

# Infrastructure Impacts of the 2019 Rangitata Flood

Liam Wotherspoon

# Acknowledgements

- Transpower, Waka Kotahi, Kiwirail, Timaru District Council
- NIWA, ECan, University of Canterbury
- Cindy Xiao, Leo Liu, Conrad Zorn, Nirmal Nair, Mohammad Aghababaei, Seosamh Costello, Prakash Ranjitkar

# Overview

- Rangitata River and catchment
- 2019 Flood Event
- Infrastructure impacts
- Network effects and simulations
- Summary



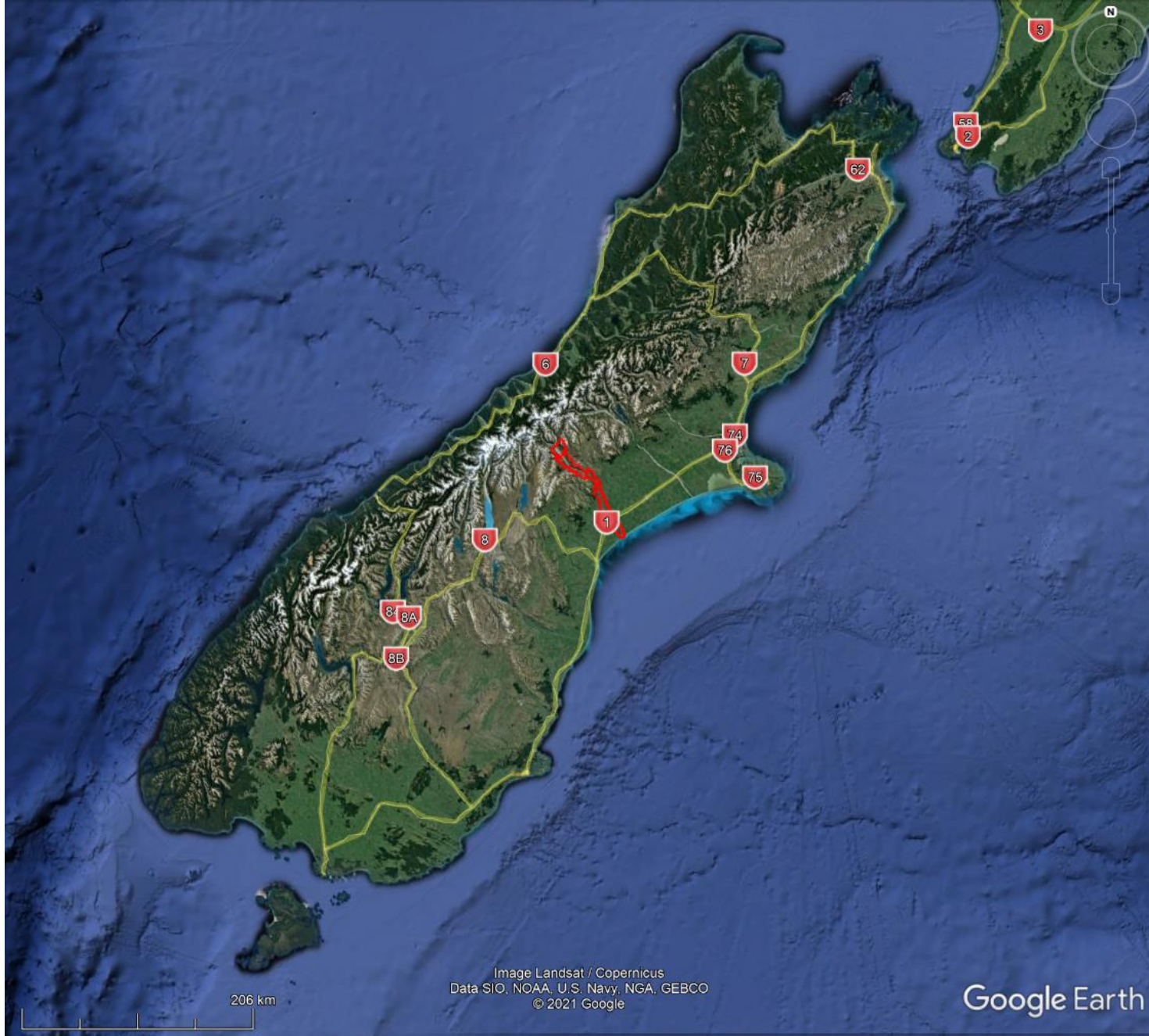
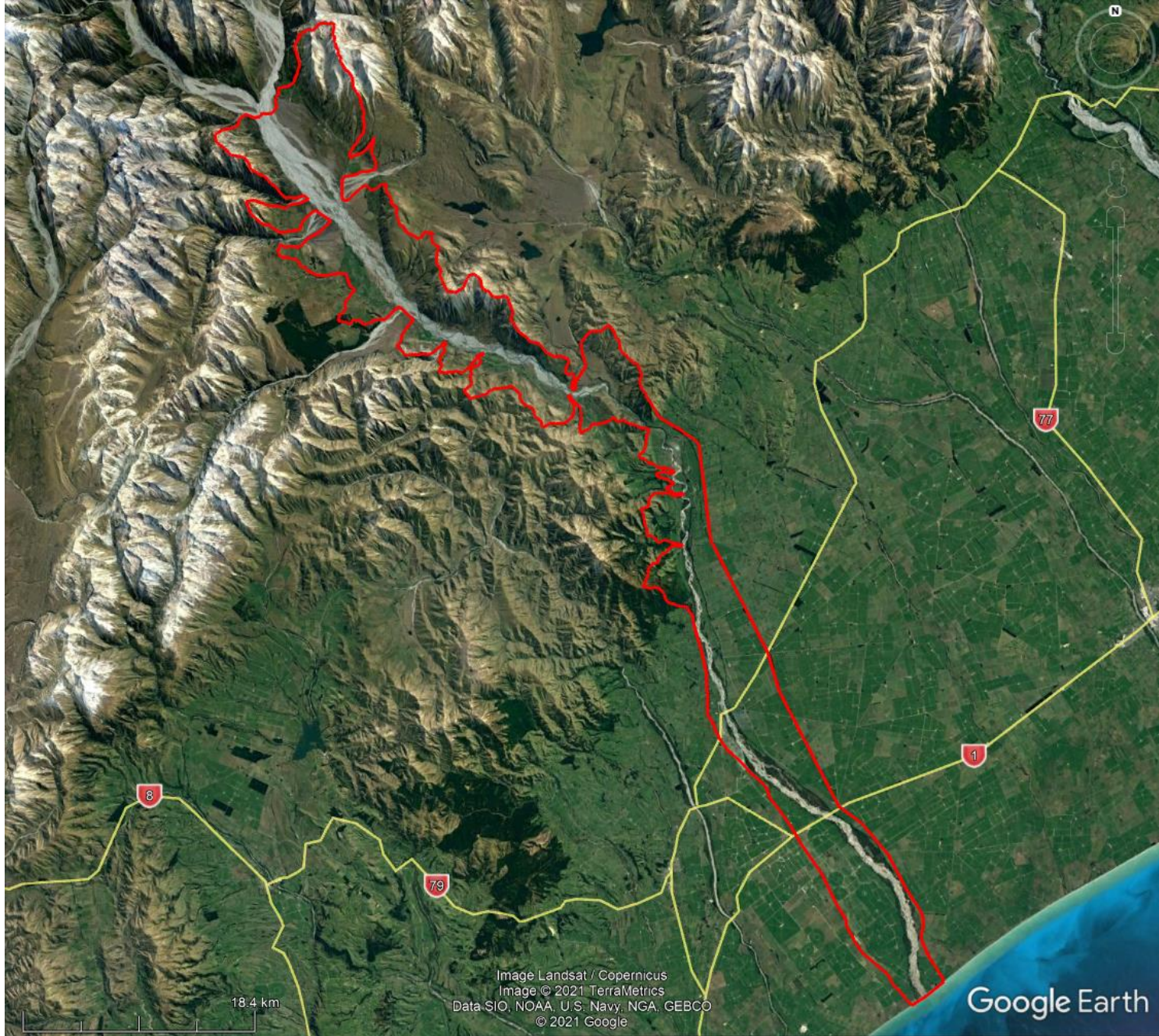


