

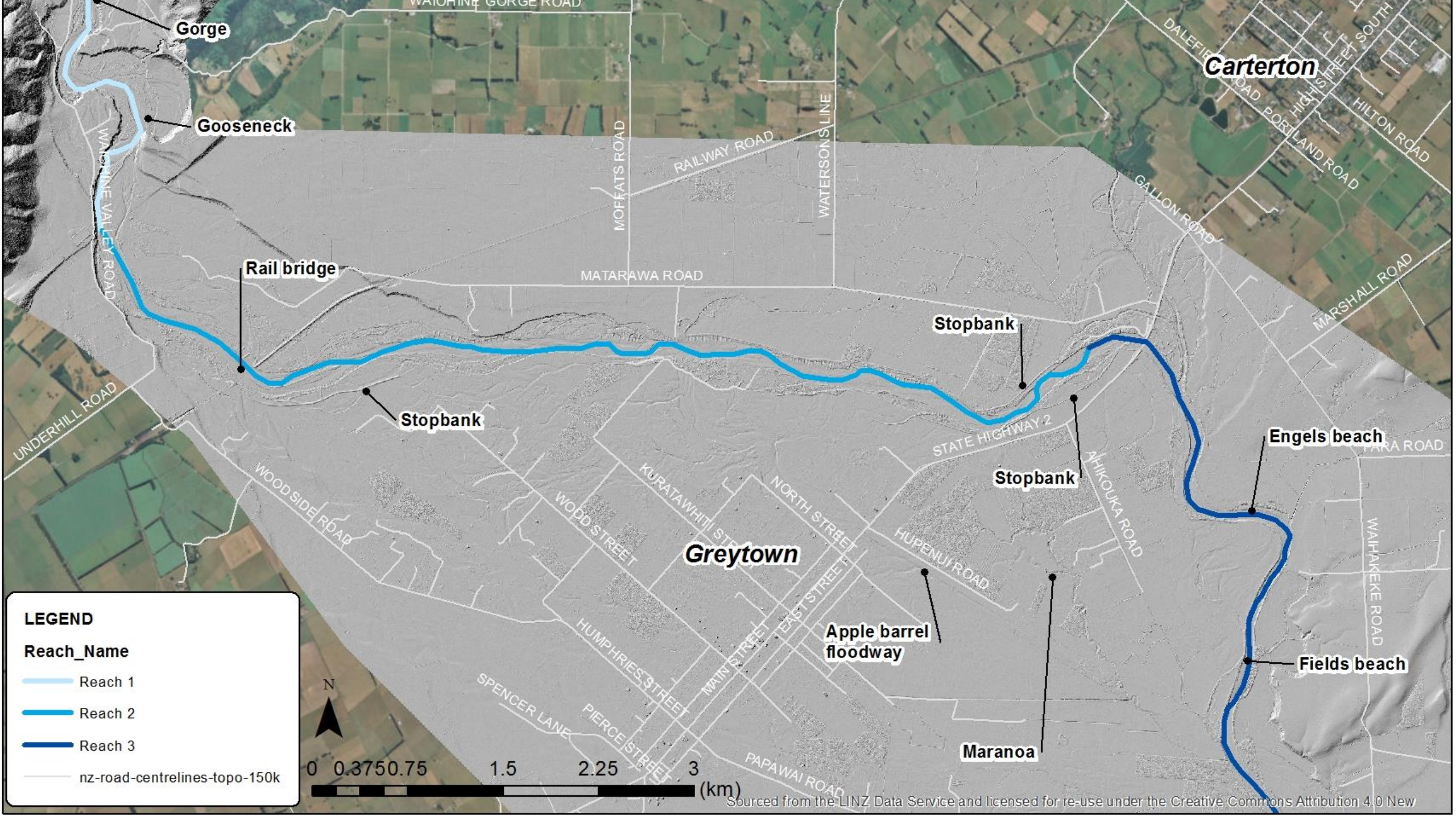
# WAIOHINE RIVER

**GEOMORPHIC TRENDS ASSESSMENT AND ITS APPLICATION TO RIVER  
MANAGEMENT**



# Background

- Greater Wellington Regional Council prepared a Floodplain Management Plan (FMP) in 2011
- \$10 million rate payer funded flood protection
- Community requested more investigation and transparency in FMP recommendations
- Waiohine Action Group (WAG) collaboratively preparing Waiohine FMP with GWRC
  - Updated flood modelling, including potential impacts of climate change
  - Updated climate change modelling
  - More information on sediment trends and potential impacts of climate change



