manatiaki kōawa

rivers GROUP

A joint technical interest group of Engineering New Zealand & Water NZ

INSIDE THIS ISSUE

NEWSLETTER

Issue 26 | July 2019

FROM THE CHAIR

Heide Friedrich

We are half way through the year, which is always a good time to reflect on where we are at, and what we still want to achieve for the second half of the year. It feels like it has been really busy so far for us, a lot of our early emphasis has been on delivering our April 2-day workshop on 'Lessons learnt from large flood events in the Bay of Plenty Region', a joint effort by the NZ Rivers Group and River Managers Group. I particularly want to thank Management Committee members Selene Conn and Graeme Campbell for their efforts getting the workshop off the ground and helping making it a success. And the Bay of Plenty Regional Council for sharing their collective knowledge.

We have a large Management Committee this year, 16 members, with 6 new members, and 3 of us only in their second year of service. There is a lot of learning to be done collectively, and relying on the old guard to help us to understand some of the environment in which we operate. Although having such a big group, it still feels like a challenge to have enough time and available hands to bring events to you. In our meetings we are discussing ways joining up with other organisations or initiatives to help with reaching out to communities. If you have an upcoming event in that river space or have ideas, yet are not sure how to implement them, please get in touch with us rivers.group@engineeringnz.org, and we can work together.

I also like to use the opportunity again to congratulate our members David Bouma and Sioban Hartwell on having been honoured as Fellows of Engineering NZ at the end of March. Now is a good time to think about whom to nominate for the next round of Fellowships, it would be great to see more people from our community honoured with such recognition.

The big event that is ahead for us in the second half of the year is our conference in November. We are proud to bring the River, Coastal and Estuarine Morphodynamics Symposium (RCEM2019) to New Zealand for the first time. Abstract submissions and early registrations have been closed by now, and we are on target to bring over 300 people together during 18-21 November in Auckland. Check out our programme https://www.rcem2019.co.nz/. We are also offering pre-conference workshops. and you can still register with the normal registration fee.

In our Management Committee meetings we are also discussing on how we best can engage with members and our communities in that river space. We are using facebook https://www.facebook.com/EngNZRiversGroup/ and twitter https://twitter.com/RiversGroupNZ, have a look and engage with us if you use those social media channels.

Heide Friedrich
Chair

INTRODUCING OUR NEW COMMITTEE MEMBERS

Amanda Death, Greater Wellington Regional Council

Having grown up around a freshwater ecologist, Amanda has freshwater running through her veins. From a young age she would assist with teaching students about the various aspects of river management, which has now developed into a full time role for her as an environmental planner for the flood protection department at Greater Wellington Regional Council. She has also picked up geological, geomorphological and emergency management skills and knowledge through studying at university and working for an emergency management group. Amanda's current role involves plenty of engagement with members of the community on various issues, opportunities and document consultation in relation to local river corridors, as well as providing assistance in the development of different plans such as local planting plans or large floodplain management plans.

Jon Bell, Horizons Regional Council

Jon leads the Investigations and Design team at Horizons Regional Council. He holds a Masters of Civil Engineering and has an interest in Environmental and Open Channel Hydraulics. Jon has over 10 years of professional experience in river engineering; with a focus on hydraulic modelling and the design of flood protection and erosion control works. He is passionate about working with rivers to deliver sustainable solutions to meet the needs of society.

ARTICLES

This article is the abstract of a full paper by Sharyn Westlake which can be accessed by the link in the abstract. The article follows up in a more general sense the issues raised in the Greater Wellington article "The Long Road to Planning for Natural hazards – reflections on Mangaroa" included in the December newsletter.

A system approach for managing and communicating risk for levee-protected communities

S Westlake[1], R Polvere[1], G Bowman[1], C Munn[1]
[1]Greater Wellington Regional Council, Wellington, New Zealand

Abstract

Dams and levees (also known as stopbanks) have similarities as key infrastructure to protect people, property and the environment from the adverse effects of flooding. Dams have a defined safety management programme accepted by the industry within New Zealand, and while elements of this programme may be used for levee management, it is not commonly applied. This paper sets out a systems-based approach developed to identify and communicate the tolerable risk and incremental consequences of levee asset performance, so that risk can be communicated and appropriate safety management applied.

