

We highlight more papers presented at the recent 2016 Water New Zealand Stormwater Conference in Nelson.

## FLOODING AND FUNDING

*Kate Purton (Beca)*

### ABSTRACT

Urban stormwater is often referred to as the “poor cousin” of the three waters, with limited funding available compared to water and wastewater. The exception to this seems to be in the years immediately following local flood events, when funding becomes available

for stormwater and flood mitigation works, often for a limited period of time.

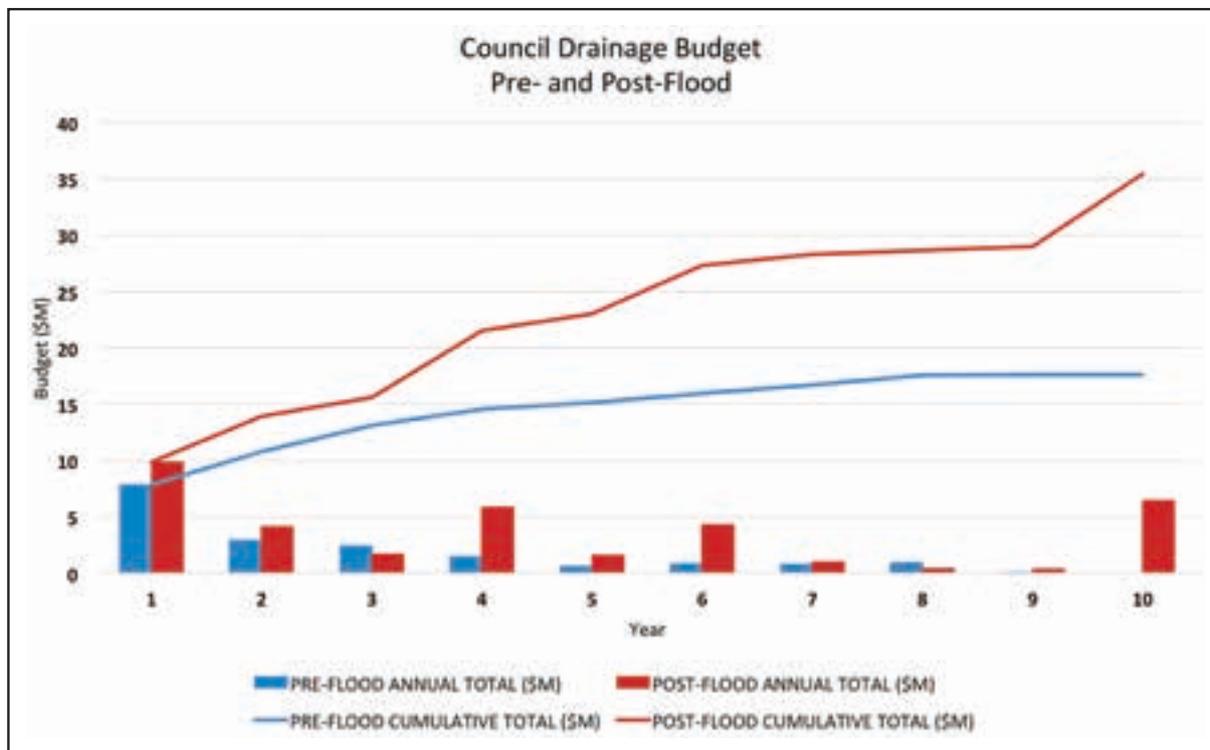
This trend appears to have persisted for generations, despite changes to legislation requiring local government to have long-term plans in place with a 10-year minimum planning horizon.

Tools available for understanding flood risk, and exploring mitigation performance and cost, should enable a more structured long-term planning approach, although costs can be high both for studies and for works, and

potentially unpalatable politically except when public consciousness of flood risk is high.

The full paper explores the relationship between flood events and funding of stormwater and flood mitigation works around New Zealand, using case studies and data from a few local authorities around the country.

It also explores alternative approaches to planning, programming and funding of these works, and how these fit with current regulatory requirements.



### PRESENTER PROFILE

**Kate Purton** is an associate – civil engineering at Beca, with over 15 years’ experience in three waters civil engineering. Kate is based in Christchurch and focuses on stormwater management and engineering, working on projects in Canterbury and around the country.



