Wairoa River Mouth

Presentation to Community Stakeholder Group 15 August 2024

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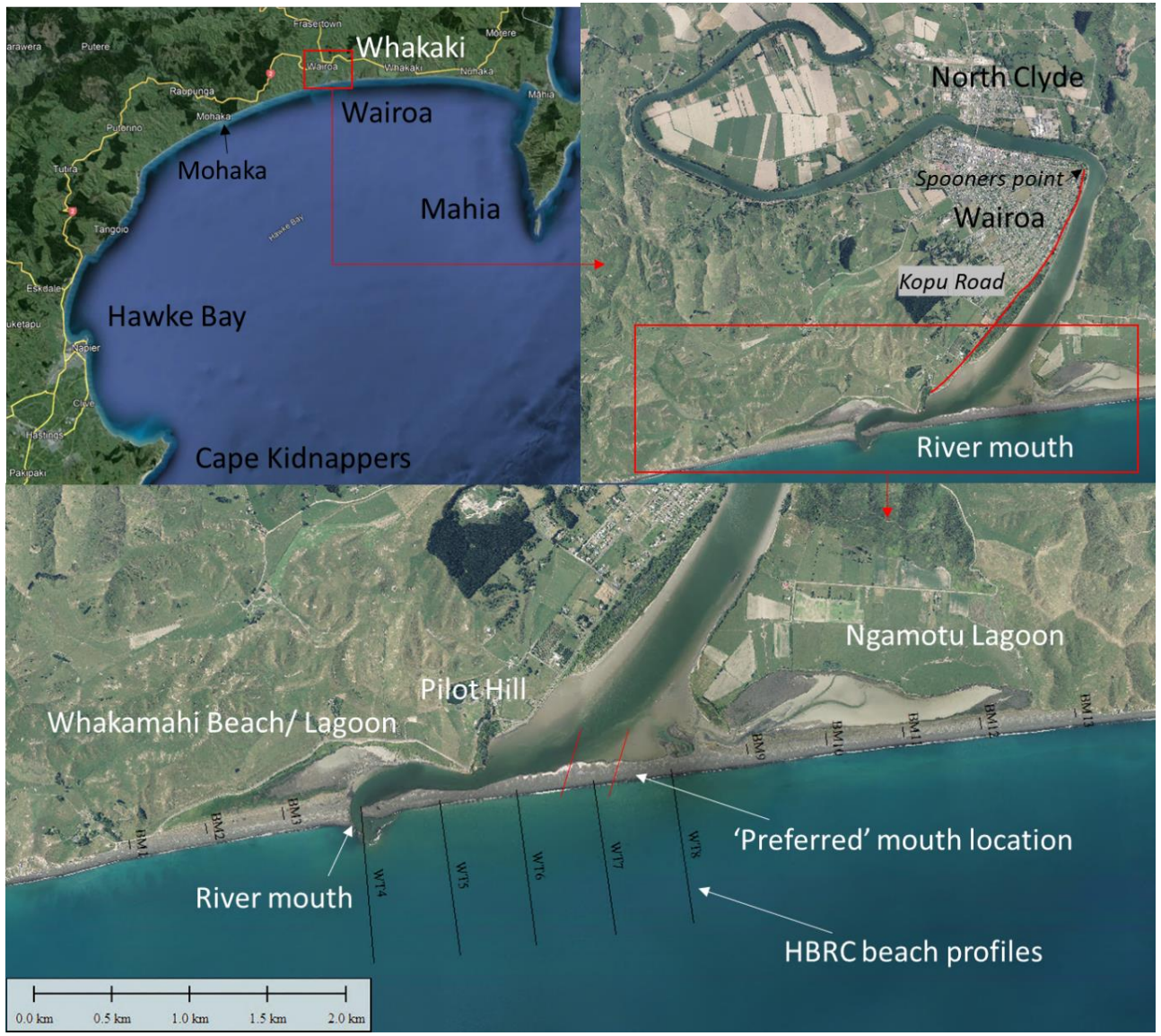
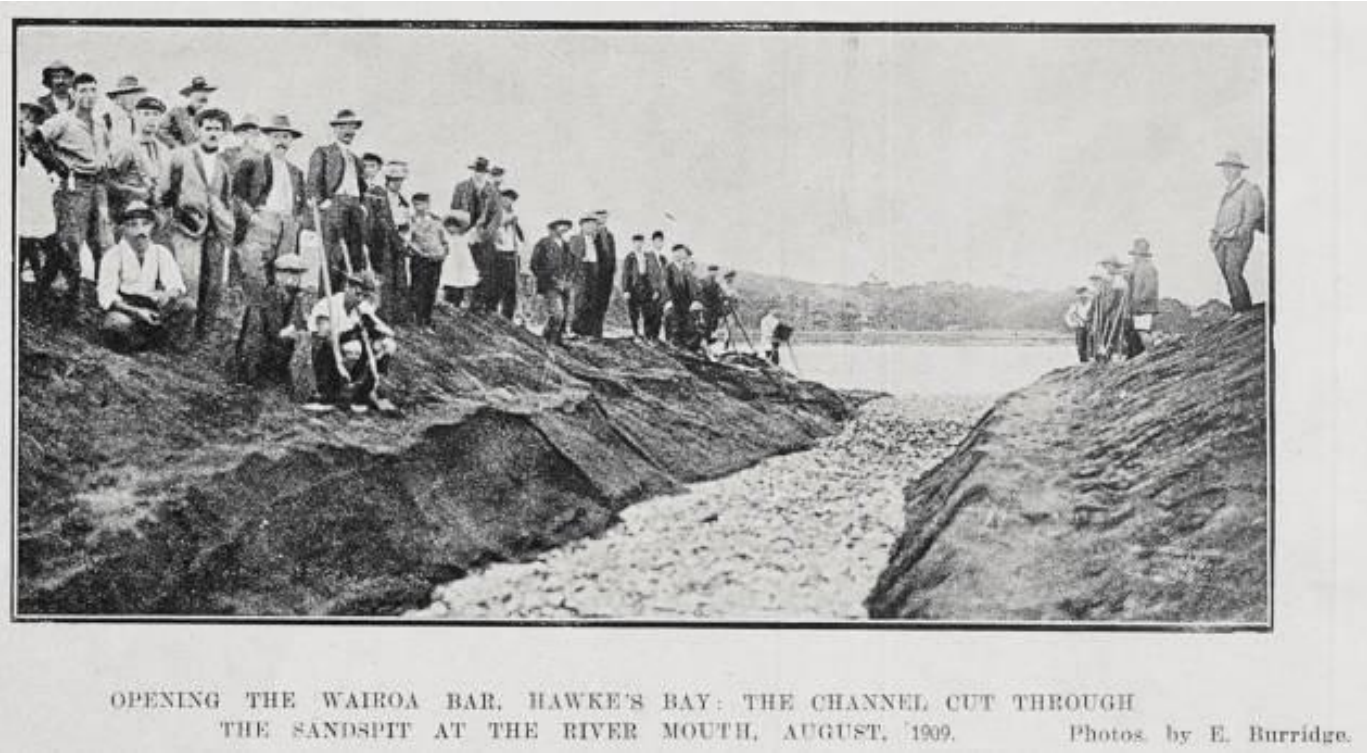
Overview

