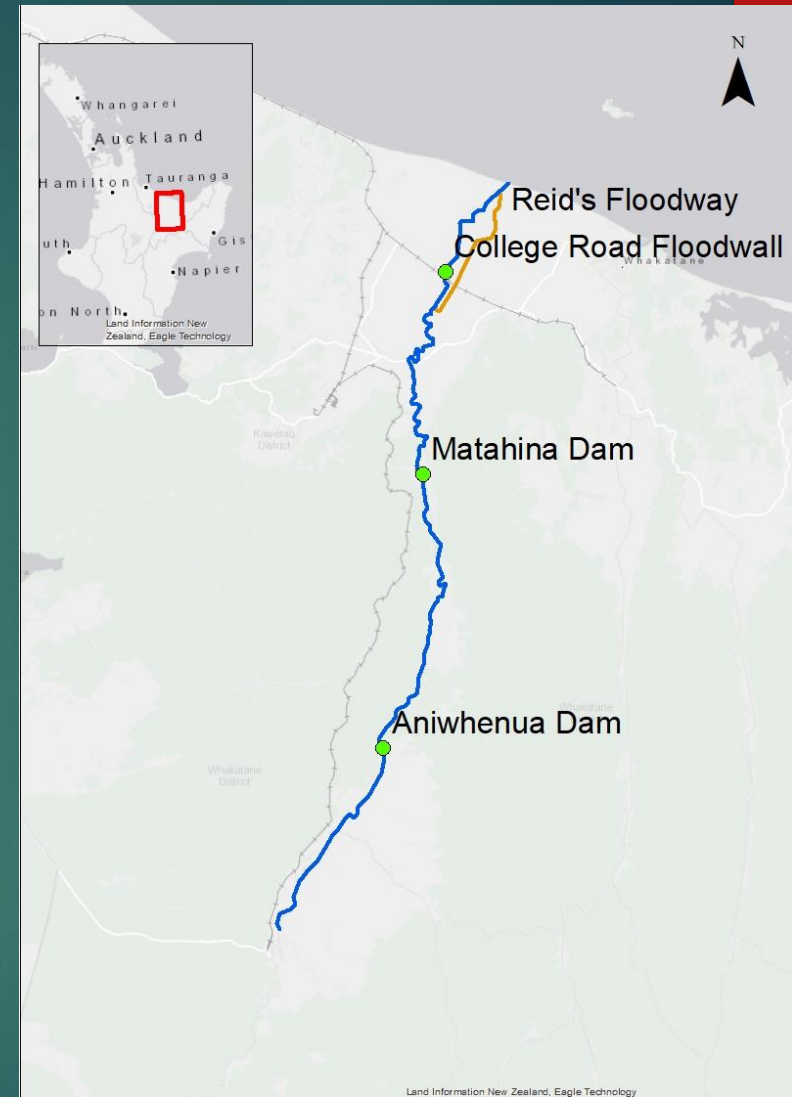


Edgecumbe 2017 Floods: A review and factors influencing stopbank/dam systems

THOMAS WALLACE



The Event

- ▶ April 2017 College Road floodwall breached
- ▶ “concrete wall opened like two gates, water flooding through”
- ▶ Hundreds of homes flooded
- ▶ \$91.5 million NZD in insurance costs
- ▶ 3 Components Discussed
 - College Road Floodwall
 - Matahina Dam
 - Reid’s Floodway



*Breached College Road Floodwall
Source: Chris McKeen, Fairfax New Zealand, 2017*

