Summary of abstracts
The programme will be published mid April – what presentation / where/when
The following is correct as of 19 Dec 2013, but subject to change

ABSTRACT summary
3910:2013 - So far, so good?
Duncan Halliwell

This paper will review the new form of NZS3910:2013 contract published in October 2013 by Standards New Zealand. It will focus on:

- The key differences between the 2013 edition and the 2003 edition it has replaced;
- The effect of some key changes that are new to New Zealand and which have been imported from overseas practice including:
  - The early warning mechanism;
  - The Comprehensive programme requirements; and
  - The cost reimbursable option.
- Some of the key points of contention with the new 2013 edition and issues that have arisen on the contract to date.
- Some potential amendments that the 2013 review process missed, and which should form the part of any future review of the contract.

The paper will also briefly discuss the new forms following on from the 3910 drafting exercise, specifically the new NZS3916 Design and Construct Contract and the NZS3917 Fixed Term Contract, and evaluate the extent to which they have improved the procurement landscape in New Zealand.

A Paradigm Shift in Delivery
Simonne Elliot

The Further North Alliance, comprised of the New Zealand Transport Agency, SKM, GHD and Chapman Tripp, is the first New Zealand planning alliance created solely to obtain consents, and the first alliance in the world to include a legal team.

The Alliance accepted the challenge of delivering consents, to construct the Puhoi to Warkworth section of the Puhoi to Wellsford Road of National Significance, within approximately half the 'normal' timeframe, which required every member of the Alliance to alter normal practice.

Investigations and design efforts were targeted to provide only the necessary information to facilitate assessments which satisfied the legal planning requirements, to obtain consents for the Project. This approach required close collaboration, establishing an overall philosophy and methodology achievable in the timeframe that all parties could accept. All members had to understand the legal planning requirements, the specific information and timing requirements of each specialist to enable their individual effects assessments.

All deliverables were achieved on-time and under-budget, with streamlined documents which the Environmental Protection Authority have accepted and recently publically notified.

By consistently scrutinising the foremost necessities and how they would contribute to the assessment of an effect, unnecessary work was eliminated, resulting in time and cost savings.

Agent Based Modelling, A Quiet Revolution in Asset Management
Simon Bush

Over the years sophisticated asset management models have been created, but these models only capture the technical half of the decision process, and not the social half. Capturing both the social and technical aspects is required because asset management is socio-technical process, with the interaction between the social and technical systems directly impacting strategy development and the long-term evolution of the asset.

To combine both the social and technical systems into one model a small number of researchers have started to use agent-based modelling. By creating these models, stakeholders’ reactions to proposed policies can be explored prior to policy implementation. This ability to explore stakeholder reactions means that, for the first time, asset management strategies can be developed that meet stakeholder expectations, while ensuring the on-going functionality of the asset is maintained.

This paper provides an introduction to this new modelling technique and discusses where it has already been used in
asset management decision making. As these early models have tended to focus on condition management this paper then goes on to describe how they can be extended to include a range of performance metrics, thus creating a framework for improved decision making.

**Anticipation And Reaction - A Story Of Seismic Alarms And Bursts In Porirua City**

*Ben Davies*

Porirua City is located 20 km north of Wellington, has a population of around 53,000, and is part of the Greater Wellington area. Although the city has its own proud culture and identity, one aspect of life that it cannot avoid sharing with the capital is a susceptibility to earthquakes. Porirua City Council (PCC) not only recognised the seismic risk, but set about increasing the resilience of the network.

In 2008/2009 seismic shut off valves were installed on all 18 major reservoirs, designed to close if flow exceeds a trigger point. This prevents water loss through a potentially shattered network and locks down a supply of potable water in the reservoirs.

This paper outlines the journey PCC took together with MWH, starting with picking logical trigger points for the valves, monitoring performance of the system through the following trial period and finding that in addition to seismic protection, the system was able to prevent significant damage in non-seismic burst events.

**Asset Management Planning: Is Our Journey on the Right Track?**

*Grant Holland, Thuens Henning, Ross Waugh*

Twenty years ago most of us hadn’t heard of Asset Management Plans (AMP); now many of us have been through several rewrites and our plans have become much more comprehensive. Our asset management plan journey has been driven by the need to meet several changes to legislation, signals from the Office of the Auditor General, and our personal and organisational initiative.

Others, only recently embarked on their AM journey.

Many Developing Countries and Least Developed Countries are applying Asset Management techniques as they look to plan for their futures. With different priorities, these nations journeys differ from ours and there may be lessons we can learn as we look at the value our AMPs are delivering to us.

This paper a will consider these questions:

- When we strip Asset Management planning back to the basics, how is the progress on our journey?
- What can we learn from others who are at a different stage of their journey?
- Are we focussing on the aspects that make a significant difference?

**Best Practice Asset Management Planning Working Group**

*Gordon Hart & Julie Muir*

In order to harness and promote the existing body of good asset management practices, the Road Efficiency Group (governed by LGNZ and NZTA) has established a dynamic representative working group, made up of representatives from eight road controlling authorities. They’re working collaboratively to identify and encourage best practice asset management planning among road controlling authorities.

This presentation will illustrate examples of best practice asset management plans (AMPs) in a manner that fosters consistency of application across New Zealand. These AMPs will:

- assist asset management planners operating in urban, provincial and rural environments
- build on the best practice guidance currently provided by the industry ie RIMS, Austroads, NAMS
- be demonstrated through asset management approaches and plans of organisations participating in this working group.

**Challenges and Opportunities for Stormwater Asset Management**

*Sarah Dudson*

Stormwater is no longer just about drainage and simplified runoff calculations; it’s a lot more exciting. Computer modelling has become an increasingly powerful tool, able to seamlessly integrate piped networks, attenuation, soakage systems, surface and channel flows. Effective stormwater management now requires multi-disciplinary teams made up of engineers, modellers, ecologists, planners and landscape architects. Not to mention the diverse range of stakeholders and changing regulatory environment.

