Flow

rivers GROUP

A joint technical interest group of IPENZ & Water NZ

Rivers Group Newsletter

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INSIDE THIS ISSUE

MAKING FRIENDS WITH THE CROCODILE

Mark Pennington, Editor

Recent newsworthy events from New Zealand and from other parts of the world have heightened awareness of our susceptibility to natural disasters. Our vulnerability to such events is dependent on what we do in the face of this susceptibility, and thereby gives us a degree of influence on potential outcomes. Frequently decisions on actions to reduce vulnerability are made in a reactive manner – such as revamping the Building Code in New Zealand following several noteworthy earthquakes. This clearly is done with the intention of reduction of potential consequences from future similar events. Our Building Code has been written to specifically address some of the potential life-threatening circumstances that accompany natural hazards.

However our vulnerability is also influenced by broad scale planning decisions that have shaped and defined the extents of various land uses in our environment. These decisions cannot always be made with the benefit of hindsight, and a degree of proactive decision-making is required. In this way there is an attempt being made to protect lives and property from events that have not been experienced recently enough to form part of recent memory, and to do this, scientific advice from professionals is frequently sought.

Our river environments are undeniably susceptible to severe effects from natural disasters, and the vulnerability of our communities in or near to these is heavily influenced by both reactive and proactive decisions that have been made at a strategic level. Within the past few months we have witnessed several natural disasters where public vulnerability has been strongly influenced by previous decisions on land use in and around river environments.

Most notably, we have recently witnessed earthquakes in Canterbury and Japan and catastrophic flooding in Queensland, Australia. From a river management perspective, the Canterbury earthquakes have revealed several effects that are directly attributable to proximity to rivers:

- River avulsion (Hororata River). A spring-fed river altered its course to follow a newly ruptured fault line, bringing unwanted surface flooding to valuable pasture.
- Lateral spreading due to liquefaction. Severe damage to infrastructure located near to rivers and water courses.
- Flood vulnerability. This occurred largely due to the effects of liquefaction on streambeds and surrounding soils causing a loss of hydraulic capacity in many waterways. While not a severe effect on its own, liquefaction could be a major contributing factor in subsequent flooding should heavy rainfall occur. Liquefaction and hence loss of level-of-service of flood protection stopbanks is one example.

River Avulsion from the Hororata River in response to September 2010 Canterbury Earthquake (photo Mark Quigley)

Liquefaction effects in a Christchurch Streambed, September 2010

Little explanation of the effects of proximity to rivers is needed when examining the Queensland floods. While flooding historically may have been contained within margins adjacent to rivers, flooding outside of these areas can occur given sufficient rainfall, resulting in overland flow and flooding, putting people and property at risk.

Eagle Street Wharf begins to disappear under Brisbane River, January 2011

The recent earthquake off the coast of Japan revealed a characteristic of rivers that is not often considered. Instead of the usual case of a river conveying water from land to sea, in the case of a tsunami rivers are efficient conduits by which water is conveyed from sea to land. Video footage from this disaster clearly shows how tsunamis are able to travel rapidly up rivers, flooding out to adjacent land wherever possible.

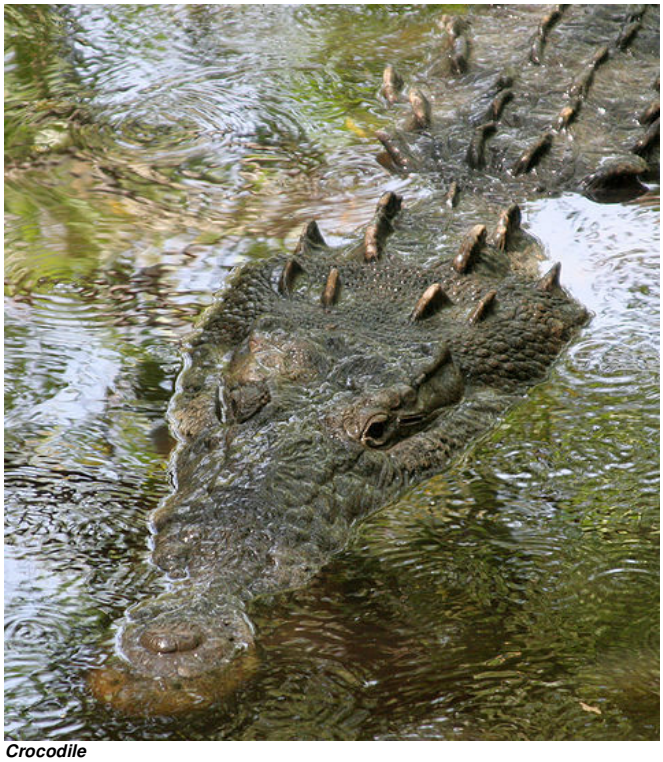
Tsunami waves are seen moving upstream along the Naka River, Japan

