

## CONCURRENT SESSIONS

### SESSION ONE: THURSDAY 21 JUNE – 1330 – 1530

#### WATER

##### 101: Time 1330

###### **Sea level raises the bar - the Rewa River intake**

Author & Presenter: Angus Buxton, Stantec New Zealand

*Raising the bar references hurdles and the hurdle in this case was that of a 17.5 m range of design intake levels in a river.*

The intake was for a new water treatment plant site moved inland due to sea level rise. A continuing trend of rising sea levels due to climate change was causing salinity to increase in the lower reaches of the Rewa River, near Suva, Fiji. A decision was made to build a new plant more than 20 km inland. This paper will summarise the pathway from project inception through to design for tender, for a river intake screening and pumping system for the proposed Rewa River Water Treatment Plant. The design for the tender incorporated an innovative and resilient raw water supply system.

*Angus Buxton is a chartered professional engineer with 35 years of experience in the management, design and analysis of mechanical and hydraulic engineering systems for water utility and process industry clients, specializing in design of pumping, process control and pressure piping systems. He has extensive knowledge and skills in leading, formulating, developing and reviewing overall design concepts, process flow analyses and control methodologies, and the planning and management of design, construction monitoring and performance review; for integration of complex mechanical and process plant and equipment.*

##### 102: Time 1400

###### **A nexus of natural hazards: when all roads lead to Rome**

Author & Presenter: Mark Pennington, Tonkin + Taylor

Within the greater Tauranga area, there has been a wide range of recent projects which address water-related impacts on developed infrastructure. These include extreme sea level inundation assessments, tsunami modelling, intense rainfall related flood modelling and also an assessment of areas prone to high groundwater levels. Except for the open coast tsunami inundation areas, all of these assessments have revealed, to within a fairly small spatial range, the same areas as being potentially prone to each natural. In this context the joint probability relating to combinations of hazards is often complex when following a deterministic route. This can be somewhat simplified if following a probabilistic route.

While a purely probabilistic analysis of these hazards is, using currently available tools, likely to be prohibitively time consuming, in this paper the results of a fuzzy mapping approach to all of these hazards are presented.

*Mark Pennington is a Chartered Professional Engineer with more than 23 years of post-graduate experience in hydrological and hydraulic investigations and analyses. He combines a high degree of technical excellence with the ability to see the big picture of flooding issues at urban and regional scales. Mark is proficient in the use of a wide range of hydraulic analysis techniques and has a robust background in hydrological and hydraulic modelling. In his role Mark has been able to successfully balance the competing needs of flood protection with those of ecological and environmental protection.*

##### 103: Time 1430

###### **Protecting drinking water quality at source**

Author & Presenter: Michael Garbett, Anderson Lloyd

*Safe drinking water is a major issue. This presentation looks at the topic generally and specifically with a Gore case-study where a water source is protected by a restrictive designation.*

The quality of drinking water has become a major issue for councils and methods to protect supplies of drinking water are being given greater attention.

Michael will discuss the steps taken to protect a specific municipal drinking water source from land use contamination.

This case study involved using the powers in the RMA and PWA to successfully acquire an interest in a dairy farm to exclude stock, and other land uses from the vicinity of bores that supply drinking water

to the town of Gore. This involved publicly notified designations under the RMA, hearing and a decision approving the designation by independent commissioners.

Compensation was paid to the landowner by the local authority under the PWA. This case study will have wide interest for drinking water suppliers and contractors. In addition to the case study the regulatory context and Department of Internal Affairs "Three waters review" will be summarised.

*Michael Garbett is a Partner at Anderson Lloyd. He has worked as a Barrister and Solicitor since 1998 and is a specialist in Local Government and Resource Management areas of law. He is responsible for legal advice to a number of Council clients. He has a wide variety of experience dealing with legal issues for a wide range of consenting projects including a municipal land-based wastewater treatment system, a gondola; wind farm; roads; commercial, industrial and residential projects. Michael has been responsible for managing a large number of Environment Court cases relating to appeals on resource consents, designations, enforcement and appeals against District Plans. Michael is the former Chairperson and currently the Treasurer of the Otago/Southland Branch of the Resource Management Law Association.*

## **104: Time 1500**

### **Achieving water and wastewater network operational resiliency through monitoring and analytics**

Author & Presenter: Eric Skowron, Jacobs

*Globally, water utilities are implementing innovative technologies and practices to reduce losses, optimise efficiency and manage risk; this presentation will discuss approaches, insights and outcomes through project examples from Australia and the UK.*

Innovative technologies using time-series network data for monitoring, analysis and optimisation of water and wastewater assets have been evolving over the past decade, particularly in the last few years.