College Road History

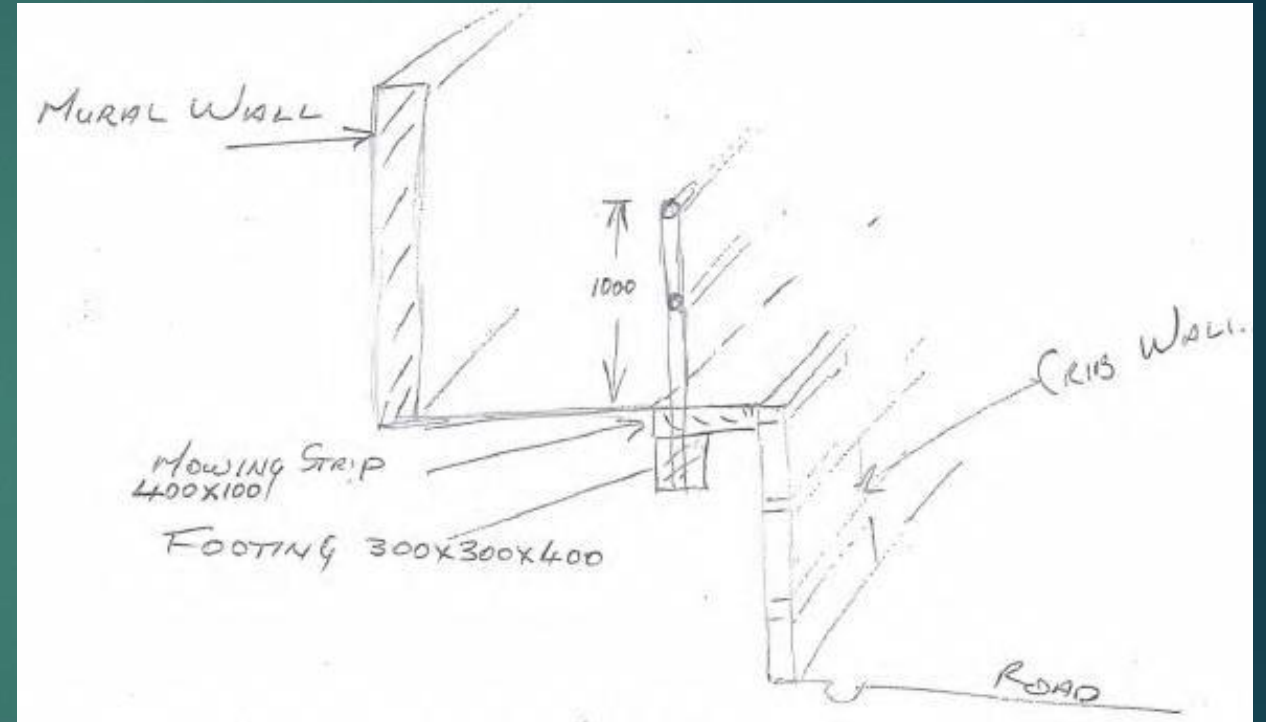
- ▶ 1973 College Road Floodwall built
- ▶ 1987 Earthquake followed with subsidence increasing the flood risk in Edgecumbe
- ▶ 1993 Floodwall replaced to increase protection
- ▶ 2000 Toe drain installed to increase drainage
- ▶ 2012 Hand Rail and concrete walkway



College Road Floodwall
Source: Bay of Plenty Regional Council, 2017

College Road Factors

- ▶ High pore pressure could have caused the observed breach
- ▶ Fill compaction methods have changed over time
- ▶ Quarry floor scrapings (non-engineered material) could cause a preferential pathway
- ▶ The concrete walkway could act as a barrier to flow



Cross section of College road floodwall
Source: Bay of Plenty Regional Council, 2012

Matahina Dam Operation Timeline

Before Council on
Extreme Alert

Time of Request	Council Request	Measured Levels
4 th April - 16:20	Aim: 71.6 m RL by 12:00	72.7 m RL at 8:00
5 th April 7:30	Aim: 71.6 m RL by 16:00	72.0 m RL at 16:00
5 th April 13:30	Aim: 71.6 m RL by 22:00	71.6 m RL at 22:00

Council on Extreme Alert

5 th April 17:30	Flow to 550 m ³ s ⁻¹	550 m ³ s ⁻¹ at 20:30
5 th April 22:30	Flow to 600 m ³ s ⁻¹	600 m ³ s ⁻¹ at 22:45
6 th April 00:00	Flow to 650 m ³ s ⁻¹	650 m ³ s ⁻¹ at 00:15
6 th April 00:30	Flow to 710 m ³ s ⁻¹	710 m ³ s ⁻¹ at 1:00
6 th April 10:00	Flow to 780 m ³ s ⁻¹	800 m ³ s ⁻¹ at 10:15
6 th April 13:30	Flow to 700 m ³ s ⁻¹	700 m ³ s ⁻¹ at 13:30