**LEGEND**

**Reach\_Name**

- Reach 1
- Reach 2
- Reach 3
- nz-road-centrelines-topo-150k



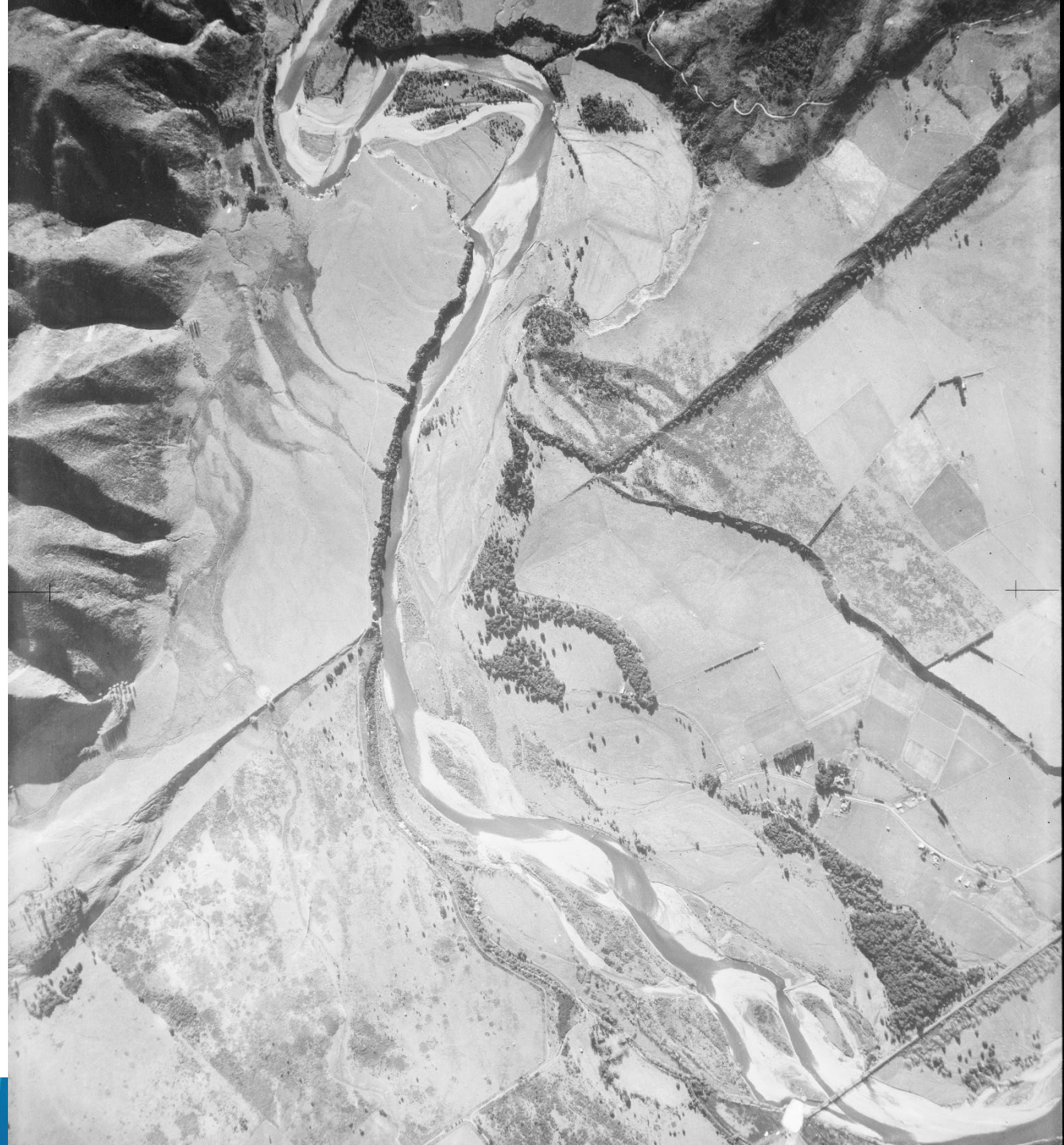
# Drivers of change

- Climatic change
  - Sediment availability
  - Vegetation changes
  - Large magnitude rain events
- Episodic events
  - Tectonic (earthquakes)
  - High intensity rainfall
- Human induced change
  - Gravel extraction
  - Active channel confinement
  - Vegetation changes