Dams are built to contain water, with the requirement to store or divert any excess to protect both the asset and downstream communities. The function of a levee is to contain and direct floodwater. The design capacity of levees is only infrequently tested which means that while the levees do not need to be designed, built or maintained to the stringent criteria required for dams, they do need to be appropriately managed and maintained.

Levees are used as a tool for floodplain management to protect communities. By controlling the natural movement of water throughout the floodplain, levees have led to land being available for sustainable economic development. However, levees only manage the hazard up to a defined design flood event and residual flood hazard remains. While it is not physically or economically viable to provide protection for the residual flood hazard, identifying, communicating and managing the risk profile is important, especially as development intensification in floodable areas and behind protection works can lead to catastrophic losses.

This paper sets out how understanding changing risk profiles through a systems approach using dam safety principles and performance-based asset management allows the management and communication of residual risks to communities protected by levees, so that appropriate safety management can be put in place and the risks known and accepted by the asset owner, emergency services and the community.

Discussion and conclusion

Dams and levees act as a system. Both dams and levees are key to protecting lives and property from natural hazards, particularly droughts and floods. Also, modifications to dams may impact downstream levee performance and risks, promoting the need to evaluate this infrastructure holistically as a system. (ICOLD, 2018)

Management of flood protection system, including levees should be carried out such that risk assessments between different systems are comparable. Levees and dams, while similar have different design criteria and different performance measures especially when the levees are hydraulically loaded only at times of flood.

Appropriate safety management measures need to be put in place, and tolerable risk determined with data and methodologies to assess consequences of failure. Risk needs to be appropriately transferred and accepted by the communities affected, especially as construction of flood protection measures generally leads to increasing development. Transfer of risk to the community is only possible if the risk in understood by the community, which is often problematic. The community have an active role to play.

Pictorially expressing the performance of the asset and risk from the levee flood management system is a way of showing this risk in an easily understood way (see Figure 1). In combination with modelled residual flood hazard to identify vulnerable locations behind levees, appropriate measures may be put in place to reduce the potential for life safety risk, property damages and economic loss. This enables identification of the consequences of failure and the areas of highest risk prioritising where effort needs to be focussed. Such measures include planning controls, building controls, emergency management and flood warning and awareness.

While the responsibility for levee safety lies with the asset owner there is a role and need to involve communities both for the future management, development and resilience of that community.