- Past management of the river mouth
- Bar influence on flooding
- Changes in bar and river mouth position
- Changes in bar and beach topography
- Coastal processes summary
- Management options

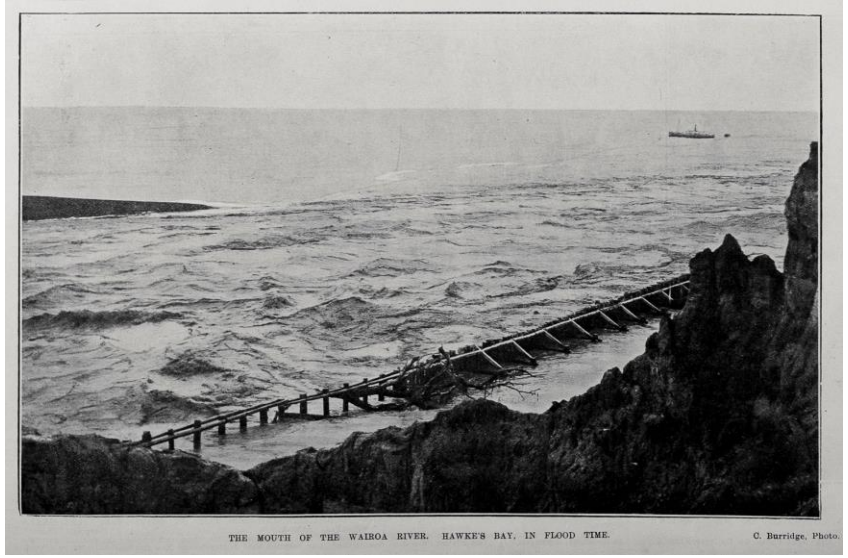
Site overview



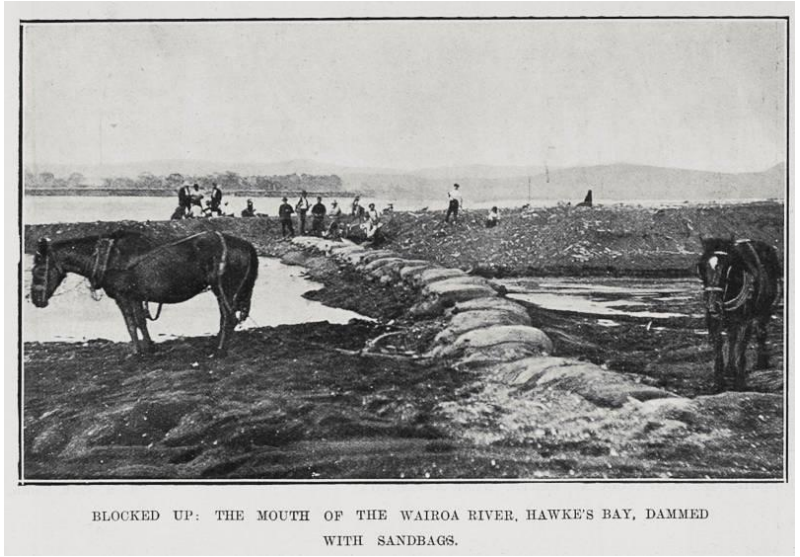
1860's - dig out for navigation



OPENING THE WAIROA BAR, HAWKE'S BAY: THE CHANNEL CUT THROUGH THE SANDSPIT AT THE RIVER MOUTH, AUGUST, 1909. Photos. by E. Burridge.



THE MOUTH OF THE WAIROA RIVER, HAWKE'S BAY, IN FLOOD TIME. C. Burridge, Photo.



BLOCKED UP: THE MOUTH OF THE WAIROA RIVER, HAWKE'S BAY, DAMMED WITH SANDBAGS.