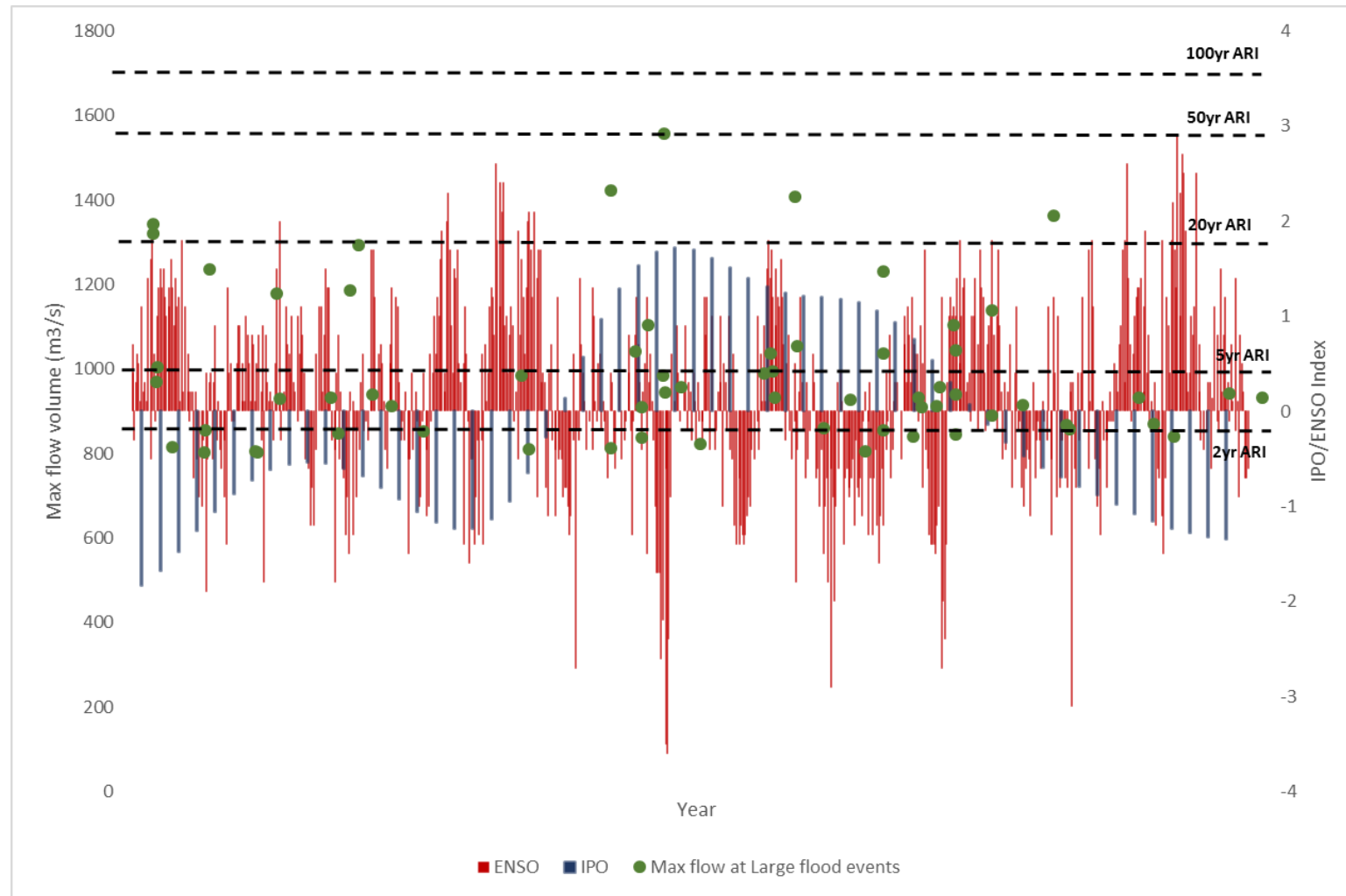
# Long term trends

- High sediment load at end of 'cold' periods
- Two alluvial fans (10-25,000 and 0-10,000)
- Multiple terrace sequences
- Evidence of large scale fault rupture between 110 and 430BC
- 1855 fault rupture



