



IPWEA NZ 2020 ABSTRACTS

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HYNDS PIPELINES FINALISTS

How to bring the word "resilience" into action: renewal planning

*Bruce Balaei*¹

*Glen Syred*¹

¹ GHD

This paper presents a practical take on the concept of resilience – and why and how it should be considered when planning for infrastructure renewal.

Infrastructure renewal is generally the most costly Capex activity for local government. While central and local authorities aim to optimise their capital expenditure, they may not always be successful in the long term due to carrying out renewal planning in silos. In addition, they lack a realistic understanding of the concept of resilience, which adds to the inefficiency. This paper provides a measurable definition of *resilience* and what it means in the context of infrastructure. It also describes a new approach to planning renewals based on asset condition, age, and resilience. This approach will help infrastructure authorities to optimise their asset renewal over time – to provide service to the maximum number of clients during both business-as-usual and times of emergency.

Being bold - front-footing the New Zealand drinking water standards

*Jayne Perrin*¹

*Amit Chauhan*²

¹ Beca, ² Selwyn District Council

Combining a driver to protect public health and provide community confidence in the water supplied to their taps, with the recent changes to the WSP and regulatory environment results in an organisation embarking on an ambitious capital works programme.

Since 2013, Selwyn District Council has stepped-up their level of monitoring and responsibility of water supplies to the 19,000 households across the district. What makes this more challenging is these supplies come from 27 separate water schemes distributed across the District.

Records from 2017 reveal 22 boil water notices (BWN) issued across 10 of those water supplies. Interestingly, many of these BWN were precautionary and issued because of the more rigorous standards that SDC has set for themselves. Each BWN requires increased operator actions, attracts increased scrutiny by DHB's, and creates frustration and nuisance for customers. The next step is to advance the level of treatment at all supplies, thereby reducing chance of further BWN and being ahead of the ever-changing requirements of NZ Drinking Water Standards. To execute that, SDC comprehensively assessed each supply and is rolling out a structured capital programme from the Main Divide to the Pacific coastline, and spending millions of dollars along the way.

Dynamic catchment risk assessment - innovative tools for water security decision-making

*Chris Shanks*¹

¹ Tonkin + Taylor Ltd

Water supply managers have never before faced such water security challenges. Legislative changes and increasingly complex catchments require a greater understanding of source contamination risks.

Contamination of the Havelock North drinking water supply in 2016 has been a catalyst for significant legislative reform in New Zealand and has brought about a sharp focus on drinking water protection. The outbreak also serves as a stark reminder of the importance of source water protection. However, this comes with significant challenges, as source catchments are often complex, with many hundreds (or thousands) of potential contamination sources and are inherently highly dynamic.

The paper presents an automated tool that allows for contaminant sources to be identified, assessed and then displayed in real-time on an interactive GIS viewer. This approach represents a significant step toward addressing some of the current challenges facing decision-makers.

Under 35's

The bold story of a young engineer and the ailing Mangaweka bridge

Camiel van Schoonhoven¹

¹ Stantec

This is the story of how I, in three short years, have led one of Manawatu-Whanganui's biggest infrastructure projects and created a better future for all.

The Mangaweka Bridge replacement is a highly anticipated and vital infrastructure project on the border between the Manawatu and Rangitikei districts. The existing bridge is 115 years old and in dire need of replacement.

Within my first year out of university I found myself unwittingly at the helm of this project, and over the last two years I have successfully guided it through the detailed business case and detailed design phases. In 2020 the construction phase is expected begin, which I plan to play a key role in delivering.

This paper tells the bold story of how I, a young engineer of tomorrow's workforce, am leading this project to change thousands of lives for the better.

A multi-generational work force - the future is bright

Jessie Winder¹

¹ WSP

Our industry is about to face a number of new challenges. We expect to see a skills shortage; so, what does it take to attract and retain emerging professionals into our organisations?

This presentation will evaluate how to attract the best talent, and how to provide emerging professionals with a platform to fast track development. It is imperative that we prepare the next generation with the skills that already exist in our industry.

Social and environmental challenges will compel us to think differently. How can we harness the mindset of the next generations in our industry to adapt, and influence the current way of thinking? In the era of Greta Thunberg and OK Boomer we must embrace the diversity of thought between generations. This presentation will also demonstrate how we can engage the workforce of today with the workforce of tomorrow.

This is how we can be bold and face our challenges.

Leveraging wellbeing outcomes through procurement and partnerships

Chris Barton¹

¹ Hamilton City Council

The evolution of contract delivery client requirements to enhance contributions to social, environmental, cultural and economic outcomes.

As part of infrastructure project delivery, opportunities to impact on wellbeing outcomes of our communities extend beyond the installation and use of the asset.

Hamilton City Councils purpose is to improve the wellbeing of Hamiltonians. In alignment with this, we have been on a journey to leverage our capital works investments beyond the traditional cost and methodology considerations to incorporate contributions to a sustainable construction industry, local re-investment, targeted employment and skills/wage development, supply chain diversity including Maori and social enterprises, and raising the bar on environmental outcomes.

By being bold and committing to incorporating broader wellbeing outcomes into planning, procurement and delivery of projects, programmes and portfolios, government agencies can use their unique opportunity as clients to shape the construction industry to truly maximise the benefits of their investment.

The Art of Decision Making

Emily Gualter¹

Edward Guy¹, Jimmy Sygrove¹

¹ *Rationale*

Energy up front reaps rewards when making infrastructure investment decisions.

When approaching infrastructure investment, the success of a project comes down to the decisions made up-front. To ensure we make the right decisions, we need to know precisely what problems need to be solved and bring together a diverse team to help solve them.

The importance of a robust optioneering process that is communicated in a way that people can understand can't be overstated. A well-structured and justified process ensures all investment partners and stakeholders are 'brought into the tent' and can easily follow the decision-making process.

Using the 'deep-dive' approach, teams can get in, gather as much information as possible, analyse it, evaluate the benefits and risks, then package it up for delivery to decision-makers. This not only creates project momentum but ensures the whole project team have information early to understand if work should proceed.