Image Landsat / Copernicus  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
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# Rangitata River

- Braided river
  - North, South and Middle Branch (last two typically dry)
- 140 km from Southern Alps to Pacific
- 1,500 km<sup>2</sup> catchment
- Steep gradient
  - 6.2 m per km
  - Larger flood energy and erosive potential compared to other rivers
- Mean annual flow 1,350 cumecs
- Largest recorded flood flow 2,950 cumecs - 1994



# Flood Control

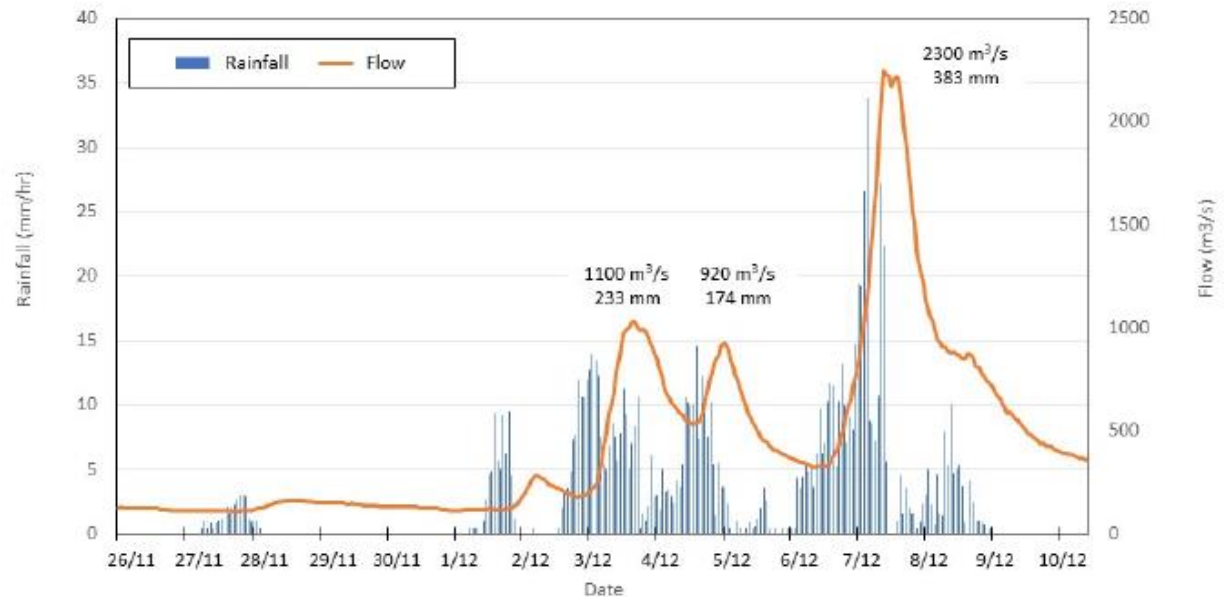
- South Branch is an overflow channel
  - Diverts flow from North Branch
  - Has been dry for 24 years
- Stopbanks at start of South Branch
  - Prevent overflows for flows less than 1,500 cumecs (approx. 5 year event)
- Stopbanks and flood protection vegetation





# 2019 Flood Event

- Rainfall
  - 875 mm over 7 days at headwaters
- Flow
  - Peak of 2,300 cumecs
  - Over 2,000 cumecs for 10 hours – 7<sup>th</sup> December 2019
  - Largest volume event on record

