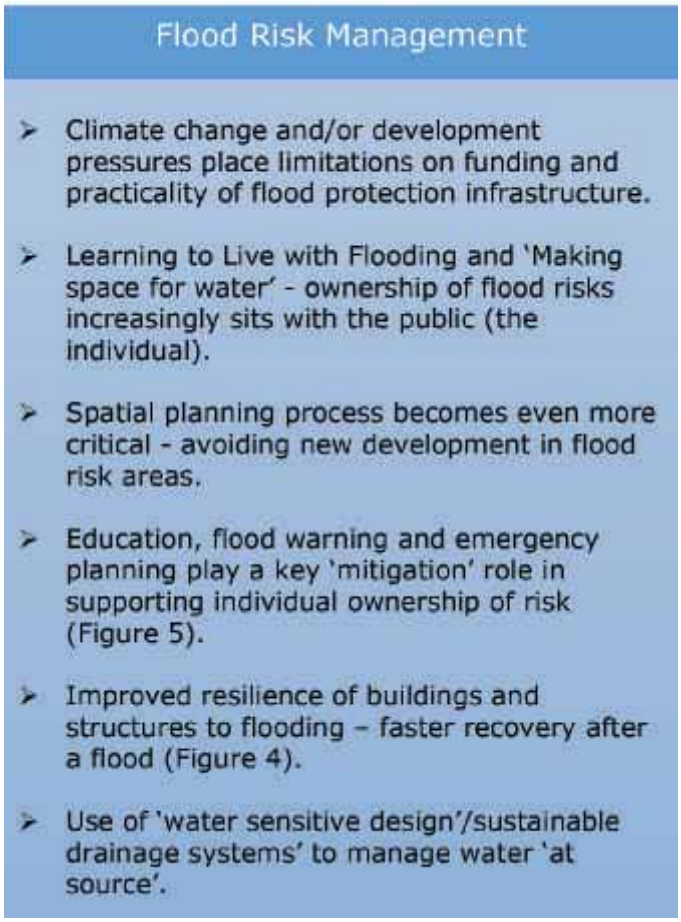


Figure 3 – A new approach to "Flood Risk Management"?

'blight' (Butler & Pidgeon, 2011). Local authorities are placed in a difficult position, particularly when there is a history of protecting and 'manipulating' waterways, which complicates a shift to a different approach to flooding.

Some local authorities experiencing regular flooding are 'more likely to favour traditional methods of protecting against flooding' (White & Richards, 2007), constructing larger infrastructure in the search for 'quick political wins'. This often runs hand-in-hand with a 'lack of understanding or confidence in the effectiveness of more modern, sustainable approaches to flood management' (White & Richards, 2007).

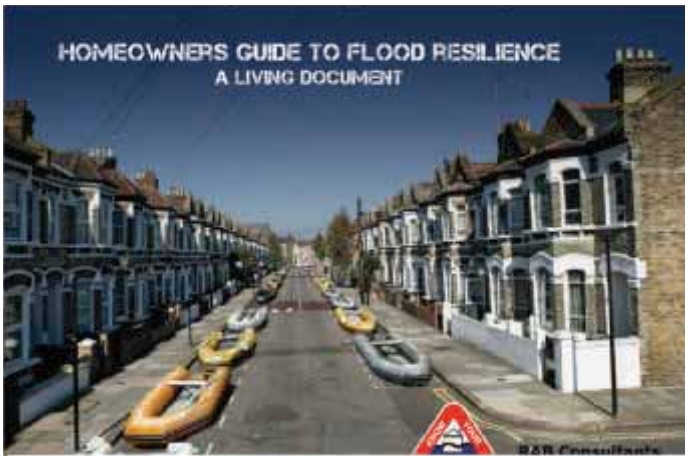


Figure 4 – Homeowners Guide to Flood Resilience – helping the community 'live with flooding'?