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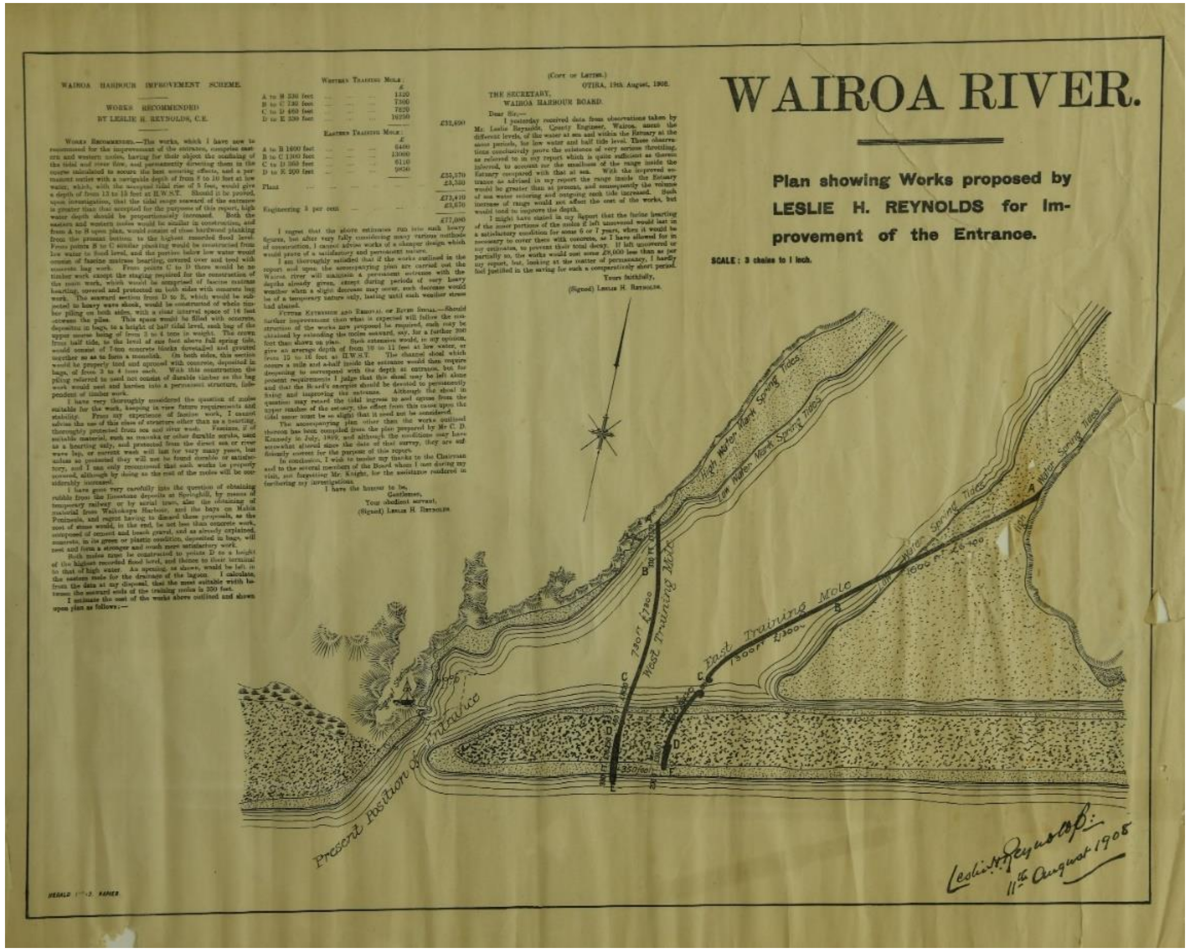
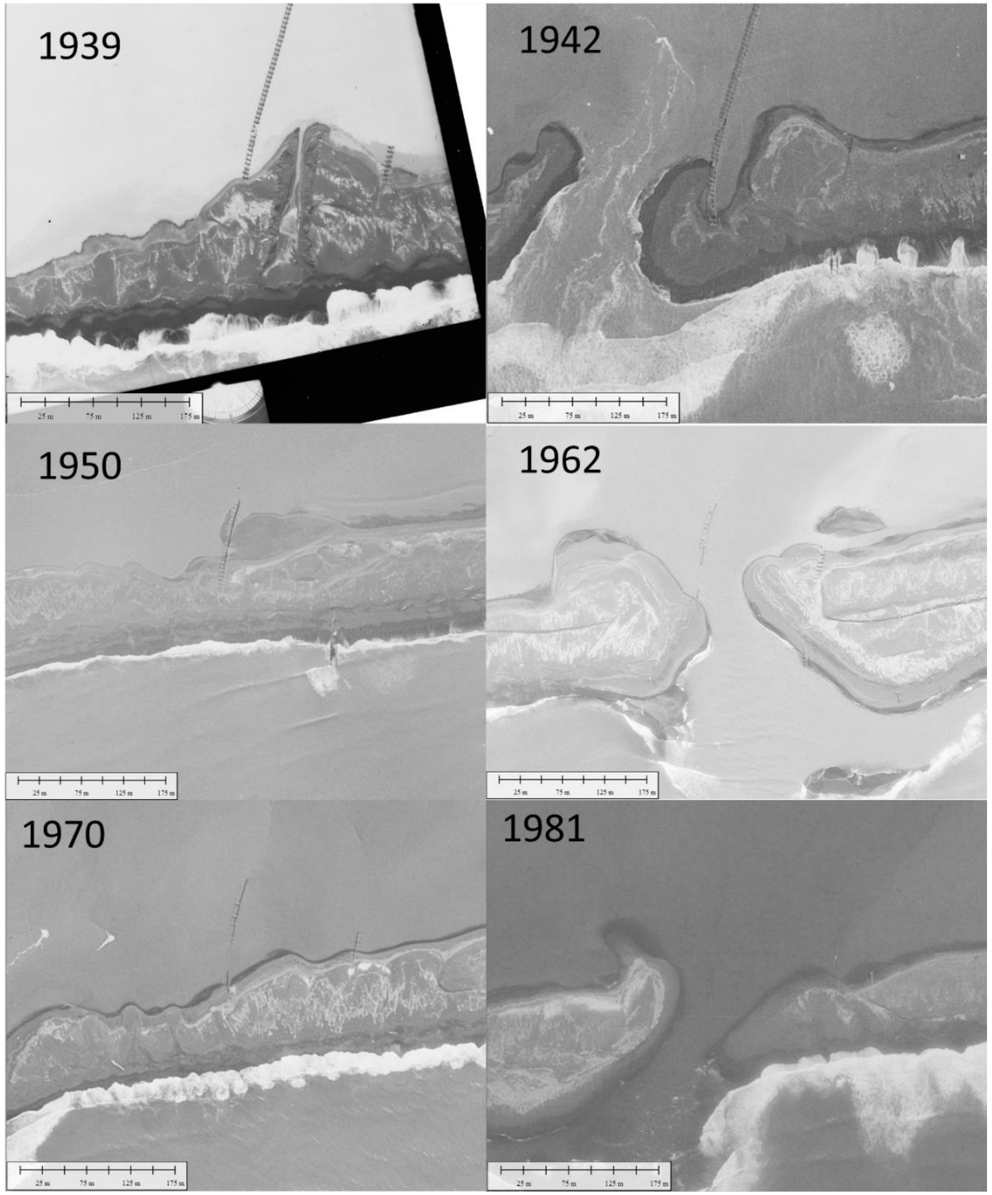
1910s - training structures for Navigation