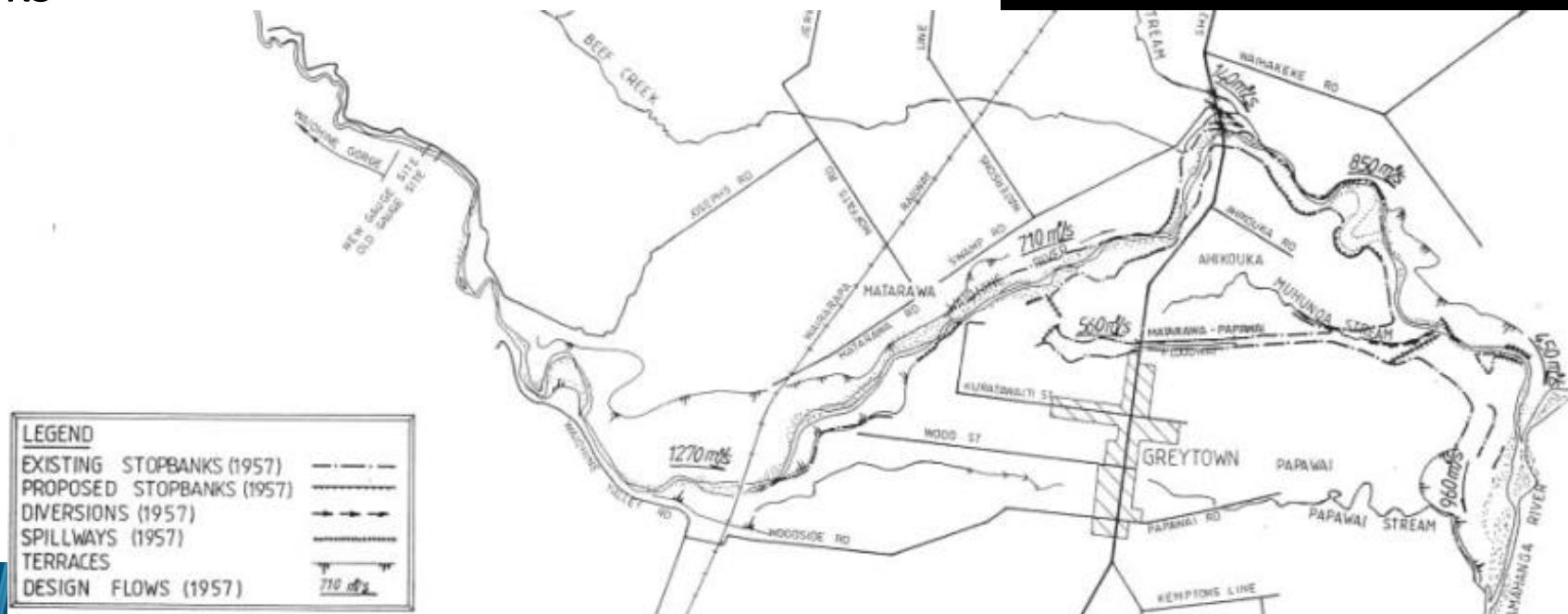