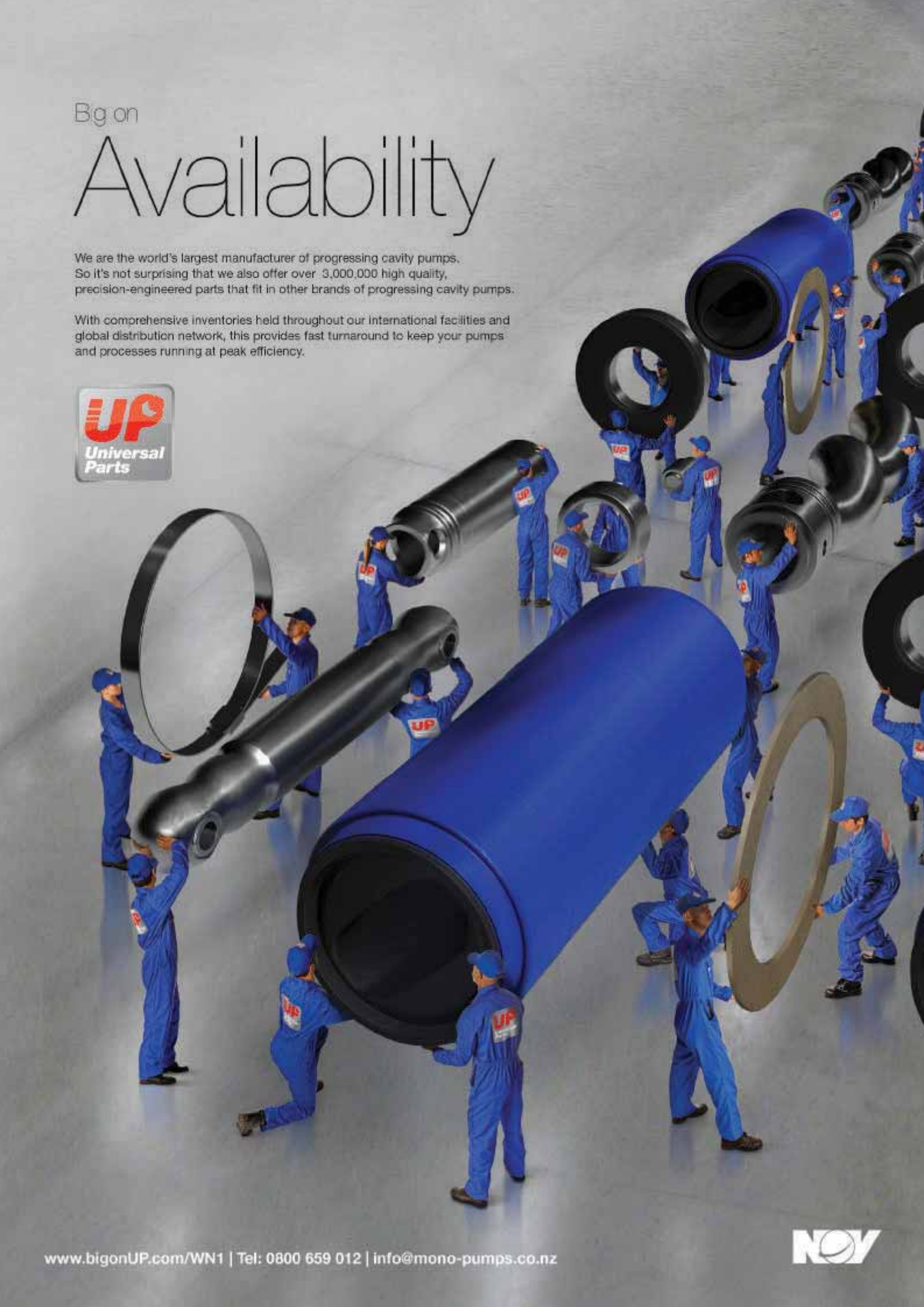
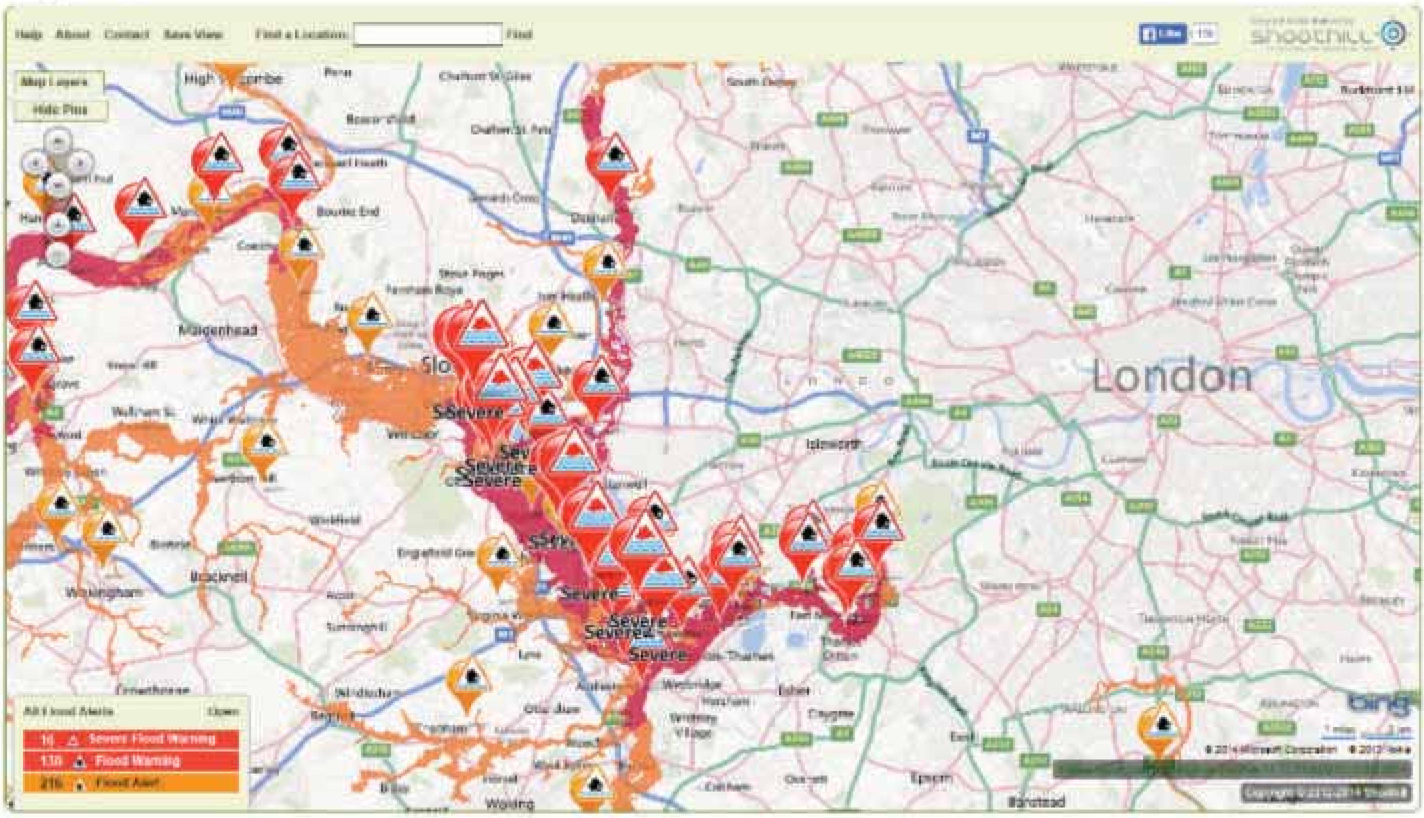

Big on
Availability
We are the world's largest manufacturer of progressing cavity pumps. So it's not surprising that we also offer over 3,000,000 high quality, precision-engineered parts that fit in other brands of progressing cavity pumps.
With comprehensive inventories held throughout our international facilities and global distribution network, this provides fast turnaround to keep your pumps and processes running at peak efficiency.
UP
Universal Parts
www.bigonUP.com/WN1 | Tel: 0800 659 012 | info@mono-pumps.co.nz
NOV

Figure 5 – Environment Agency Flood Warning Map, February 2014 provides 'live' updates to communities



Days of continually increasing flood protection heights could be numbered

In addition to local authorities' own views, more importantly there is also the need to alter the mind-set of the public, the media and the insurance industry that favours structural flood mitigation (Johnson & Priest, 2008). As demonstrated by the public reactions and expectations in the wake of the January 2014 flooding in England, this requires a focus on 'societal change' more than any direct action from a government department or local authority, to form the basis of a sustainable approach to 'flood risk management' (Butler & Pidgeon, 2011).

Land use planning and development control play a key role in sustainable "Flood Risk Management" (Porter & Demeritt, 2012). The UK Government is expecting local authorities to construct additional houses to boost economic growth, in turn 'relaxing' planning legislation to encourage developers. At the same time they are advising less money is available from central government for flood defence. A softer 'flood risk management' approach also makes spatial planning even more challenging, as the 'black and white' of 'defended or undefended', becomes many shades of grey with consideration of hazard, safety, access, flood resilience, emergency planning, and so on.

In the currently evolving meteorological and economic climate England appears to have little choice in adopting "Flood Risk Management" over "Flood Defence", however its success will hinge on public buy-in. This challenge cannot be underestimated given "flood defence" has been the status quo for generations; and given the January and February 2014 flooding, advising of such a change would be political suicide. Although "Flood Risk Management" is the probable way forward for England, the change in approach will take generations to undo the mistakes of the past, with taxpayers picking up the tab in the interim in one form or another.

6. Conclusions

England's period of accelerated flood risk policy change over the last decade is now turning into a period of change in "Flood Risk Management". New Zealand can watch on in a collective sympathy as decision makers struggle with 'no win' flood risk management decisions and the British public suffer at the hands of the climate.