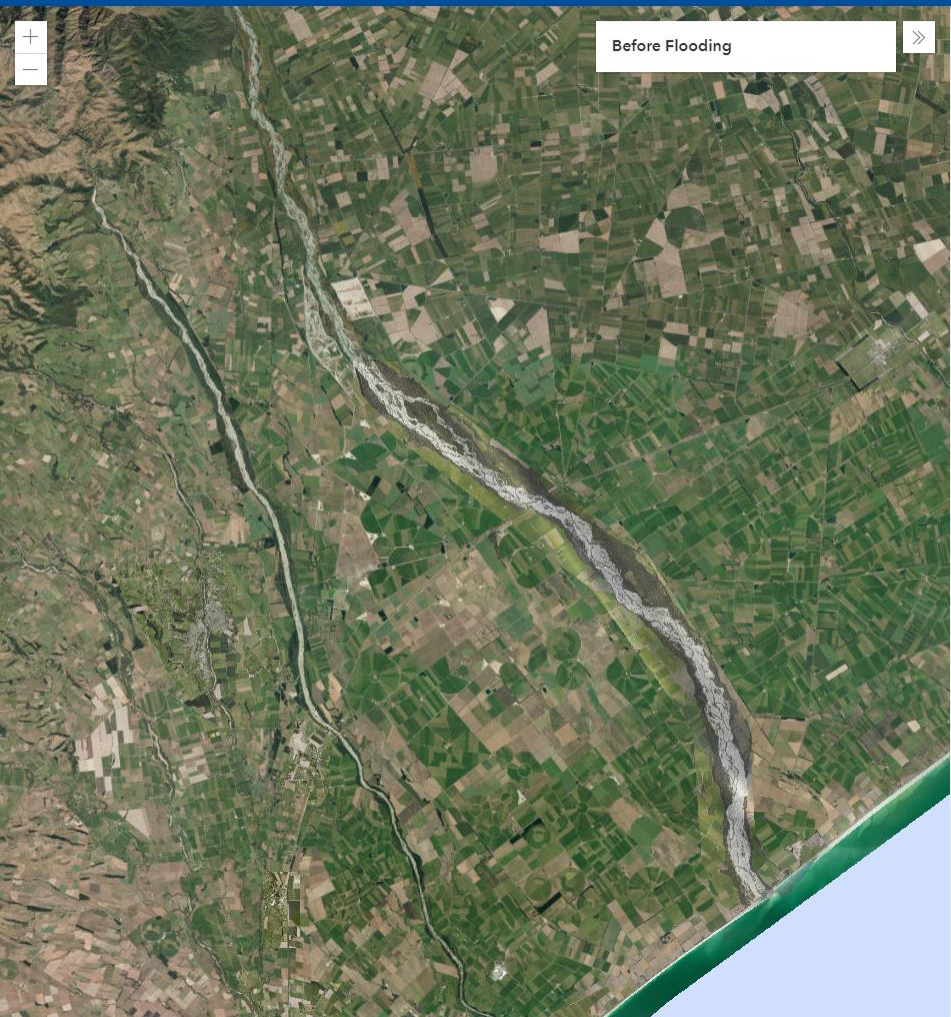




# Flood Event

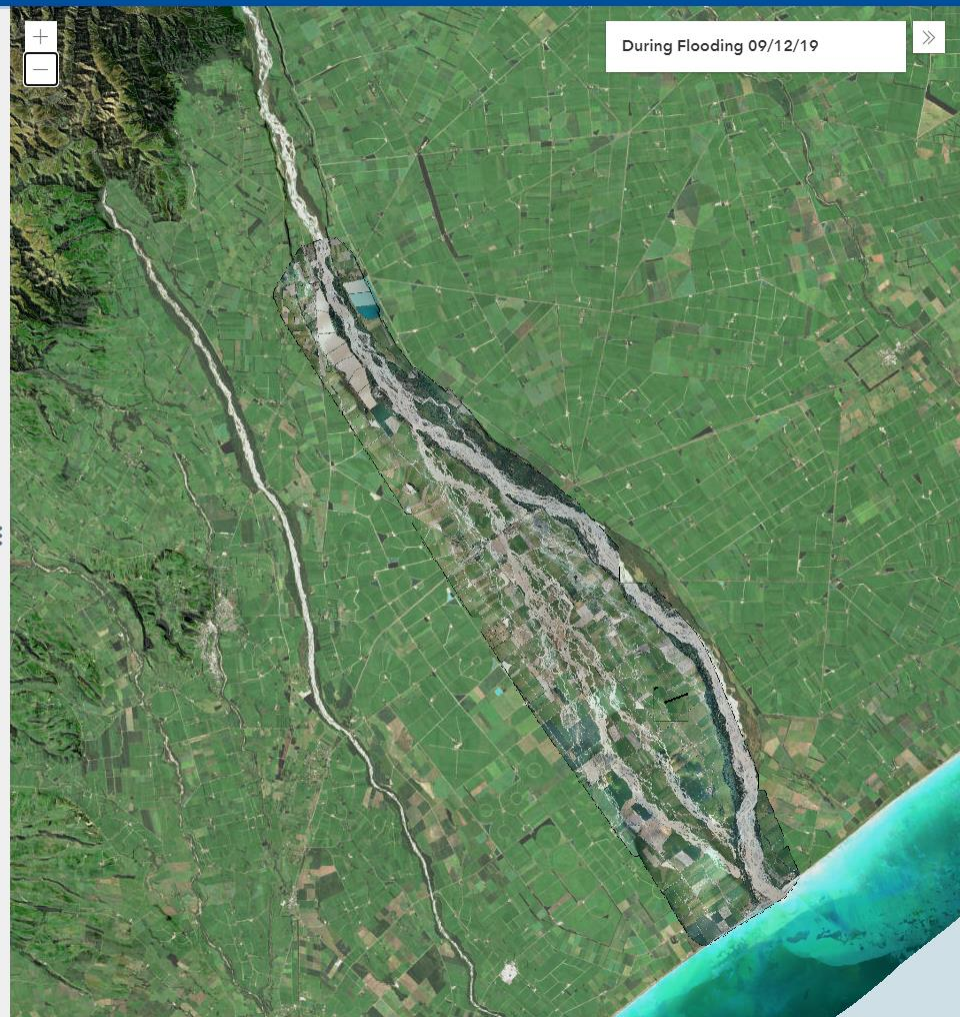
- Approximately a 1 in 20 year flood event
- Breakout in three main locations
  - South Branch (First time in 24 years) – expected
  - Near Main South Rail Line
  - Near Arundel
- Riverbank and stopbank erosion





Land Information New Zealand; Land Information New Zealand; Ministry for Primary Industries; Environment Canterbury