Matahina Dam Operation

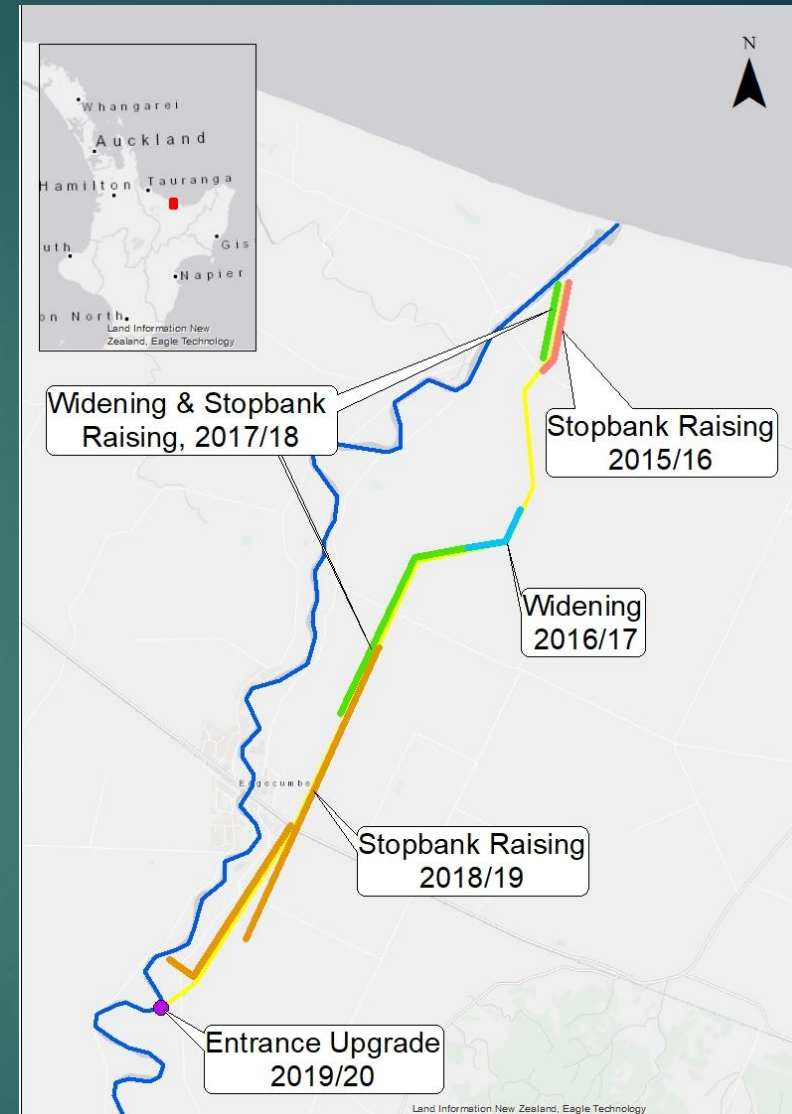
- ▶ “Inadequacies in the *Flood Management Plan*, around communications and clarity of roles”
- ▶ Operation of Matahina Dam reduced the downstream flow by 20%
- ▶ Aniwaniwa (Aniwhenua) Dam upstream was requested to be used for storage and denied



Matahina Dam spillway during 2017 event
Source: Chris McKeen, Fairfax New Zealand, 2017