Asset Management

An aging bridge portfolio - rationalising, prioritising and delivering

Roy Clearwater¹

¹ *Southland District Council*

Unfortunately, aging infrastructure and the bow wave of assets reaching end of life is an all too familiar story in our line of work.

For Southland District Council, there are few examples that are as prevalent as their aging portfolio of 852 bridges. This presentation seeks to articulate how Council is managing its large bridge replacement programme in an advanced and audacious manner.

Southland District Council found itself in a quandary with bridges reaching end of life much sooner than data predicted which has led to a number of bridge closures. The temporary reduced level of service while bridges are treated in order of risk and priority has led to ever-increasing social expectations placing mounting pressure on politicians and staff alike.

Optimised decision making using a bridge matrix prioritisation tool and challenging conversations with the community is how Southland District Council has gone about tackling the vast forward works programme with limited funding availability.

This presentation will cover off the development of the bridge matrix, programme prioritisation, procurement methods and lessons learnt along the journey to date to maximise our bridge replacement programme with available budget.

Asset management - the ultimate tool for climate change adaption

Colin Gerrard¹

¹ *Harrison Grierson*

Climate Change is a crucial contemporary issue affecting all asset owning organisations. Delivery of future levels of service may be severely impacted with increased risks and costs to manage these.

Using Asset Management principles to evaluate the trade-offs between service, cost, and risk for built and natural assets allows mitigation and adaption strategies to be incorporated into Asset Management. Thus existing processes can be used by engineers and asset managers to develop short term solutions to move towards sustainable service delivery.

Colin will examine infrastructure responses to climate change and discuss how Asset Management is the ultimate tool to manage long term adaption. He will discuss why climate change responses should be integrated with asset management and how these can be implemented throughout an Asset Management system.

RTD water services - what is stopping us?

Ian Ho¹

Peter Free¹

¹ *GHD*

We, as Kiwi, see our water with high social and community values. We expect water out from the tap is safe to drink, and rivers or streams that we dive in is safe to swim.

With the imminent establishment of the new regulator, we expect our future water services to be **RTD**, **R**eliable, **T**ransparent and **D**ata-Driven.

However, we do not expect this will be an easy and smooth journey. What are the “road-blocks” stopping us from achieving Reliability (robustness, resilience and best for value), Transparent (open, trust-building) and Data-Driven (insights, benchmarking) water services for all.

Interviews are conducted with former and current water service managers from different size of water service providers. Their visions and concerns will be consolidated into an “idea map” to help us navigate towards the “RTD water services future”.

The Asset Management Data Standard (AMDS) programme

Jane Strange¹

¹ AMDS

The Asset Management Data Standard (AMDS) programme is a collaboration between Waka Kotahi NZ Transport Agency and the Road Efficiency Group (REG) to improve the management of land transport infrastructure asset information that supports best decisions about New Zealand’s land transport assets – our roads, highways, bridges, cycleways and what sits on and under them. The AMDS website is <https://www.nzta.govt.nz/roads-and-rail/asset-management-data-standard>

The adaption of am maturity frameworks to provide a forward-looking gap assessment of the ability to meet country specific future objectives

Ross Waugh¹ & Theuns Henning²

¹ Waugh Infrastructure Management Limited, ² Auckland University

[A methodology to undertake a forward-looking asset management assessment of an organisations ability to meet country specific future objectives. New Zealand application is discussed](#)

“By investing in infrastructures, such as transport, bridges, dams, communication, waste management, water supply and sanitation as well as energy and digital infrastructure, countries can raise their productivity and enhance other economic variables.” (Source Royal Academy of Engineering). This statement reconfirms that at the heart of a country’s socio-economy and community well-being sits the effective services delivery from infrastructure. Asset management ensures that the infrastructure delivers on this promise.

This presentation details a World Bank project for the Kingdom of Saudi Arabia Ministry of Transport, an AM Maturity Framework was developed to provide a forward-looking assessment of an organisations ability to meet country specific future objectives. The methodology and tool allowed the KSA Ministry of Transport to prioritise asset management related projects to meet their requirements within the Kingdoms national Vision 2030.

This presentation provides an overview of methodology developed for the Kingdom of Saudi Arabia Ministry of Transport

By examining some New Zealand specific national objectives, the presentation provides examples of how this methodology could be used within the New Zealand legislative and planning context.

Case Studies / Contract Management

Improving the resilience of key pipelines - Auckland International Airport

Leigh John¹

¹ Aquatech Solutions

[How do you rehabilitate a key watermain under the noses of large passenger planes at an operational international airport without disrupting operations and service?](#)

The main focus is on the rehabilitation of pressure pipelines to improve integrity and resilience by 30x whilst reducing build carbon by over 80%, disruption and safety related claims & risks during installation. An overview of rehabilitation techniques is presented along with recent seismic testing and Auckland International Airport case study.

All underground assets have value and these systems can also be used to turn a drainage or conduit pipes into a pressure pipeline to increase capacity or overcome access limitations.

Data & Technology

Data and digital approaches will change the face of engineering - how do we embrace the change?

David Wyllie¹

¹ *Tonkin + Taylor*

The Fourth Industrial Revolution is characterised by the shift toward automation, using robots, AI and the Internet of Things. The real question is how do we get from where we are today to this utopia of automation, AI and digital twins?

This vision has been with us for a long time the difference now is that the technology, communications and cost will actually make it possible. If done appropriately we can embrace the change while saving money and delivering better outcomes for our customers.

This paper will cover example of application within the three-waters sector, highlighting some of the steps that can be taken and the technologies used to start /continue on this digital journey. The examples given show how this process can both save money in the short term but also set things up so that the data can be used to deliver even bigger gains in the future.