Feasibility studies in the 1990s

- Issues relating to the bar and flooding were investigated by Works and T+T
- Migration of the river mouth to the west causes an inefficient flow path for catchment drainage that increases flooding risk to the town.
- Migration of the river mouth east towards Ngamotu Lagoon causes an inefficient flow path for catchment drainage that increases flooding risk to the town.
- Migration of the river mouth to the west encroaches on valued conservation areas at Whakamahi Lagoon.
- Erosion at the base of Pilot Hill occurs if the mouth is offset to the west, as river flow scours the base.
- Total closure of the mouth can occur, resulting in exacerbated flooding risk and poor water quality.

Field investigations were recommended to better understand design parameters

Current management: mechanical openings

Influence of the bar on flooding

WSP (Jan 2024) Wairoa Short List Options Flood Modelling Report

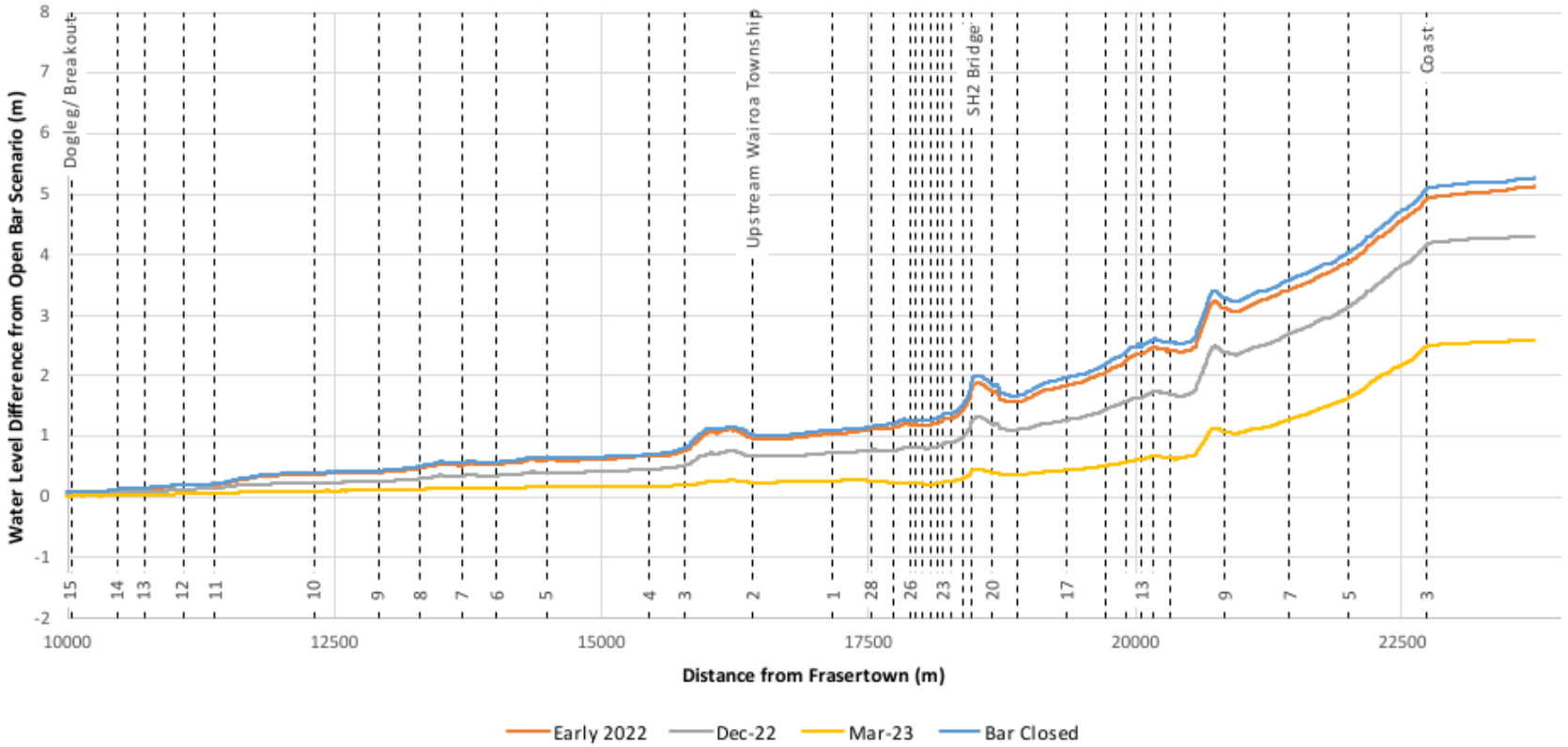
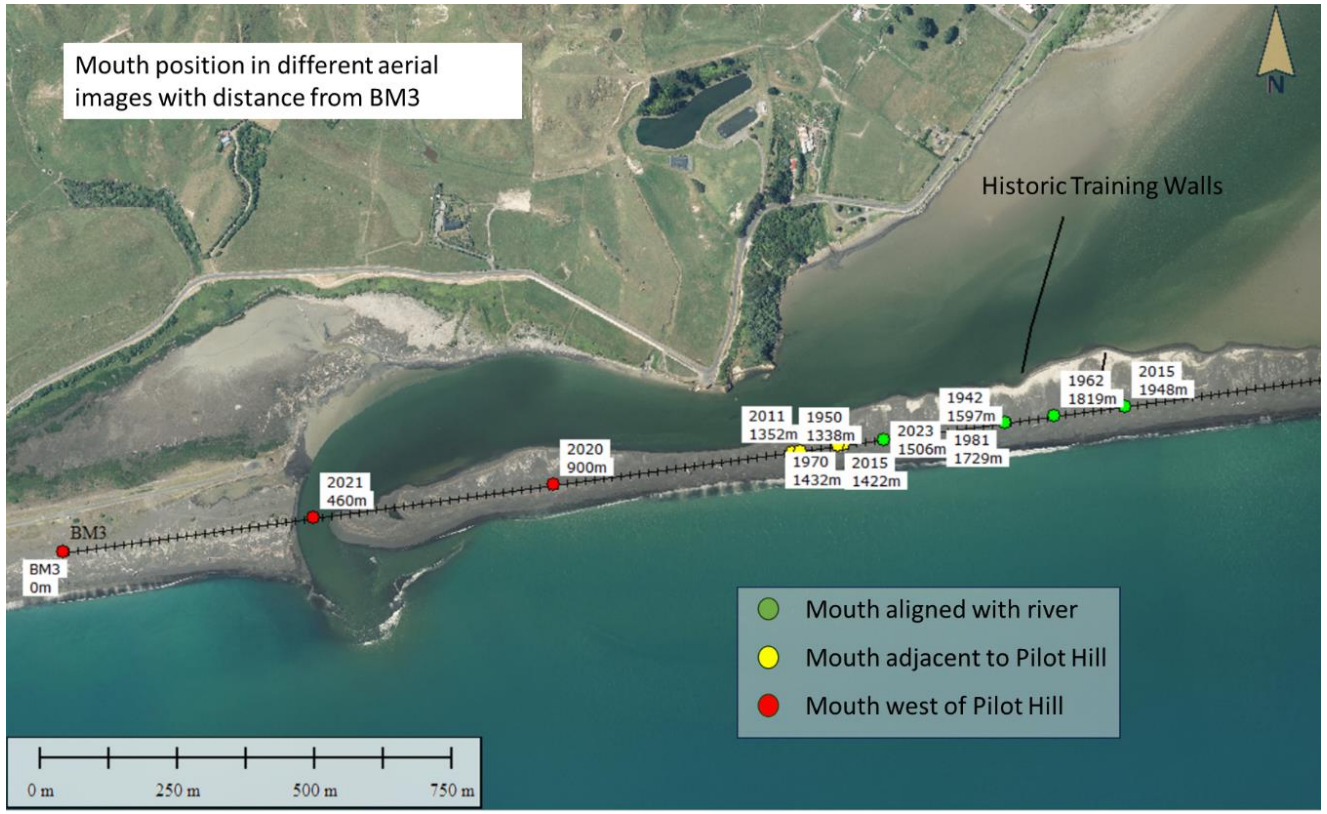