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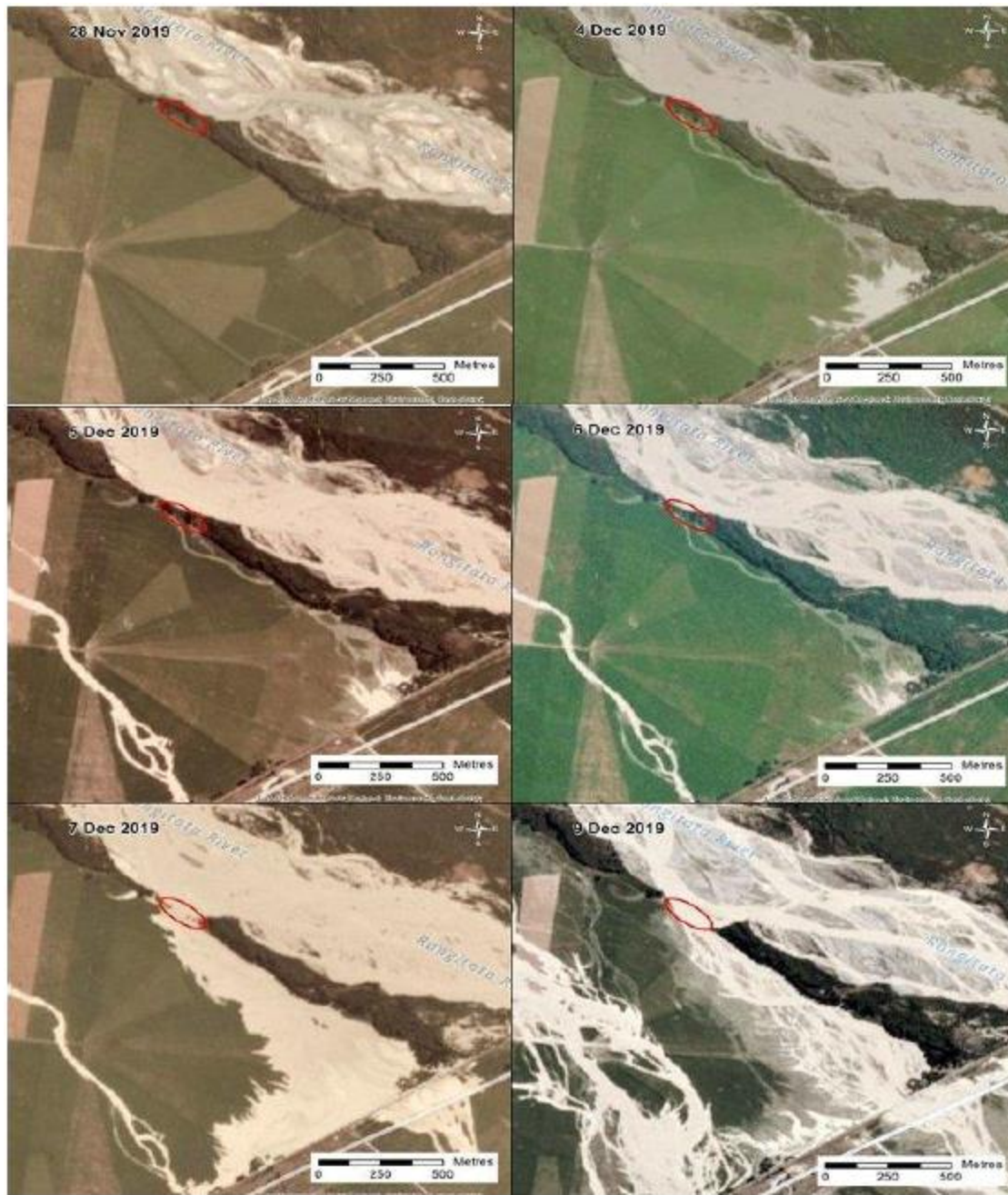
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# Flood Protection Repair



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# Flood Protection Repair





# Flood Protection Repair



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Google Earth



# Infrastructure Impacts

- State of Emergency for approx. 1 week
- Coincided with other infrastructure impacts on West Coast (SH6)
- Collation of photos and report for impacts to:
  - Transportation
  - Power
  - Telecommunications
  - Water
  - Agriculture



# Rail and Road

- Bridges over South Branch



# Rail

- Main South Line washout
  - 330 m of significant damage
  - Two other locations with less severe damage