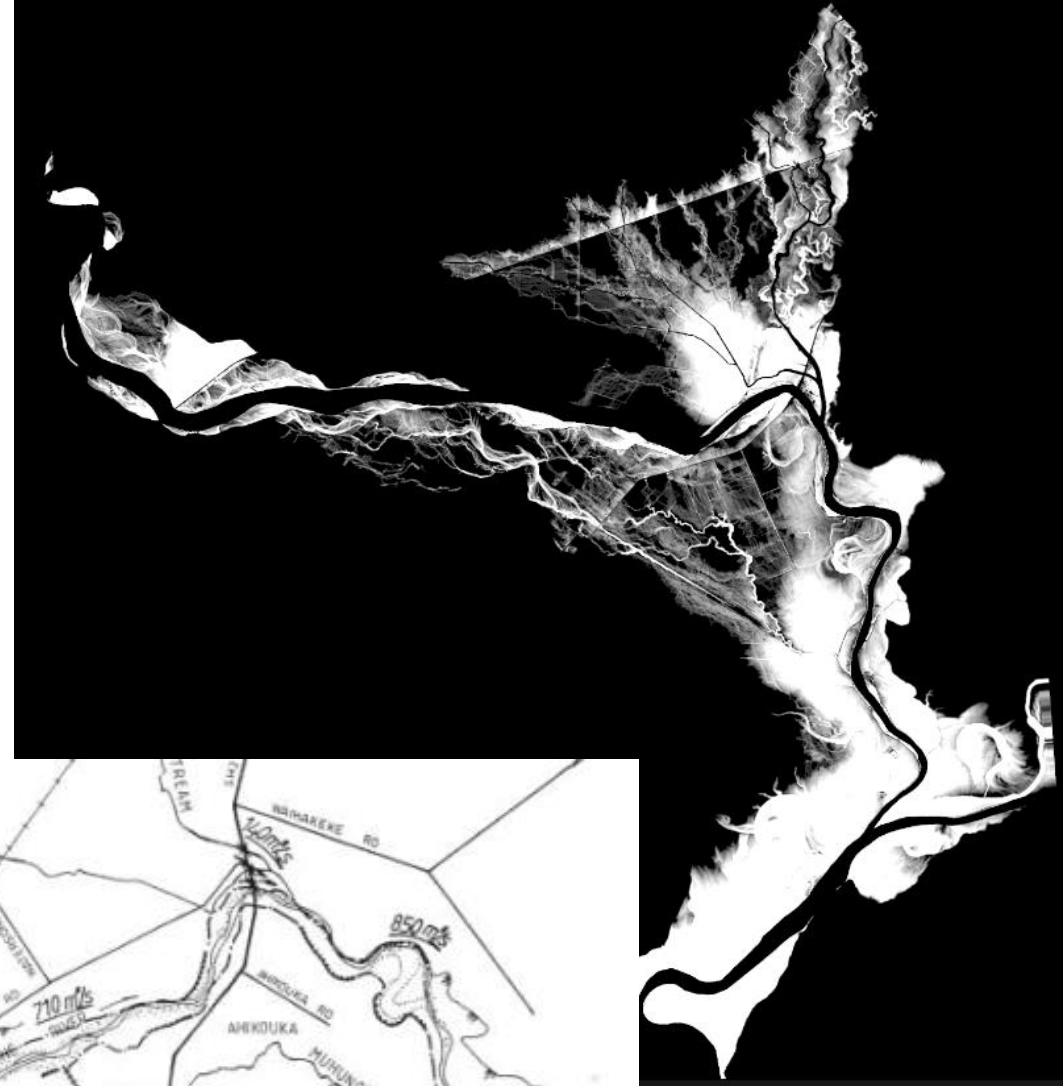
# Current trends