Figure 9-8. Maximum water level difference between a fully open bar and other positions from Figure 9-2 for 1% AEP, current climate event. HBRC cross-sections locations represented by vertical dashed lines.

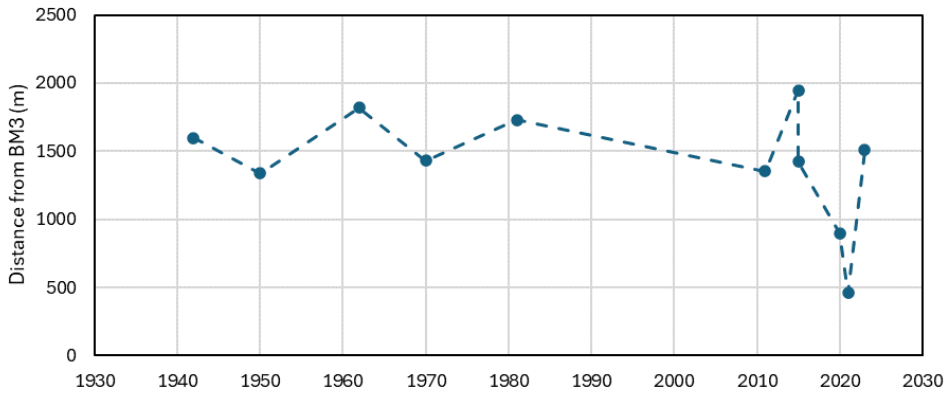
WSP model interpretation

- Results show that the wide-open mouth (March 2023) results in a river level along Kopu Road being 2 - 2.5 m lower when compared to the mouth being located at Whakamahi Lagoon.
- The narrow open mouth results in the river level along Kopu Road being ~1 m lower when compared to the mouth being located at Whakamahi Lagoon.
- Area of highest risk is along Kopu Road and Wairoa Town.
- Influence of river mouth tapers to become negligible at the North Clyde break out point.
- Recommendations for next stages of design:
  - Include dynamic tidal boundary condition, with storm surge and sea level rise scenarios
  - Use the post Gabrielle mouth as the ‘best case’ scenario instead of the ‘open’ mouth
  - Understand the design sensitivity to an ‘unmanaged scenario’ with the mouth located west at Whakamahi.