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# Rail

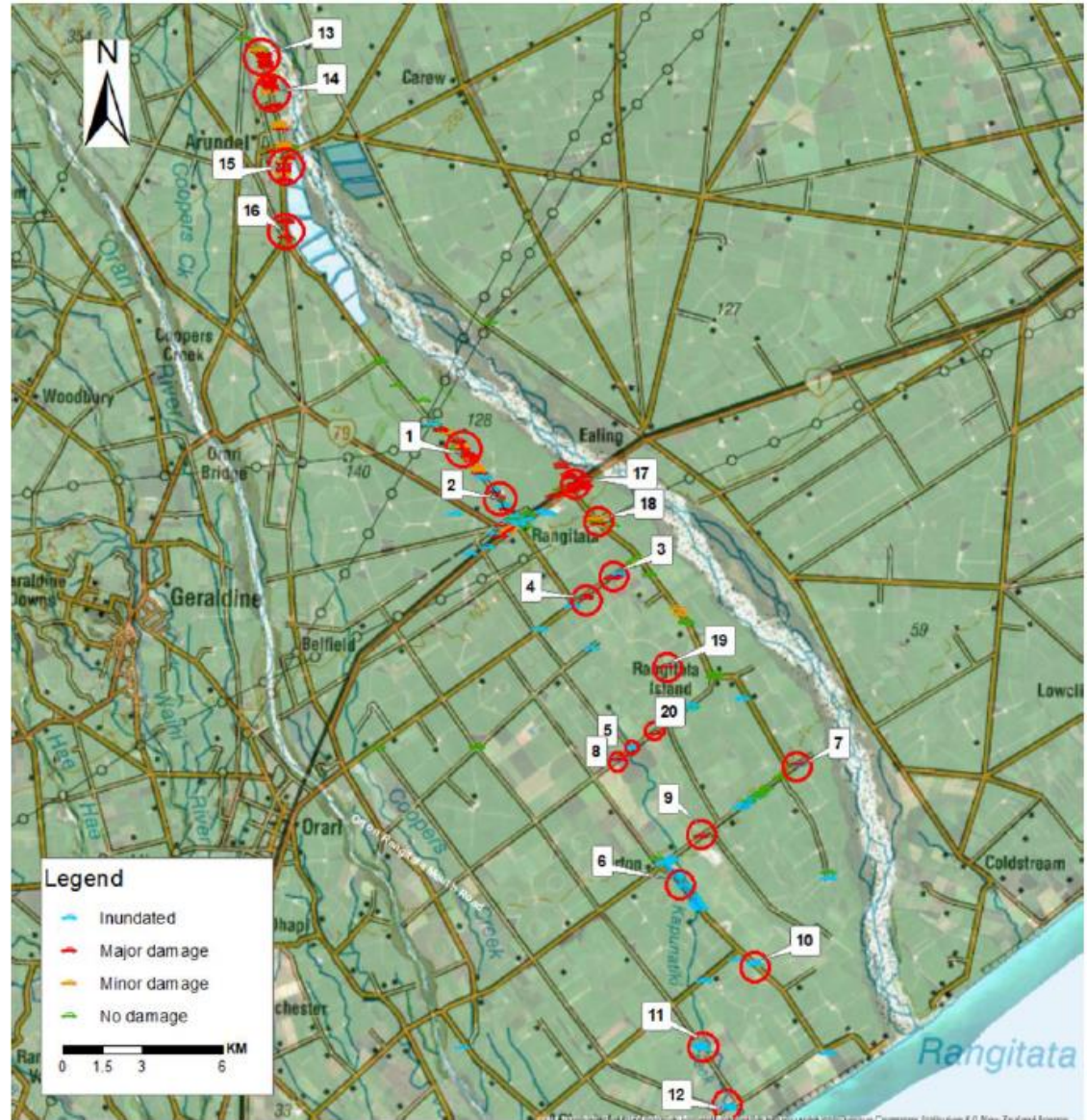
- Reopened 20<sup>th</sup> December
  - 13 days after event