Objectives for achieving network resiliency are often specific to particular regions (example: seismic risk in New Zealand, water scarcity in arid regions, etc). However, similar technologies and approaches are often used to achieve diverse business needs and resiliency objectives.

The presentation will present a summary of insights and outcomes from water utilities Jacobs has worked with in Australia and the United Kingdom whom have implemented emerging technologies for management and operation of water and wastewater networks to understand network response to events, reduce avoidable losses, manage assets and mitigate risks.

Case studies will be presented, identifying different approaches and technologies applied with particular focus on the business needs achieved, return on investment realised, lessons learned and forward vision for improving network resilience.

*Eric Skowron is a civil engineer at Jacobs in Wellington, New Zealand with 17 years of experience in New Zealand, Australia and the United States. Eric provides water and sewer modelling, analysis, planning, operations optimisation and project management consulting services for municipal and industrial clients. Eric manages delivery of technology projects for major water utilities, enabling clients to identify unexpected network behaviours early and optimise network operational efficiencies.*

## **TRANSPORT**

### **201: Time 1330**

#### **Managing disruption in three gorge roads – case histories from responses to three 2017 North Island landslide events**

Author & Presenter: David Stewart, WSP-Opus

*Case histories are provided for the response to three significant landslide events that disrupted main road networks in the lower North Island during 2017, including the use of innovative technology.*

Major rock fall events in July blocked traffic into Wellington on SH1 in Ngauranga Gorge, followed by a larger event on Ngaio Gorge Road. Prior to closure of SH3 in the Manawatu Gorge, creeping slope movements at the Kerry's Wall site provided a risk to road users.

The paper discusses the various stages of the response to the three events and how the use of drones and other modern survey techniques assisted in the understanding of slope conditions, risk assessment and managing safety.

All three events resulted in road closure for varying periods of time. The paper describes the process used to assess risks and implement measures to ensure safety for workers and road users during and after emergency works.

*David Stewart is a Senior Engineering Geologist and Geotechnical Engineer at Opus International consultants in Wellington with over 30 years' experience in slope assessments. He specialises in assessment of slopes and management of risks for a range of clients and types of landforms / infrastructure around*

NZ, particularly highways. David oversees the slip assessment for the Wellington Highway network and also carries out slope assessments for other clients such as KiwiRail and Councils. His expertise has been in much demand of late in for major storm events and for landslide sites and events such as those in the Manawatu Gorge, Ngauranga Gorge and Ngaio Gorge. David is a certified UAV operator and along with drones is always looking for new ways of assessing and managing risk from slope failures.

## **202: Time 1400**

### **Taming of the death toll – what really drives road safety?**

Author & Presenter: David Mitchell, Harrison Grierson

Co-author: Mike Tottman, Harrison Grierson

*As historical crash trends are being reversed, is it now time to adjust our Safe System funding priorities from safer roads and roadsides more towards safer road use and safer vehicles, especially with the emerging new technology?*

As we all know, road crashes costs lives, disrupt or destroy families for a lifetime and can result in significant transport network disruption and reduce network resilience. The reactive approach to road safety of identifying locations of high crash rates and then applying localised safety improvements has been replaced with the more holistic Safe System approach. The recent and significant increase in the road death toll may indicate that safety gains from making the roads more forgiving to crashes is now reaching a point of diminishing returns. From a record high of 795 deaths in 1987 to a low of 253 in 2013, the increase since 2013 in death and serious injuries (DSIs) vastly outstrips population or traffic growth.

Future improvements to develop a safe system could well require a shift in spending focus from safe roads and roadsides to safe road use and safe vehicles. Opportunities from new technologies around vehicle control and speed have the potential to make driving a vehicle obsolete, or at the very least allow vehicles to take control in dangerous situations.