This paper uses the development of a stormwater model for Ashburton to illustrate how far stormwater management has evolved. Innovative new modelling technology joined with smart use of LiDAR, aerial photographs, sound
engineering and 'hands on' validation was a powerful combination. This approach enabled us to graphically present, in a non-technical way, the remarkably good correlation between predicted flood extents and actual flooding observed which was invaluable in giving council and other stakeholders’ confidence in our work and the results. We will also discuss the imminent changes to the Local Government Act and how the stormwater model can be used a powerful asset management tool. This enabled Council to make informed decisions, demonstrate effectiveness and efficiency in design and help councils in preparation of 30 year asset management plans.

Chatham Islands Challenges – Upgrading New Zealand’s Most Remote Community Water Supplies
Graeme Glasgow

The Chatham Islands face significant water challenges despite large surface water lakes. Their remoteness, some 680km south-east of New Zealand, presents unique circumstances for the identification, design, construction and operation of water supplies. The settlement of Waitangi with a population of 300 faces shortages and relies upon a single groundwater source. The small community of Te One, 4km north of Waitangi has no public water supply and relies on rain water. Kaingaroa, located on the north-east promontory with a population of 60, relies upon a decaying fish factory water treatment plant and a lake source prone to runoff. Owenga, in the south-east of the main island with a population of 40, relies upon erratic spring fed ponds, household bores and rain tanks but suffers frequent shortages and quality issues. Achieving the New Zealand Drinking Water Standards, providing quality, sustainability and affordability that can be constructed under the unique conditions on the Islands requires close collaboration between the stakeholders to transform the facilities and deliver solutions. This paper will discuss the challenge to secure water supplies, present details of the options proposed for Waitangi/Te One and Owenga and the design of the upgraded supply for Kaingaroa about to commence construction.

Collaborating With Private Developers and Government Agencies to Deliver Stormwater Infrastructure for Growth in Auckland
Shelley Wharton

New growth areas require significant investment from Council, infrastructure providers, and private land developers. Prioritisation and coordination of infrastructure investment is critical because there are many growth areas in Auckland. Stormwater is intrinsically linked to landform which often means the land developer is best suited to implement catchment-scale infrastructure projects. Where land ownership is fragmented it poses a number of challenges to achieve efficient infrastructure. This requires a flexible and collaborative approach for implementing stormwater projects that should be delivered by developers but funded by Council. Infrastructure Funding Agreements negotiated between Council and developers detail obligations, timeframes and payment terms, and manage risks. A collaborative approach also requires a new approach to capital expenditure budgets and project delivery. Large growth areas should be treated as major projects with multiple sub-projects phased over ten or more years. An implementation plan and project briefs define overall catchment objectives and preferred solutions to inform developers but leave flexibility. The Special Housing Accord for Auckland and immediate application of Unitary Plan policies adds to the current challenges in implementing stormwater infrastructure. Managing integration of multiple designs between Council projects, Special Housing Areas and other private developments is necessary to achieve successful long term outcomes.

Collaborationists
Luke McCarthy

In July 2012 a team of professionals from GHD was hand-picked by Auckland Transport to provide asset management services. The contract required collaboration. No longer would we hide behind our PCs, our tablets, or our smart phones sending txts or emails in capitals or italics to emphasise a point. We would be bold and communicate face to face. We would become “Collaborationists”. Our mission was to deliver credible pavement and non-carriageway forward works programmes for Auckland Transport. The challenge was to collaborate, to work together and to cooperate across Auckland Transports transport divisions to bring about change that would deliver on the levels of service that the stakeholders of Auckland Transport would be proud of. To be a Collaborationist, one needs to truly understand the dynamics of actually talking to people, to guide, meld and unite towards the common purpose; the forward works programmes. This story is about the highs, the lows, the tears, the joy and the undeniable passion that people within this industry have to create an asset management legacy that Auckland would be proud of, that Auckland could share with the world and be known forthwith as leaders.

Councils’ Roles in Negotiating Future Water Supply Solutions
Anna Robak

Water is a basic human need, but the cost of supplying potable water is escalating due to increasing abstraction, drier
weather, rising contamination levels in rivers and groundwater, increasingly stringent legislation, and ageing infrastructure. The combination of these factors is placing increasing pressure on many communities, and more water suppliers may be forced to consider alternatives such as discontinuing their water supply services or significantly reducing service levels.

Understanding the acceptability of an alternative is a dynamic process; it is a negotiation between supplier and consumer. As part of this negotiation process, water suppliers will need to understand what is important to their communities. Councils, when entering these negotiations, must understand available alternatives that can achieve the same outcomes, and people's attitudes towards these alternatives.

This paper explains how a willingness to pay study was used to understand people's attitudes and preferred solutions for a sustainable water supply. The findings will help water suppliers develop strategies that offset costs while maintaining sustainable water suppliers at preferred service levels. The research finds that Councils do not have to do it all themselves; in the future, they may find roles as advisors and monitors, resulting in lower water supply costs.

Creating a Safety Assessment Tool For Diverse Council Assets
Warren Bird

Responsible infrastructural asset management requires that public safety hazards are understood and, where necessary, mitigated. The Auckland Council Stormwater Unit required a way to assess more than 300,000 diverse assets, and rank them according to public safety risk. This ultimately led to the development of a stormwater safety risk assessment tool based on risk management principles. The tool was further developed using GIS to screen large numbers of assets (e.g. manholes). This paper discusses the process of developing the safety risk assessment tool, including a number of fascinating insights gained as the development team investigated local and international practice, the practices of other utility industries, and sought to understand just how much risk urban stormwater facilities actually pose to the public.

The best-practice safety approach described here for stormwater assets is likely to be capable of adaptation to other classes of infrastructural assets.

Creating a Win-Win for Everyone: Professional Formality
David Bridges

In today’s collaborative, consultative, consensual environment, this paper examines whether in fact we are achieving value for money or sampling blurring the lines of accountability through the way in which we are attempting to procure and deliver capital works. The paper examines a number of case studies of both highly successful and challenging, as well as routine projects, to identify the attributes that contribute to “best for project” – “value for money” outcomes. One of the key elements identified is that of “Professional Formality”. This element is explained and developed within the context of delivering successful projects.