Innovation / Moving Goal Posts

No place to someplace

Nick Aiken¹

¹ WSP

Opportunity. Our infrastructure occupies pride of place in many of our towns and cities. Be it transport, water, education, health, or another. It is also frequently very centrally or strategically located, and very interconnected. This means infrastructure presents major opportunities to our communities as they look forwards to a future that we know will be quite different from today. Often these opportunities are recognised, but just as often they are not or the way to unlock their potential is not clear. Drawing on a quickfire series of recent transport and water examples from across the North Island of New Zealand, Nick will talk about the opportunity to look at how we can design and use these spaces differently to add value, delight our increasingly diverse communities, and be more ready for the future. Examples will include the acclaimed or award-winning transport infrastructure of the 'Karaka' Bridge (Palmerston North), 'Kuaka' Gateway (Napier), 'Hemo' RAB (Rotorua), Haywards Interchange (Wellington), Hamilton Rail Trail, and the development of subdivisions along the Wairakei stream in Tauranga, amongst others.

The power of customer insight

Kelly Marshall¹ & Daren Courtnage¹

¹ Fulton Hogan

It's the same for any product or service. The earlier you engage with those who'll actually use it, the better it will be.

Sound pretty obvious? Yes, and it's something we probably all know instinctively. But how often are engineering solutions designed with the end-user's needs and realities *uppermost* in mind? How often do other more practical or pressing considerations get precedence in the design phase? How much detailed collaboration occurs at the outset to ensure the customer is at the centre of the result? Its easy to focus on what we know, rather than what we don't know, but it's what we don't know, particularly what's important to our customers, that can make or break an outcome.

Fulton Hogan's SCiD²® process is designed, literally, to put the customer at the heart of a project. SCiD²® - or *Safety & Customer in Design and Delivery* - applies 'human-centered design' to ensure the process is designed around the right outcome for humans, right from the start, with a collaborative approach.

This presentation will demonstrate how this tool has created a mindset shift and built customer thinking capability, using a very simple and practical approach, which has ultimately enhanced our project outcomes.

Waste stabilisation ponds - outdated technology or retro chic?

Kirsten Norquay¹

¹ Stantec

A low energy, low carbon, low cost, and resilient solution to treat wastewater.

A perception is waste stabilisation ponds (WSPs or oxidation ponds) are outdated and should be replaced by mechanical treatment regardless of the receiving environment. This presentation challenges this. Many communities in New Zealand invested significant money in WSPs in 1970s-1980s to protect public health.

Well designed and managed WSPs reliably remove organics, solids, pathogens and some nutrients. As treatment is primarily through the interaction of sunlight, algae and bacteria, WSPs require minimal inputs compared to mechanical treatment.

When higher treated wastewater quality is required, mechanical plant can be added to further reduce nitrogen, phosphorus or pathogens.

WSPs can also accommodate storm flows, which will increase with climate change, potentially minimising treatment bypasses and overflows.

Overall WSPs offer a low energy, low carbon, low cost, and resilient treatment solution, if we are bold enough to challenge perceptions.

The introduction of seismic resilient ductile iron pipe technology

Todd Randell¹

¹ Hynds Pipe Systems

[A Water Transmission Main was constructed recently near Wellington where Japanese designed and manufactured Seismic Resilient Ductile Iron Pipe \(SRDIP\) system was installed for the first time in New Zealand.](#)

This paper provides an overview of its advanced technology and applications in both New Zealand and Japan. The system is considered most effective in pipeline construction where assets are exposed to events such as earthquake, tsunami, ground liquefaction, landslide and river crossing, as well as in areas containing crucial service hubs such as hospitals, civil defence head-quarters and government buildings.

The presentation covers the design features of its unique and innovative “anchor-block” free, “chain-link-restraint” pipeline systems which tolerate severe extension-compression movements and angular deflection to occur simultaneously during natural disasters. The case study also demonstrates how easily the joints are made on site within small confined spaces using specially-designed tools.

But I know it is worth more than \$1...

Charlotte Reed¹ & Rob Hannaby²

Tim Fisher¹

¹ Tonkin + Taylor, ² NZ Transport Agency

[Demonstrating how we can use new Natural Capital Protocol approaches to fully capture the value delivered by land transport infrastructure and the Resource Management Act.](#)

Developing cost-beneficial business cases for new infrastructure projects can be challenging. Economic models can lack sufficient data to enable the ‘intuitive’ value of the project to be captured in a financial sense. This is particularly the case for the many valuable components of a scheme which are driven by the requirements of the Resource Management Act – to avoid, remedy and mitigate negative effects.

To overcome this challenge, NZTA commissioned research turned to the Natural Capital Protocol approach. Applying this approach to three land transport schemes enabled the full scheme benefits to be captured and demonstrated, creating ongoing developments in NZTA. The findings can also inform forthcoming changes to the RMA proposed and a return to a focus on the four wellbeings in local government.

Rethinking water/wastewater maintenance from the bottom-up

James Thorne¹

Rob Meek²

¹ WSP, ² Christchurch City Council

The difference between a Lego model and a wooden toy? The wooden toy can't be broken into parts and remodeled to suit changing needs. And so it is with our current maintenance contracts.

In Christchurch the water and wastewater maintenance contracts are up for renewal. We have taken the opportunity to rethink the way maintenance needs are planned, compiled and executed starting from the bottom-up. It's time to move away from the top-down approach that begins with last years' budget plus a few percent (if you're lucky) and the rigid tome saying what's in and what's out.

Our bottom-up approach considers first the portfolio assets that require maintenance, then breaks up tasks into standard activities, associates these with database assets, assigns a risk-based frequency for each unique asset-activity combination, and builds up the expected cost using unit rates piece by piece... not unlike a Lego model.

Pollution source tracking and management for a cleaner environment

Damian Young¹

¹ Morphum Environmental

Every minute of every day the extensive stream, culvert and pipe networks, which service our developed environments (towns/cities/industrialised lands), convey environmental & man-made derived flows (often polluted), via and too, sensitive receiving environments.

From the central business district of Melbourne draining to the Yarra, to the sprawling estuaries and waterways of urban Auckland and Sydney, the pressure on the environment has never been greater. Fortunately, modern technologies and integrated management practices, have the potential to arrest and in some case reverse, the negative environmental trends being observed.

To be bold and face the challenges of the future, pollution source tracking and management in 'Realtime', is an essential way forward. This presentation aims to introduce some of the latest technologies that are emerging to deliver cleaner, safer and healthier outcomes for the environment and our communities. From distributed 'Realtime' low-cost high value sensors, to the latest GIS approaches, and analytical methodologies.