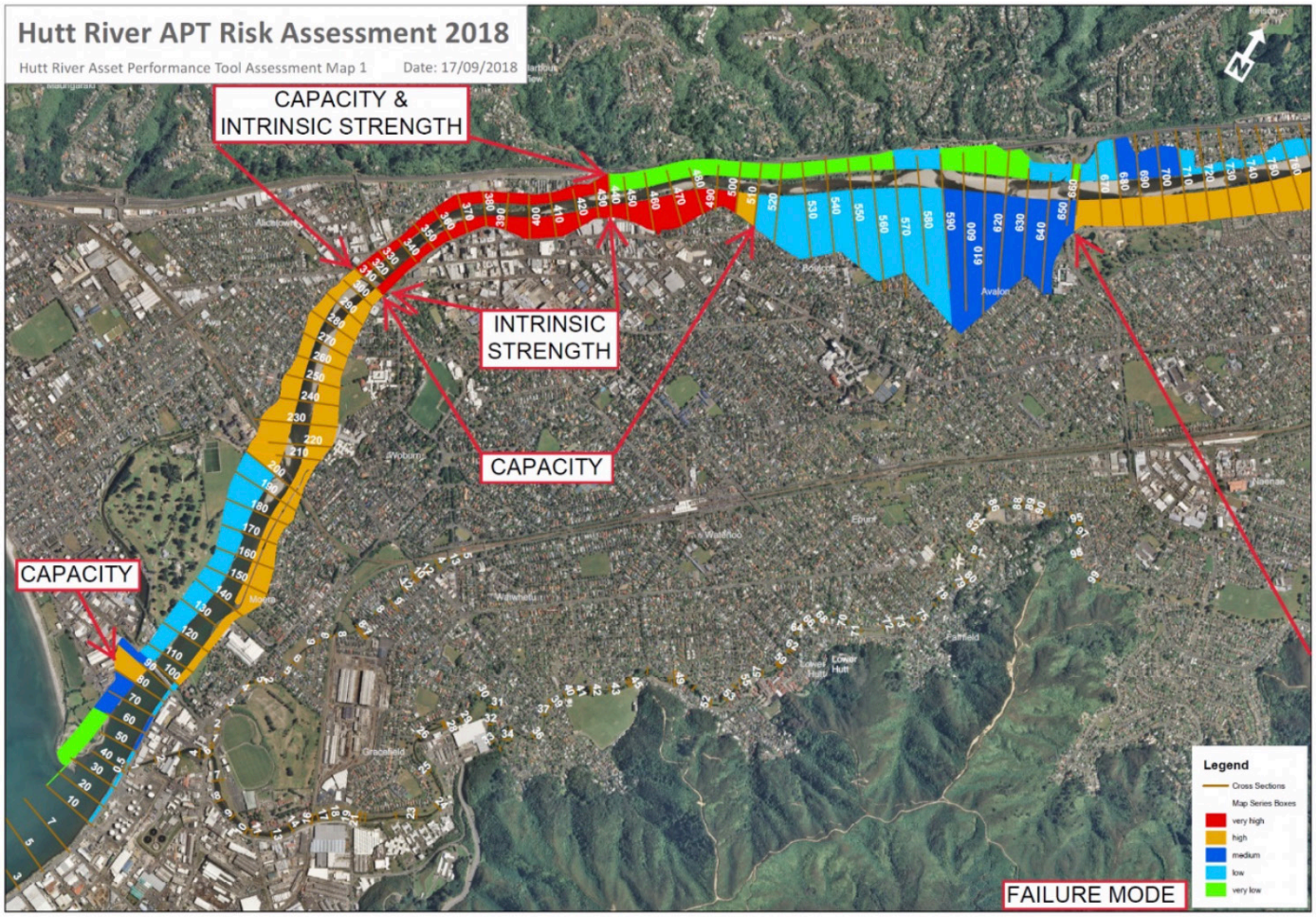


Figure 1: Risk assessment output from the asset performance tool

Note: This is a condensed version of the paper that was presented at the Floodplain Management Australia Conference in May 2019. If you would like to see the full paper please click here.

See next article on NZ Contribution to ICOLD Levee Sub-committee by David Bouma. Sharyn references the ICOLD Review of levee performance in her "Discussion and Conclusions" section.The full ICOLD report reference is included in the full paper which can be accessed through the link

ARTICLES

NZ contribution to International Commission on Large Dams (ICOLD) Levees Committee

In 2017 ICOLD formed a Technical Committee on Levees in recognition that levees (known in NZ as stopbanks) have many similarities with earth embankment dams, with the consequence of failure potentially catastrophic in terms of damage to property, and risk to life.

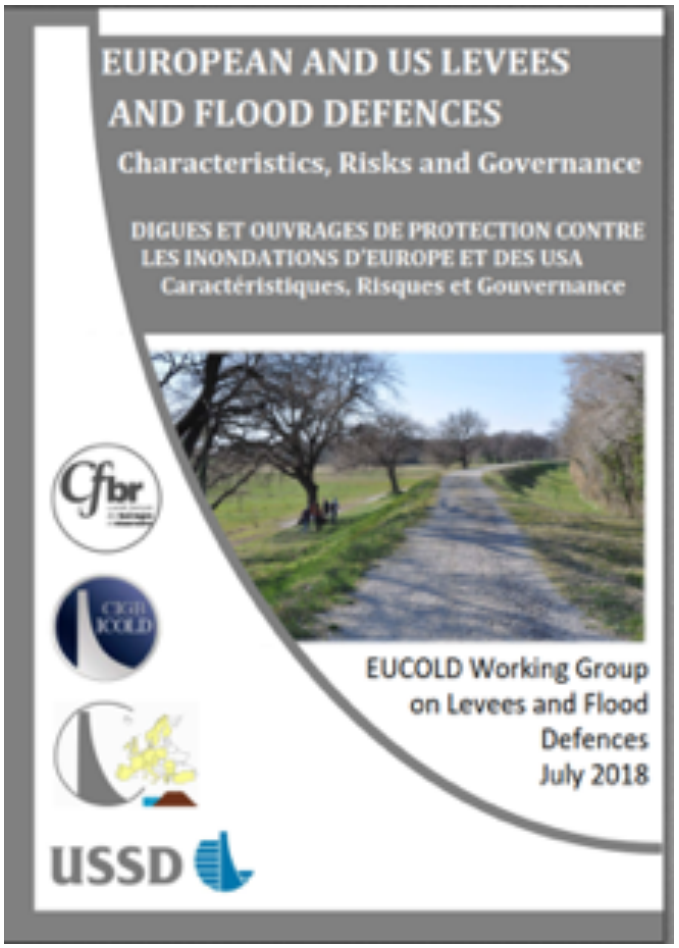
The ultimate aim of the Committee is to improve the sharing of technical skills, knowledge and experience between the dams industry, and the levees industry to enable learning in both directions. The ultimate output from the Committee is likely to be an ICOLD Bulletin that will provide international guidance.