- Increase in large magnitude flood events during positive phases of the IPO
- El Niño lower base flows, possibly increase frequency of large events
- La Niña higher baseflows, potentially more risk of extratropical cyclones?



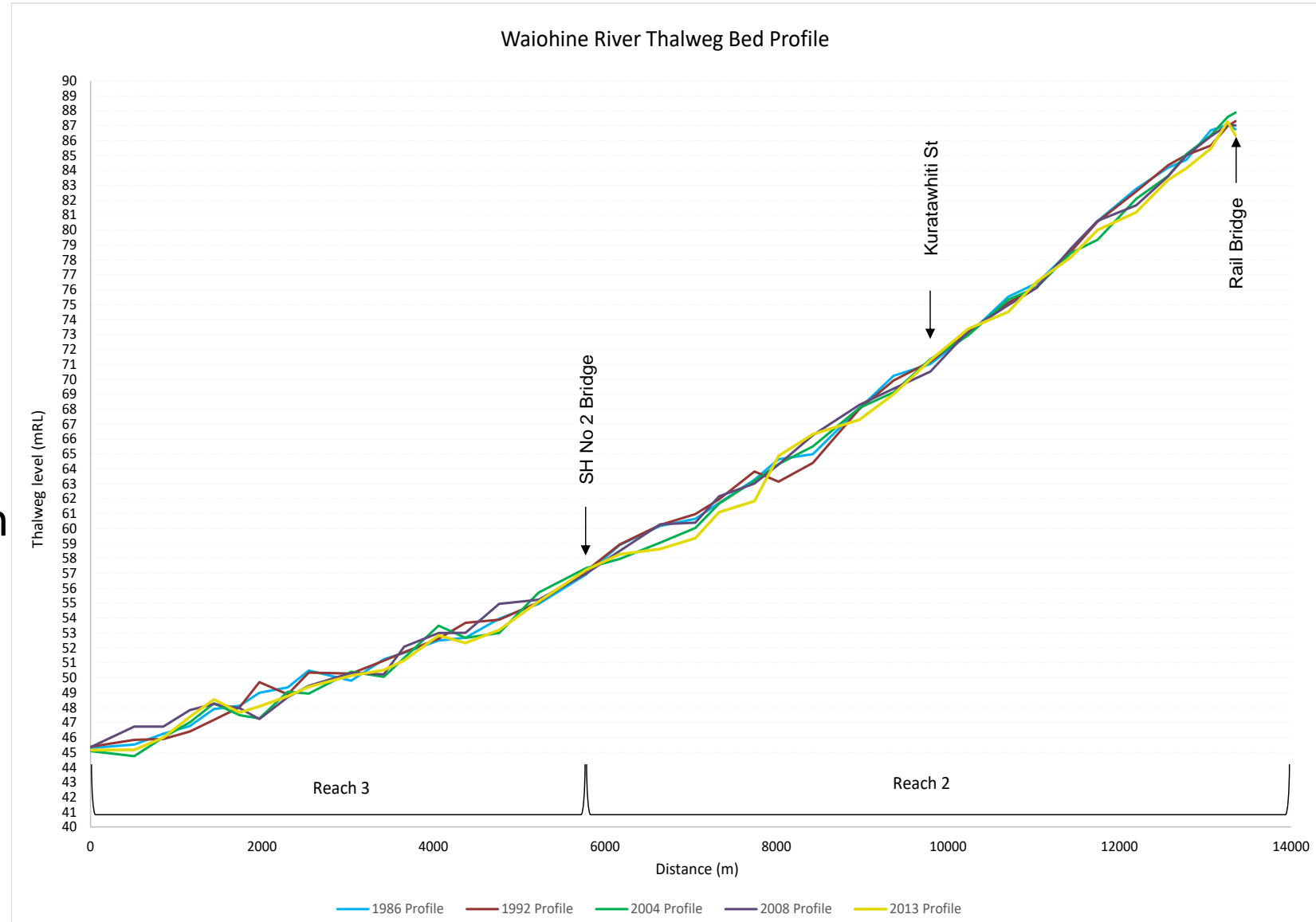
# Current trends

- Current position dictated by river management
- Gravel management
- Willow and rock groyne training
- Informal and formal but infrequent stopbanks



# Current trends

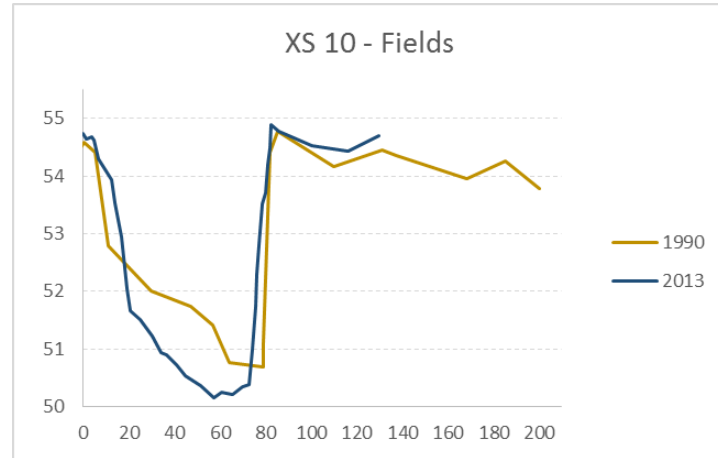
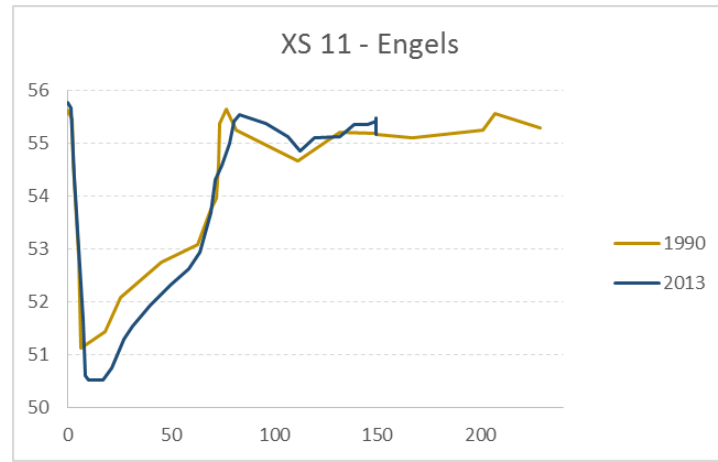
- Slight degradation trend
- Pulses of sediment (sediment slugs)
- Limited change over 27 years upstream of Kurtawhiti Street and immediately downstream of SH2 bridge
- Localised change, gravel management, channel straightening