In New Zealand we should also assume there will not be a bottomless pit of money to 'engineer' our way out of flooding. Learning lessons from England's experiences, we should place increased emphasis on 'front loading' our flood risk planning – strategically assessing flooding across the full local authority boundary as part of a robust evidence base for our Regional, Unitary, and District Plans. This could then lead to developing district, city or regional wide strategies to manage all forms of flooding, recognising their inter-connectedness, but sometimes differing responsibilities for management.

We should be applying a precautionary approach while doing this – recognising both flood data limitations and the understanding of climate change will be refined in the future. Land use planners should seek to understand the sensitivity of the flooding information they are using by understanding the upper limits of predicted climate change.

We should seek to avoid flood risk areas. Positively, there are signs that New Zealand is now learning this critical lesson. In Auckland the Council is seeking to preclude residential floodplain development in the notified Unitary Plan.

Alternatively, if we need to provide 'structural' flood protection, due to the many other competing development drivers communities experience, have we considered the 'whole of life' costs to our future society and sequentially sought out all reasonably available sites at the lowest probability of flooding before zoning a flood risk

area for development? There will always be a role for infrastructure to provide flood protection, however it should not be used as an enabler and should form part of an integrated approach to flood risk management.

As well as providing planners with the tools to sequentially locate development outside flood risk areas, strategically assessing and developing solutions across the local plan area, not the catchment, provides a basis for development of robust development control policies and guidance.

In the future much of our flood infrastructure may become obsolete as a result of climate change, as it becomes at best unsustainable, at worst unaffordable to continue to build bigger. It may be necessary to let some places flood more frequently in the future (Defra, 2009 in Porter & Demerrit, 2012). At present this is not a legislated change in England, but is gathering momentum supported by Government policy documents such as 'Making Space for Water'. There is understandably significant concern about what this means for existing communities in flood risk areas (Clover, 2004). "Flood Risk Management" is no 'panacea' for dealing with floods, but is a reality of the fiscally constrained and changing 'climate' we now live in.

Whether we choose to or not, we will find ourselves learning to live with increased flooding in New Zealand. The responsibility on the shoulders of our land use planners in this regard cannot be underestimated. England is finding land use planning decisions of the past have placed them in 'no win' situations; with people to protect, more houses to build, and not enough money for flood protection. Whilst we have had similar experiences in parts of New Zealand, land use planning still offers significant opportunity for us to learn from the experiences of our Commonwealth cousins and ultimately limit the level of risk we expect our future communities to 'live with'.

Acknowledgements

Special thanks to Suman Khareedi, Warren Bird and Jarrod Snowsill of Opus International Consultants for reviewing this paper and suggesting improvements.

About the Author

James is an experienced engineer and project manager having worked for over 13 years on a variety of flood risk management projects in both New Zealand and the United Kingdom, from strategic planning and policy making to detailed design and construction supervision. James has provided flood risk planning advice to developers and local authorities across the UK and has worked on a number of high profile projects including the London 2012 Olympics, Drain London Surface Water Management Plans and the Southampton Flood Risk Management Strategy. ■

References

Bennett, O. (2014). 'Flood defence spending in England – Commons Library Standard Note' [Online] http://www.parliament.uk/business/publications/research/briefing-papers/SN05755/flood-defence-spending-in-england [Accessed 11th February 2014]

Butler, C. & Pidgeon, N. (2011). 'From 'flood defence' to 'flood risk management': exploring governance, responsibility, and blame'. Environment and Planning C: Government and Policy, 29, 533–547.

Clover, C. (2004). 'Defra calls it 'Making Space for Water': others call it flooding'. [Online] http://www.telegraph.co.uk/comment/personal-view/3611981/Defra-calls-it-Making-Space-for-Water-others-call-it-flooding.html [Accessed 11th February 2014]

Conway, G. (2014). 'Rising seas threaten Christchurch homes' [Online]: http://www.stuff.co.nz/business/industries/9588487/Rising-seas-threaten-Christchurch-homes [Accessed 11th February 2014]

Department for Communities and Local Government (2006). Planning Policy Statement 25: Development and Flood Risk (London, HMSO).

Department for Communities and Local Government (2009). Planning Policy Statement 25: Development and Flood Risk Practice Guide (London, DCLG)

Department for Environment, Flood and Rural Affairs (2014). 'Defra Funding for Flood and Coastal Erosion Risk Management in England' [Online]: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/277910/flood-coastal-erosion-funding.pdf [Accessed 13th February 2014].

Department for Transport, Local Government and the Regions (2001). 'Planning Policy Guidance 25: Development and Flood Risk' (London, HMSO).

Environment Agency (2009). 'Investing for the future: Flood and coast risk management in England – A long-term investment strategy' (Bristol, Environment Agency).

Environment Agency (2014). 'A history of flooding on the tidal Thames'. [Online] Available from: http://www.environment-agency.gov.uk/homeandleisure/floods/117047.aspx [Accessed 10th February 2014].

Institution of Civil Engineers (2001). 'Learning to Live with Rivers' (London, Institution of Civil Engineers)

Johnson, CL. & Priest, SJ. (2008). 'Flood Risk Management in England: A Changing Landscape of Risk Responsibility?' International Journal of Water Resources Development, 24, 4, 513–525.

Met Office (2013). 'Record wet January for parts of Britain'. [Online] http://www.metoffice.gov.uk/news/releases/archive/2014/Early-January-Stats. [Accessed: 11th February 2014].

Ministry for the Environment (2010). 'Preparing for future flooding: A guide for local government in New Zealand'. (Wellington, Ministry for the Environment).

Parker, DJ. (1995). 'Floodplain development policy in England and Wales'. Applied Geography, 15, 4, 341–363.

Penning-Roswell, E. (2001). 'Flooding and planning – conflict and confusion'. Town and Country Planning, April 2001, 108–110

Pitt, M. (2008). 'Learning Lessons from the 2007 Floods'. [Online] Available from: http://webarchive.nationalarchives.gov.uk/20100807034701/http:/archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html [Accessed 10th February 2014]

Porter, J. & Demeritt, D. (2012). 'Flood Risk Management, Mapping and Planning: The Institutional Politics of Decision-Support in England'. Environment, Politics and Development Working Paper Series, 43.

Price, D. & McInally, G. (2001). 'Climate Change: Review of Levels of Protection Offered by Flood Prevention Schemes' (Edinburgh, Scottish Executive Central Research Unit).

Richards, J., White, I., Carter, J. (2008). 'Local Planning Practice and Flood Risk Management in England: Is there a Collective Implementation Deficit?'. Urban Environment, 2, 11–20.

Turnstall, S., McCarthy, S., Faulkner, H. (2009). Flood risk management and planning policy in a time of policy transition: the case of the Wapshott Road Planning Inquiry, Surrey, England'. Journal of Flood Risk Management, 2, 159–169.