New Zealand is one of 22 countries around the world represented on this committee. David Bouma was elected in 2018 by the NZSOLD Management Committee to represent NZ on this committee. Kaley Crawford-Flett from QuakeCoRE also attended some of the ICOLD Levee Committee meetings in Ottawa, and is coordinating a number of research projects on stopbanks in New Zealand with cooperation from the River Managers Group.

The ICOLD Levees Committee is currently working on two reports:

1. An international version of the report shown below. This report has one Chapter for each country that provides information on the inventory of stopbanks, their characteristics, risks and governance. The NZ chapter will be prepared in cooperation with the River Managers Group and draw information from the NZ Inventory of Stopbanks that was developed as part of a research project funded by the Resilience to Natures Challenges (RNC) Infrastructure Programme and administered by QuakeCoRE. It will also draw further information from the NZ River Managers Group who own and manage the majority of NZs flood protection network.
2. The Dam-Levee Inter-comparison Report. The proposed aim of this report is to produce a technical report illustrating similarities and differences between dams and levees, in terms of design, construction, management aspects, and all related topics.

David is co-lead author of Chapter 5 – Design of this report.



Contact David at dbouma@tonkin.co.nz if you would like an electronic version of this report.

The Committee aims to have a first draft version of both these reports completed by early March 2020 with fine tuning to be completed at next year's ICOLD annual meeting in Delhi in April 2020.

There may be an ICOLD Bulletin to write after these two initial reports. The committee timeframe stretches over a further 5 years at this stage.

Please contact me if you would like further information, or you would like to contribute to the NZ inputs of these two reports.

David Bouma

Our Changing Rivers: developing experimental river systems in the laboratory

By Edwin Baynes, University of Auckland

Since February 2019, Dr Edwin Baynes and Dr Heide Friedrich have been setting up a suite of river experiments in the Fluid Mechanics Laboratory at the University of Auckland as part of a research project funded by the George Mason Centre for the Natural Environment. The aim of the 'Our Changing Rivers' project is to develop the understanding of river dynamics in the context of their response to external perturbations, such as sediment inputs or frequency of high magnitude discharges. Due to the timescale of change in the natural environment and the difficulty in conducting repeat-surveys of large spatial areas, the understanding of river response to external perturbations is currently relatively unconstrained.

The small-scale analogue experiments developed in the laboratory (Fig. 1) replicate the physical processes that control the transport of sediment in natural rivers, a critical component of healthy river systems and one that is often disturbed by human activity or extreme natural events (storms, landslides or earthquakes). By controlling the initial conditions and using different scenarios for inputs to the system (sediment and water discharge), the experiments show the evolution of the channel morphology at timescales that are much faster than in natural settings, giving an insight that is impossible to obtain through surveys of the natural environment.

During the experiments, the change in the channel morphology is tracked using a high resolution camera system that creates 3D images of the entire experimental channel reach (Fig. 2). This data can be used to extract the channel network, quantify the location and volume of erosion/aggradation within the channel through time as well as provide information on local flow hydraulics and interactions with the bed. This holistic dataset allows the potential to develop the understanding of the controls on river behaviour in response to changes in sediment supply over all parts of a channel reach rather than individual point measurements.