Procurement

Making the bold move to a contract that meets the needs of all participants

Ewen Skinner¹ & Jon Kingsford²

¹ Morrison Low, ² Napier City Council

[Napier City Council had a number of challenges and an open mind to the procurement of their upcoming road maintenance contract.](#)

Their experienced in-house team wanted to embrace more collaborative working principals and secure a contractor that worked with them in a more proactive and collaborative manner to achieve best for network outcomes.

From the inception of the project, through workshops with both internal and external stakeholders and ECI with the tenderers, an innovative contract was developed. This contract was seen positively by the supplier market with a mix of bundling services, extension of the term to provide for appropriate investment, and linkage of performance to benefits that are meaningful to the contractor. The contract had the ability to transition over time from a traditional to outturn cost type model that better manages risks and incorporates key alliancing principles.

Out with the Old and In with the Bold: Post-Covid Tendering for agencies and tenderers

Caroline Boot & Stephen Mockett¹

¹ NZ Procurement & Probity, ² Plan A Tender Specialists

[The path to NZ's post-Covid recovery is in our hands.](#)

To get those desperately needed shovel-ready and PGF projects up and running to boost our economy, we need smart, agile and effective ways to award contracts, But we mustn't sacrifice fairness or the broader community outcomes that deliver lasting value from public investment.

This enlightening presentation explains the impacts on both clients and tenderers, from the coal face of tendering.

Stephen Mockett, General Manager of Plan A Tender Specialists, will describe what tenderers can expect from the new environment of agile tendering, and how to maximise their scores for social, environmental, economic and cultural components of Broader Outcomes.

Caroline Boot, of NZ Procurement & Probity, will describe the new ways that smart government agencies are fast-tracking evaluation of tenders through plug and play agile procurement techniques.

If you are keen to win tenders in the bold new post-Covid procurement world, this presentation is a must!

Risk Management

Co-creating a vision and adaptive coastal plan for St Clair - St Kilda

Tom Burkitt¹ & Tom Simons-Smith²

¹ WSP, ² Dunedin City Council

We describe how Dunedin City Council is co-creating with the community a **bold** and aspirational adaptive coastal plan for St Claire to St Kilda.

The coast from St Kilda to St Clair is under increasing threat from storm-induced erosion, with pressures set to rise with increasing storms and rising seas.

There is already encroachment on existing assets and land, and the sea wall at St Clair is at risk of structural failure and overtopping under extreme conditions. Access to the beach is often unsafe, and the Kettle Park Landfill is at risk.

A new approach to management is required. This project is about transitioning from a reactive management regime towards a holistic, inclusive, transparent, and adaptive management approach that addresses the issues and unlocks long-term cost savings, whilst managing the coast in a way that reflects what people value most about *their* place.

Conditions clinic

Michael Garbett¹

¹ Anderson Lloyd

Michael Garbett a Partner at Anderson Lloyd will provide tips and tricks about preparing enforceable conditions that embody best practice and should lead to faster consent and designation approvals.

In any infrastructure project there will always be a range of conditions that need to be prepared and complied with. This conditions clinic will explain the legal principles that underpin drafting of good conditions. Any set of conditions needs to be workable, enforceable and mitigate relevant effects. Decision makers need to be satisfied that suggested conditions will meet these criteria. The tips and tricks will focus on conditions for consent and designation applications, and also cover contracts and tenders. Participants will understand the principles they should adopt to work on effective conditions.

Risking failure as an essential ingredient of success. (with wisdom from Churchill, Kipling, religion and motorsport).

Roger Oakley¹

¹ Stantec

A think piece, asking if the infrastructure sector is becoming too risk adverse, and whether this restricting the ability of the sector to deliver great results to the community.

This presentation takes the stance that this is true, at least sometimes. History, great minds, and sport all point to the dangers of being too fearful of failure, and that overcoming this fear is a precursor for real advancement. Sometimes light-hearted, but with a serious theme, the presentation looks at how risking failure can enable great strides forward, and the subsequent development of the capability and attractiveness of our profession. The people in the infrastructure sector have all the normal human shortcomings, the presentation looks at some of the ingredients needed to create an environment where people feel safe to push themselves to embrace some risk.

Applying the UNDRR's ten essentials of resilience¹ to local level planning

Rebekah Robertson¹

James Hughes¹

¹ *Tonkin + Taylor*

[The UNDRR's Ten Essentials of Resilience is a framework and toolkit that has proven extremely useful in identifying and prioritising resilience improvements at a local level.](#)

The 'Ten Essentials' is a framework and toolkit developed by the UN which has been applied in over 90 cities around the world. It focuses on ten key areas including - natural hazard and risk understanding, resilient infrastructure, risk-sensitive land-use planning, emergency response and recovery management, as well as institutional and financial capacity for resilience. The framework provides a practical and useful approach to understanding resilience, identifying gaps and weaknesses, and developing a focused resilience improvement strategy.

This paper will present the framework, how it can be tailored and applied to prioritise resilience improvements and discuss a case-study where it was applied with Tasman District Council.

NZ's first regional and local climate change risk assessments - findings and lessons learned

James Hughes¹ & Alex Cartwright¹

Rebekah Robertson¹

¹ *Tonkin + Taylor*

[A number of Councils around New Zealand have begun assessments to better understand climate change risks and to inform adaptation planning.](#)

Climate change is now beginning to have wide ranging impacts, and it is critical that we understand and look to manage both current and future risks in as co-ordinated manner as possible. This paper explores climate change risk assessments, compares similar approaches used both locally and internationally, and presents some lessons learned for subsequent assessments. The paper also compares current assessment methodologies used within the fields of disaster risk reduction and emergency management and makes some recommendations for improved alignment.

The Government has also commenced the National Climate Risk Assessment which assesses risks to New Zealand's economy, society, environment, and ecology - as set out in the Climate Change Response (Zero Carbon) Amendment Bill, as well as proposing mandatory disclosure of climate risks for listed companies via mechanisms such as the Taskforce for Climate-Related Financial Disclosure. The linkages between these national initiatives and regional/local assessments will also be discussed.

