

# Aotearoa dam and stopbank resilience

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## Dam Resilience Research Programme (DRRP)

Understanding the whole-life performance of our dams and stopbanks in a seismic setting



**Dam Resilience Research Programme**

International research groups  
(Internal instability, scale modelling)



Laboratories, faculty, staffing, students, projects

- Geology (project collaborations)
- Geography (project collaborations)



External linkages



- Councils
- UBC (Vancouver)
- Sheffield (UK)
- Others via ICOLD EWG

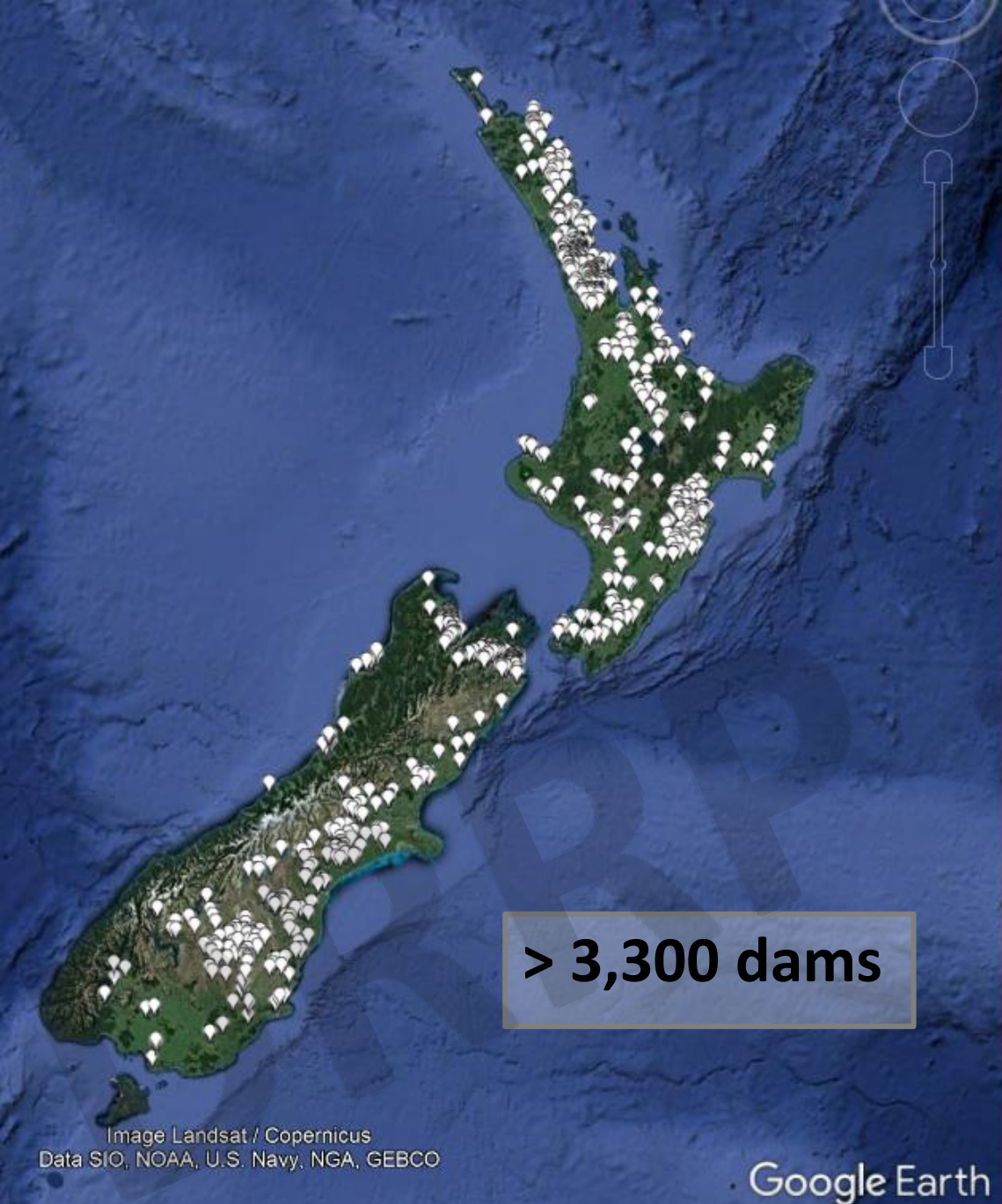


Programme Steering Committee

# “Big picture” resilience

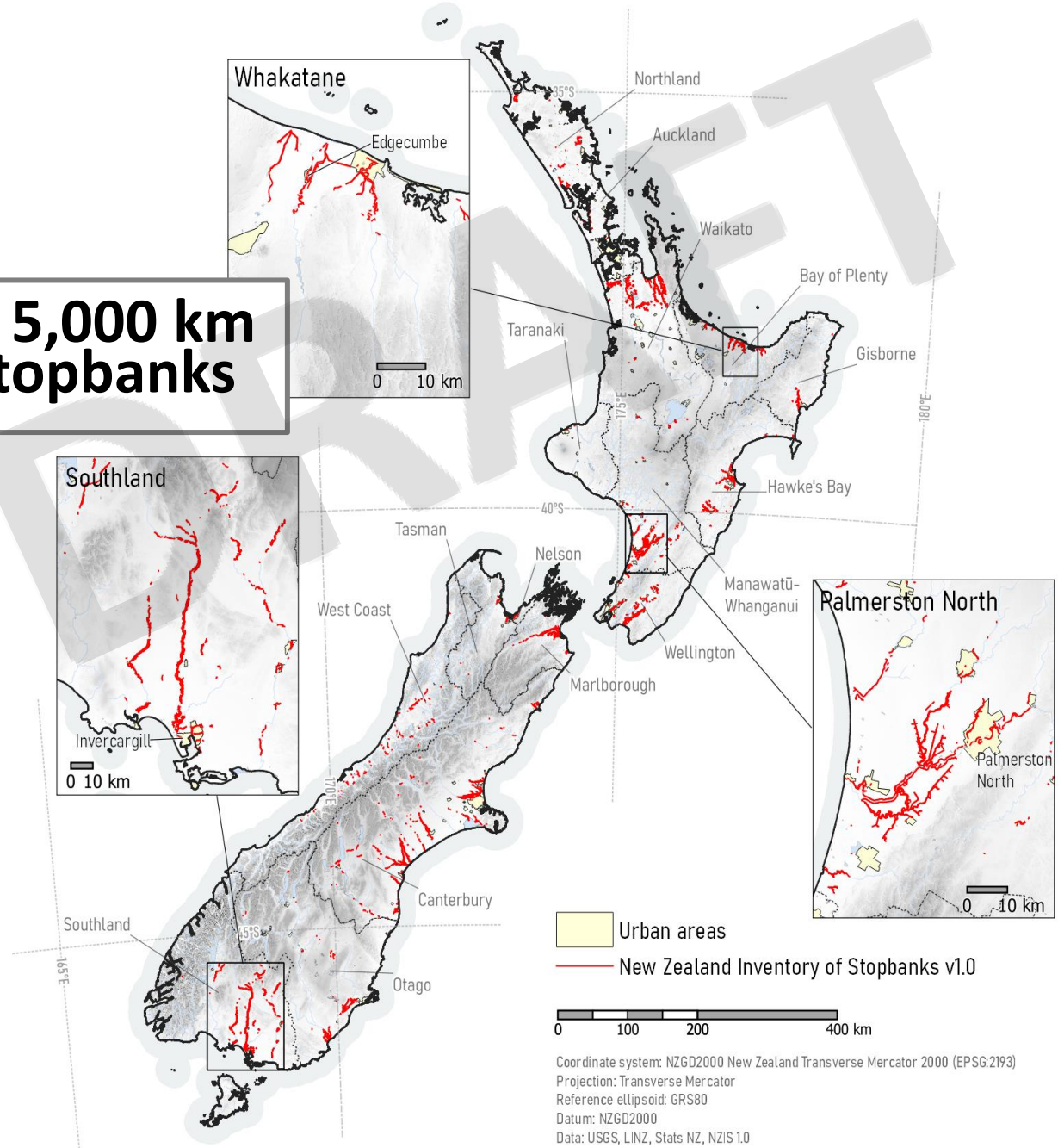
NZID and NZIS: dams and stopbanks in  
Aotearoa New Zealand