This paper will discuss the opportunities that new technology could bring to driving and road safety in New Zealand and debate where the most suitable areas for safety investment could be targeted compared to the current balance of funding. Maybe it is now time for a fundamental re-think on road safety funding allocation.

*David Mitchell provides technical direction to Harrison Grierson's transportation team. David has 27 years' experience as a traffic and transportation engineer. He has a background in road safety but has been heavily involved in many aspects of transportation from urban developments to large and small scale rural roading improvements. David has been involved in a number of plan changes and strategic land use planning that considers traffic generation, distribution and hence changes and impacts from traffic safety. He also has an extensive safety background through crash reduction studies, day and night time inspections, and continuously working towards reducing DSI's and crashes by introducing consistent treatments on routes and throughout the roading network.*

## **203: Time 1430**

### **Unconscious decisions – what were we thinking?**

Author & Presenter: Warren Ladbrook, Harrison Grierson

*We don't think about every action required to drive a car, which can lead to bad - sometimes disastrous consequences. Infrastructure habits can be the same!*

We all have unconscious bias, to follow the path that is familiar - that 'seems right'. We often prefer to use the same types of solutions as worked for us in the past. We call on the same trusted resources, and we don't always take the time to re-evaluate the decisions that we're making. Why change what's working well?

This paper will postulate that our 'automatic' decisions are not always in our own best interest, and that certain decisions need to be carefully considered on a first-principles, holistic, whole-of-life basis - as in authentic Better Business Cases. Further, that we need to move beyond financial based decisions, and also consider the broader economic context.

*Warren Ladbrook has directed the planning, engineering, and construction of many large, complex international and inter-agency infrastructure projects, including significant post-disaster reconstruction here and abroad. He has proven credibility in directing the implementation of challenging objectives, especially in regard to time-critical and evolving requirements. Warren leads the emerging Infrastructure Advisory Services at Harrison Grierson, providing clients with fresh insights based on international success, and resulting in effective programme delivery.*

## **204: Time 1500**

### **Pulling numbers**

Author & Presenter: Theuns Henning, The University of Auckland, IDS

Co-authors: Murray Gimblett, Advisian & Seosamh Costello, The University of Auckland

*We perfectly understand the impact of every dollar invested into road maintenance, and therefore we are able to benchmark investment and performance across different authorities, and know exactly why maintenance costs and performance are different for these councils - yeah right*

Benchmarking of road maintenance investment and consequential performance is a complex topic matter, and to date, it has been evading many engineers. New Zealand uses a hypothecated fund for road maintenance and construction, for subsidizing road-based public transport and for enforcing road safety regulations. Thus knowing the whole of life cost of roads is central to both revenue collection and to funding. This paper covers the costs that RCA's in New Zealand have been reporting. It reviews different approaches to cost attribution and outlines an approach to benchmarking. It demonstrates the value and learning's from any benchmarking attempt to find what could be considered the 'holy grail' of asset management.

*Dr Theuns Henning immigrated to New Zealand in order to implement dTIMS (asset management software) during 2009. He is the founder and Director of the Climate Adaptation Platform, Transportation Research Centre and senior lecturer at the University of Auckland. He is specialising in the areas of Asset Management, Performance Monitoring, Performance Based Contracts and Benchmarking. Theuns received his ME (Transportation) from the University of Pretoria, South Africa. He has completed his PhD in 2009 at the University of Auckland. Theuns has been the author of 28 international journals, primary author of four RIMS Body of Knowledge guidelines and two World Bank Guidelines for developing countries.*

## **ASSET MANAGEMENT**

### **301: Time 1330**

#### **Data for next generation decision making**

Author & Presenter: James Thorne, WSP-Opus

*Asset managers are turning to data for our next generation of decision making. Despite exponential data growth, finding the right data remains elusive as ever.*

This paper examines the role of data in optimising a district-wide pipe renewal programme.

Getting the right data is paramount when you're dealing with invisible assets buried underground, of varying size and materials, forming a complex network where problems show up far from their origin, and you're analysing low probability high consequence failure events.