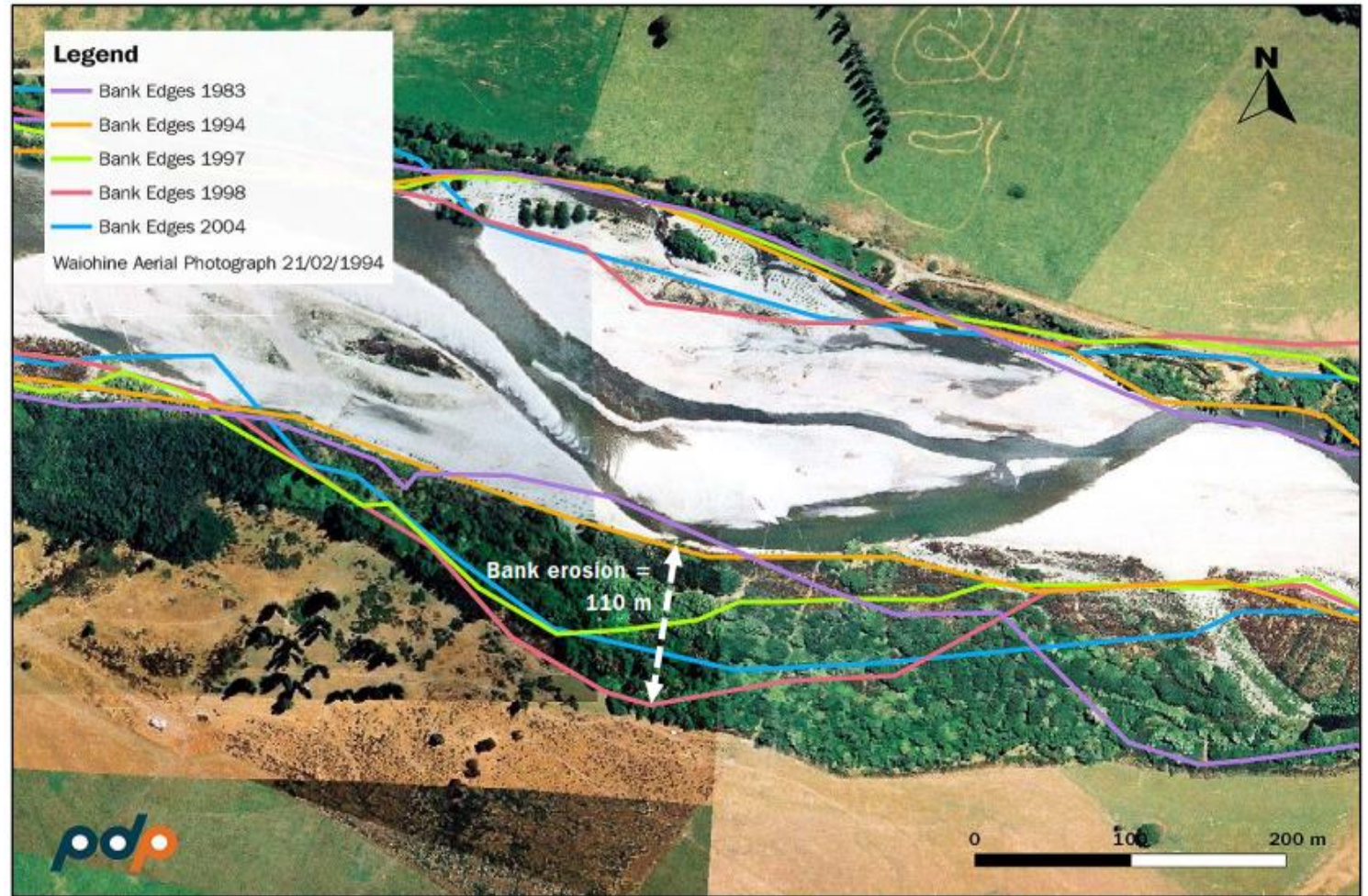
# Current trends

- Changes in morphology downstream
- Linked to reduction in sediment supply and increase in transport capacity
- Result of river management, as well as natural processes
- Changes in flood dynamics from rail bridge?