Combined dam-stopbank systems



**> 3,300 dams**

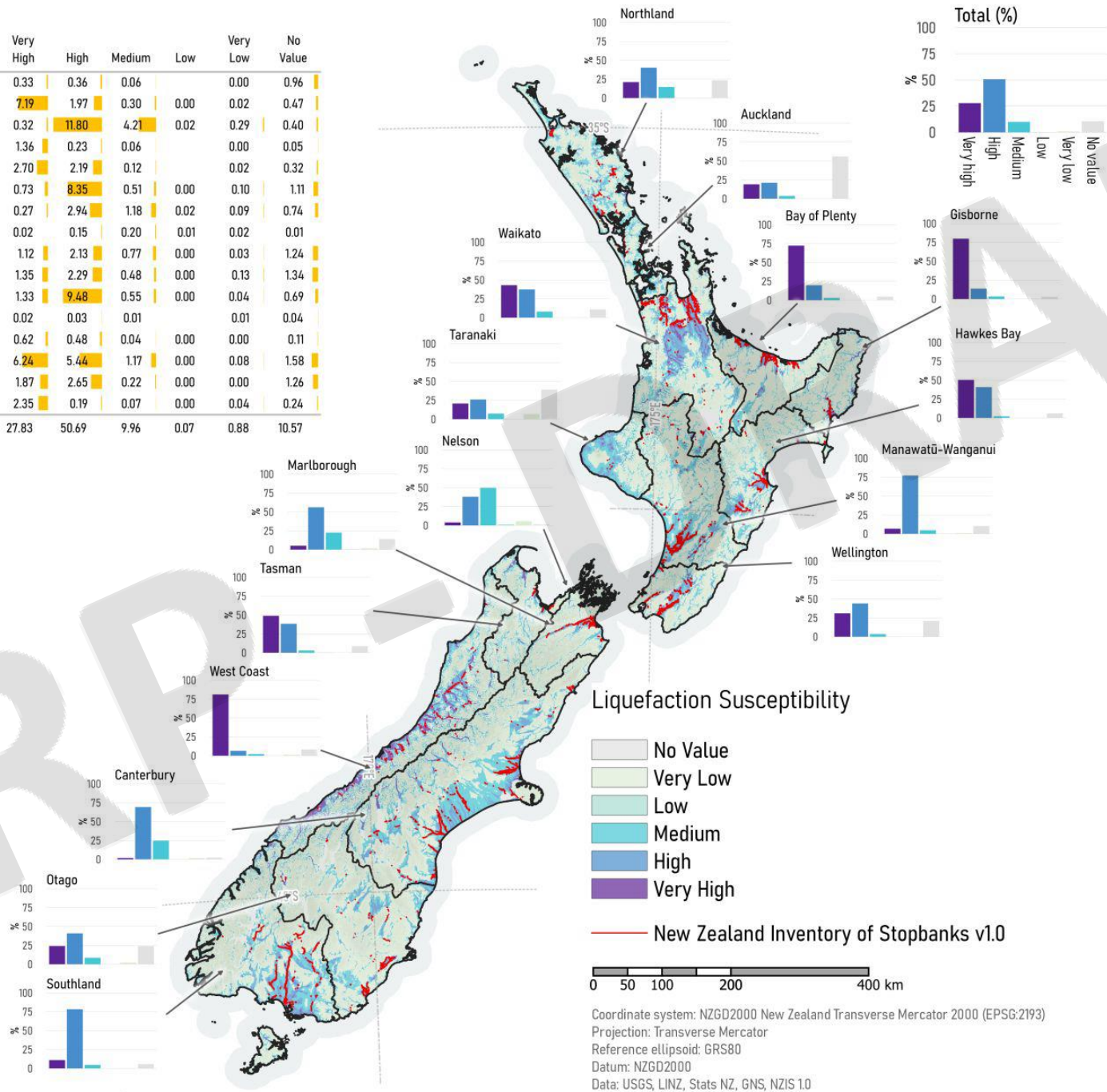
**> 5,000 km stopbanks**



Crawford-Flett, Blake, Pascoal, Wilson, Wotherspoon (forthcoming) *A standardised inventory for New Zealand's stopbank (levee) network and its application for natural hazard exposure assessments*