**Takanini Concept Design:** The Takanini stormwater channel has been designed to reduce a large flood plain by channelising and conveying large event flood flows, but provides other benefits. A naturalised channel and streamside planting provide a sense of place and good open space outcomes. The channel links key open spaces and the intent is to provide parkside roads and pedestrian and cycle access. A part of the channel design process entailed consideration of urban design elements and subdivision layouts adjacent to the channel.

IMAGE COURTESY OF HARRISON GRIERSON.

# THE COMMERCIAL BENEFITS OF WATER SENSITIVE DESIGN

*Katja Huls & Andrew Chin (both from Auckland Council)*

## ABSTRACT

Water sensitive design is being implemented via the Housing Accords and Special Housing Areas Act which implements the Proposed Auckland Unitary Plan (PAUP). Special Housing Areas have allowed Auckland Council to test planning provisions to encourage water sensitive design (WSD) in greenfields and brownfields scenarios.

Our recent experience with implementing WSD is that it leads to a decentralised approach which provides strong commercial benefits which have been well received by the private development sector.

While WSD is intended to lead to good ecological, urban design and amenity outcomes, it also has less obvious benefits. Good WSD can do away with the need for large scale communal stormwater devices.

The retention and protection of streams avoids engineered flood

management approaches because stream corridors can be designed to allow flood flows to be conveyed safely. Hydrology mitigation leads to stormwater management at a sub-catchment level with multiple devices higher in the catchment – a more decentralised approach.

This decentralised approach means that the implementation of stormwater infrastructure is not tied to negotiated agreements between private landowners or cumbersome public land acquisition processes.

It also leads to a shift in asset types,

the use of smaller pipes and smaller devices which are significantly cheaper to build. Valuable land can be used more efficiently as smaller devices can be located within the road corridor, stream corridors and private lots.

Consequently there has been a shift in asset funding sources; from straight ratepayer investment to a mix of private, ratepayer and transport corridor investment. Decentralisation and the use of a treatment train approach is also less likely to result in significant device failure, providing a more resilient network.

## PRESENTER PROFILES

**Katja Huls** is a qualified planner with 13 years' experience in the planning profession, she has specialised in water for the majority of this time. She works for Auckland Council as a senior stormwater specialist providing stormwater input to structure and area planning processes for greenfields developments, and large scale brownfields development.

**Andrew Chin** is chartered engineer and qualified planner, with experience in three water infrastructure approaching 18 years. He has worked professionally in the public and private sector both in New Zealand and the United Kingdom. He is currently the stormwater asset management team manager for Auckland Council.

# PRECAST CONCRETE MANHOLES

## A REVIEW AND UPGRADE OF CURRENT PRACTICE

*Husham Issa Al-Saleem & Wayne Langdon (both from Humes Pipeline Systems)*

### ABSTRACT

Stormwater manholes and access chambers are traditionally constructed using precast concrete components supplied by concrete pipe manufacturers. Many years of good performance have provided confidence in the adopted approach.

As a result manhole components have been accepted as fit for purpose and most TA specifications are related to hydraulic and operational requirements rather than the structural design.

The recent development of new performance design standards in New Zealand has increased serviceability life expectancy of main infrastructure components to 100 years.

Recent NZTA and TA specifications require a review of existing product designs to ensure compliance for “strength” and “durability”.

This paper presents the results of intensive research work conducted by the authors to achieve this goal. The main design parameters investigated were loading, load factors for the design of lids to suit various infrastructure construction conditions, lateral load on manhole walls, foundation stability and buoyancy.

Durability design is defined in the terms of the existing New Zealand Standards which define exposure conditions for which manhole components are designed to achieve 100 years’ life.

The paper also lists service conditions which allow designers to specify standard manhole components for safe bearing capacity, traffic loads and depth of installation.

The conditions cover existing design and construction practices allowing designers to select the correct product or carry out an alternative specific design.