An Indian proverb wisely suggests that "If you are going to live by the river, make friends with the crocodile".

Quite what our planners and decision-makers determine to be "the crocodile" is something over which river management professionals may be able to have some influence. The effects listed above could easily be defined as such "crocodiles", and while we may not necessarily find it within ourselves to "make friends" with these, we certainly need to be aware of them and prepare for future encounters. However we do not always have the benefit of hindsight and many "crocodiles" have not been observed in recent history, and as a result planning and guidance documents are not always prepared from the proactive perspective.

Crocodiles hunt by stealth and cunning, remaining unseen and almost "unseeable" until it is time to strike. However nowadays we know where most crocodiles live, or at least understand the kind of territory that they prefer and under what circumstances we should expect to encounter one. Being reactive is one way we can reduce our vulnerability, but it requires exposure to at least one event before action is taken. Being proactive is clearly preferable, as no-one wants to be crocodile prey before we acknowledge the existence of any specific crocodile.

Recent natural disasters have occurred in places where memory of past such events has faded, or does not exist. It behoves us to take note of these, learn from them and apply this learning to our own backyards in a proactive manner to reduce our vulnerability. Doing otherwise could easily be regarded as negligent. ≈



Crocodile

QUEENSLAND FLOODS

Lessons Learnt and Where to from Here?

An event hosted jointly by the Rivers Group and IPENZ Auckland Branch

Date: Tuesday 3 May
Time: Presentation 6.00pm followed by finger food, refreshments and networking
Venue: Room 3407, Level 4, Faculty of Engineering, University of Auckland, 20 Symonds Street
Presenter: Bill Syme MEng, Associate, BMT WBM Pty Ltd, Brisbane

The 2010/2011 Queensland floods caused loss-of-life, extensive damage and major disruptions to communities and businesses. The emergency response during the floods and cleanup in the aftermath was highly praised, but how can Queensland be better prepared next time round? Community preparedness, flood risk management plans and good government policy are keys to substantially reducing flood risks and damages. These and other flood risk mitigation actions will be presented and discussed.

Bill Syme has over 25 years experience in flood modelling and flood risk management, primarily in Queensland and New South Wales along with several other countries including New Zealand. Bill has an Honours degree in Civil Engineering, and a Research Masters from the University of Queensland. He has worked for the Danish Hydraulic Institute in Denmark and Bangladesh, and is presently an Associate of BMT WBM based in Brisbane. During his 20 years with BMT WBM, he carried out and managed numerous flood modelling and flood risk management investigations, managed its Flood Group, and more recently was responsible for the uptake of TUFLOW as one of the world's leading flood modelling software packages.

This will be a fascinating evening hearing about a recent natural disaster and response, and is not to be missed.

RSVP to Michelle Bound ipenz.auckland@gmail.com or phone (09) 415 5987 for catering purposes. ≈

RENEWAL OF RESOURCE CONSENTS FOR OHAU CHANNEL WEIR AND OKERE CONTROL GATES

Grant Webby (Opus International Consultants, Wellington)
Ken Tarboton (Group Manager Environmental Hazards, Bay of Plenty Regional Council, Whakatane)
Robbin Britton (Project Manager and Consultant to Environmental Hazards Group, Bay of Plenty Regional Council)

The Rivers and Drainage Group (now renamed Environmental Hazards) of the Bay of Plenty Regional Council recently applied for resource consents to continue to operate the Ohau Channel weir at the outlet from Lake Rotorua and the Okere Gates at the outlet from Lake Rotoiti. Following an RMA hearing, commissioners decided to award the consents, however an appeal against this decision has been lodged with the Environment Court.