Ultimately, this work will highlight the complex processes that help to shape our natural environment, which will feed into management practices that aim to work with, rather than against, the natural dynamics of river systems. The range of experimental scenarios and channel configurations is endless, so please get in touch with the research team (edwin.baynes@auckland.ac.nz) if they could potentially complement your work.

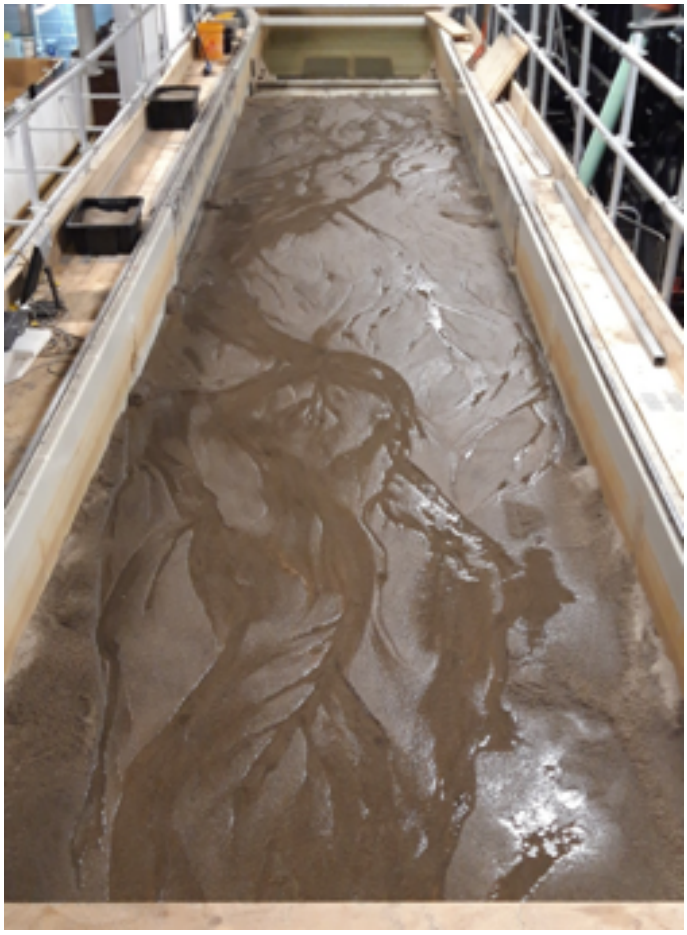


Fig. 1: Experimental braided river channel in the Fluid Mechanics Laboratory, University of Auckland.

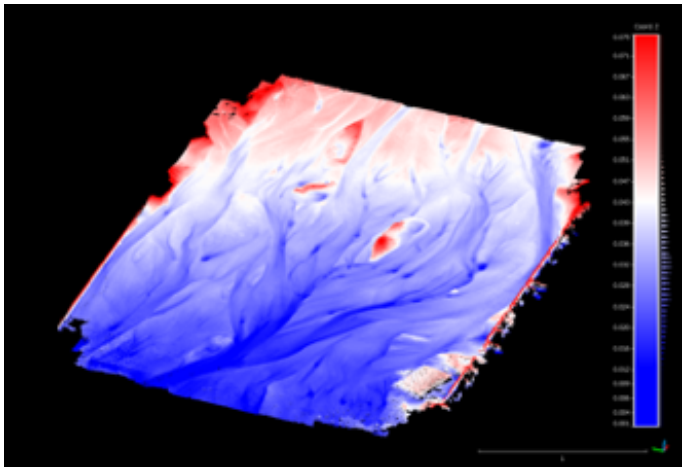


Fig. 2: 3D image of the experimental channel. Colours show the elevation (in m)

ARTICLES

This article by Brian Megaw is an extract from the River Valley June newsletter. Brian is Managing Director and senior guide for River Valley. The link to River Valley is: https://www.rivervalley.co.nz. Ph 06-3881444. Email: info@rivervalley.co.nz. Brian notes at the end of his article that his reflections could be a blueprint for life! Certainly for the Rivers Group they are very relevant to our river engineering and river science colleagues!