Refurbishment of the Ross Creek reservoir

Ian Walsh¹ & Natalie Veale¹

Camilla Bennett²

¹ *WSP*, ² *Dunedin City Council*

The Ross Creek reservoir was constructed for municipal water supply purposes in the 1860's pioneering era of Dunedin city's development. The reservoir is situated within a reserve area immediately north west of the city centre. This urban setting results in the impoundment attracting a high potential impact classification rating and associated management obligations concerning the potential hazards that any uncontrolled release from the water body may generate.

An extended period of closely monitored recommissioning has followed completion of the physical refurbishment activities. This paper addresses several features of the project management system that was adopted to meet the unusual challenges presented. The construction hazard management planning process is covered, along with the uncertainty and risk associated with disturbing and altering a 150 year old asset where site condition discoveries and departures from expected dam performance could disrupt the programme.

How many deaths does it take?

Graeme Wells¹

¹ *Beca*

Seven people have drowned in effluent and oxidation ponds in the last decade alone. The inadequacy of fencing and egress provisions were commented on in all cases.

As professionals involved in designing, detailing, reviewing, and operating ponds of all types, we have a duty to learn from these unfortunate past events so risks of further fatalities are reduced.

There are standards for swimming pools, but not ponds.

What about the other ponds we have created; open excavation borrow pits, stormwater detention basins, and wetlands to name some. If it is man-made, then the PCBU has a responsibility under Health and Safety legislation to protect against any consequential health or safety risks. This duty applies to both current operational ponds and new ponds being contemplated .

This paper will look at what guidance there is, what can be learnt from past fatalities, and what design and operational improvements we can make.

Tomorrow's Workforce

Who needs engineers anyway?

Anna Bridgman¹ & Louisa Bloomer¹

¹ Stantec New Zealand

Meet Anna and Louisa. One is a civil engineer and the other is not, but they are working together to solve engineering challenges.

Both are helping infrastructure clients across NZ, Australia, and abroad to investigate, plan, and design to meet the needs of their communities, growing populations and ageing infrastructure.

It is well documented that there is currently a skills shortage in our area, and it is growing. Learn how one company is addressing this current and growing skills shortage by investing in non-engineers within traditional engineering teams, and the range of educations and backgrounds that is providing employees with these skills. Hear how these new starts are integrating across the business, helping colleagues and clients understand how their diverse skills can be utilised, and about some of the projects these skills are involved in.

The journey of rebranding public infrastructure - the sequel

Deborah Lind¹ & Myles Lind²

¹ Harrison Grierson, ² IPWEA NZ

At IPWEA 2019 we made a call to arms to the industry to positively rebrand and raise awareness of public infrastructure services to better engage our stakeholders and encourage our next generation of infrastructure professionals. Has the call been heard?

In this paper we will present an update of the current state of the public infrastructure sector and the initiatives that have been implemented across NZ during the past year to address skills shortage. We will highlight success stories that have connected strongly with our communities, championed diversity and inclusion, motivated young people into our sector, enhanced networks and advocated industry training.

In this paper we will discuss what has worked well, lessons learnt, how these initiatives are making a positive difference and what more there is to do.

Why the asset management competency framework will ensure the sector survives

Sandra King¹

¹ REG Group

Feedback from the sector has identified a capacity and capability issue for asset management practitioners, which is growing.

Our sector is changing rapidly, the changing demographics, expectations and learning styles of people entering the workforce and the need for more holistic evidence-based investments is requiring a higher expectation of what people need to do. Historically we believe many people are 'accidental asset managers', the development of this framework was to provide direction towards people being able to proactively design their career pathway, and for organisations to objectively make investment decision on training, skill acquisition, recruitment and procurement decisions for professional services.

The comprehensive framework will be the foundation to enable the sector to focus on what is needed to build capability at an individual, organisational and national level. This presentation will consider the testing, a sector heat map, how the sector will be better off and can guide training with greater evidence.

Sticking it out: how do we get more women to stay in engineering

Nicky Smith¹

¹ HEB Construction

Engineering continues to be a leaking pipe when it comes to the retention of women; with few women entering the industry, and too many leaving.

This paper draws on the findings from interviews with 13 women currently working in the engineering industry in New Zealand along with published research on the factors that impact on the retention of women in engineering. Inclusion is identified as a key factor in the retention of women in engineering, yet at best our industry provides an environment where women are welcome as long as they conform to the male dominated norms of our industry. This paper will explore the opportunities employers have to provide a more inclusive environment that will ultimately lead to better retention of their female engineers.

Transport / Public Transport

Streetscape design - a visionary approach

Sarah Dove¹, Natalie Rooseboom¹

¹ *Tauranga City Council*

In Tauranga, streetscape design has historically been driven from an engineering perspective. However, this has not provided aspirational design or utilised the ability for the road environment to create inclusive and vibrant communities.

The street environment is complex in nature, with differing directions being sought from urban designers, planners, transport planners and engineers. Further, there are the landowners/developers and utility operators outcome desires to consider which often conflict.

This presentation will look at a visionary toolbox and GIS approach which has sought to transform Tauranga City Council's current philosophy. The modular element design approach has sought to provide a balance between providing certainty and allowing innovation and has involved extensive stakeholder engagement with the project steering group, along with local developers, utility companies, and SmartGrowth organisations. This collaboration was essential in seeking endorsement for the new approach ensuring that it will be used for all projects going forward.

This presentation will demonstrate progress with the GIS tool and how it can be effectively used to inform street design and produce desirable outcomes. The presentation will also provide feedback on the 'stakeholder journey' and should assist other regions when considering how to better embed aspirational streetscape design into practical guidance.

How to successfully navigate H&S in a rapidly changing world

Chris Evans¹

¹ *EROAD*

Chris Evans will share the EROAD story highlighting the fundamentals H&S Managers should consider when dealing with a diverse generational workforce for effective consequence management of telematics and safety.

Safety management has never been so complex. To remain effective there is a need for H&S to integrate with business values and systems and today's modern H&S managers need to be competent and credible in an array of business areas to successfully champion H&S value.