Lakes Rotorua and Rotoiti are the largest (~81km^2) and third largest (~35km^2) of twelve major lakes in the Rotorua region, collectively known as the Te Arawa Rotorua Lakes. Both lakes are of volcanic origin and were formed thousands of years ago. They are the only two lakes draining directly into the Kaituna River. Lake Rotorua, with a catchment area of 508km^2, drains through the meandering Ohau Channel into Lake Rotoiti. Lake Rotoiti, with a catchment area of 125km^2, in turn drains into the Kaituna River. The Kaituna River flows northwards over a distance of about 50 km and exits into the Bay of Plenty at Maketu.

The Ohau Channel Weir is located at the outlet of Lake Rotorua into the Ohau Channel. The normal weir operating configuration is with the stop-logs installed in the centre portion of the structure to partially control lake outflows. This limits how far lake levels can fall below median levels, thus preventing the lake reaching extreme low levels. The stoplogs are removed above a trigger level so that the structure does not influence high lake levels. Lake outflows under such conditions are controlled primarily by the hydraulic capacity of the Ohau Channel itself.

Prior to 1982 the water level in Lake Rotoiti was controlled by a natural constriction and rock ledge at the outlet to the Kaituna River at the Okere Falls. The lake level was high during years of high precipitation and natural inflows, and low during years of relative drought. This situation changed in 1982 with the construction of the Okere Control Gates in the Okere Channel, the outlet channel from Lake Rotoiti (see Figure 1). The structure consists of three radial gates which control the level of Lake Rotoiti and the rate of discharge out of the lake into the Kaituna River.

In principle Lakes Rotorua and Rotoiti effectively behave as two giant interconnected bath tubs with the lake levels rising and falling depending on the balance of inflows and outflows. Lake levels rise when the net volume of inflows exceeds the volume of outflows (as determined by the hydraulic capacity of the outlet channels in each case) and vice-versa.

Figure 1:Photograph of Downstream Side of Okere Control Gates Structure from Left Bank of Okere Channel

The level of Lake Rotoiti has been recorded continuously at the outlet to the Kaituna River since 1906. Prior to the advent of lake control, the lake level was high during years of high rainfall and natural inflows (e.g. during the 1960's and 70's) and low during years of relative drought. The installation of the Okere Control Gates enabled the occurrence of very high lake levels and very low lake levels to be eliminated in the period 1983-1995. Following the renewal of resource consents in 1996, the lake operating regime was narrowed down to a target level of RL 279.116m ±75mm with a consequential reduction in the overall range of lake levels and no baseline seasonality.

The proposed operating strategy for the new consents was developed using a hydrological optimisation model of the Lakes Rotorua / Rotoiti System developed and implemented by Hydrologics Inc. (USA). The strategy takes account of a broad range of economic, environmental, cultural and social objectives and is expressed in the form of discharge rule curves for each calendar month which define what the daily average outflow from Lake Rotoiti should be as a function of lake level. Figure 2 shows simulated lake levels over-plotted for each year from 1998 to 2007. These simulated levels indicate a broad seasonal trend although this is slightly out of phase with the pre-control seasonal trend which had natural low lake levels in March and April. ≈