Reid's Floodway

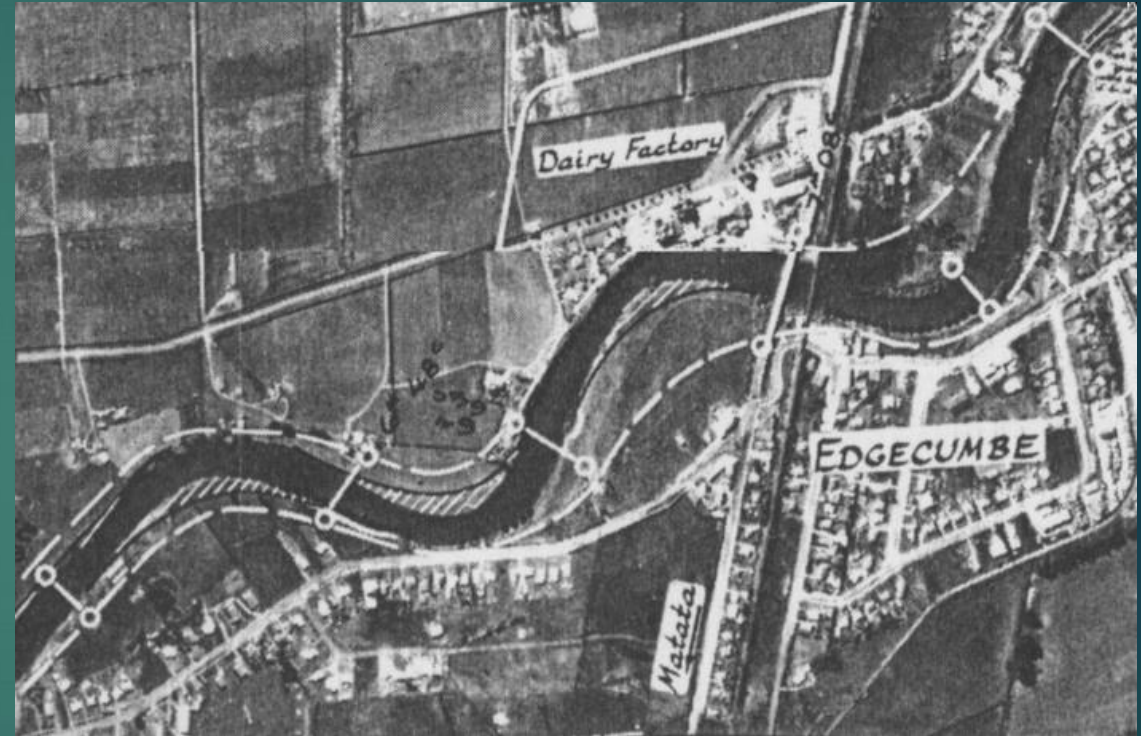
- ▶ Used as a storage system rather than conveyance system
- ▶ Channel widened by 50 m
- ▶ Numerous delays and additional costs
- ▶ Floodway not operational during 2017 event
- ▶ Could potentially have reduced flow by ~20%
- ▶ And less pressure on the wall during the flood event.



Works to complete Reid's Floodway (Jan, 2017)

Contributing Factor Construction

- ▶ Stopbanks built in the late 1800s in ad-hoc fashion
- ▶ Many unknowns of stopbanks
- ▶ Construction methods have changed since built
- ▶ Council has since construction issued stopbank guidelines



Edgecumbe in 1968

Source: 1968 Rangitāiki River Commission Volume 4 Plan No. R400

Contributing Factor Urbanisation

- ▶ Settlers developed land for agricultural and horticultural use
- ▶ Floodway built as there was not enough room between housing and the river
- ▶ Shift now to 'Making Room for Rivers'
- ▶ And restoring the natural functioning of river floodplains



*Breached College Road Floodwall
Source: Malcolm Growden, 2017*

Contributing Factor

Stakeholders and Plans

- ▶ Lack of clear protocol between stakeholders
- ▶ Ad-hoc decision to ask Aniwhenua Dam to store water
- ▶ Complex relationship between Council and Landowners