Breaking down the fundamentals of pipe renewal, with case studies from post-earthquake and business as usual contexts, James will provide insights into:

- Why is data important for pipe renewal?
- What do I do with my legacy data?
- What narrative can I extract from my data?
- How do I get the most bang for my data buck?
- And lastly, what is a data hierarchy and where do I get one?

### **302: Time 1400**

#### **Opotiki sewer rehabilitation project – a right sized solution for regional NZ**

Author & Presenter: Peter Askey, WSP-Opus

*Old leaky pipes, a small rating base, high groundwater levels, pressure for development.*

An all too common situation for many small communities in New Zealand, demanding innovation in approach to investigations and project design.

Opotiki township has 1350 domestic sewer connections. The reticulation dates from the 1950's and parts are now in poor condition. Very high Inflow and Infiltration results in a loss of service in wet weather and an expensive system to run. To optimise a solution for the future wastewater reticulation, a comprehensive and staged investigation was undertaken. This involved groundwater monitoring, sewer flow monitoring, CCTV inspection and a pilot repair project targeting private sewers. Results from this showed that rehabilitation of the existing system would be more cost effective than a complete replacement. Year 1 of a 3-year programme of works involving repair of private sewers, pipe lining, manhole refurbishments and for the worst lines, replacements, is now underway.

**Peter Askey** Principal Environmental Engineer Peter is based in the Whakatane office and provides advice on waste management to clients across NZ. Peter's 35 years' experience covers a range of wastewater issues including: • Reticulation design • Inflow and Infiltration reduction • On site effluent management • Monitoring of wastewater discharges • Advice on trade waste discharges Peter is currently involved in a comprehensive I & I reduction programme for Ōpōtiki. This has involved a multi-faceted approach to the problem and innovation with monitoring of groundwater levels and tackling of private system repairs.

### **303: Time 1430**

#### **Assessment of seismic resilience of Christchurch's wastewater pipelines**

Author & Presenter: Marcus Gibson, Beca

Co-authors: Melanie Liu, Beca & Mark Johnson, Christchurch City Council

*Resilience modelling of wastewater networks. Seismic events can induce physical damage to and, subsequently, impede the operability of wastewater networks.*

With time and budget constraints there is a need for territorial authorities to prioritise replacement of assets within their network renewal programme. Renewals provide an opportunity for asset manager to improve network resilience, when resilience benefit of selected renewal strategies is considered. This paper presents a project undertaken for the Christchurch City Council to evaluate seismic resilience of wastewater pipelines. By use of the resilience assessment framework developed by Beca, asset managers can better understand the vulnerability of assets and effects on network level of service, e.g., where are the weaker assets that are more vulnerable to earthquakes and will cause large loss of service if they are damaged. Based on anticipated physical damage and the number of properties served by an asset, a prioritisation ranking is produced, and indexes provide a measure of system resilience. These outcomes can be used to support evidence-based decision making for asset management, hazard planning and risk mitigation. This information can also be used to quantify resilience of a network and monitor change with time.

**Marcus Gibson** is a Senior Associate Geotechnical Engineer with Beca Ltd. As Geotechnical Discipline Lead within SCIRT (Red Team) for the three waters infrastructure rebuild following the 2010-2011 Canterbury Earthquakes, Marcus and his team undertook extensive assessment of damaged infrastructure and design of remedial with a focus of improving earthquake resilience. Building on knowledge from the rebuild, Marcus has actively developed strategies and processes to focus three waters renewal expenditure to improve resilience benefit to the community.

### **304: Time 1500**

#### **The politics of water**

Author & Presenter: Steve Finnemore, Harrison Grierson

*The politics of the day can influence a sector structure for generations - just look at the UK Water Sector.*

This paper will look at how the structure of the UK water sector was influenced by political landscape of the day and the reasons why the water industry in England and Wales is in private ownership whilst in Scotland it remains in public ownership. It will look at the challenges and performance gains under both ownership models and the common themes for success. In light of the 3-Waters Review currently being undertaken by the Minister of Local Government, what are the structural lessons for New Zealand?

**Steve Finnemore** based in Newmarket, Steve is a Technical Director and GM Infrastructure responsible for the Water and Roading Sectors and leads a team of approximately 60 civil, chemical and mechanical engineers. He has over 20 years' experience in the planning, design and implementation of large multi-disciplinary infrastructure projects to the public and private sectors. He is a Better Business Case Practitioner providing Infrastructure Advisory Services primarily to the Public Sector. During his career, Steve has increasingly taken a Governance role as Project Director on key infrastructure projects.