Tracking river mouth position

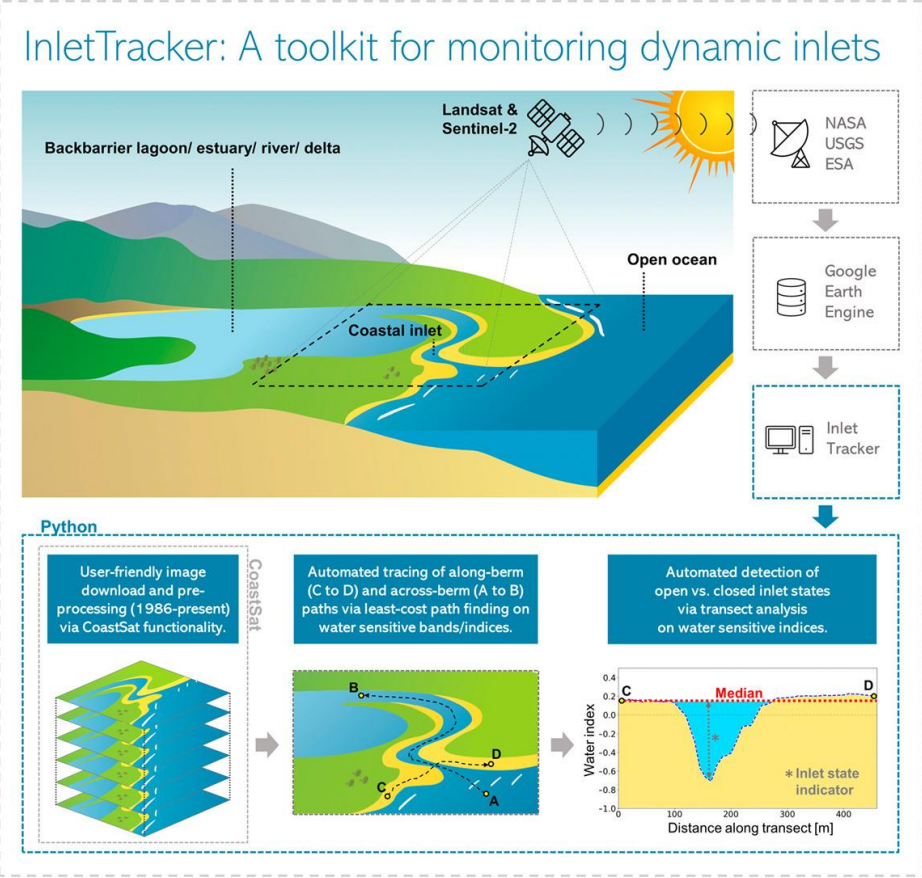


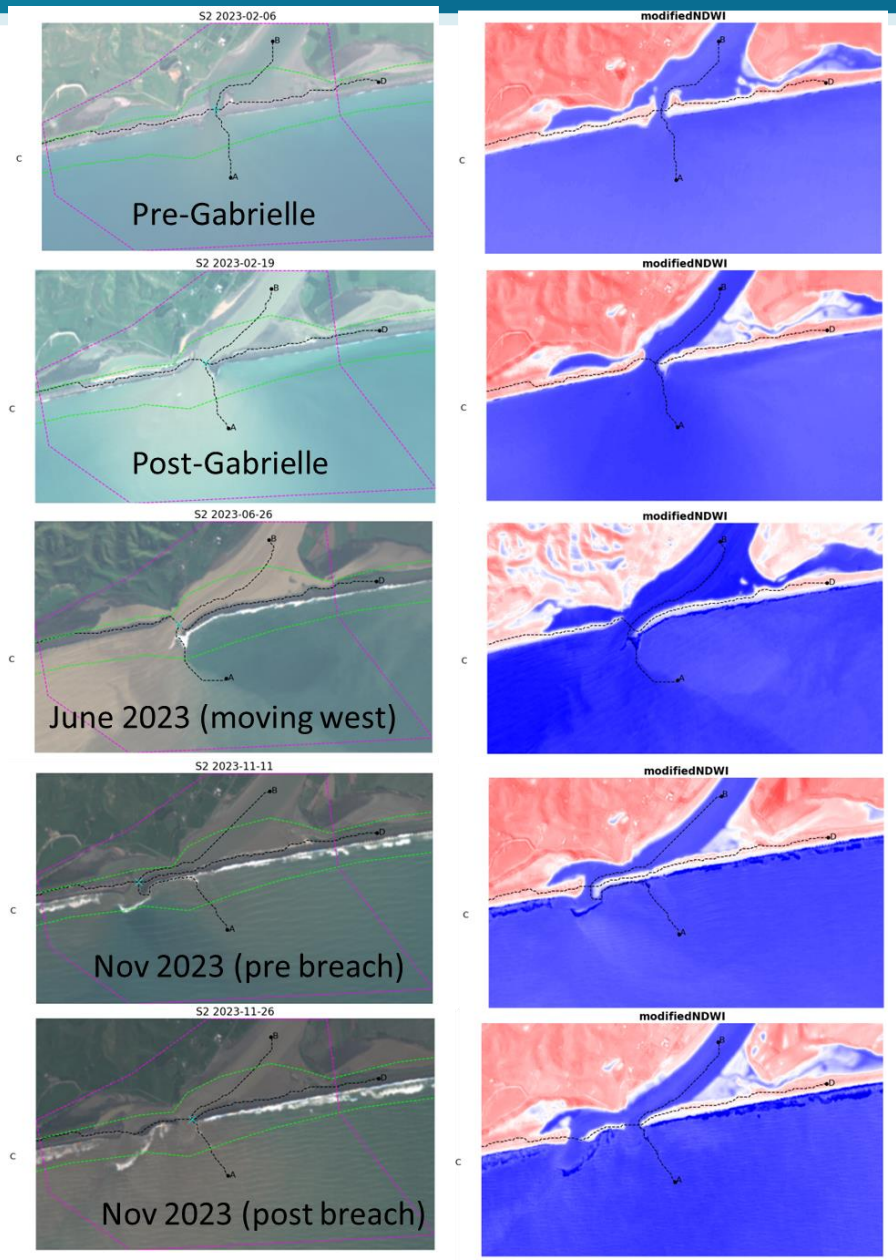
LINZ aerial images
- useful, but not frequent enough
alternative methods required