White, I. & Howe, J. (2002). Flooding and the Role of Planning in England and Wales: A Critical Review. Journal of Environmental Planning and Management, 45, 5, 735–745.

White, I. & Richards, J. (2007). 'Planning Policy and Flood Risk: The Translation of National Guidance into Local Policy'. Planning, Practice & Research, 22, 4, 513–534.

Wintour, P (2014). 'UK Floods: Downing Street to hold clear-up summit with insurers'. [Online] http://www.theguardian.com/environment/2014/feb/18/uk-floods-downing-street-meet-insurers-rising-premiums [Accessed: 20th February 2014]

Wynn, P. (2005). 'Development Control and Flood Risk: Analysis of Local Planning Authority and Developer Approaches to PPG25'. Planning, Practice & Research, 20, 3, 241–261.

GEA Westfalia Separator waterMaster

Energy consumption reduced by up to 50 percent

Outstanding efficiency and productivity based on

- GEA Westfalia Separator **eco**drive (-5%)
- GEA Westfalia Separator **summation**drive (-5%)
- Deep-pond design (-30%)
- GEA Westfalia Separator **energy**jets (-10%)

Enquiries: Jeroen Smal +64 21 988 203 jeroen.smal@gea.com

GEA Westfalia Separator New Zealand Limited

8 Fisher Crescent, Mt Wellington, Auckland 1060, New Zealand
Phone +64 9 276 2388 Fax +64 9 259 0173
www.gea.com

engineering for a better world

GEA Mechanical Equipment

A Brief History of Ningbo Water Meter Company

Chinese company, Ningbo Water Meter Company (NWM), was formed in 1960 and started water meter production in 1964 – the first water meter manufacturer in China.

The production of water meters grew steadily, from producing 60,000 water meters in 1978 to 1,000,000 water meters in 1983.

In 1987, NWM was the first Chinese water meter manufacturer to win an International tender for the supply of water meters.

In 1994, the company was accredited with ISO9000, ISO 9001 and has a Government controlled ISO17025 testing laboratory onsite as part of their quality assurance and verification.

In 2012, NWM formed an exclusive agent's agreement with Fluidflo Pty Ltd of Australia to service the Australian and New Zealand markets. Fluidflo has been supplying goods and services to the Australian water meter market for over ten years and its personnel have over thirty years' experience in the water meter field.

In 2013, Fluidflo was accredited with ISO 9001 and AS/NZS4801. Their products now cover applications such as irrigation, industrial, commercial and urban development and have a range of meters from 6mm to 2,500mm.

"Fluidflo and EDMI Australia and EDMI New Zealand formed an alliance in 2013, for the sale and distribution of water meter products for both countries."

Water meters in certain sizes for the Australian market where they are used for "Trade", need to conform to certain government requirements. To achieve this, samples were provided for testing to the Australian standard AS3565.1 and National Measurement Institute NMI R-49. These were for volumetric water meters in sizes 20mm and 25mm in both DZR brass bodies and composite bodies.

Approvals were granted in early 2014 for the sale and distribution of these water meters.

Fluidflo and EDMI Australia and EDMI New Zealand formed an alliance in 2013, for the sale and distribution of water meter products for both countries. EDMI has a track record in both the electricity and gas markets, and since the creation of its Water Division, will now service the major water utilities in both countries.

With the introduction of smart electricity meters into Victoria in 2013, Fluidflo has been working with EDMI to develop a smart water meter using the NWM volumetric composite water meter and EDMI electronics.

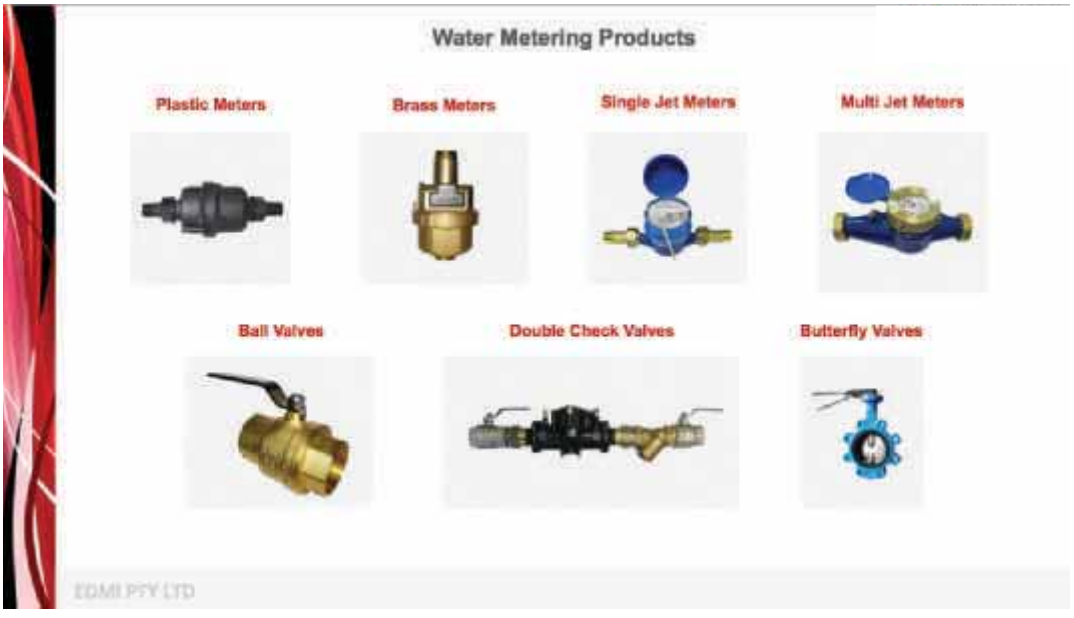
"In Australia today, more water utilities are moving towards a combination of smart water meters and automatic meter reading, and it is expected this trend will continue. This technology offers utilities the ability to read water meters remotely, identify anomalies with excess consumption or leak detection, and reduced billing periods."

Today, NWM produces over 7,000,000 water meters annually and manufactures water meters under licence for a number of International water meter companies. The company has OIML accreditation in Europe, AWWA in America and NMI R-49 accreditation in Australia.

In Australia today, more water utilities are moving towards a combination of smart water meters and automatic meter reading, and it is expected this trend will continue. This technology offers utilities the ability to read water meters remotely, identify anomalies with excess consumption or leak detection, and reduced billing periods.

NWM has now taken the concept of using composite material for water meter manufacture into backflow prevention manufacture. Today, EDMI New Zealand has access to the only all composite backflow prevention device manufactured by ARI Flow Control from Israel. These valves are fully compliant to AS/NZ2845.1 and Water Mark certification in Australia.