River Lessons – What I have Learned from a Lifetime on the River

Having spent a good deal of my working life either guiding on rivers, mostly the Rangitikei, or working in some other way associated with that pursuit, I thought it might be a good time to reflect a little on what those years have taught me.

Humility

There is an old saying amongst river guides that goes like this. "There are only two types of river guide, those who have flipped (their raft), and those who are going to flip."

The popular perception of river guides, and possibly how many river guides view themselves, especially newly qualified guides, is of a somewhat larger than life character. A swash buckling, (often loud) hero who takes on the unpredictable elements of a river and safely guides customers over drops and through swirling white water.

If the river has a voice, and many days I have thought it does, then I am sure it chuckles, or even laughs outright at this foolishness. Many a time I have seen the guide who has the most inflated view of their own importance get the biggest beat down. After one of these beat downs, the epic swim, the long down time, one realises one's fragility and inconsequence to the powerful force of the river.

You learn humility. Sometimes, guides can be slow learners requiring multiple lessons, but eventually the message gets through.

Respect

Following on from humility is respect. You learn respect for the forces of nature. You recognise these powerful natural forces as being outside your control. You learn to work with them and not against them. Over time you see what those forces can do. Reshape rapids, move huge rocks with nothing but the force of water, create incredible beauty.

Prior Planning

If you enter a rapid with no plan other than believing that the best will happen, then it is highly likely that the best will not.

Often the most critical part of running a rapid is the set up at the entry. A good set up, a plan for what lies ahead. A good set up and plan greatly increases the chances of success.

The early days of guiding on the Rangitikei

Guiding on the Rangitikei this Summer

Patience

An observation I have made over the years is that when running a rapid, experienced guides almost always seem to have a lot of time. There is little that is frantic or hurried. They have learned the art of patience.

Patience is doing the right thing at the right time, waiting for the appropriate moment to call that command that puts the boat just where it should be.

Decisiveness

Coupled with patience is decisiveness. When the time is right, then the command is called for action by the crew, or the critical stroke with oar or paddle is taken. There can be no dithering at that time. It is total decisive commitment.

Teamwork

Over the years, I have been very lucky to have worked with some tremendous river guides. Guides who have not only incredible skill levels but also many other talents. They have written books. They can sing and play the guitar; they have a vast knowledge of culture, nature and geology. They can build, they can really cook. They can hold conversations about things they know nothing about. Sometimes people even believe them!

But what has made it most special is the camaraderie and almost sixth sense bond that develops amongst professionals who, over years, work together. No need for big arm signals, for yelling and shouting, rather there is the small thumbs up, the slight nod, the intuitive placement of rafts leapfrogging down the river — rafts covering each other, covering critical points in rapids.

As a guide in this environment, you feel both safe and valued.

Awe

I would challenge anyone to not work in this sort of environment, one where nature rules, where the forces of wind, rain, river current and tectonic forces have shaped the landscape, not to feel awe at the majesty of it. I would challenge them to not feel upon occasion, both inconsequential, but also, incredibly lucky to be in such an environment.

Gratitude

These things the river has taught me. I am thankful and grateful for the opportunity I have had.

Looks a little like a blueprint for life, doesn't it?