# Road

- All Rangitata River crossings closed for number of days



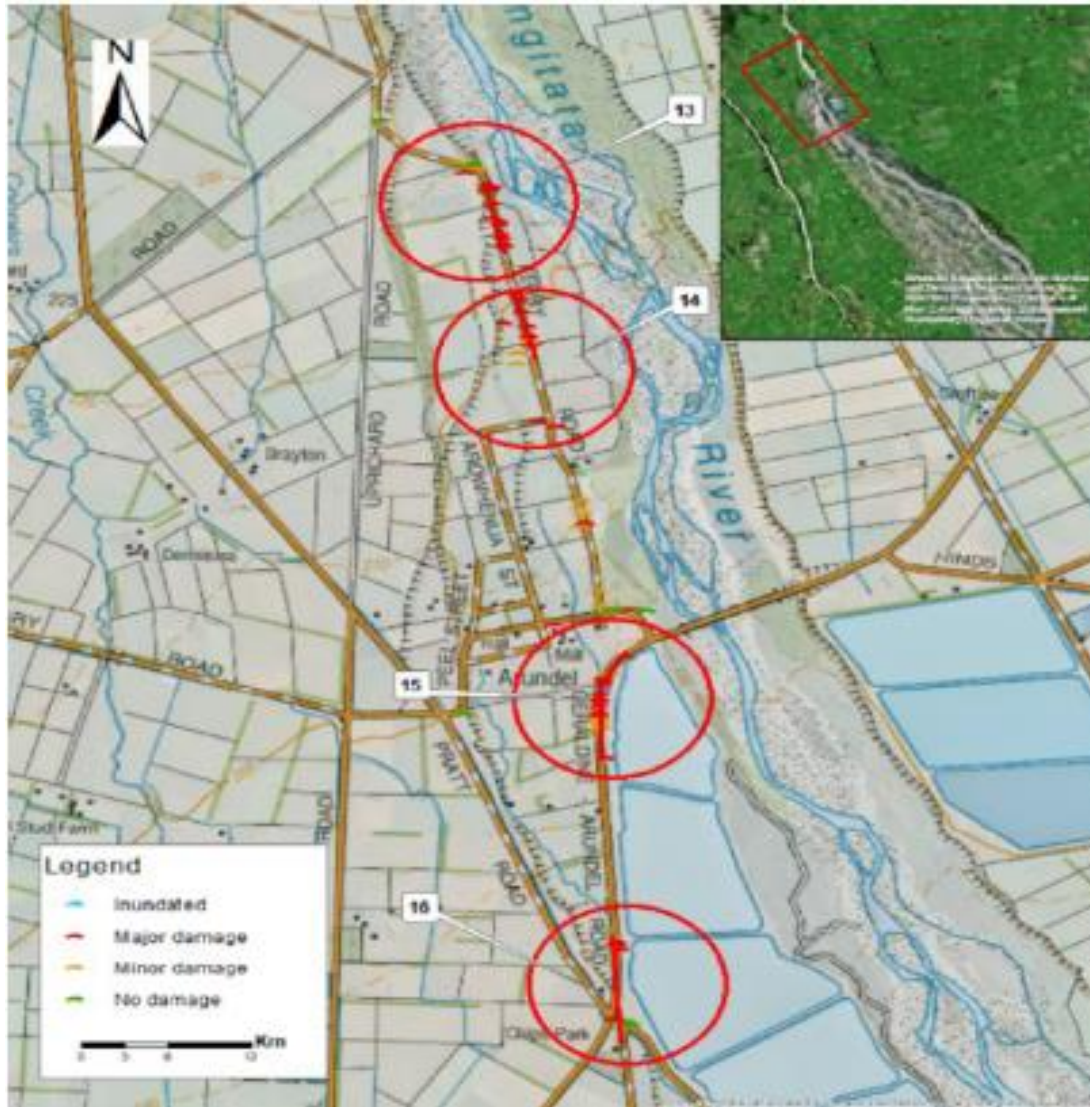
# Local Roads

- Road and bridge abutment scour
- Scouring of up to 3 m in some areas





# Local Roads



# State Highway

- SH1 & SH72
  - SH1 closed Dec 7 -11
  - SH79 short closure





# Transmission

- Damage to 7 transmission structures on ROX-ISL
- Loss of one circuit
- No loss of power through transmission network



# Transmission







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# Transmission









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# Transmission

- Temporary repair & replacement



# Telecommunications

- Spark network outages
  - Fibre optic cable severed due to flooding
  - Landline
  - Mobile
  - Broadband