Being a composite body, it offers a light weight installation, lower costs compared to comparable brass bodied devices and a 70% lower carbon footprint compared to brass bodied backflow devices. ■



Smart Water Networks and iPERL

Water is both challenging to manage and increasingly precious. Within the next decade, approximately 1.8 billion people worldwide will be living in areas of absolute water scarcity[1].

As a finite resource, even in New Zealand access can be at risk from a growing population and demand against a back drop of greater treatment and delivery cost requirements restricting consumer accessibility and affordability. These factors will continue to put pressure on infrastructure requirements, particularly in cities.

The water industry is aware of the issues it faces including environmental impacts, an aging infrastructure and increases in energy prices. Globally, utilities are spending nearly $184 billion each year related to the supply of clean water – $14 billion of which is spent on energy costs just to pump water around the current networks.

Water not only feeds bodies, it also feeds economies. Given the link between Gross Domestic Product (GDP) and the availability of potable water, this vital resource is both a source of personal well being and critical to both national and regional economic livelihood.

People and Technology will Bring Smart Water Networks into Focus

Moving Smart Water Networks past the barriers and taking it from promising experiment to widespread reality will require engagement across a diverse set of stakeholders including utilities and municipalities, regulators, investors, industry and utility associations, technology providers and academia. Collectively, these industry leaders can address the environmental and financial needs for Smart Water Networks to revolutionize the water distribution infrastructure of the future.

> "Just as industry associations and individual industry leaders played a significant role in encouraging legislation needed to push adoption of electric smart grid solutions, the same approach should be taken for smart water solutions."

Utilities can partner with technology providers to develop and refine solutions and establish benefits of Smart Water Networks. Regulators can reward and incentivize improvements in operational efficiency. Simply diverting savings captured by utilities to other municipal operations or reducing tariffs and price increases leaves little incentive for utilities to seek additional productivity improvements. If water utilities have the capability to monitor water on a real-time basis, regulators could consider defining new standards which require more frequent reporting and testing.

Just as industry associations and individual industry leaders played a significant role in encouraging legislation needed to push adoption of electric smart grid solutions, the same approach should be taken for smart water solutions.

Now is the Time to Act

All of Sensus findings on Smart Water Networks, based on interviews done by McKinsey and published in the Sensus White Paper "Water 20/20[3]", point to a massive opportunity for utilities and could truly revolutionize water distribution networks – many of which have remained largely static and untouched from the benefits of new technology Network implementation.

New Zealand could drastically improve the situation through innovative partnerships. Utilities and municipalities, regulators, investors, industry and utility associations, technology providers and academia have an opportunity to affect change partnering the right technologies with the right stakeholders.

Approximately two-thirds of the world's population or 4.6 billion people facing water stressed conditions in the next decade[2]. With the human toll and the financial well-being of utilities at stake, the time to act is now. To offset unnecessary human and economic hardship.

Sensus' Role in Smart Water Networks

Sensus has unveiled a revolutionary new smart water management technology, the iPERL. This new endpoint will provide the reference for industry in both long term accuracy and will be unrivalled with its flexible communications platform. iPERL promises to unlock the full potential of Smart Water Networks for utilities and their customers and have been undergoing application trials in NZ since the beginning of 2014 now that the this metering technology has been released for supply to Australasia.

Unlike conventional mechanical metering, iPERL technology provides linear metrology across nonpareil low flow capabilities and most importantly the accuracy of iPERL remains unchanged with time, offering significant improvement in whole life value to utilities. iPERL's measurement capability is independent of water quality, pressure, installation conditions or orientation and will provide further gains in operation efficiency. iPERL's data can be relied upon and trusted when making critical decisions regarding the distribution network making it a revolutionary tool to reduce non-revenue water (NRW) and improve the accuracy of network processes such as load balancing and burst detection.

We all know that population movement and growth are gravitating to urban areas – this will place more and more pressure on water networks in the years to come. Add in the high energy costs associated with water supply, the potential impact of global warming on water scarcity and the increased consumption resulting from improving living standards and it is clear that we need a more sustainable way of delivering water resources.

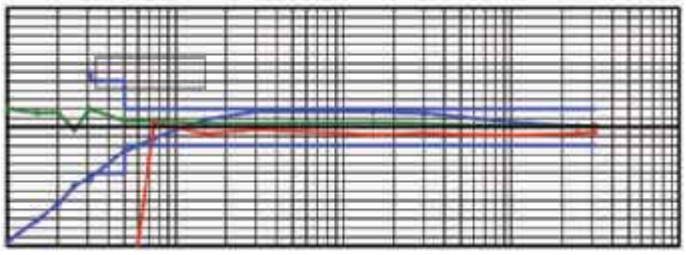
iPERL offers a technology pathway to meet these challenges by enabling the benefits of Smart Water Networks for customers and by delivering communication solutions making this a reality.

iPERL is equipped with Sensus low power 433MHz open public frequency integrated radio technology. The design provides billing and alarm status, for walk-by/drive-by, plus the ability to interrogate the meter for more detailed dialogued statistics. Along with SensusRF, iPERL also offers an compliant OMS certified T1 broadcast platform. Furthermore SensusRF provides a link to the long range radio infrastructure, FlexNet.

The European manufactured iPERL is the next generation of Sensus iPERL already successfully launched in the USA. The optimisation of the measuring principle, while offering RF communication and a 15 year battery life are major accomplishments which will change the markets perception of the value a domestic water meter can bring to a water network.

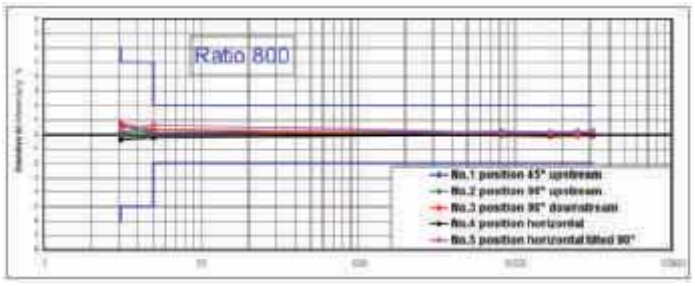
Reduction in network leakage is critical as well as the sustained supply of clean potable water. Without reliable sensors our knowledge of the network can not be trusted. iPERL will become a critical endpoint in any proactive network monitoring system. An accomplishment in addition to its life performance, iPERL has been designed with end of life disassembly in mind. Although hermetically sealed, the device uses innovative potting methods that allow all electronic components to be "pulled" from the device without the need for machining.

Simplicity, productivity and environmental sustainability are the three axis of innovation embodied in iPERL, and it's available now to help bring the vision of Smart Water Networks to reality.



Reduction of Non-Revenue Water

Figure 1 shows the metrological performance curve for iPERL (green) compared to that of a high quality piston meter (blue) and a competitive solid state flow meter (red). Based on its outstanding metrological performance, iPERL ensures that the water utility accounts all the water supplied to the consumer, thus representing a considerable reduction in Non-Revenue Water.