**Belmont Structure Plan:** The Belmont stormwater management approach provides for the detention of large storm events within naturalised detention basins. The basins provide ecological and amenity benefits and contribute to open space outcomes, linking key open spaces together. The overall layout was designed to enable development, each large landholding having one basin. This approach reduces dependence on other landowners to enable development and is made possible by implementing the lower value communal basins in combination with distributed at source devices; rather than higher value catchment wide devices.

### PRESENTER PROFILE

**Husham Issa Al-Saleem** holds BSc, MSc (Civil Eng) qualifications from the University of Baghdad, Iraq, and is recognised in New Zealand with CPEng, IntPE, MIPENZ.

Since 2009 Husham has been working as a senior civil engineer with Humes Pipeline Systems, where he is involved in research and development, management of technical projects, sales training and technical support.

# EVALUATING THE VIABILITY OF SUSPENDED RAINGARDENS FOR STORMWATER TREATMENT

*Eugene Salmin (Opus International and University of Auckland, Department of Civil & Environmental Engineering), Suman Khareedi (Opus International) and Lokesh P Padhye (University of Auckland, Department of Civil & Environmental Engineering).*

## ABSTRACT

Biofiltration low impact designs (LID) such as rain gardens are proven stormwater treatment technologies. However, with Auckland and other cities of New Zealand witnessing increasingly high-density developments, the land required for such traditional LID is not readily available. While green roofs are a possible LID alternative in high-density developments, their suitability depends on the angle or pitch of the roofs.

Suspended raingardens can be an ideal LID alternative for urban environments, providing a runoff treatment without needing land space.

This is a multi-stage research project aimed at creating a novel approach to stormwater treatment in urban environments. The first stage of this research is focused on finding suitable lightweight media for suspended raingardens. To ensure that this new approach is reasonably equivalent to the treatment efficiencies of conventional practices, we tested different lightweight media compositions with densities in the order of 350kg/m<sup>3</sup> in the laboratory.

Our trials were batch experiments focused on assessing their efficacy in removing total suspended solids (TSS) and



Vertical vegetable garden on a residential building

SOURCE: [HTTP://GARDENIOUS.COM/VERTICAL-VEGETABLE-GARDENING/](http://GARDENIOUS.COM/VERTICAL-VEGETABLE-GARDENING/)

dissolved metals: lead (Pb), zinc (Zn) and copper (Cu) from Stormwater runoff. The media we tested complied with TP10 regulations from Auckland Council in terms of TSS removal.

The removal of all three heavy metals was significant too. However, we also encountered some practical challenges with the use of these media during our experimental runs. This paper discusses these findings and the viability of suspended raingardens as an effective stormwater treatment alternative for high-density urban environments. [WZN](#)

## KEYWORDS

*LID, Stormwater Runoff, Raingardens, Suspended Raingardens, Stormwater Treatment, Green Roofs, Bridge Drainage, Contaminant Removal*

## PRESENTER PROFILES

**Eugene Salmin** In 2012, Eugene joined the Masters in Environmental Engineering program at The University of Auckland to broaden his knowledge in Stormwater engineering. His passion for resolving water related issues and exposure to real life water-quality issues encouraged him to become involved in this project.

**Suman Khareedi** Suman is the Work Group Manager – Stormwater and Water Sensitive Designs at Opus International Consultants, Auckland. For more than 22 years, Suman has been involved in the design, construction supervision and quality control of stormwater management projects, including public infrastructure, building drainage and reticulation for subdivisions. In recent times, Suman has been the Project Director and Technical Reviewer for a number of recent stormwater capital works design projects in the Auckland region. Suman has also been the project manager and lead designer for many technically challenging stormwater

design projects, including the high-profile Daldy and Halsey Streets Redevelopment, which involved implementing a number of innovative, alternative LIDs in challenging site conditions.

Currently, Suman is leading the project to design suspended raingardens, an innovative LID for urban environments.

**Lokesh P. Padhye** Dr. Padhye is a senior lecturer at the University of Auckland. His research is focused on water quality management and water/wastewater treatment. Dr. Padhye obtained his master's and a doctorate in environmental engineering from Georgia Institute of Technology (US). He then worked as an environmental engineer at Geosyntec Consultants in Atlanta for three years before entering an academic career.

He has been working in the field of emerging environmental contaminant research for past 15 years and has published numerous research articles and book chapters.