Curvature: The Answer to Our Road Network Asset Management Prayers?
Mike Tapper

Curvature: The answer to our road network asset management prayers?
Whangarei District Council (WDC) has collected data on projected forestry harvest volumes for the next 30 years. The challenge is turning this data into an assessment of the impact road renewal and routine maintenance costs. WDC contracted Beca to undertake this analysis together with them.

To accurately assess and future impacts, a reliable parameter to determine varying surfacing life and maintenance costs is required for the individual treatment lengths, particularly in identifying vulnerable sections. Curvature from Falling Weight Deflectometer (FWD) data provided a reliable correlation with predicted overall pavement strength and surfacing performance and that observed in the field. Curvature was also used as a differentiator in assessing likely maintenance cost flows from various traffic loading scenarios. This has given confidence that the future expenditure profiles are robust and reliable. The relationships are network evidence based and not overly reliant on theoretical relationships.

The benefit is an improved method of predicting “project level” performance of vulnerable sections with a network level data collection methodology. With new NOC contracts and constrained budgets, improvements in identifying vulnerable treatment lengths are needed to collaboratively deliver long term maintenance strategies for the new environment.
Delivering a Risk-based Skid Resistance Strategy for a Roading Network
Simon Hunt

Road safety is a significant risk, especially if the condition of its assets contributes directly to accidents. A key contributor to road safety is the road surface. Funding is tight, so we need to develop a risk-based skid resistance strategy for the roading network to give us a prioritised programme of work.

Working with several Councils, we have developed/implemented the following methodology:

- Familiarisation with the relevant Council and Transport Agency documents
- Road Segmentation: Splitting the roading network into segments based on road classification, accident history, high risk locations (as per NZTA’s T10 Specification)
- Site inspection to confirm the roading segments
- Weighted scoring system based on the risk of an accident to give a priority score
- Determine the skid resistance and texture testing regime based on the ranking of the road segments
- Develop a suite of treatments, based on performance, including proven aggregate performance
- Develop treatment programme, including temporary solutions, based on available funds and site ranking
- Develop and implement a monitoring programme to improve strategy

Through case studies, we will demonstrate how the development/implementation of this strategy delivers a risk-based prioritised skid resistance works programme tailored to the respective Council’s budget.

Efficiencies Through Collaboration
Garson Bell
By Bernard Cuttance of NZTA and Garson Bell of Resolve Group

The Road Efficiency Group Best practice asset management team is investigating ways of improving efficiencies in procurement through collaboration. Four specific interrelated areas have been investigated, namely: Standard documentation; Pre-qualification; Performance assessment; and Bonds and Insurances. The reason for these four being chosen is the evidence (in some cases anecdotal) that:

- Non-standard documentation increases the cost of tendering;
- The extended and correct use of existing pre-qualification lists across the roading industry could lead to tendering and evaluation efficiencies and cost savings;
- 93% of the work on State Highways is undertaken by subcontractors who get no recognition under the existing contractor performance assessment; and
- The true cost of bonds to the roading industry.

The Efficiencies through collaboration paper will outline the investigations undertaken and recommended actions with respect to the abovementioned four areas. Whatever action is taken it is essential to ensure that it does not hinder the continued establishment, viability and growth of small to medium sized contractors.

Hamilton Southern Links - Leading Tomorrow’s Infrastructure: Collaborate, Transform, Deliver
Mike O’Halloran

Hamilton Southern Links is a partnership between Hamilton City Council and the New Zealand Transport Agency to investigate and plan for the long term transportation and integrated land use infrastructure needs of the southern area of Hamilton in the Waikato.

The Southern Links project involves 32 kilometres of future transport network, including 21km of state highway (straddling Waipa District, Hamilton City, and Waikato District) and 11km of urban arterial roads located within Hamilton City.

This was a unique and complex investigation because the evaluation requires multiple considerations of economic, environmental, social and cultural elements for each link in the transport network.

Through extensive consultation, collaboration and working together as a community, the investigation has now confirmed the preferred route network which was typically 400 metres wide including a new crossing over the Waikato River, a taonga to Maori.

The Southern Links road network has been developed using a robust and comprehensive approach, the results of which have been publicly consulted to ensure stakeholder issues are understood and incorporated into the preferred option wherever practicable.
Protecting the corridor for the preferred network is important to allow Hamilton to grow and cater for future demands.

**Hunstbury Reservoir - Post Earthquake Reconstruction**  
*Dennis Hunt*

Dennis Hunt 1, Robert Clifton 2, Mark Christison 3  
1. Beca Ltd, Wellington, New Zealand  
2. Fulton Hogan Ltd, Christchurch, New Zealand  
3. Christchurch City Council, Christchurch, New Zealand

The 22 February 2011 Christchurch earthquake extensively damaged the 35,000 cubic metre Huntsbury reservoir and all stored water escaped. The 59 year old reservoir was the principal potable water storage facility in the city. A geological shear zone on a diagonal orientation across the site was subsequently discovered. Partial replacement water storage was deemed essential by December 2011, and alternative sites were not available.

Challenges this presented included:
- Could the 59 year old structure be reconstructed to reliably store water?
- Was a safe construction methodology feasible?
- Could investigation, design, construction and commissioning be done in the timeframe?
- How extensive was the shear zone, what future earthquake movements could be expected and what constraints did this impose?

This is a story of how teamwork, integration of design, construction and operations, prompt decision making, astute risk assessment and consultation with the community reinstated water storage on Huntsbury Hill.

The result is a completed facility with significant reuse of the existing structure and a landscaped community area.

**Is It Possible to Create Meaningful Benchmarks of a Council’s Infrastructure Management Performance?**  
*Dan Bonifant*

Benchmarking has become a buzz word across Australasia, in New Zealand the Government has introduced standard financial benchmarks and across Australia, the various states are at different stages in developing KPI frameworks for mandatory reporting.

The key to benchmarking is having confidence in the comparability of the data. Reporting at the national or state level is generally at such a high level as to defeat the purpose or differences in interpretation make comparisons difficult.

Morrison Low, Xyst and a group of New South Wales Councils have created a pilot program to develop a series of benchmarks for the management and operation of roads which will seek to address these issues through
- Industry involvement in the development of benchmarks
- Benchmarks that provide detail about the
  - Provision
  - Investment
  - Operations
  - Infrastructure; and
  - Environment
- Development of detailed guidance notes; and
- An onsite audit of the data to ensure comparability and compliance with the guidance notes.