# Rural Infrastructure



# Irrigation Ponds



Discharge through pond weir

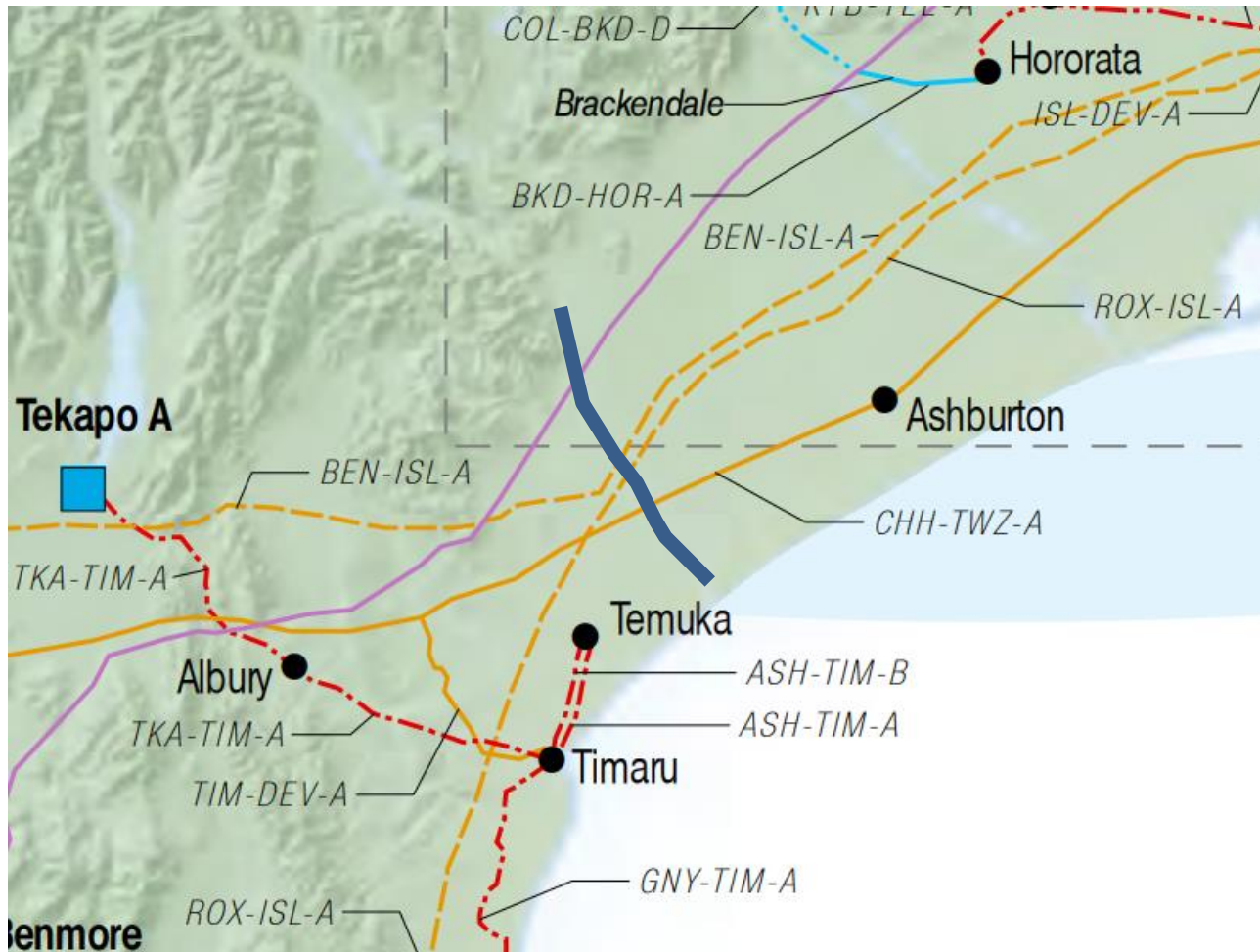




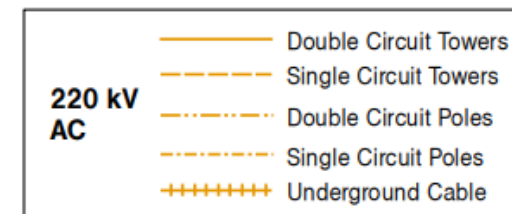
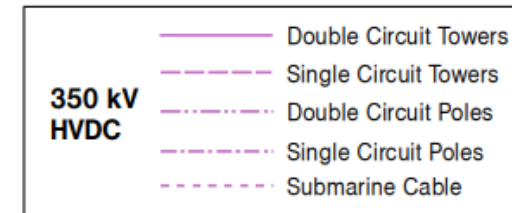
# Network Effects

# Transmission Modelling

- Modelling of loss of lines



## Transmission Lines





# Transmission Modelling

- Single circuit                      No loss of load
- ROX-ISL-A + BEN-ISL-A                      198 MW lost load
- All circuits (4 – 2 on one line)                      500 MW lost load
- Would affect middle-upper South Island



# Road Transport Modelling

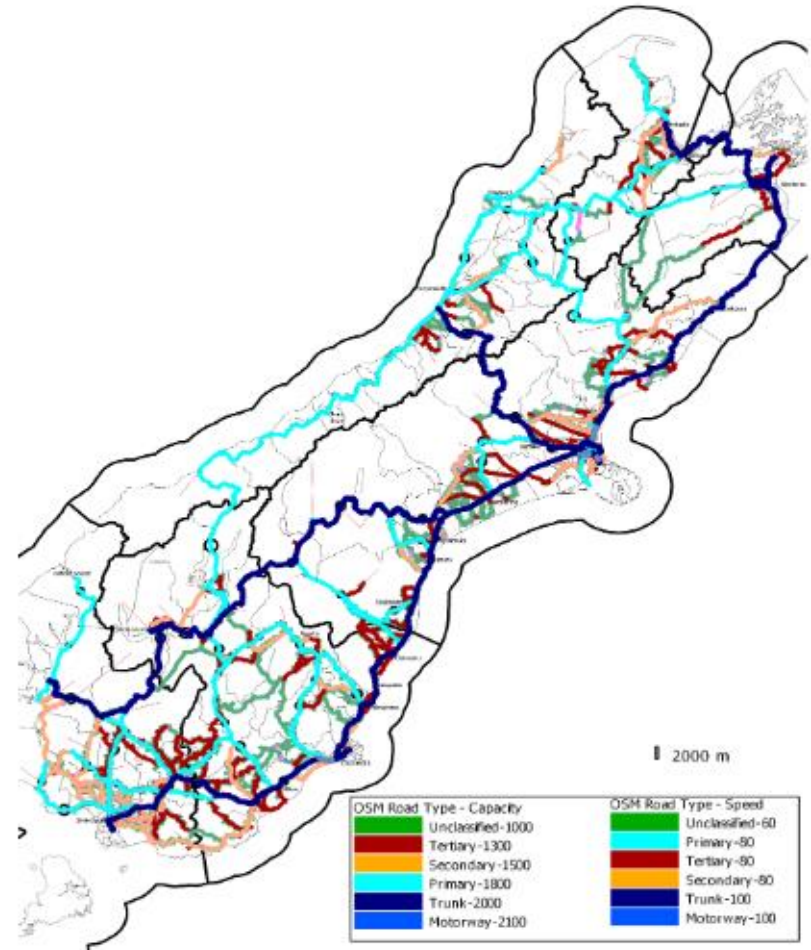
- Road outages
  - SH1                      Dec 7 -11
  - Inland Route 72      Dec 7 – 9
  - Only Rangitata River bridge crossing locations
- SH6 Haast Pass – landslides led to outages
  - SH6                      Dec 7 - 20
- Lower SI cut off from rest of the country





# Road Transport

- Modelling of Transport Network effects
- Over 9000 lost trips per day



# Direct Infrastructure Costs

- ECan \$2.5m ongoing
- Transpower \$6m
- Waka Kotahi \$1.3m
- Kiwirail \$1m





# Summary

- Flooding related impacts across infrastructure networks as a result of the 2019 Rangitata Flood
- Flooding in South Branch part of flood management plan
  - Rural land and infrastructure
  - Transmission network damage a key point
- Other breakouts
  - Significant rail and road damage
- Compounding effect of wider storm impacts



# Questions?



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