Technological advancement is rapidly changing the risk control balance and the modern ease of access to information on the internet is impacting "reasonably practicability".

The workforce's attitude to and comfort with new technology must be clearly understood and addressed for the successful adoption of new technology. More than ever, H&S managers need to understand what tech is available and how the different generations within their workforce will naturally react to technology.

The paper describes how EROAD has successfully managed road safety risk in a culturally and age diverse workforce, engaging a myriad of generational attitudes towards technology, business values and risk perception.

Local roads funding and maintenance -filling the gap

(The Chartered Institution of Highways and Transportation Review into the funding and governance of local highway authority infrastructure in England)

Matthew Lugg¹

¹ *WSP, UK*

10 years of austerity and severe weather created a pothole epidemic on the UK's local road network this paper describes how CIHT made a difference.

As President of CIHT I used this opportunity to champion a cause that I have been passionate about through my long career in the Public Sector ensuring the local road network is kept safe and serviceable. In doing so I was prepared to

challenge the status quo and go in front of the Parliamentary Transport Select Committee made up of MPs to successfully make the case. At the time of writing the CIHT Review is due to be published in the New Year in time to influence the new Conservative Government and all the signs are looking good that they will respond positively.

The winter of 2018/19 in UK was a long and cold with a number of storms that had a devastating impact on the condition of local roads which were already in a poor condition with an estimated \$18 billion backlog of maintenance. The CIHT Review considered the following questions of the Local Road Network : -

- What is the condition?
- What are the economic and social costs of not maintaining it?
- Does the current approach to the governance, management and funding of it need to be improved?
- What are the funding requirements of it and are current funding streams suitable for the future?
- Is there a role for alternative models for its maintenance and investment and the associated benefits of doing so?

Facing our challenges together - realising enduring excellence

Andrew McKillop¹

¹ REG Group

A cornerstone initiative of REG is the implementation of a common level of service and performance framework which is fundamental to addressing the issue of performance and cost variability.

The One Network Road Classification (ONRC) system used for the 2018/21 National Land Transport Programme (NLTP) is being enhanced to create a One Network Framework (ONF) for the 2021/24 NLTP development. Using the ONRC and ONF, Road Controlling Authorities and the NZ Transport Agency can compare the state of roads across the country, and direct investment where it is needed most.

ONF coupled with the REG business excellence, asset management competency and data quality frameworks, the boldness of REG is enabling the transport sector to change and realise enduring excellence.

Road to zero: review and recommendations

Harish Shivaramu¹

Erik Barnes¹

¹ Auxilium Ltd

The central government of New Zealand recently proposed the 'road to zero' safety approach; with the intention of reducing fatal and serious road injuries by nearly forty percent over the next decade.

To help organisations move toward achieving this goal, this review evaluates and summarises efficient road safety practices adopted by various countries around the world.

The increasing severity and occurrence of road accidents all over the world is a major concern to administrations involved with road safety; and New Zealand is no exception. There has been a gradual increase in annual road fatalities in New Zealand, from 253 in 2013 to 384 in 2018. Among the OECD countries, New Zealand is placed in the bottom quarter in terms of road safety, with the social cost of crashes estimated at 4.8 billion NZD per year. Considering the importance, this presentation, while focusing on various components of the transport system (i.e. road infrastructure, policy making, user behaviour, traffic conditions and speed management), intends to provide valuable inputs to the 'road to zero' national road safety initiative.

16 Years Old in New Zealand - Foamed Bitumen Stabilisation Has Matured Well – Lessons Learnt

Bryan Pidwerbesky¹

Thorsten Froebel², Allen Browne³

¹Fulton Hogan, ²Higgins, ³Hiway Stabilizers

Ever wondered how the Foamed Bitumen Projects done over the past 16 years in New Zealand are performing? You don't want to miss this data driven factual report.

The first modern Foamed Bitumen Stabilisation (FBS) equipment arrived in New Zealand in 2004. Since then, FBS has grown from a small niche market to being an option in almost every rehabilitation pavement design since 2007 and greenfield pavement design since 2009. A detailed analysis of road lengths rehabilitated using FBS demonstrated that the NZTA specification for Insitu Stabilisation of modified layers (NZTA B/05) in 2008 resulted in a significant improvement in pavement performance. Over the past 16 years, millions of square meters of existing local roads and State Highways have been rehabilitated using FBS. Data presented in the paper will demonstrate that the majority of these pavements are performing extremely well.

The use of FBS in Alpine regions has successfully proven FBS provides a robust freeze-thaw resilience in the pavement structure and is a cost-effective, long-term solution for rehabilitating pavements in colder regions of NZ. It is the moisture resilience and robust performance of FBS that has seen recent increased adoption across New Zealand and Australia.

This paper was compiled by practitioners with over 50 years of combined experience in the design and construction of FBS pavements. The paper presents key lessons learnt in terms of design criteria and construction specifications from detailed pavement investigations, and how the FBS technology compares to other rehabilitation methods in terms of whole of life cost effectiveness.

Thorsten Froebel is Pavement Design Manager, Higgins. Thorsten has worked for contractors and consultants across New Zealand and Australia during the past 2 decades, at the forefront of Foamed Bitumen stabilizing, after a career overseas.

Allen Browne is Group Technical Manager at Hiway Stabilizers. Allen has worked for consultants and contractors over 3 decades, and has been a leader in Foamed Bitumen stabilizing in NZ and Australia for over 15 years.

Dr Bryan Pidwerbesky is Technical Director – Pavements, at Fulton Hogan. He has been involved in designing and constructing foamed bitumen stabilized pavements in NZ for the past 15 years.

Water Supply, Stormwater, Wastewater

Our seventh principle "Water safety culture must drive water safety plans"

Robert Blakemore¹ & Laurence Edwards¹

¹ Wellington Water

The move towards regulatory change for the 3 waters has signalled the need to find mechanisms to address deficiencies in the water services that are provided to New Zealanders. The importance of water safety plans as a tool to drive investment is an inevitable desired outcome of this change.