Brian Megaw

The team covering each other on the river

A team photo before the rafting trip

Guiding the rapid Max's Drop

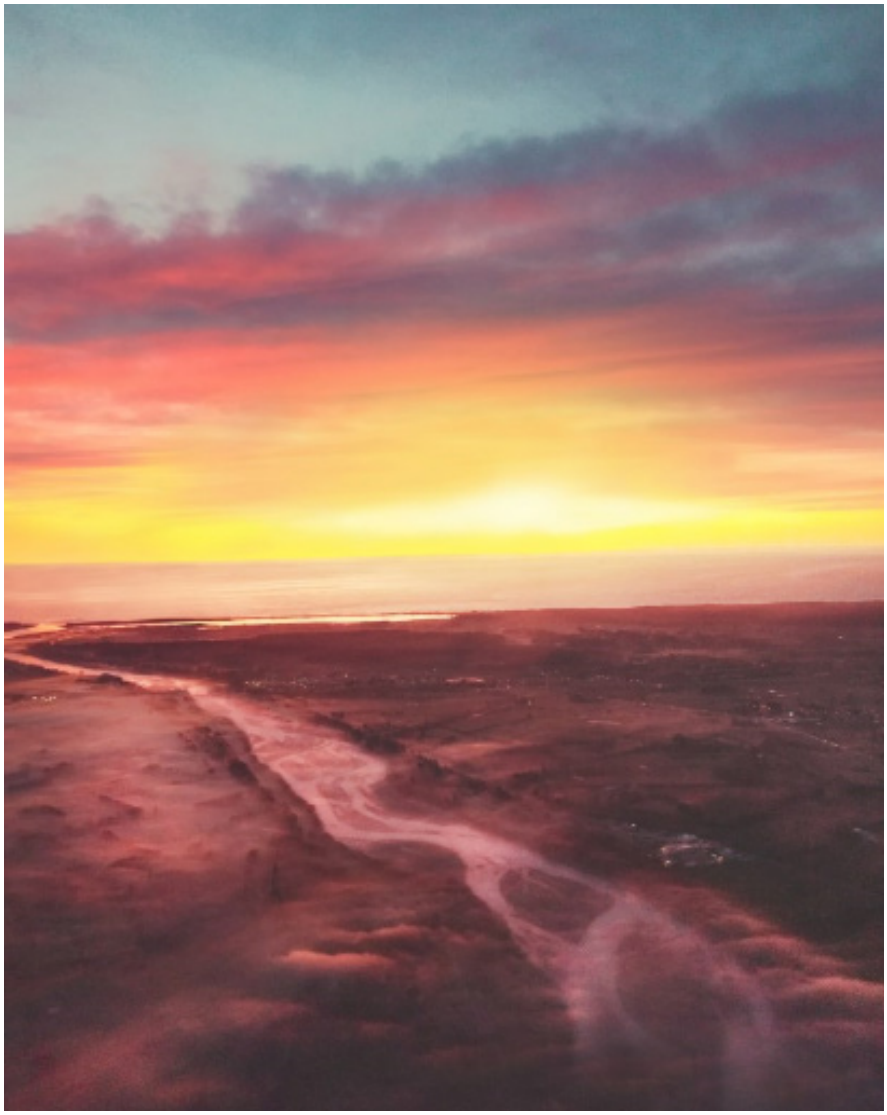
A River Engineer mentoring our young people

George Arthur Bowman, Flood Risk Engineer at Greater Wellington Regional Council

I've been helping Years - 4-6 at Bellevue School in Newlands design, build and launch water rockets as part of an Engineering New Zealand initiative to get more children into STEM (Science Technology Engineering Mathematics).

The idea is we will get more children to pursue a STEM career, and for me personally that we will get more of the future generation into river engineering and flood protection! I personally believe it is around these ages that you can trigger imaginations and influence children to think about what jobs they might like.

NZ RIVERS GROUP PHOTO COMPETITION... A COMMENT FROM THE WINNER



1st Place: Joel Wallan - Waimakariri Sunrise

Penportrait and comment from our photo competition winner Joel Welean

I was born and raised in Upper Hutt, but the Waimakariri signals for me, the entrance into Christchurch, my second home. Through my Engineering studies at the University of Canterbury, I have come to appreciate the complex hydrology of central Canterbury and the need to consider the effects of human activity on rivers such as the Waimakairi. I am reminded of this when I fly over, struck by the beauty of the river, and this photo completely captures this feeling.

manatiaki kōawa rivers GROUP
A joint technical interest group of Engineering New Zealand & Water NZ

Massey University
Rivers students BBQ & prizegiving

12 noon, 24-July 2019
AHB 1.40a and Courtyard
All Rivers Group members welcome!

Guest Speaker and three cash prizes to be awarded:
$100 to highest achieving student in river processes
$100 to highest achieving student in river management
$50 to highest achieving rivers student at 200 level

The event is sponsored by the NZ Rivers Group to promote student interest in their river related subjects and to promote membership of the Rivers Group, which is free to students, just like this event.