## **WORKING COLLABORATIVELY**

### **401: Time 1330**

#### **Impact of social characteristics of communities on water supply system resilience**

Author & Presenter: Behrooz Balaei, WSP-Opus

Co-authors: Suzanne Wilkinson, University of Auckland & Regan Potangaroa, Victoria University

*This paper sought to consider the key social factors affecting water systems' resilience to disasters as well as the relevant indicators to measure them.*

Although a number of social attributes of the communities can affect water system functionality during business as usual period, this study focuses on the characteristics of the individuals and societies that can

facilitate or toughen the post-disaster recovery process. A mix of close- and open- ended questions has been used to collect experts' opinions from a variety of relevant perspectives and backgrounds such as sociologists, water engineers, etc. to address the objectives of the study on the basis of a water supply system resilience measurement framework. The interviewees have been selected from a wide spread range of countries and cultures such as New Zealand, Iran, United Kingdom, and Vanuatu to achieve a variety of opinions and judgements. The findings show that individual demands and capacities, individuals' involvement in the community, and cultural characteristics play vital roles in water systems' resilience to disasters. The research results provide recommendations mostly to public sectors on fostering resilience of water systems to disasters through improving societies' crucial characteristics.

*Behrooz Balaei is a Water Asset Management & Resilience Engineer in Opus International. He has 8 years of experience in the disaster management field focusing on infrastructure resilience, damage estimation, mitigation planning, risk reduction, and asset management. He studied his M.S in Disaster Management at the University of Tehran in Iran. Having worked at the Tehran Disaster Mitigation and Management Organization (TDMMO), he has been to several disasters and gained a wealth of experience. Behrooz has been working on water supply systems resilience to determine the technical, organisational, social, economic, and environmental factors which affect water system functionality after an earthquake in his PhD journey.*

#### **402: Time 1400**

##### **They might all be pipes, but not all pipes are the same**

Author & Presenter: Tony Gordon, WSP-Opus

*Too often pipes are "buried" rather than "installed" resulting in local authorities receiving pipes that will cause problems and will not last as long as they should.*

This paper explains the key items that should be addressed in the design and installation of pipes, highlighting the differences between rigid pipes, such as concrete pipes, and flexible, plastic pipes. Whilst there is no fundamental reason to exclude either pipe type from consideration in a project, the design and construction requirements for both differ and these differences, which have an impact on installation and lifetime costs, need to be understood and considered during design and construction to provide the best-value installation.

The different ways that flexible and rigid pipes interact with the soil in which they are installed are outlined. The implications that this has on embedment and backfill requirements, the need for deflection testing, installation costs and expected life, are explained.

*Tony Gordon is a Principal Environmental Engineer based in the Christchurch Opus office where he is involved in a wide range of 3-waters projects. Following the 2010-2011 earthquakes he was on secondment in the Stronger Christchurch Infrastructure Rebuild Team (SCIRT), his last roll being that of 3-Waters Discipline Lead with 3-waters technical responsibilities for the SCIRT Design Team. He has a broad range of experience in water-related civil and agricultural engineering projects, in more recent years being predominantly involved with wastewater, stormwater and water supply reticulation projects.*

#### **403: Time 1430**

##### **Future cities: preparing for a disruptive future**

Author & Presenter: Chloe Smith, Fulton Hogan

*A focus on the interaction between our digital and physical environment will enable smarter infrastructure and cities, and safer worksites with improved efficiency.*

We are on the cusp of a shift in technology which will enable smarter infrastructure and cities, and safer, more efficient worksites. To prepare for this disruptive future, Fulton Hogan has been exploring innovative concepts and solutions including:

- Road marking technologies, with the aim to provide solutions for autonomous vehicle lane-keeping, as well as making our roads safer in low light conditions and adverse weather conditions
- Cycleway and footpath lighting solutions, including way-forward lighting options as well as lighting paths to keep pedestrians safe
- Bikescout, to keep our cyclists safe as they navigate our busy and congested streets
- Electric and autonomous vehicles, to provide a more sustainable, efficient fleet

Worldwide, initiatives in progress include autonomous vehicle trials; the transportation of vehicles on 'skates' at high speed in tunnels beneath congested cities; and a new system for road user charging, utilising GPS location in vehicles to determine if they are operational during off-peak or on-peak hours.