This paper will provide an overview of the pilot project, the benchmarks that have been developed and the results (due out in February 2014) and take some time to explore the benefits of having a benchmarking framework developed by the industry, for the industry.

**Kapiti Water Supply: Getting it Right**  
*Andrew Watson*

Water supply on the Kapiti Coast has been under stress for over 20 years. Council’s application to augment the supply from the Otaki River was declined in 2001, leading to Council developing a groundwater supply to augment its river source. However, the groundwater quality was disliked by many in the community.

With continued population growth through the 2000s, the capacity of the supply was once again under pressure, and planning commenced on the search for a 50-year sustainable solution.

Over 150 reports from the previous 20 years were reviewed and checked for high level fatal flaws to develop a list of 32 options. Extensive consultation was undertaken to establish values and measurement criteria. Multi-criteria analysis was undertaken to shortlist to eight options (storage and groundwater).

In September 2010, following wide-ranging investigations, Council selected the innovative River Recharge with Groundwater option. Over the following two years Council undertook extensive groundwater and ecological investigations, concept design, and the AEE. Consent lodgement was in November 2012, and consents were granted in September 2013.
The paper will mainly focus on:
planning the project
iwi, community and stakeholder involvement
difficulties of consenting under uncertainty and an innovative design
lessons learned.

Local Road Asset Deterioration
John Smith

Local road asset deterioration caused by slope instability in regional Victoria, Australia
Condition deterioration of local roads can occur rapidly as a result of failure due to a trigger event. Rehabilitated
roads may continue to experience high rates of deterioration due to the highly softened and disturbed ground typical
of previous landslip occurrences.
The susceptibility and vulnerability of the road assets are assessed. The susceptibility of the assets is related to
geology, topographic elevation, steepness of slope, location of natural and artificial drainage, vegetation cover and
rainfall intensity patterns. The vulnerability of the asset is related to how critical is the road for resident access, has the
road previously suffered landslide damage, has the road and roadside been repaired previously, have preventative
measures such as enhanced drainage and re-vegetation been installed.
Within the local government area investigated, the distribution of landslide activity affecting roads has been identified
and mapped. Asset condition classes are defined and it is recognised that slope instability can cause the road condition
either to progressively deteriorate or to move directly to a low condition by sudden failure. The condition class
assessment is supported by an assessment of the risk of impact by slope instability.

Long Term Planning Eating the Elephant One Bite at a Time
Daniel Johnson

A perception towards long term and renewals planning is that we are all right, but are we. What do we know about
the performance and condition of our pipelines, how can the right data and smart systems be used to make informed
decisions and justify our expenditure.
Improved technologies to assess the condition of buried pipelines with the support of technical experts are now better
understood and becoming more widely used and accepted, knowing when and where to use this approach is still not
well understood by Councils.
Asset Management Systems are being developed for Councils, with expectations that they will provide the answer to
system performance and financial reporting, this is largely not the case as the data requirements and quality is not
currently sufficient.
This paper discusses the challenges that Asset Managers are faced with in developing an Infrastructure Strategy, and
smart solutions to long term planning one bite at a time.

Managing Stormwater Pipes – How To Deal With The Poor Cousin
Philip McFarlane

The Government’s National Infrastructure Plan estimates the value of New Zealand’s stormwater infrastructure to be
8.9mil. This is 70% of the value of the wastewater infrastructure, but Capex budgets for stormwater infrastructure are
only half of those for the wastewater networks and Opex costs are only one third.
This raises the question; are we giving our stormwater assets the attention that they desire? Or are we neglecting our
stormwater pipes because they are perceived as being less important and they are out of sight and out of mind?
This paper discusses approaches to management of stormwater pipes. The deterioration of stormwater pipes and the
factors that affect the rate of deterioration over time are identified. The effect of deterioration on structural and
hydraulic performance of stormwater pipes is discussed in the context of planning and prioritising repairs and
renewals.
The paper considers the pipe scoring system in the New Zealand Pipe Inspection Manual that is often used by local
authorities to assess the condition of gravity pipes and asks is this scoring appropriate for assessing the condition of
stormwater pipes.

Measuring the Resilience Of Transport Infrastructure
James Hughes

Internationally there is a growing call for building more ‘resilient cities’ and for improving the resilience of our critical
infrastructure. This is in response to a realisation that the services we take for granted may be robust in the face of
predictable hazards, but are in fact extremely fragile in the face of unanticipated shocks.
In the context of transport infrastructure, operators strive to ensure that transport assets and services function continually
and uninterrupted in the face of a range of existing and emerging hazards. This has led to a specific focus on the concept of resilience and how this can be defined, measured and improved across the transport system.

In this paper (funded by NZTA) we research the theory of resilience and propose a measurement framework that broadly covers both technical and organisational dimensions of resilience and breaks these into specific principles and measures which can be utilised to qualitatively assess resilience.

We approach the measurement of resilience from a view that a risk management approach alone is insufficient and needs to be complemented by an awareness that resilience requires both consideration of events that fall outside of the realms of predictability and, importantly, that failure is inevitable.

**Natural And Community Assets: Stormwater O & M As A Driver For Ongoing Community Involvement**

Tom Mansell

The traditional approach towards the operational maintenance and on-going usage of council-owned stormwater management assets, has been one which has lacked in collaboration with our surrounding communities. Auckland Councils ownership of approximately 500 stormwater ponds and wetlands across the region, affords us excellent opportunities to promote long term, community-inclusive stewardship and usage of these assets.

The Rata Road, Stanmore Bay, constructed wetland restoration project documents the success of a collaboratively-based joint venture. The project involved Auckland Councils Stormwater Operations, Projects and Environmental Services (E.F.S.) units, contractors, a local collage, the community and the press.

This paper will demonstrate how careful planning, good communication and enthusiastic engagement with a wider community, can provide assets that meet the requirements of stormwater management, the environment and the community alike.

**Network Optimisation - Connecting the Dots**

Richard Sprosen

The ability to invest in road network infrastructure on the scale of our neighbours in Australia is just not feasible. Our population simply cannot support the capital required for extensive undergrounding of transport infrastructure. Waterview, with a price tag of $1.4B is very unlikely to become the norm.