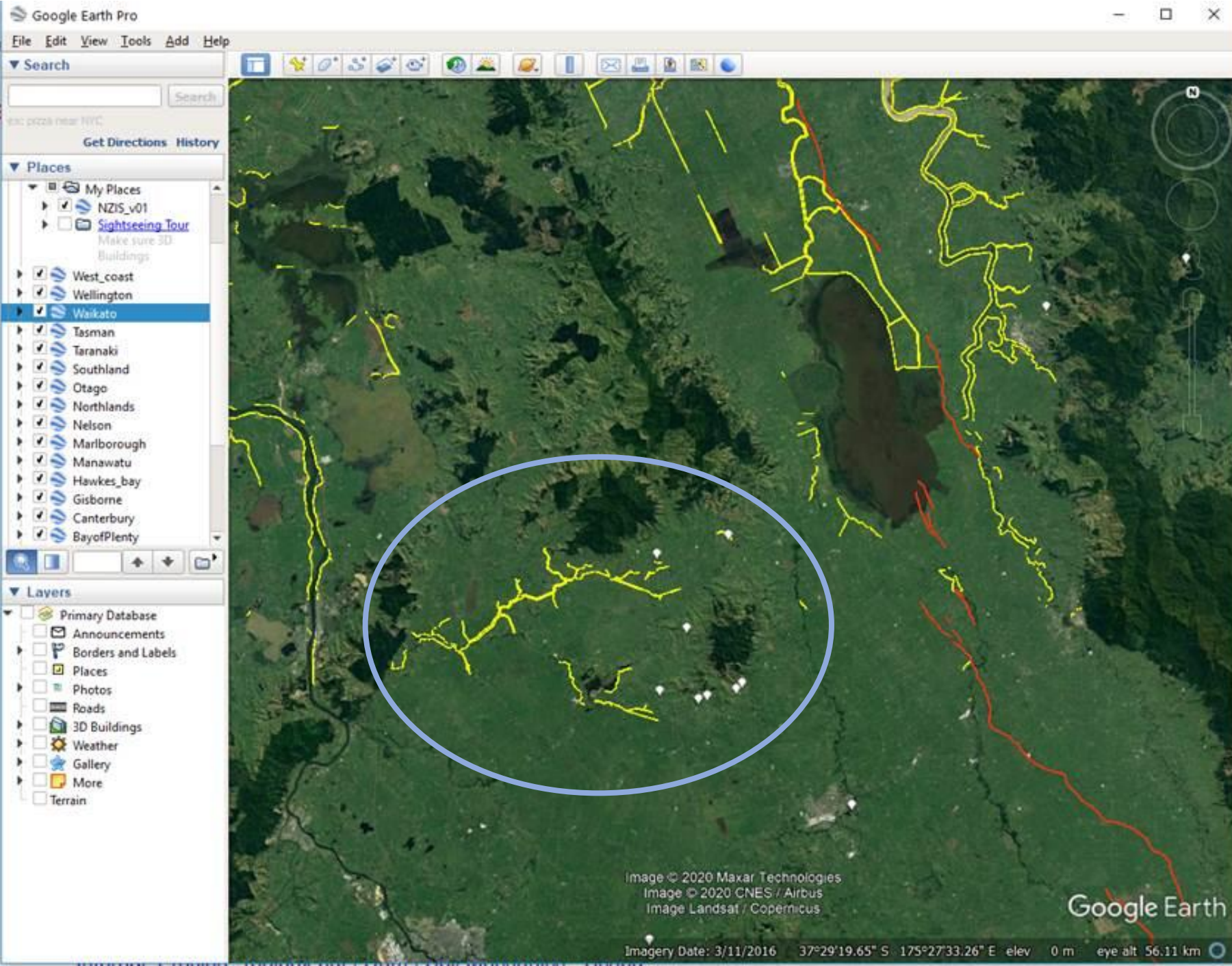


Regional Council/ Unitary Authority	Very High	High	Medium	Low	Very Low	No Value
Auckland	0.33	0.36	0.06		0.00	0.96
Bay of Plenty	7.19	1.97	0.30	0.00	0.02	0.47
Canterbury	0.32	11.80	4.21	0.02	0.29	0.40
Gisborne	1.36	0.23	0.06		0.00	0.05
Hawkes Bay	2.70	2.19	0.12		0.02	0.32
Manawatū-Wanganui	0.73	8.35	0.51	0.00	0.10	1.11
Marlborough	0.27	2.94	1.18	0.02	0.09	0.74
Nelson	0.02	0.15	0.20	0.01	0.02	0.01
Northland	1.12	2.13	0.77	0.00	0.03	1.24
Otago	1.35	2.29	0.48	0.00	0.13	1.34
Southland	1.33	9.48	0.55	0.00	0.04	0.69
Taranaki	0.02	0.03	0.01		0.01	0.04
Tasman	0.62	0.48	0.04	0.00	0.00	0.11
Waikato	6.24	5.44	1.17	0.00	0.08	1.58
Wellington	1.87	2.65	0.22	0.00	0.00	1.26
West Coast	2.35	0.19	0.07	0.00	0.04	0.24
<b>Total (%)</b>	<b>27.83</b>	<b>50.69</b>	<b>9.96</b>	<b>0.07</b>	<b>0.88</b>	<b>10.57</b>



DRRR

MAFET



# Geotechnical resilience of NZ embankments

Internal erosion mechanisms and modes



# Non-standardised laboratory testing for internal erosion mechanisms: path of research

Fully parameterised soil mechanics framework

**TYPE 3:** World-first dynamic testing at larger scales, improved methodologies.

High quality, site-specific, dynamic conditions.  
Precise results, real-world applicability.

Advancing the State-of-Art: laboratory facilities

**TYPE 2:** Larger scale, improved instrumentation, internationally-benchmarked.

Greater confidence, site-specific.  
Improved applicability.

Improved apparatus, higher-quality data

**TYPE 1:** Basic, small scale

International State-of-Practice. Initial observations.  
Limited parametric understanding.

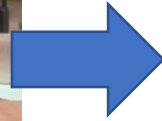
Empirical (observational) testing

**Experimental laboratory testing**

- Current state-of-practice for deficiency identification:
- Limited characterisation of earthfill soils
  - Application of empirically-derived screening methods (unverified in NZ applications)