**Chloe Smith** was appointed to the position of National Innovation Manager for Fulton Hogan New Zealand in 2015. In this role, she is responsible for delivering a future focussed innovation strategy, established to develop new solutions for customers, and identify potential investments in the innovation space. Chloe joined the company in 2012, working on the Canterbury Earthquake Rebuild as a Programmer and Project Delivery Manager. Her diverse background in the arts, finance and construction, included several years working in the United Kingdom. Chloe has presented at International and National Industry Conferences and was the co-recipient of the Premier Award for Innovation Achiever's Award as a part of the United Kingdom's Chartered Institute of Building, International Innovation and Research Awards 2016.

#### **404: Time 1500**

##### **Love thy neighbour - partnership for resilience**

Author & Presenter: Peter Brown, Stantec New Zealand

*Governments, international development agencies, engineering companies and communities partner together for resilient water supply systems on a remote island of Vanuatu.*

Vanuatu consistently ranks No. 1 on the United Nations World Risk Report list of countries with high exposure to natural hazards. Recent events include a Category 5 cyclone in 2015, severe El Nino droughts in 2016, and volcanic activity in 2017. Each event required Government and international aid intervention.

The Government of Vanuatu's Department of Water Resources (DoWR) is working to establish resilient water supply systems across Vanuatu. Local implementing partners such as World Vision Vanuatu (WVV) work with DOWR to do community mobilisation, stakeholder liaison and training and construction to allow the project to succeed.

Stantec New Zealand recently supported WVV to design and construct a water supply system on Malo Island. Following recent droughts, water supply has been scarce forcing local people to walk for up to an hour to collect water. The goal of the water supply is safeguarding life and natural hazard resilience.

*Peter Brown is a Chartered Professional Engineer and Civil Water Team Leader at Stantec in Auckland. Peter has a mix of experience in water and waste engineering both in NZ and in the Pacific. He is interested in community development and the support private companies can provide to development agencies. Peter has also been a volunteer in Vanuatu supporting a water supply programme for community resilience.*

## **ENVIRONMENTAL / RESILIENCE / SUSTAINABILITY**

#### **501: Time 1330**

##### **Volcanic Eruption Impacts - SPOTLIGHT PRESENTATION**

Author & Presenter: Brad Scott, GNS Science Volcanologist

*Volcanic eruptions, can I preserve my assets from the impacts of an eruption?*

Volcanic eruptions are one of several geological hazards that can impact infrastructure and take lives. In contrast to other hazards there can be some warnings and there are several mitigations possible. Near source impacts will be totally destructive, however more distal impacts, especially from volcanic ashfall can be managed. This talk will look at lessons learnt about the impact of volcanic ash, using local and global eruptions, on engineering infrastructure. It will also introduce resource material that can be used in event response.

*Brad Scott is a volcanologist with GNS Science and has worked on volcano and geothermal hazards, eruptions and impacts for over 44 years. He has worked on eruptions in NZ, PNG, Tonga, Antarctica and Vanuatu.*

#### **502: Time 1400**

##### **Slow the flow (of water and money) with natural flood management**

Authors & Presenters: Colin Cranfield & Jonathan Chambers, Harrison Grierson

Co-author: Saeed Ghavidelfar, Harrison Grierson

*Protecting communities from flooding has traditionally relied on "holding the line" and building bigger flood defences, but how sustainable is this approach with predicted climate change and increased rainfall?*

Flood management thinking is now increasingly focused on integrated solutions that include catchment-based, natural flood management processes to "slow the flow" or reduce the volume of water that reaches the lower catchment, thereby making existing traditional defences more resilient.

This paper considers an alternative approach to managing flood risk in which natural, non-structural flood management options complement traditional defences. This approach can include reassessing the catchment hydrology, identifying suitable locations for natural flood management interventions, and re-examining hydraulic modelling parameters. Such an approach can attenuate flood flows, thereby reducing the cost of maintaining and upgrading existing defences and also improving farm productivity.