With the exception of a few big ticket items such as a second harbour crossing and the inner city rail loop, government spend on transport infrastructure will inevitably move from large projects to maximising the efficiency and lifespan of the existing network.

So how are we doing it?

Innovative approaches to maximising the productivity of our investments by only providing what is necessary, when it is necessary, are becoming more prevalent. NZTA’s new business case approach, investment logic mapping, network optimisation schemes, corridor management plans, route optimisation and network operations planning are all examples of this.

While individually these are all great ideas, we have somewhat of a scattergun approach at the moment, trying anything and everything to achieve the same goal. This paper will use project examples to pose a potential framework for a consistent approach to how we plan for the right infrastructure at the right time.

**New Zealand’s National War Memorial Park**

Johnathan Priestley

The First World War (WW1) was one of the most significant events of the 20th century. Just over 100,000 New Zealanders served overseas, from a population of barely one million. One in five did not return, 40,000 returned wounded. Anzac Day 2015 marks the centennial anniversary of the WW1.

The National War Memorial is located at Buckle Street in Wellington. On 7 August 2012, the Government announced the creation of the Memorial Park to mark the Centenary and honour all affected by the War. The project involves undergrounding State Highway 1, diversion of services and completing the park inside a 2.5 year window.

The challenge – prepare the site, dig the trench, construct the tunnel, build the park; all in an urban environment with significant space constraints.

The solution:

1. Enact special legislation to give blanket consent for the works.
2. Create an Alliance of NZTA, URS, T&T, HEB & Downer
3. Start design and construction a head of fully understanding the scope.

This paper focuses on how the Alliance has solved the challenges associated with major diversions of infrastructure assets running through the site by collaboration with Stakeholders and the use of ‘BIM’ technology to maintain
**Operating Characteristic Curves: Giving Quality a (calculated) Chance.**  
*Emily Craigie*

Tomorrow’s infrastructure requires a broader range of materials and innovations to deliver value for money and meet client’s expectations of design life performance. When adopting any new materials or technologies, it can be difficult to know whether quality is truly attained. Specifications that rely on a set of single pass/fail measures of properties to govern compliance do not always deliver the required product or performance.

This paper investigates the use of statistical analysis, in particular operating characteristic curves, and their role in ensuring all parties get a fair deal in quality control. In order for infrastructure owners to have confidence in material performance and construction methodology, a compliance scheme that accurately represents a product’s properties is required. The statistical approach to characterisation of sample values not only improves the effectiveness of testing plans but also provides a fuller picture than current deterministic pass/fail methods of quality control.

A case study is included to illustrate the power and value of operating characteristic curves. It highlights the cost saving and practical benefits of a statistics-based approach to analysing sample data.

**Performance Measures to Support the One Network Road Classification**  
*David Darwin & Siri Rangamwa*

The Road Efficiency Group (REG) is a collaborative initiative by the road controlling authorities of New Zealand. Its goals are to drive value for money and improve performance in maintenance, operations and renewals throughout the country.

In mid 2013 REG established a joint working group comprising members of Local Government, NZTA, DOC and MOT commenced development of an integrated classification for the New Zealand road network (state highways and local roads) that:

- reinforces a “one network” approach and assists national, regional and local planning, investment, maintenance and operations decision making utilising existing frameworks where appropriate
- supports collaboration & cooperation between councils and between councils and the NZTA
- supports a customer focused approach to the seamless movement of goods and people

This presentation will share the work that has been done to develop performance measures to support the customer levels of service developed as part of the One Network Road Classification.

**Prioritisation Process For Funding Of Unsealed Roads In The Auckland Region**  
*Ayokunle Martins*

Prior to the amalgamation of territorial organisations in Auckland, each approved organisations have a unique policy for sealing their unsealed road sections. Consequently, after the establishment of Auckland Transport in November 2010, the task of sealing the unsealed road sections now rests solely on Auckland Transport.

Funding is provided by Auckland Council, it is considered unlikely that any remaining unsealed roads would attract NZTA funding.

Auckland Transport is committed to a process of ‘fair and transparent decision-making’ in regard to the allocation of rate payer’s funds to support the sealing of these unsealed road sections. This paper outlines the scientific process used by the Programming and Development Services team in relation to that funding allocation.

Currently, the regional prioritisation tool - An approach to prioritisation is Auckland’s regional tool for decision-making. The six regional guidelines from this regional tool are:

- Traffic movements
- Dwellings/km
- Amenities
- Gradient
- Incidents
- Heavy Commercial Vehicles

The process we have developed therefore includes adherence to these principles and has been refined to take account of lessons learned over the past three years of preparing and funding the Auckland regional transport programme.

**Raising The Performance Of Consultants Using Comparison Of Key Performance Indicators**  
*Adrian Percival*
The Auckland Councils Stormwater Unit has to evaluate Resource Consent requirements against nine legacy Council District Plans, three legacy Regional Plans and the Proposed Auckland Unitary Plan. An innovative approach to engaging and managing consultants was required to get consistent, good quality and timely outcomes.

To minimise ongoing and time consuming procurement processes, the Stormwater Unit decided to go to the market to recruit three Planning Consultancies for a 1+1 year contract. The work would be divided up regionally along some of the District Plan boundaries.

Having three consultants working for the Stormwater Unit, doing the same work, at the same time, presented an opportunity to measure and compare the consultants with each other to ensure Council was getting good, cost effective and reliable advice. Key Performance Indicators (KPIs) were developed to record performance on individual projects and on an ongoing basis. The assessment criteria included:

- Responsiveness;
- Performance against estimates;
- Quality of Deliverables;
- Performance;
- Staff Changes on Contract; and
- Innovations/Improvements/Streamlining Suggestions.

The result has been improved performance from the Consultants. This has been achieved through the comparison of scores and improved communications of expectations being achieved, or not.

Re-designing Existing Transfer Stations for Improved Resource Recovery

Phil Landmark

Legislative demands and public pressure to recycle have increased the need for improved waste reduction and resource recovery facilities. Most territorial authorities (TAs) do not have resources to design new resource recovery centres (RRC) and changes have to accommodate existing infrastructure.