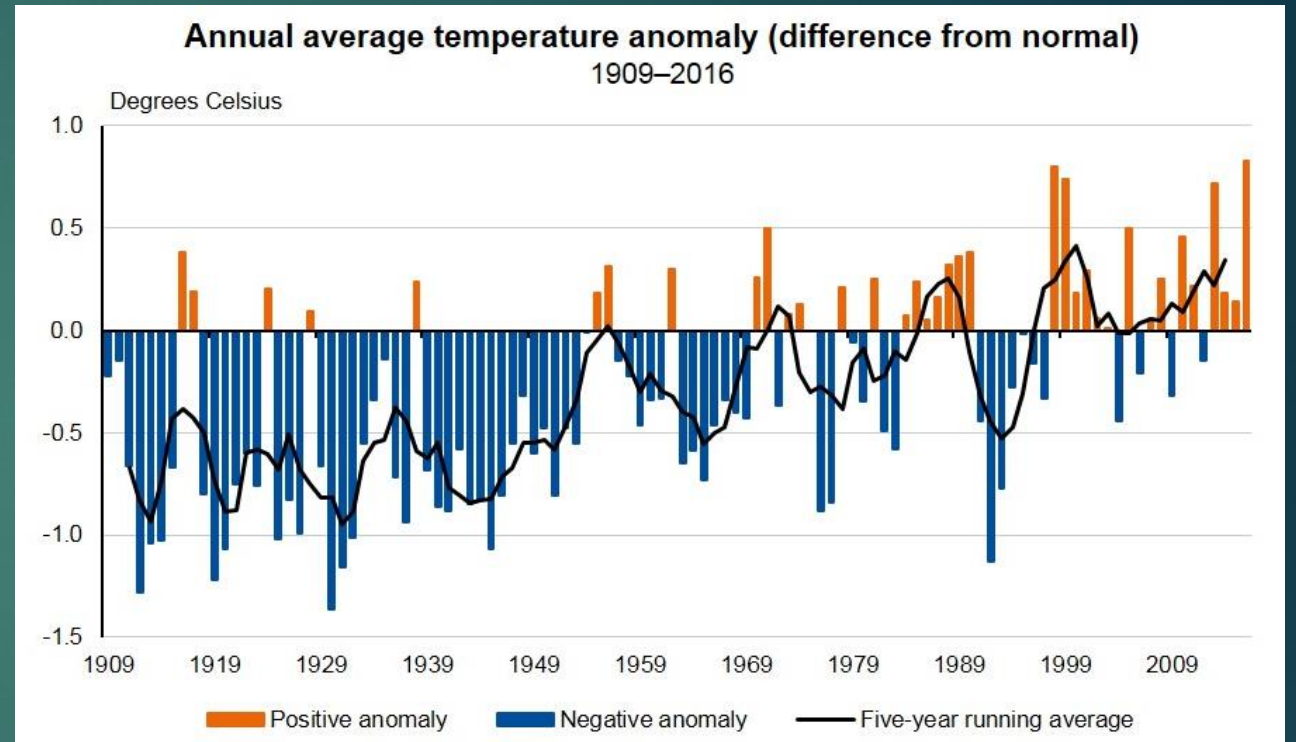


Children being evacuated from Edgecumbe
Source: Tautini Hahipen, 2017

Contributing Factor

High Intensity Weather

- ▶ Could have provided some future flood capacity in Reid's floodway for climate change events
- ▶ Recommended from review that the Council develop long term, sustainable solution to manage the effects of climate change



Average temperature difference anomaly
Source: NIWA, 2017

Sample of Report Recommendations

- ▶ Residual risk to flood protection structures from variability in ground conditions should be taken into account in land use planning and emergency planning, including alert and evacuation procedures.
- ▶ Specifications drawn up for placement of fill for flood defence walls should recognise that a higher quality of fill is needed for floodwalls than for stopbanks, and should be subject to quality control.
- ▶ The College Road floodwall should not be replaced with another wall, but ways sought to enable a stopbank to be constructed in its place (noting that the properties closest to the breached wall have been acquired by the Regional Council).
- ▶ Review the Lake Matahina Flood Management Plan with the aim of:
 - ▶ discussing and agreeing a clear protocol around forecasts and timing that requires 70.0mRL as the target lake level.
 - ▶ developing a template for use in written communications during flood drawdown mode that includes specific details on the timing and rate of outflows required to achieve specified lake levels at specified times
- ▶ Specific consideration needs to be given where large capital works upgrades, such as Reid's Floodway and Spillway, are not yet completed and operational.
- ▶ The Regional Council should give high priority to developing and implementing long term sustainable flood risk management solutions for the Rangitāiki Plains to manage the effects of climate change as well as providing ecological and cultural value to the wider community.

My Research

into better decision making before, during
and after high intensity weather events

References

Bay of Plenty Regional Council. (2014). *Stopbank design and construction guidelines*. Whakatāne, N.Z: Retrieved from <https://www.boprc.govt.nz>

Bay of Plenty Regional Council. (2017). *Rangitāiki river scheme review – April 2017 flood event*. Whakatāne, N.Z: Retrieved from <https://www.boprc.govt.nz/>

Blake, D. M., Pascoal, E., Rodger, M., Crawford-Flett, K., Wilson, M., & Wotherspoon, L. (2018). *Mapping New Zealand's stopbank network: a standardised nationwide inventory*. presented at the International Conference on GIS and Geoinformation Zoning for Disaster Mitigation, Auckland, N.Z.

Insurance Council of New Zealand. (2019). Cost of natural disasters. Retrieved 2019, from <https://www.icnz.org.nz/natural-disasters/cost-of-natural-disasters/>