Uninterrupted Metrological Performance

iPERL can be installed in any orientation, without any effect on the metrology. Sensus have also implemented a system by which the flow direction is detected at point of installation so as to allow the engineer to absolutely select the most accessible installation condition. ■

Sources

Craig Ramsay, Managing Director
Deeco Services Ltd from Sensus Metering Systems

Footnotes

1 and 2 http://www.un.org/waterforlifedecade/scarcity.shtml
3 http://sensus.com/web/usca/solutions/smart-water-networks

iPERL™ SMART METER

KEY FOR AN INTELLIGENT WATER NETWORK

Established 1938

ON TOP DOWN UNDER

Deeco

Deeco with iPERL has the perfect platform for an intelligent water network. As a fully electronic data endpoint, iPERL guaranties highest metrological performance, offering a starting flow rate of 1l/h and a measuring range of MID R800, well mentioned irrespective of the installation position or network conditions. Even air shocks or foreign particle in the medium will not disturb the correct measuring.

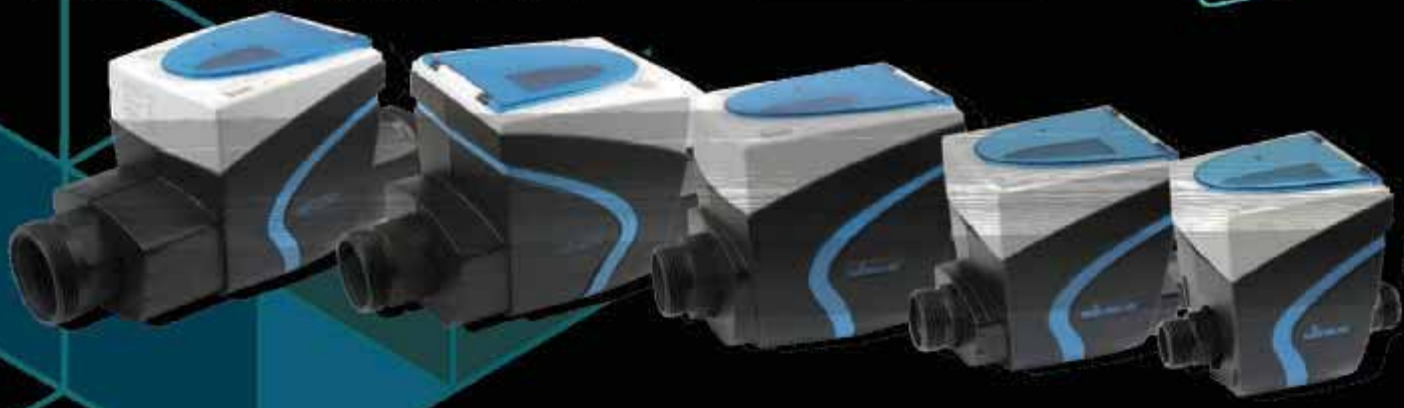
All measuring and operation data are continuously sensed and broadcasted using a communication network system. Thus flow rates and operating states are always available for connected control systems. So, a real-time water supply management will come true. Instant identification of leakages or permanent monitoring of water quality as well as efficient utilisation of resources are the results.

Reduce your energy costs addressing Non-Revenue Water, manage your network efficiently with reliable data, preserve the most precious of natural resources with Sensus Smart Network Solution and build a Smart City for a "greener" future.

The entire range of a smart water network communication and the efficiency of iPERL as key technology can be discovered on **www.deeco.co.nz** or by contacting **Deeco Services Ltd**.

SIMPLE
ACCURATE
RELIABLE
LONG LASTING
DATA DRIVEN

That's iPERL by Sensus



SENSUS

The Measure of the Future

Real-time reliable data is the key to smart networks

Sensus is a leading clean technology solutions company offering smart meters, communication systems, software and services for the electric, gas and water industries. Sensus technology helps utilities drive operational efficiency and customer engagement with applications that include advanced meter reading, data acquisition, demand response, distribution automation, home area networking and outdoor lighting control. Customers worldwide trust the innovation, quality and reliability of Sensus solutions for the intelligent use and conservation of energy and water.

iPERL™ In all over 16 millions smart endpoints such as the inline iPERL and Sensus 640 Manifold smart meters are connected to Sensus FlexNet data networks worldwide with a further 16 millions more already committed by customers for delivery.

Deeco Services Ltd | National Service & Distribution | 21 Regent Street PO, Box 33-226, Petone
Tel: 0800 433326 | **Fax:** 0800 333267 | service@deeco.co.nz | **www.deeco.co.nz**

Timbertanks – A Proven Asset

The proven sustainability of timber water tanks and reservoirs makes them the best choice for treatment and storage of water and a wide range of other products, according to the clients of Auckland based Timbertank Enterprises.

District councils and rural water schemes around the country have opted for timber tanks because of their suitability when it comes to cost, managing the asset over the long-term and even their looks.

A recent example saw the Kapiti District Council's installation of a 200,000 litre tank built on DOC reserve land by a popular bush walk, win an award because it blends in so well with the surrounding environment. Comments included that design and construction of the tank was of high quality and provided an innovative solution to the replacement of two older tanks.

"Timbertank wood reservoirs and tanks can be assembled anywhere – including remote and difficult locations."

KDC Utilities Infrastructure Manager Chris Appleby said the tank was chosen because of site access for construction – 100 metres up the hillside – and that it fits especially with DOC's insistence on preserving the natural environment. "It serves part of Waikanae and extends our water zone. We expect it to service the area for 50 years. We have two other timber tanks in the region that have been here for 40 years and will shortly be upgrading them," said Mr Appleby.

Near Tauranga, a Timbertank installed for the Western Bay of Plenty District Council at Minden Road Te Puna, has become something of a tourist attraction, as buses on the way to view the Bay from the heights, often stop so tourists can take a photo of this 'attractive wooden tank'.

The Waikato District Council has been selecting Timbertanks for use to provide potable water for small communities for some years. Towns such as Pokeno, Raglan, Te Akau, Tuakau, Hoeka and Matangi have a variety of different capacity tanks to meet local needs, while the Te Kauwhata water treatment plant has four tanks.

And in Warkworth north of Auckland, staff at the Wastewater Treatment plant say they love the look of their Timbertank. It is a buffer tank to collect big flows of waste on occasions such as after heavy rain. The tank is equipped with a mixer, aeration, flushing and measuring equipment, so easy access for operators is important – hence the stairway and ancillary equipment on the outside. Originally installed at Tinsdalls Hill for 25 years, it was disassembled, refurbished and relocated to the plant – a good example of maintaining an asset's value even with a radical relocation.