The paper uses recent NZ projects as case studies to show how the re-design of existing waste management and resource recovery facilities have focused specifically on improving the recovery of resources.

The case studies highlight the importance of strategically reviewing facilities, getting stakeholders involved and establishing the need for facilities improvement from decision-makers.

Key principles for the design and operations of RRCs are discussed and the case studies illustrate the importance of obtaining information on quantities of waste and recyclables, vehicles and charging methods, and show how such information impacts on various aspects of the site design.

The benefits of including operators in the design process from concept through to preliminary and detailed design were significant, and different contract procurement models were used to accommodate limited construction timeframes and multiple contractor interfaces.

Outcomes from the improved facilities have included positive public feedback with increased usage, closer co-operation between TAs and operator staff, and significantly improved site safety.

Re-engineering the Nature; Integrating Human Society with the Natural Environment for Mutual Benefits; Creating Sustainable Eco-systems By Embracing Ecological Engineering

Darme Dharmasena Watthayalage

Ecological Engineering first introduced in (1960) by Howard Odum; fusing ecological sciences and engineering principles; promoting harmonized co-existence of human habitats with natural environments benefiting both; is about research, development, design, building, and operation of combined human habitats and sustainable ecosystems; relying on system approach; using self-designing capacities of ecosystems; conserving nonrenewable energy & biosphere, and field testing of ecological theory.

Ecologies stressed or damaged by ever increasing population growth demanding speedy restoring of damaged, conserving endangered and creating novel to sustain support and self survival. Incapacity of conventional engineering to facilitate human growth with environmental sustainability created a gap for innovative novel approaches. Ecological engineering principles are good contender to fill this gap.

Number of success stories of systematic or casual implementations of these principles and achieving positive social and environmental outcomes are documented. These finding are recommending timely embracing of these principles. What
is lacking is awareness about the possibilities and potential outcomes. Therefore proposing to create awareness among wider communities on benefits, form special interest and activity groups; share knowledge and experiences, embed them in to educational curriculums, introduce new education programs, conduct research and developments, create service capacities, and provide incentives for ecologically engineered developments.

Road Maintenance Task Force Recommendations - Collaboration – How Well Have We Done? Niclas Johansson

The national land transport delivery model has essentially remained unchanged since the local government amalgamations of 1989. The global financial crisis of 2008 and its continuing economic impacts, has required Governments worldwide to challenge their expenditure. Delivery of the 2009 Government Policy Statement on Land Transport Funding (GPS), flat-lined the total funding available for maintenance and renewal activities. As a consequence the New Zealand Transport Agency (the Transport Agency) together with Territorial Local Authorities (TLAs) and industry representatives investigated options for improving the delivery of land transport activities in what was called the Road Maintenance Task Force (RMTF). The RMTF identified collaboration, asset management and LoS road classification as some, among other, key areas to extract better value. Governance and implementation structures were set up jointly between NZTA and TLAs to pursue these opportunities: The Road Efficiency Group (REG) was formed. Niclas Johansson and Edward Guy have led the REG collaboration initiatives across the country, and this paper is a stock take two years down the track. It will provide insights into the full range of models, what worked and what didn't.

Seismic Response Of Underground Utility Systems Jonathan Morris

This paper describes progress in a four year research project funded by the Ministry for Business Innovation and Employment on the seismic response of underground utilities. A key goal of the project is to help develop robust, evidence-based national recommendations and guidelines to help improve community resilience to seismic events. This paper will describe how information on ground deformation, geology and seismic loading is being used together with underground utilities damage data to assist in understanding the risks from future earthquakes. While there is a focus on the Canterbury earthquakes, information from other earthquakes within and outside New Zealand provides complementary data.

Recent work has focussed on improving understanding of how modern ductile materials respond to seismic events, through analysis, modelling and testing. The paper will compare examples of how ductile pipeline systems respond to earthquake loads with the response of more traditional materials. This provides insights into the forms of damage and the associated consequences, which are likely to differ as the proportion of modern materials increases through new construction and renewals. Even in the preliminary stages, the models are capable of providing guidance to reconstruction engineers on the likely responses of different installation and remedial options.

Starting From Scratch – The Fiji Roads Authority Story Neil Cook

This presentation explores the challenges and highlights of the first year of operation for the Fiji Roads Authority, through the experiences of the author, who is the inaugural Chief Executive of the Authority. The Fiji Roads Authority was established on 5th January 2012, and under the management of ‘Change Manager’ MWH the next 12 months were a transitional phase as the former Department of National Roads was dis-established and the new Fiji Roads Authority structure was built. The Author’s involvement began with an initial contact in May 2012, which ultimately led to accepting the role of Chief Executive commencing 4th January 2013.

First year challenges that will be discussed include delivering a 8 Million (FJD) roading programme at the same time as building a corporate structure, populating key roles in the organisation, establishing core systems for running the business and managing the assets; all the while dealing with a government bureaucracy that can be pedestrian in many ways, and at its worse is deliberately obstructive and resistant to the reform process Government is promoting. In addition to the challenges the presentation will highlight the successes as Fiji Roads Authority delivers improved road management and maintenance delivery for Fiji.

Sustainability Considerations In Infrastructure Procurement
Kerry Griffiths

Kerry Griffiths, Senior Principal Sustainability Consultant with URS New Zealand, is currently undertaking in-depth research into the use of infrastructure sustainability rating tools as a means of delivering business value and improved social and environmental outcomes. In this paper she will explore the drivers behind the use of such rating tools from the perspective of infrastructure developers – focussing on New Zealand and Australia. She will explore the extent to which innovation and transformation are important factors. Kerry will signal future research questions related to the use of rating tools in procurement decisions and project implementation. Kerry will draw on her practical experience of applying sustainability measures and frameworks on state highway projects in New Zealand and on rail projects in Australia. More recently she has worked with the Australian IS Rating tool and the US-based Greenroads framework. Her colleagues in the UK are also assessors and verifiers of the well-established CEEQUAL rating tool, and will provide additional insight to the paper and its conclusions.