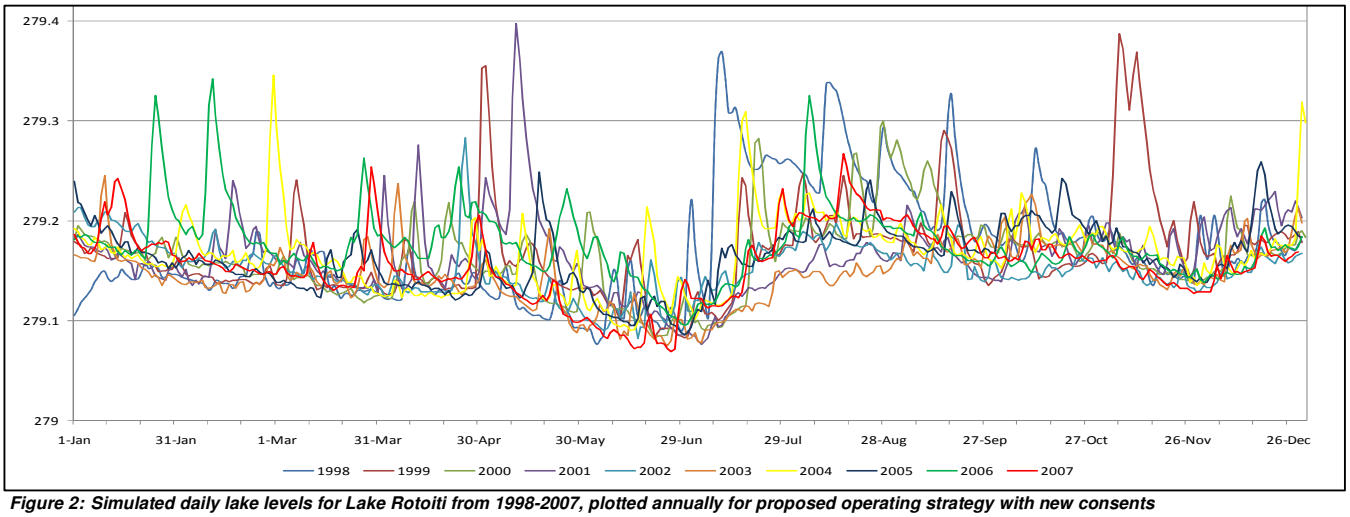


Figure 2: Simulated daily lake levels for Lake Rotoiti from 1998-2007, plotted annually for proposed operating strategy with new consents

CONSENTS GRANTED FOR SHOTOVER DELTA TRAINING LINE

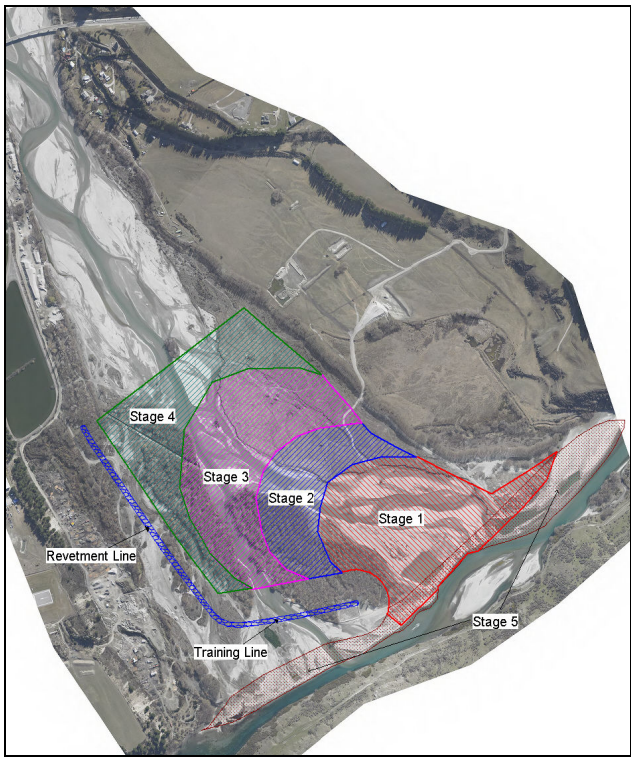
Gavin Palmer, Otago Regional Council

The Environment Court has granted the Otago Regional Council (ORC) the consents needed to construct a 1.3km long gravel and rock armoured training line and revetment on the Shotover River delta near Queenstown. This follows an earlier decision of the Court to grant the ORC the consents needed for the extraction of gravel from the delta (approximately 1.2 million cubic metres) to achieve and maintain a target profile for the surface of the delta. The profile will be achieved through staged extraction.

The granting of consents is the culmination of investigations that commenced in 2004 based on physical and numerical modelling by a team including ORC engineers, Dr Hugh MacMurray of Barnett and MacMurray Ltd and Dr Tim Davies of the University of Canterbury and Lincoln University. Those investigations showed that the flood hazard for Lake Wakatipu and parts of Queenstown, Glenorchy and Kingston is increased whenever the Shotover River enters the Kawarau River at the western side of the delta.