The Thames Coromandel District Council, mindful of conservation values as well as residents' pockets, has for many years been choosing to install Timbertanks to cater for its ever increasing population – particularly in holiday times. A map showing the extent of their commitment to using timber tanks can be found at www.timbertanks.co.nz/news/

TTEL managing director Justin Jordan says the Timbertanks system is a truly sustainable choice. "The wood used is plantation-grown and therefore a renewable resource, while the energy consumption from raw material to operational tank is minimal when compared to that of both concrete and steel alternatives," said Mr Jordan.

In fact, the production of dry lumber actually has a huge negative net carbon emission rating, as wood stores significant amounts

atmospheric carbon dioxide. Steel emits significant amounts of CO_2.

"Our water tanks and reservoirs are more competitive than alternative tanks in terms of ease and speed of installation, cost, adaptability, ease of maintenance and servicing and overall durability," he said.

Timbertank wood reservoirs and tanks can be assembled anywhere – including remote and difficult locations. They require minimal maintenance and importantly, their design and construction is such that earthquake and cyclone resistance is highly rated – proven in practice throughout the Pacific and, since the Christchurch experience, adapted for even better performance in extreme EQ.

"If we are genuinely concerned about the environment and are expecting more extremes of wet or dry weather than currently being experienced in some parts of the country, then we should also be seriously considering the best options for collecting, storing and conserving this precious resource when the storms hit," said Mr Jordan.

"The recent storms experienced in the north of the Island saw two tank roofs being embedded with flying branches. With the construction of our roofs being specifically designed as modular and highly serviceable, in less than an hour they were repaired and made tight again, without any loss of function."

Cost benefit analysis bears out the decision to install Timbertanks ahead of other options. A 1000m³ Timbertank (costing approximately $300,000) will have 18 tonnes of processed timber in it and a life expectancy of between 50–100 years. Apart from the obvious positive aspect of carbon sequestation and using a natural long-lasting material such as treated timber, the aesthetic and economic values make it a no-brainer first choice. ■

Top left – Te Kauwhata: A 30 year old tank looking as good as new, Top – Waikanae: Utilities Infrastructure Manager Chris Appleby (left) and Senior Water & Wastewater Engineer Haig Meyer inspect the new tank. Note the vermin (read possums, rats) repel strip installed on this tank because of the location, Above – Warkworth: The refurbished and relocated tank at the wastewater plant

Correction

In the July issue of Water, we published an article on SolarBee with some inaccuracies. The Editor apologises for this mistake and has published the corrected article in this issue.

SolarBee Potable Water Mixers

Why Mix Your Potable Tank?

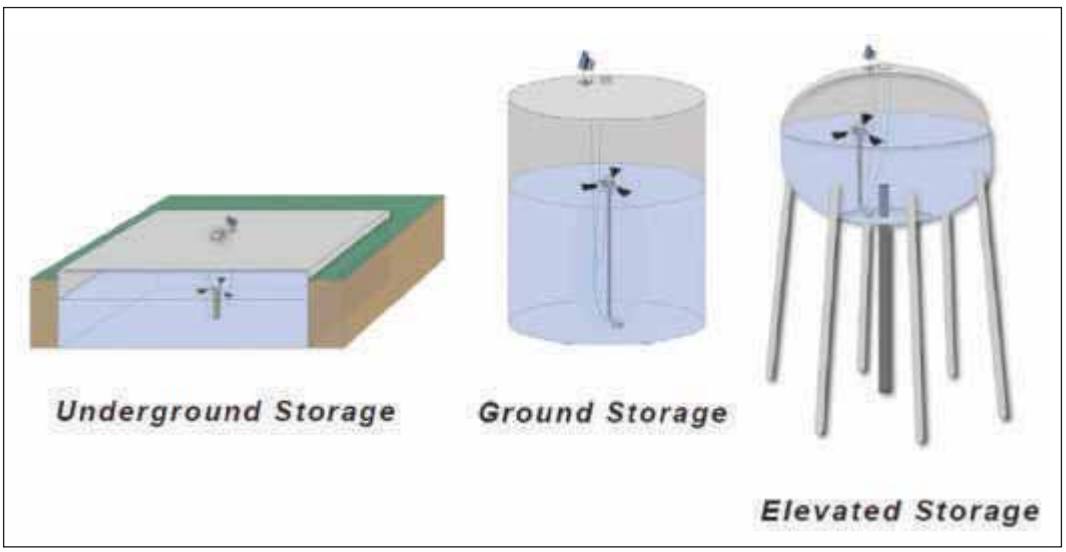
Active mixing in water storage tanks ensures uniform distribution of disinfectants and representative sampling. Well-mixed tanks consume less disinfectant chemical, produce fewer disinfection by-products, and eliminate the need for energy-intensive and costly deep-cycling or flushing.

Stagnation in Potable Water Storage Reservoirs Can Cause:

- Loss of residual disinfectant (chlorine or chloramine)
- Inconsistent water age, taste and odours
- Therma stratification – even 0.1°C differential can inhibit mixing effects of normal inflow and outflow
- Nitrification and high heterotrophic plate counts
- Excessive ice build-up and tank damage in cold climates

The Benefits of Medora's Potable Water Mixing Include:

- Uniform distribution of disinfectants, consistent residual readings, representative sampling
- Impacts the tank boundary layers where the bacteria build up, and provides uniform water age
- Prevents stagnation, thermal stratification, and short-circuiting
- Reduces nitrification and high heterotrophic plate counts
- Reduces ice build-up and tank damage in cold climates



SolarBee®
Circulating the World's Water
Covering Oceania

Features of SolarBee Mixing Equipment

SolarBee mixing equipment operates day and night on solar power or low energy grid power. Its collapsible design allows for customer or factory installation and it will fit through hatches as small as 18" in diameter. With an injection system for boosting, the equipment has just one moving part and a life expectancy of 25 years. It self-adjusts for varying water levels and produces SCADA outputs for monitoring as well as a safe low voltage.

> "Well-mixed tanks consume less disinfectant chemical, produce fewer disinfection by-products, and eliminate the need for energy-intensive and costly deep-cycling or flushing."

Medora Corporation's mixers' energy-efficient, high-volume flow capabilities can be used to increase the baffle factor and actual T10 (the time at which 90 per cent of the water remains in the CT basin) detention time in treatment plants. Increased detention time allows a lower chlorine level to be used to meet the required CT, or chlorine concentration multiplied by time. A lower chlorine level will lower the total trihalomethane (TTHM) potential.

Mix First, Then Boost

Frequent boosting with small doses of disinfectant is far less costly than having a major problem occur in your distribution system. All of Medora's potable water mixers are equipped with chemical injection capability and the company offers an optional Disinfectant Boost System to dose small amounts of disinfectant (chlorine or chloramine) to maintain the desired residual level.

The Disinfectant Boost System is a portable air-operated injection system designed to be mounted in the back of a pickup truck or ute. It allows a single operator to safely and reliably boost multiple tanks in one day from ground level. With frequent monitoring and this portable boosting unit, customers can give end-users optimal quality water. ■

Medora Coporation's potable water products are certified to NSF/ANSI Standard 61.