Regional land use and management policy should in the future also include the consideration and implementation of natural flood management processes. Methods to introduce natural flood management can draw on approaches adopted in NZ by some regional authorities for Farm Environment Plans and territorial local authorities for Water Sensitive Design.

**Colin Cranfield** is a technical director at Harrison Grierson and has lead 3 waters teams over the last 30 years. Currently focussed on the technical specialism of flood hazard and stormwater management in the Auckland and Waikato regions and working on a diverse mix of high density, urban and pastoral, rural schemes.

**Jonathan Chambers:** Jonathan is a graduate environmental engineer with experience in hydraulic modelling, water sensitive design, and flood management. He is currently working towards a master of environmental engineering studies at Auckland University alongside his work at Harrison Grierson.

### **503: Time 1430**

#### **Building resilience through green infrastructure – is contaminated land an opportunity?**

Authors & Presenters: Kevin Tearney, Jacobs New Zealand Limited and Marta Karlik-Neale, AECOM  
*The disruption caused by the contaminated land offers an opportunity for challenging the status quo and building resilience through green infrastructure. One question remains. Who pays?*

As shown by the 100 Resilient Cities programme, green infrastructure is one of the most important tools for building resilience. It can improve the ability of human and environmental communities to respond to shocks and at the same time generate a variety of benefits in 'quiet times'. One of the key reasons why green infrastructure is not used on mass scale is because of issues with valuing the benefits it generates. Our thought piece prepared for the Ministry for the Environment (MfE) in 2012, focused on extending the current human health based National Environmental Standard (NES) for soil to cover environmental receptors, proposed a cost benefit analysis method to calculate clean-up standards based on an overall value of environmental systems, rather than solely on human health. We believe similar approach could provide a method for evaluating green infrastructure investments on contaminated land.

**Kevin Tearney**, Principal Environmental Consultant, Jacobs New Zealand Limited Kevin Tearney is an environmental professional with over 35 years of industry experience gained mainly within New Zealand, Australia and the UK. Kevin is a contaminated land specialist and has thorough understanding of National regulatory requirements and planning frameworks associated with developments on contaminated land in New Zealand, through practical application and involvement in Ministry for the Environment working groups developing contaminated land guidance and providing input to the implementation and update of the soil NES for the protection of human health.

**Marta** is a sustainability and environmental management consultant with 15 years' experience in Europe and New Zealand. She leads AECOM's Sustainability and Resilience practice for New Zealand, specialising in environmental accounting (carbon footprints, LCAs etc.), infrastructure sustainability and climate change and resilience.

She studied economics and management in Poland, where she worked in communication and marketing. She also completed a Masters in Environmental Science with London University.

For the last year and a half Marta managed the development of the Wellington Resilience Strategy working closely with Wellington's Chief Resilience Officer, Mike Mendonça and various 100RC experts.

### **504: Time 1500**

#### **Development of a resilient water supply for Auckland**

Author & Presenter: Priyan Perera, Watercare Services Ltd

Co-authors: Charlotte Reed, Tonkin + Taylor & Jon Reed, Beca

*Resilient organisations plan for disruption. Watercare has applied planning approaches that ensure it has*

*a robust system to respond to disruption to Auckland's water supply*

Watercare is the largest water and wastewater utility in NZ, providing services to 1.4 million people. A key focus of our capital investment is continuing to build system resilience, as our customers become less forgiving of ongoing disruption following significant acts of nature.

We commenced our resilience planning by applying frameworks from the UK water industry. We defined reasonable and auditable risk allowances that we included in our supply planning. In 2015 we commissioned a study to model 'reasonable worst case' scenarios addressing major disruptive events. This work guided us to progress schemes that increase the ability of our water treatment assets to resist and absorb major disruptive events. Our contingency planning was put to the test during the Tasman Tempest in March 2017.

**Jonathan Reed** has over 20 years' experience of managing water resources in New Zealand, Australia and the UK. His main areas of experience revolve around water resource planning and management. He has led many planning studies for Watercare and other municipal clients in NZ. His current role at Beca includes leading major projects and operational management of the 150-strong water team across NZ and Australia.