This presentation describes our experience in developing a regional water safety plan that brings together the multiple water safety plans of each of the client councils to allow a true source to tap approach to risk management in the region. The paper details how the plan is hard wired into investment programmes, and gives insight into the approach adopted by staff to ensure the plan continues to be a living document. It discusses why the culture of those contributing to the development of the plan is considered key to success in management of public health risks to drinking water. The plan has been written with oversight of the Safe Drinking Water Committee. This governance committee is made up of staff from across the company with the aim of fostering and developing a safe drinking water culture akin to that adopted for Health and Safety.

Keywords: Water safety plan, investment programmes, organizational culture

Managing stretched infrastructure

Reuben Bouman¹

John Crawford¹ and TBC²

¹ Beca, ² Queenstown Lakes District Council

[What to do when your plant is at capacity with no redundancy, and s..t happens.](#)

The WWTPs servicing the townships of Queenstown and Wanaka (known as Shotover and Pure respectively) have been severely stretched in recent years, with upgrades at both plants in the design phase. The difficulty of operating "stretched" plants was compounded recently by a failure in the aeration diffusers network at Pure leading to the loss of a quarter of the capacity. The presentation will address how QLDC, plant operators, and Beca have worked together to handle these challenges.

We will also discuss underperformance of the ponds at Shotover, only treating 20% to 25% of the load instead of the 30% to 35% planned, and the solutions required to meet this challenge.

Heavy ho – If's off to lift a pump we go!

David Carshalton¹ & Kylie Hills²

¹ Beca, ² Christchurch City Council

[When is it bold to use a dry mounted pump? When is it bold to avoid a gantry crane in a pump station?](#)

Beca is frequently asked to explore the merits of dry mounted sewer pumps to assess if the additional cost is justifiable. Also, the question of how to lift these pumps is raised, with the 'safe' option to use a gantry crane often adopted due to time pressure. However, operators highlight that the cost hiring a mobile crane is attractive compared to the cost of maintaining a gantry crane.

In this paper, Beca has brought together our recent experience in New Zealand and Australia to summarise the merits of each style of sewer pump mounting and lifting mechanisms. It will also present our experience in using other solutions to the lifting challenge including davits, monorails, and above ground sewer pumps.

The aim is to leave attendees confident to be bold in selecting the correct pump mounting style and lifting arrangement accounting for cost, safety and sustainability.

The Avon River Precinct – collaborating to regenerate central Christchurch

Stephen Down¹

Duncan Farish¹

¹Jacobs New Zealand Ltd

The Avon River Precinct (ARP) is a new riverside promenade development along the Avon River, in the heart of Christchurch's CBD. This project was an unprecedented opportunity to regenerate central Christchurch following the earthquakes of 2010 and 2011. Its purpose was to create "a connected and accessible precinct" that would bring people back to the City to live, to work and to socialise. The precinct has been open to the public since November 2018 and has successfully met these objectives.

ARP was one of the key "anchor projects" managed by Ōtākaro Limited. Ōtākaro was established in April 2016 as successor to the Canterbury Earthquake Recovery Authority (CERA). The project was procured through an Early Contractor Involvement (ECI) process. Jacobs formed part of the Downer New Zealand Design and Construct team who were awarded the project following a competitive tender process. Jacobs, working collaboratively with the wider project team, were responsible for the stormwater design including; stormwater pipework, surface geometry and sustainable urban drainage systems (SuDS) such as rain gardens and swales.

The stormwater design presented the technical team from Jacobs with several key technical challenges. These included, but were not limited to; the complexity of working in a congested city centre, the need to integrate with a multitude of adjacent rebuild projects, a compressed project delivery programme and the imperative to deliver a high quality, cost effective outcome for the people of Christchurch. The success of ARP can be attributed to the entire project team working collaboratively to tackle and, overcome, each challenge as it arose.

An initial intensive six-week programme consisted of a qualitative assessment of the Principals Requirements and Reference Design Documentation. This assessment was necessary to identify the key project componentry and the associated value engineering opportunities, constructability issues and programme risks and was instrumental in setting the project up for success. The assessment was carried out in close collaboration with Ōtākaro, Christchurch City Council (ultimate asset owner) and the wider design team (Downer, pavement designers and landscape architects) and resulted in significant programme and financial savings for the project.

The close collaboration relationships developed at the initial stages of the project continued through the detailed design and construction phases. This collaboration resulted in the works being delivered by the agreed completion date and within budget. Most importantly, this collaboration has delivered a precinct that has successfully contributed to the regeneration of the Christchurch CBD.

This paper is intended to be a case study of an ECI contract that successfully delivered in the face of significant programme, financial and technical challenges. This paper is also intended to analyse and describe the collaboration between client, contractor and consultants that was the foundation of the aforementioned success.

Finding capacity in our own backyard - a total water management strategy

Britta Jensen¹ & Mark Walmsley²

¹ Stormeng, ² Waipa District Council

Conventional Three-waters Master Planning (TWM) considers each service separately. Key elements, capacity, standards and asset condition, are reviewed independently without regard for conflict or synergy with other assets.

These past TWM processes have been an effective tool for understanding future projects for Waipa DC. However, increases in population and population density, a better understanding of external influences (e.g. climate change and catastrophic events), legislative changes and an evolving appreciation of our limited resources, calls for a new approach.

This paper presents a new TWM strategy which recognises need to appropriately utilise and manage the water cycle holistically. Examples are drawn from Waipa DC's approach where traditional Three-waters planning was improved upon by addressing multiple objectives, considering conventional and innovative solutions. The paper outlines the process for selecting the projects based on the utilising GIS and modelling platforms to develop projects that promote sustainable, resilient and cost-effective outcomes for the region.

Slips, floods and falls: Dunedin's watercourse programme

Jonathan Krause¹ **Tom Dyer**²

¹ Stantec New Zealand, ² Dunedin City Council

Sinkholes. Landslips. Flooding. Frustration. Despair. The Dunedin City Council is taking these issues out of the "too hard" and "not our problem baskets" and addressing them under its bold new Watercourse Programme.