The training line will assure a favourable location for the confluence, and the target delta surface will improve the sediment buffering characteristics of the delta. Whilst not eliminating the flood hazard the works will help manage the situation, complementing the other measures in the joint ORC/Queenstown-Lakes District Council (QLDC) flood strategy for Lake Wakatipu and Wanaka communities "Learning to Live with Flooding" adopted by both Councils in 2006. High lake levels in May 2010 and earlier this year reinforced the importance of the strategy.

is underway under consents already held by other parties, with a significant amount being used as engineered fill for the Queenstown Airport Runway End Safety Area works. ≈



The Shotover Delta at the Confluence with the Kawarau River

The ORC is arranging a contract for the quarrying of rock riprap for the training line, and construction will commence in Winter subject to first achieving part of the target profile. Construction is expected to be completed over 4 to 6 weeks, with the particular form of the training line depending on whether the revetment component that will protect QLDC's proposed wastewater disposal field also proceeds. In the meantime, gravel extraction

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CULVERT DESIGN WORKSHOP SOLD OUT, REPEAT LIKELY

As previously advised, the Rivers Group is hosting a workshop on Culvert Design at the University of Auckland on 3 May 2011. This event is being run as a pre-conference workshop for the WaterNZ Stormwater Conference starting the following day (http://www.waternz.org.nz/stormwaterconference.html).

Unfortunately all available spaces on the culvert design workshop have been filled, and we are unable to accept any further registrations. The limit of 30 attendees was set to ensure good access to laboratory demonstrations, where any more attendees would have compromised the viewing of everyone. As this event has proven to be popular, the Rivers Group Committee is considering re-running this in the near future. Please get in touch with the committee if you would like to find out more, or if you would like to suggest timing and venue. Contact details of the committee can be found on our website:
http://www.ipenz.org.nz/riversgroup/Committee.cfm ≈

SYMPOSIUM AND AGM 2011

Members of the Rivers Group committee are in discussion with the New Zealand Hydrological Society with regard to the symposium and AGM. These events may be held immediately before the annual NZHS conference, so that attendees who travel can cover two events in series. At this stage we understand that this may be in Wellington towards the end of this year. The Committee welcome any feedback members may have on this.

Contact details of the committee can be found on our website:
http://www.ipenz.org.nz/riversgroup/Committee.cfm ≈

RIVERS IN THE NEWS

The Rivers Group continually monitor news events for mention of rivers, and regularly update our website with links to these stories. If you have not done so before, we recommend that you visit http://www.ipenz.org.nz/riversgroup/links.cfm. These links are updated regularly and provide an easy way in which to keep up-to-date with events regarding rivers both locally and internationally. ≈

7TH SOUTH PACIFIC STORMWATER CONFERENCE

The Stormwater Special Interest Group of Water New Zealand invites you to attend the 7th South Pacific Stormwater Conference. The SIG runs an annual stormwater conference each year, and every second year the conference is larger with a more significant international component. The 2011 conference will be held between 4-6 May at the Sky City Convention Centre, Auckland, New Zealand.

The 2011 conference is being run slightly differently to previous conferences in that it will have three streams, one of which will be devoted to Stormwater Modelling and another to the Rivers Group. The Water New Zealand Stormwater SIG has teamed up with the Modelling SIG and the Rivers Group to bring you an interesting programme, which can be viewed at http://www.waternz.org.nz/stormwaterconference.html. The first day of this conference (Wednesday 4 May 2011) features a full Rivers Stream, containing 8 papers on River Management and River Modelling. There are numerous related papers on stormwater quantity and quality, asset management, modelling, monitoring and the hydrological process.

AUCKLAND 3-6 MAY
STORMWATER:2011
7TH SOUTH PACIFIC STORMWATER CONFERENCE

Both the culvert design workshop and the joint IPENZ / Rivers Group event (advertised separately in this newsletter) are set to run immediately before the conference, with the intention of making travel easier for those coming from out-of-town. ≈


Upper Hurunui River


flow is the official newsletter of the Rivers Group, is published quarterly, and is distributed to all Rivers Group members.

Limited advertising in subsequent issues may be considered.

We welcome contributions for future newsletters, and particularly appreciate any photographs of rivers that readers are willing to share. Please contact the editor, Mark Pennington, for further information: mark.pennington@pdp.co.nz.