For more information phone: +64 9 347 8338 or visit http://aquaenvirons.com/inc/solar-bee/

NEW ZEALAND
ENGINEERING
EXCELLENCE
AWARDS 2014

CELEBRATE A NIGHT OF INGENUITY

10TH ANNIVERSARY AWARDS' DINNER

TICKETS ON SALE NOW
EARLY BIRD RATE UNTIL 1 OCTOBER

IPENZ invites you to the last event in our Centenary Calendar and the 10th New Zealand Engineering Excellence Awards' Dinner.

Join the finalists, business and industry leaders and MPs in recognising the impact engineering makes in the lives of people everywhere.

FRIDAY 28 NOVEMBER 2014
PULLMAN HOTEL, AUCKLAND

WWW.NZEEAWARDS.ORG.NZ

SUPREME AWARD SPONSORED BY
spiire

IPENZ CENTENARY EVENT
1914 – 2014

SPONSORED BY
HERA INNOVATION IN METALS
HAYS Recruiting experts in Engineering
URS
CallaghanInnovation
POWERCO
meridian
IPENZ FOUNDATION
MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI
Auckland Council
NZ TRANSPORT AGENCY

"GEA Westfalia Separator waterMaster achieves first-class separation results whether as a stationary or a mobile unit. This applies to the dewatering and thickening of sewage sludge, the treatment of drinking water and the recovery of valuable materials, like nutrients nitrogen and phosphorous."

GEA Westfalia Separator Technology

Energy Consumption Reduced by up to 50 Percent with the New WaterMaster

The CF decanter series ensures highest uptime reliability along with maximum performance and separation efficiency round-the-clock, with minimal energy consumption, according to GEA Westfalia.

The "Greener" Your Water and Wastewater Treatment, the "Blacker" Your Figures

GEA Westfalia Separator waterMaster achieves first-class separation results whether as a stationary or a mobile unit. This applies to the dewatering and thickening of sewage sludge, the treatment of drinking water, and the recovery of valuable materials, like nutrients nitrogen and phosphorous. Numerous technical innovations in the GEA Westfalia Separator waterMaster ensure a uniquely favourable energy balance and first-class separation performance.

Optimised Drive System GEA Westfalia Separator Ecodrive

Whilst earlier generations of decanter centrifuges had two separate frequency converters to drive the bowl and scroll, the waterMaster is controlled by only one frequency converter. The frequency converter of the secondary motor starts the primary motor when the machine starts up. Once the decanter bowl has reached its rated speed, the machine switches to mains operation and the frequency converter is applied to the secondary motor where it now controls the differential speed. This saves one frequency converter in the control unit and eliminates the loss of efficiency caused by a frequency converter.

This has allowed energy consumption to be reduced by a further five percent.

Efficient Gear Drive: GEA Westfalia Separator Summationdrive

The kinematics of GEA Westfalia Separator's summationdrive bring together ("sum") the outputs of both motors and then transmit them precisely to bowl and scroll. Unnecessary conversion losses, such as those which occur in other solutions involving reverse power (backdrive or additional belts), are not an issue with summationdrive. Instead, differential speed is supplied energy-efficiently and seamlessly across a broad range, saving up to five percent energy compared to other drives. As a result, any additional electrical components for recycling energy can be dispensed with.

Benefits of Deep-Pond Design

The deep-pond design of bowls in the GEA Westfalia Separator waterMaster ensures optimised flow characteristics in the bowl with high hydrostatic pressure, improved clarification and a reduced energy requirement for discharging the product. This reduces electricity consumption by up to 30 percent and also dramatically cuts the requirement for flocculants.

Reduced Energy Demand with GEA Westfalia Separator Energyjets

One source of energy consumption in a decanter centrifuge is the power required to discharge the clarified liquid. This can represent up to 50 percent of the decanter's total energy requirement. Using GEA Westfalia Separator energyjets, specially-shaped weir plates with integrated flow deflection allow the decanter's energy requirement

"GEA Westfalia Separator waterMaster achieves first-class separation results whether as a stationary or a mobile unit."

to be reduced by up to 10 percent. All in all the specific energy consumption of the waterMaster has been reduced by up to 50 percent overall. This means the decanter now requires only 0.5kWh for each cubic metre of thickened sludge. GEA Westfalia has also managed to reduce flocculent consumption, rendering water and wastewater treatment more sustainable and ensuring that customer investment holds its value for longer. ■

For enquiries contact:
Jeroen Smal, Business Development Manager – Business and Industrial, GEA Westfalia Separator NZ Limited, phone: 09 259 8921 or email: jeroen.smal@gea.com

Water New Zealand Conferences & Events

Water New Zealand* Annual Conference & Expo 2014 – *Implementing Reform
17 – 19 September 2014
Claudelands Events Centre, Hamilton, New Zealand

***Water New Zealand* Asia Pacific Stormwater Conference**
20 – 22 May 2015
Pulman Hotel, Auckland, New Zealand

Visit waternz.org.nz for more information on the upcoming conferences

Other Conferences:

IWA World Water Congress & Exhibition
Lisbon, Portugal, 21 – 26 September 2014
W: iwa2014lisbon.org

Water Environment Federation Technical Exhibition and Conference
New Orleans, USA, 27 September – 1 October 2014
W: weftec.org

Stormwater Australia Conference
Adelaide, Australia, 13 – 17 October 2014
W: gensevents.au

21st Century Watershed Technology Conference and Workshop
Hamilton, New Zealand, 3 – 6 November 2014
W: watershedtech.org

2015 Australian Water Association Conference 'Ozwater 2015'
Adelaide, Australia, 12 – 14 May 2015
W: awa.asn.au

Advertisers Index

Classifieds

ACUFLO

NZ OWNED & NZ MARKET COMMITTED
PROVEN PRODUCTS & PERFORMANCE

MANIFOLDS

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

WATER METERS

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

BOXES

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

BACKFLOW

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

PERFORMANCE TESTED

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

NEW ZEALAND MADE

ACUFLO INDUSTRIES LTD

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

ISO 9001 CERTIFIED GCS

FLYGT

LET'S GET SLIMMER WITH A WHOLE NEW FLUID DYNAMIC.

The cost of moving water will have major implications on your bottom line. The Flygt slimline propeller pumps are fit to transport large volumes of water at low heads with the ultimate in performance. A lean profile means you can scale down on your pump station size. Add to that an optimized propeller design and state-of-the-art N-technology for sustained high efficiency. Whether it's for continuous or intermittent duty, clean or contaminated water, we'll help you with all the dynamics to move volumes, effectively and reliably.

Like us on facebook

NZ Tel: 0800 331 914
www.xylemwatersolutions.com/nz

xylem
Let's Solve Water