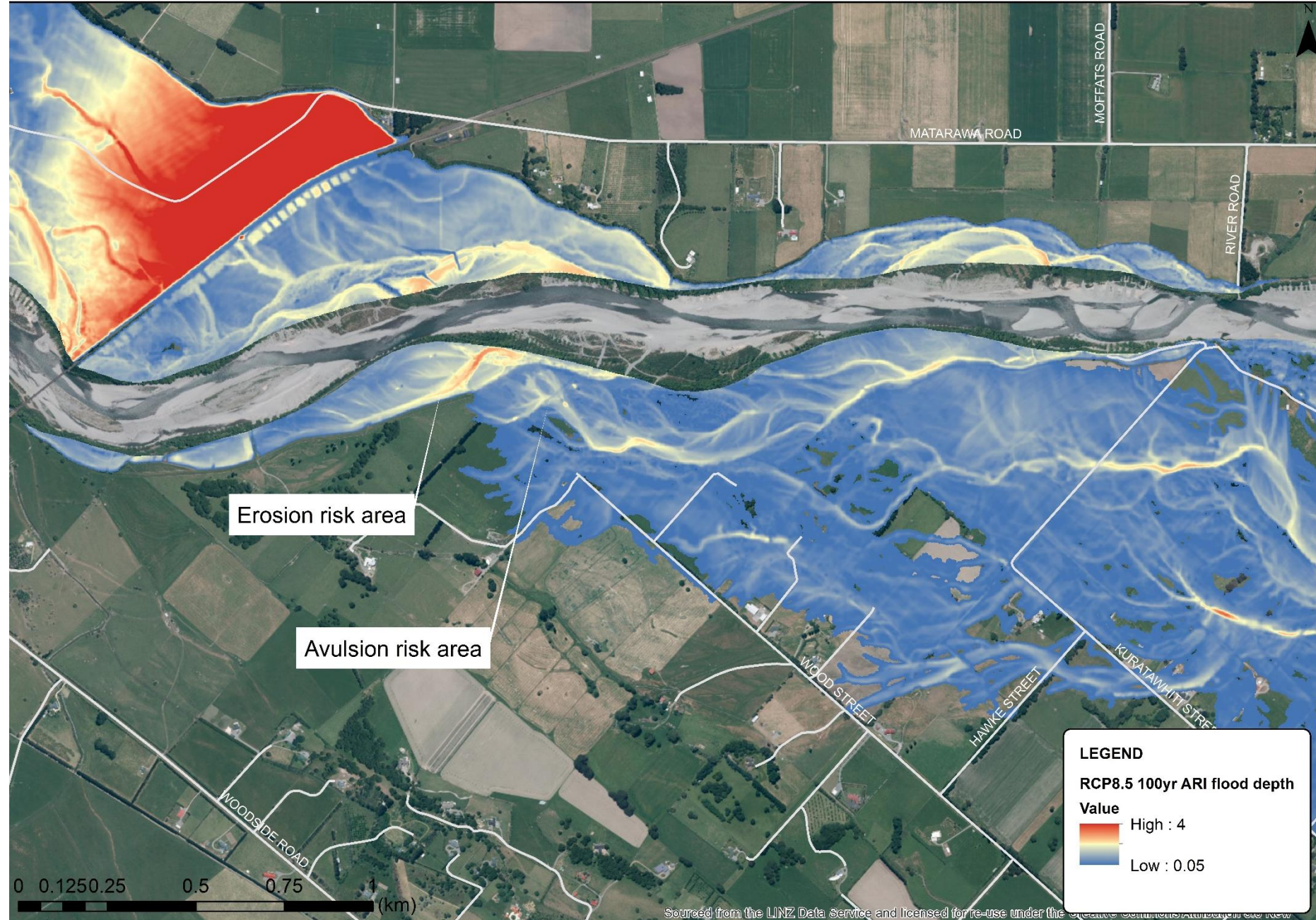
# Current trends

- Wandering gravel bed river, lateral (fluvial) erosion is expected
- Up to 110m bank retreat in some areas
- Reduction in bed levels could switch to mass wasting of banks
- Groynes no longer effective?



# Current trends

- Many active 'flood channels' = Avulsion risk
- Upstream headcut erosion from downstream engagement
- Evidence of lateral scour risk and risk to stopbanks?



# Future trends

- Status quo
  - Continued sediment reduction
  - Possible reduction in effectiveness of willows
- Climate induced change
  - Catchment scale vegetation changes
  - Increase in high magnitude rain events
  - Changes in base level (sea level change and Ruamahunga River response)

# Implications for management

- Increasing erosion remediation costs
- Gravel management implications
  - Loss of armouring
  - Downstream bed changes
- Willow use
  - Climatic changes
  - Biocontrol agents
- Erodible corridor and stopbank location
- Management reaches
- LiDAR and cross section monitoring every two years and after events
- Episodic events and extreme flood events, management reset