The DCC's long-held policy had been to enable property owners to build and maintain their own piped/open watercourse infrastructure. Roughly half of the city is serviced for stormwater by private pipes and streams. After three significant rain events – with private assets failing, damage to homes and land, and customers utterly confused as to why the city was not picking up the bill – the DCC chose to change its approach and deal with challenging problems head-on.

In the programme's first year, we're making real progress that's built on a strong foundation of Council direction, clear frameworks and a commitment to regular, transparent communication with stakeholders. We aim to share what we've learnt on our journey so far.

What lies beneath the surface - the challenges, solutions and lessons learnt from servicing Wynyard quarter's growth with civil infrastructure 10 mins

Umer Malik¹

¹ Beca Group Limited

Adopting a bold approach to address challenges can sometimes produce inadvertent new issues. Servicing Auckland's crown jewel, Wynyard Quarter is one such example. Abuzz with new streetscaping that lines new developments, what lies beneath the surface can sometimes be forgotten.

The 300m long gravity sewer along Beaumont St is the deepest component of Wynyard Quarter's wastewater network masterplan. With a shallow groundwater table, highly contaminated ground and traffic management constraints, conventional trenching methods struggle to meet environmental and financial constraints. Utilizing a combination of in-situ ground stabilization and micro-tunnelling has provided a methodology for trenchless work in hostile ground conditions but not without creating a myriad of new problems in the form of construction risks and regulatory consent conditions.

It begs the question, are new wastewater networks optimized for their site? Or is land use planning not factoring in the entire suite of challenges and constraints associated with public works?

Water supply levels of service; how often is it okay to run out of water?

Charlotte Reed¹ & **Jonathan Reed**²

¹ Tonkin + Taylor, ² Beca

Should we be planning for communities to run out of water? And how often should we be restricting water use?

Most summers many New Zealand communities face water restrictions. As the competition for water resources increases, water supply managers at Local Authorities face a 'perfect storm' of significant infrastructure costs, a changing climate and increasing customer expectations. Arguably planning to run out of water is not an acceptable approach – but what Level of Service contract do Local Authorities have with communities, and do the communities understand this?

Some Local Authorities in New Zealand plan to provide a water supply that meets defined Levels of Service for restrictions and drought severity, but the majority do not. As the New Zealand water industry moves towards an era of regulation, should Local Authorities **be bold** and introduce Levels of Service as an integral part of the decision-making process to provide an adequate water supply on a financially sustainable basis?

Catchment planning in the Tasman District - a long story short 10 mins

Wouter Woortman¹

¹ Tasman District Council

Tasman District Council is developing community focussed, interactive Catchment Management plans using ArcGIS StoryMap to provide holistic and long-term direction for the management of stormwater in Tasman's urban areas.

The Richmond Catchment Management Plan (CMP) was first off the rank in Tasman's Catchment Planning programme. Developed in close collaboration with iwi partners, the plan embraces Te Ao Māori principles and brings together stormwater and flooding information, environmental information, social and cultural information on a whole-of-catchment basis.

The digital Storymap presents information in an easily accessible and interactive format. Maps, photos, diagrams, videos and text are combined to illustrate spatial relationships and create awareness of key issues. The result is a compelling overview of Tasman's new and holistic approach to manage stormwater in Richmond and a blueprint for future CMP's across the district. The Richmond CMP can be viewed on the Tasman District Council website: <https://tasman.govt.nz/link/richmond-cmp>

Working Collaboratively

A journey to resilience: Tokelau wharves and reef passage rehabilitation

Geoffrey Anderson¹

¹ *Calibre Consulting Ltd*

Delivering infrastructure in remote locations is challenging. However, with a bold attitude and collaborative approach to risks, solutions that enhance the resilience and development of communities can be achieved.

Tokelau is a small Pacific Island nation that lies approximately 500km to the north of Samoa. With no air services available, the country relies on shipping for all its transportation needs. The only physical access route is via boat. The wharves and reef passage rehabilitation project is a significant upgrade of Tokelau's wharfs and reef channels to make operations safer, more resilient to rising sea levels, increase economic benefits from trade and mobility and improve certainty, resilience and quality of life for its people. The paper will have a focus on the collaborative project delivery approach and how this improved risk management, with lessons learnt that can be applied to the delivery of projects in the New Zealand context. In particular dealing with the challenges encountered when servicing a project with remote delivery resources.

Damage in Dunedin: how to deliver \$20 million of repair work following an extreme rainfall event

Hayley Annear¹ & Ryan van Heezik²

¹ *Beca*, ² *Dunedin City Council*

On the 21st and 22nd of July 2017, in Dunedin, it rained -a lot. The rainfall was described as a 1 in 200-year event with a Civil Defence Emergency declared in the city. Bridges were washed out, slips recorded, and the city cut off from the rest of the nation due to closed roads.

The following 2 years saw a total of \$20 million spent fixing the damage, with over 1,000 jobs completed. The works were spread across the networks of Dunedin City Council's Transportation and Parks Departments and included: Building retaining walls for slips, re-metalling roads, straightening bridges, rebuilding seawalls, upgrading stormwater pipeline and replacing culverts. The repair works involved over 20 subcontracting companies, 6 consulting companies and many stakeholders including the local Dunedin population. Despite some challenges, including further significant rainfall in November 2017 and February 2018, the project was delivered with positive outcomes. How was this done? Through collaboration.

The (w)hole problem with Taupo

Marten Beiermann¹

Ian Gray¹

¹ *WSP*

The catastrophic failure of bulk water and trunk wastewater pipes along Taupō's iconic CBD cliff front in July 2019, caused significant damage and required rapid and complex design and build across 6 elements over the ensuing 4 months.

WSP walked alongside Taupō District Council who retained overall project management and Downer NZ who acted as the Prime contractor in delivering the immediate disaster relief components through to the fully reinstated lakefront.

WSP delivered project management and site supervision to align the design and build process across water, wastewater, stormwater (including an improvement device), pavement and cliff reinstatement.

Significant project complexity existed throughout the project duration, where multiple design clashes required resolution as different elements were prioritised and built, based on identified element and overall project risk.

The lessons gained in this project help us all plan better for the future when thinking about our key infrastructure.