Tairāwhiti Roads – One Network Journey
Dave Hadfield

A strategic shift is taking place in the way land transport must be delivered in New Zealand. The changes driven by the NZ Transport Agency Maintenance and Operations review and the Road Maintenance Task Force sees roading professionals working in increasingly challenging times. However the need for efficient, effective, safe and accessible roading services remains unchanged.

Gisborne District Council and NZ Transport Agency have collaborated to accept that challenge with innovation. We will establish a revolutionary co-managed, Gisborne-based unit to maintain and improve roading services in one of New Zealand’s most remote and challenging regions.

Council and NZ Transport Agency representatives are currently working through the implementation of the business unit, including stakeholder consultation, strategic plans, annual budgets, staff and performance models. This will see the grouping of state highway and local roading contracts using the performance-based Network Outcomes contract. Dave Hadfield, Council’s land transport manager and Shaun Perrin NZ Transport Agency maintenance contract manager will speak about the process of establishing this ‘one-network’ approach, which will allow for smarter asset management, better decision-making and joint regional efficiencies predicted to result in savings of between seventeen and forty—three million over a ten year term.

Taupo Water Supply upgrade, the journey from inception to delivery
Jason Ewert

With the implementation of the DWSNZ in 2000, Taupo District Council (TDC) identified the requirement to upgrade the Taupo urban water treatment plants and improve the reticulation network. This paper describes how TDC investigated potential upgrades to the Taupo water supply to identify an affordable yet robust strategy for Taupo’s future water supply to meet the current and foreseeable future water supply needs of Taupo. The drivers and objectives of the project are described. An evaluation of twelve potential sites and various treatment options was undertaken considering factors such as required consents and approvals, site footprint vs. plant footprint, required reticulation upgrades, risks and total project cost.

The outcome identified a single coagulation/microfiltration membrane plant at the site of the existing Lake Terrace water treatment plant (WTP) as the preferred option. The selected site had very significant space constraints. This paper explains how this challenge has been overcome to enable construction in a space many considered impossible and still accommodate cost effective chemical delivery, a modern treatment facility and a landscaped public access rooftop on the lakefront.

The WTP process configuration, unique plant layout, initial treated water quality results and costs vs. budget are presented and discussed.

Te Mato Vai - Master Planning A Potable Water Supply For Rarotonga, Cook Islands
Colin Gerrard

The Cook Islands Government are committed to supplying reliable potable water to all properties connected to the water network by 2015/16. The reliable supply of potable water affords an important opportunity to provide for population and economic growth and the continuing health of local communities.

This commitment is a substantial undertaking for the people of Rarotonga. It is the largest single infrastructure project in the Cook Islands since the International airport construction in 1974. As a legacy project it is important that the potable water system is designed to fulfil its obligations now, and for future generations.

A Master Plan has been completed with the aim of providing tangible benefits for the local community:

1. An asset which is optimal in design so that it provides a reliable water source to all connected properties.
2. Treatment facilities that keep the local communities safe from pathogens, protozoa and viruses within their drinking water
3. A prioritised programme of works to deliver the project to the committed budget

This paper will present the Master Plan’s development and recommendations for the delivery of this significant infrastructure project and highlight some of the unique challenges required to meet this step change.

The Role Of the Ground Model in Design of Low Cost Slip Repairs On Rural Road in the Waikato District
Jonny Watson

There is high demand for low cost slip repairs on rural road networks as Local Governments need to maintain access and services to rural communities whilst managing limited budgets. The ground model is an essential tool in developing solutions for slip repairs. The cost of determining the ground model is a good investment, as by understanding the geology and geomorphology of a slip, a more appropriate and cost effective solution can be designed and constructed. Without one, the risk of increased costs or costly design changes, resulting from unexpected ground conditions, is high.

Determining the ground model for slips on rural roads typically includes: a site walkover inspection and engineering geological mapping, desk study of aerial photographs and geological maps, some intrusive site investigations and inspections during construction.

Working collaboratively with Waikato District Council in designing remediation for 24 slip sites that resulted from an intense rainstorm during July 2012 has highlighted the importance and value of ground models based on previous and ongoing experience within a geographic area and sound engineering geology. It was essential for determining and clearly communicating risks and developing flexible solutions that can be easily modified during construction to cope with variable ground conditions.

The Safe Economic Road Surfacing For Tomorrow's Infrastructure
John Vercoe

Auckland Transport road maintenance contracts are a new initiative of a potentially long-term collaborative contractual relationship (up to 8 years). The New Zealand Transport Agency is also letting similar long-term (9 year) “Network Outcome Contracts” for the state highway network. In both of these, long-term cost minimisation is a key driver. Innovation will be required to improve the status quo.

Downer, being one of New Zealand’s foremost roading infrastructure providers, is well placed to operate in this new environment and has been developing greatly improved techniques for resurfacing & maintaining the chipseal network using materials and techniques which are a significant step forward in safety, sustainability, and economics. This paper will describe the nature of these new techniques and developments, including for the first time in New Zealand a full carbon footprint sustainability assessment of the new techniques verses past methods. The paper will also give some detailed economic comparisons between the new techniques and those used in the past, as have been collated on the urban chipseal network in collaboration with Auckland Transport.

Timaru's District Wide Sewer Strategy
Ashley Harper

Over the last 15 years the Timaru District Council has developed and implemented a comprehensive wastewater treatment and disposal strategy. The development of the strategy via a facilitated working party was a key feature and resulted in a million work programme spanning 10 years.

The main drivers of the strategy were:-
- A requirement to cease discharging treated effluent to rivers resulting in improved environmental standards
- To reduce the risk of trade waste dischargers relocating
- To be cost effective and affordable
- Compliance with the National Coastal Policy Statement.

The resulting strategy involved:-
- Upgrading three existing oxidation ponds
- Installation of an ‘inland towns’ pipeline to convey oxidation pond effluent to the existing Ocean outfall
- The separate piping of industrial effluent
- The construction of oxidation and maturation ponds and the planting of wetlands for the treatment of domestic wastewater
The on site treatment of industrial effluent by industry.

The implementation of the strategy required integration with the existing network and pump station renewal programmes.