**Contribution**

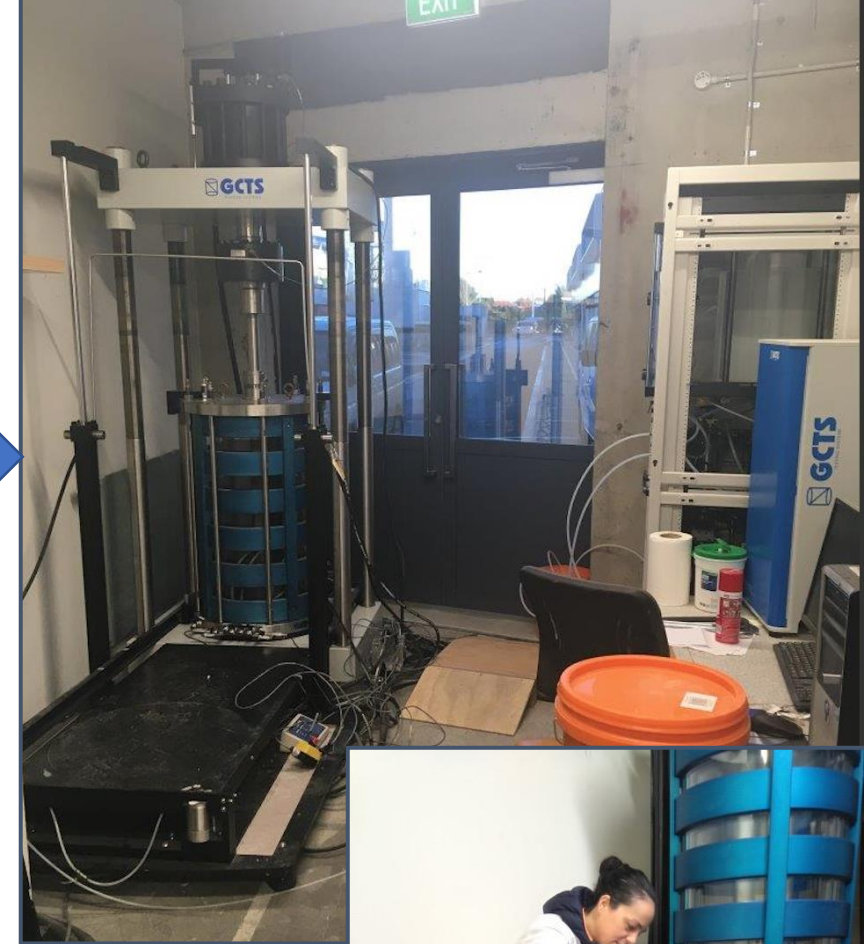




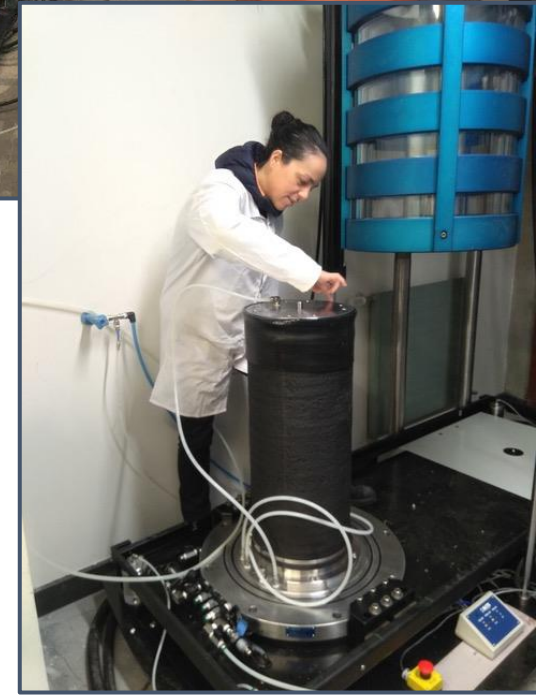
**TYPE 1:** Basic, small scale



**TYPE 2:** Larger scale, improved instrumentation, internationally-benchmarked.



**TYPE 3:** World-first dynamic testing at larger scales, improved methodologies.



# Research Team

## Stopbanks

Prof Matt Wilson (UC)  
Assoc Prof Liam Wotherspoon  
(UoA)  
Dr Tom Logan (UC)  
Assoc Prof Asaad Shamseldin  
(UoA)

- Various aligned/upcoming/  
undergrad projects

### ALUMNI

- Thomas Wallace (ME)
- Eduardo Pascoal
- Dr Daniel Blake

## Stopbank-dam systems

*Thomas Wallace (UC PhD student)*



## Dams

- *Dr Katherine Yates (UC Postdoc Researcher)*
- *Katie Vincent (UoA PhD student)*
- Winnie Pan (UoA undergrad research assistant)
- Other aligned/part-time (Dr Sean Rees)

### ALUMNI

- Ross Waters (ME)
- Various undergrad projects
- Various PMEG projects