All physical work is now complete with the paper and presentation expanding and describing on the planning processes, community engagement, design features, the construction phase, costs and funding.

Transforming Emulsions Into Infrastructure Solutions
Sean Connaughton

Client expectations from bitumen-based surfacing’s are continually increasing. Better performance, longer shelf life and greater value for money among a few. In response and coupled with a desire to consistently improve our products, Fulton Hogan has invested heavily in R&D to supply improved bitumen emulsion products to the market.

The primary objective of this paper is to explain how recent developments in bitumen emulsion products can deliver improved performance and value for money. The paper includes examples of emulsion solutions developed for three different market areas – roading, construction, and agriculture.

The methods used in the development of these emulsion products to ensure their performance meets client’s expectations in each specific application are also described in the paper. (1) Break and set time, washout resistance and chip compatibility for Roading Emulsion. (2) Tensile and elongation strength, water vapour transmission rates, puncture resistance and peel strength for Construction Emulsion. (3) Substrate adhesion, chemical and biological resistance for Agriculture Infrastructure Emulsion.

The results presented in this paper include the development from client concept to product delivery for end use. All have been specifically designed and engineered to provide winning emulsion solutions for our clients and their projects.

Understanding the Impacts Of Sea Level Rise On Assets And Values – Developing An Interactive Tool for Collaborative Decision Making
Charlotte Reed

Engaging asset owners and communities in discussions about the impacts of progressive long term change, such as sea level rise, is a challenge for Government organisations. Wellington City Council developed an interactive model to allow internal and external stakeholders to visualise the impacts of sea level rise.

An initial high level assessment of impacts was carried out for the ‘do-nothing’ scenario for a range of future sea-level rise change scenarios. Economic impacts were based on the value of land and assets inundated. Social impacts incorporated the population affected, the age profile and social demographic of that population. An initial cultural impact assessment considered the scale and nature of known sites that would be inundated. Environmental values were developed based on criteria in the Wellington City District Plan. These high level impact assessments will be further developed in consultation with asset owners, iwi, communities and interest groups.

The interactive model enables users to ‘drag’ the sea-level up or down and see how economic, social, cultural and environmental damage would change. This tool enables a more focussed discussion on trigger points and consequences and will be used to inform internal and external discussions, debate and decision making around social and infrastructure adaptation.

Use Of Criticality And Risk To Identify Wellington Region’s Key Three Water Assets
Nicola Chisnall

As part of its continuous improvement programme, Capacity Infrastructure Services Ltd in conjunction with AECOM has developed a comprehensive, systematic framework and geo-spatial tool to identify those assets critical to the delivery of the three water services to its communities. Criticality is assessed with clear linkages through to the risk and service level frameworks with transparent consideration of economic, social, cultural and environmental aspects.

Capacity has built this criticality model within InfoNet to directly draw on data from within the established asset management information system, although the framework can be readily applied within other geospatially enabled systems. The criticality model is directly linked to the failure likelihood model to form an overall network failure risk model. The geospatial representation of these network risk profiles enables Capacity to:

- Target inspection and maintenance effort at optimum frequencies
- Identify optimum intervention points and maintenance/renewal thresholds
- Target renewal works
- Assist with emergency management planning

This paper overviews the approach adopted, presents the framework and outputs of the criticality model, and shows how these contribute to developing the most cost-effective works programmes.
Using A 360° GIS Viewer To Innovatively Manage And Deliver Infrastructure Assets
Malcolm Archbold

A combination of existing technologies has created an innovative GIS imagery collection and viewing system allows an asset owner to view, assess, collaborate and add value to their existing asset management or GIS systems. This new type of GIS viewer provides a very efficient way of recording and viewing physical assets such as plant rooms, confined structures, and detailed infrastructure. The system provides a complete 360° view of the asset's environment from multiple locations. The system provides an excellent record for valuation, ownership and insurance purposes or simply “knowing what’s there”. In addition, it can provide health and safety benefits by removing some of the needs to enter potentially hazardous locations. The viewer can be used in conjunction with an existing asset management or GIS system thereby adding value to an organisation’s existing AM/FM system. It helps an organisation to achieve its objectives of collaboration, reducing risk and increasing productivity.


Using Bluetooth Technology To Fill Information Pot Holes On Our Road Network
Richard Young

New technology is revolutionising how we gather information on how customers use our highway networks. In New Zealand around one in seven vehicles has an active Bluetooth device, this figure is increasing. With robust technology, appropriate privacy protection, a length of Number 8 wire and a forward looking roading authority; the harvesting of information on where these devices travel is proving to be a rich and valuable source of data.

The NZ Transport Agency, working with Beca and technology partner Blip Systems have pioneered the deployment of a roadside Bluetooth detection network to deliver strategic monitoring that provides levels of performance information that were previously near impossible to achieve. We now have the ability to remotely, in real time, provide answers to questions that industry previously struggled to reliably answer......

What routes do people choose? How do routes choices vary over time? How reliable is that journey? Did we achieve the time saving on that new highway? How effective was the speed limit change? Can I have KPI data in real time? Can I cost-effectively monitor for incidents on rural highways in real time? Can I share this data? And finally, what is the real impact of those STOP/GO guys!

What Happens When You Mix Water And Electricity?
Tracey Willmott

Water and energy - both are essential services provided to our communities; however they are also predominantly managed and delivered under different ownership structures and governance. Does this mean that the framework for good practice asset management is different for each, or should it be? Can each sector effectively collaborate to transform asset management practice in order to deliver services more efficiently? This paper presents a comparison of asset management practice in New Zealand’s water and electricity industries (local government and distribution respectively). It discusses similarities and differences, as well as opportunities for leveraging lessons learned to strengthen capabilities for good practice asset management in New Zealand. It contemplates whether asset management practices can be transferred from one industry to another. In doing so, this paper also questions whether private infrastructure providers (specifically, electricity distribution businesses) can genuinely meet levels of service commitments whilst also meeting stringent regulatory requirements, and asks whether we really know our Councils are making sustainable asset management decisions without a strong regulatory body that mandates disclosure for performance, forecasting and benchmarking. A Dunedin-based example is provided to supplement the discussion, drawing on the authors' experience in the local government (3-waters) and electricity distribution sectors.