Satellite tracking

590 cloud free images from the last 10 years, used to track rates of change / migration





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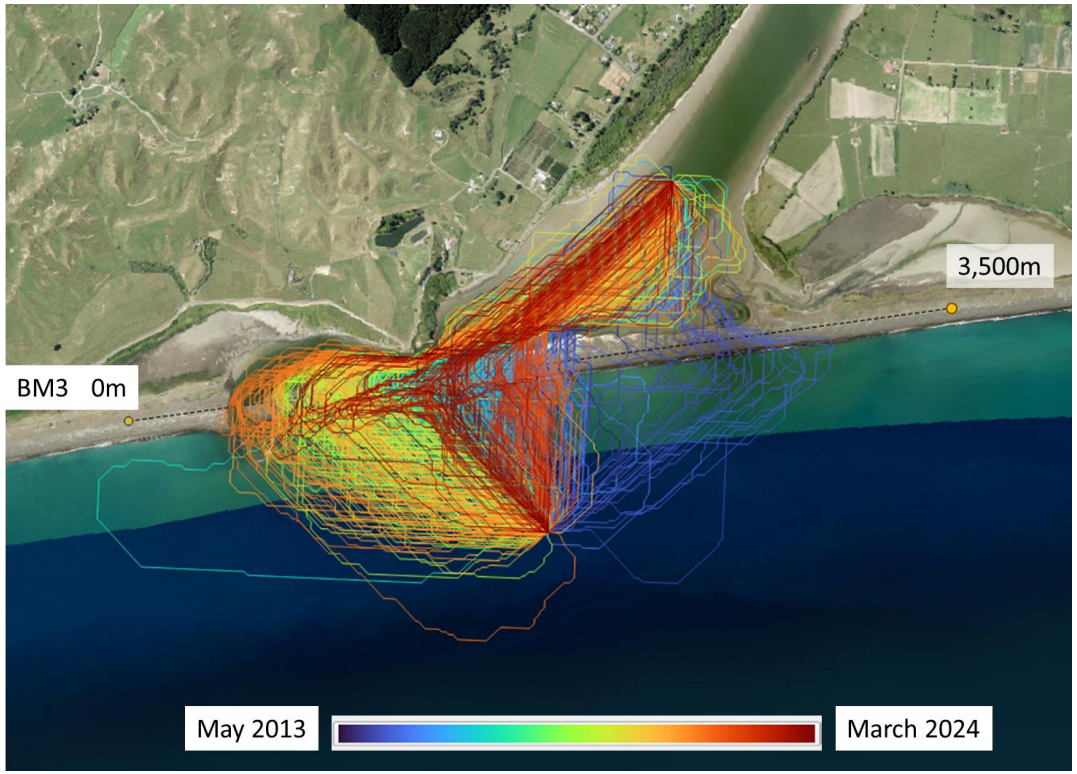
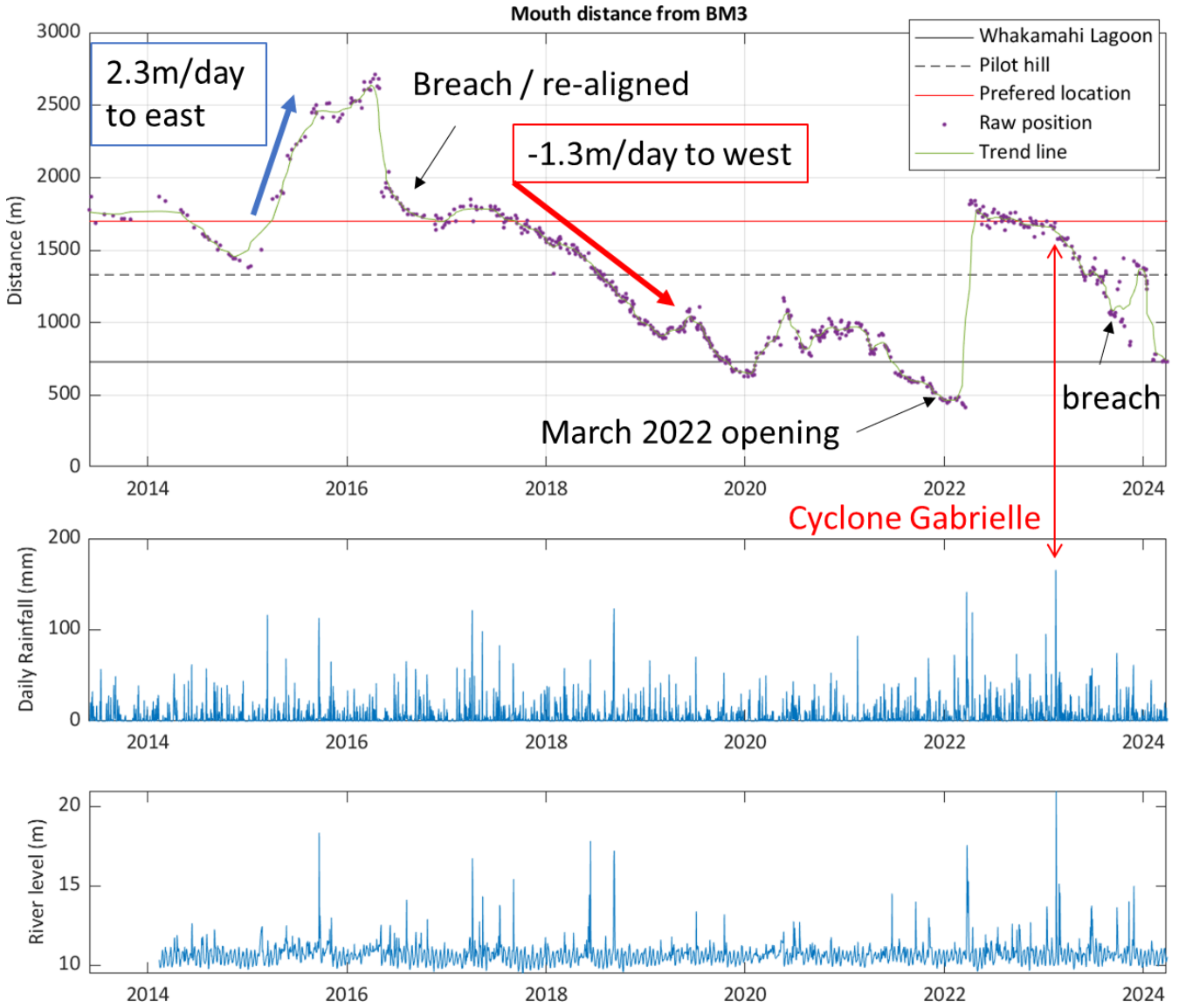
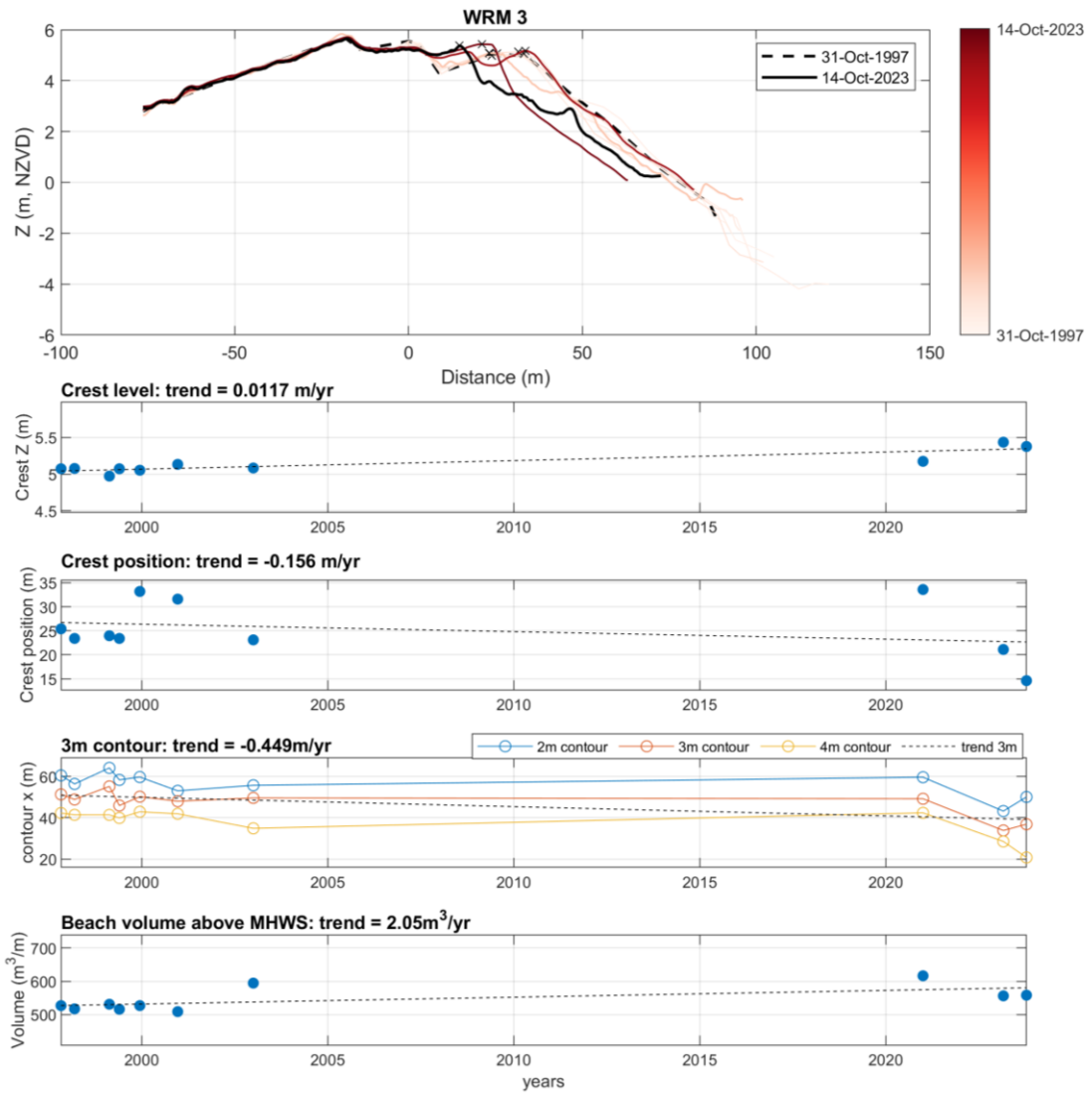




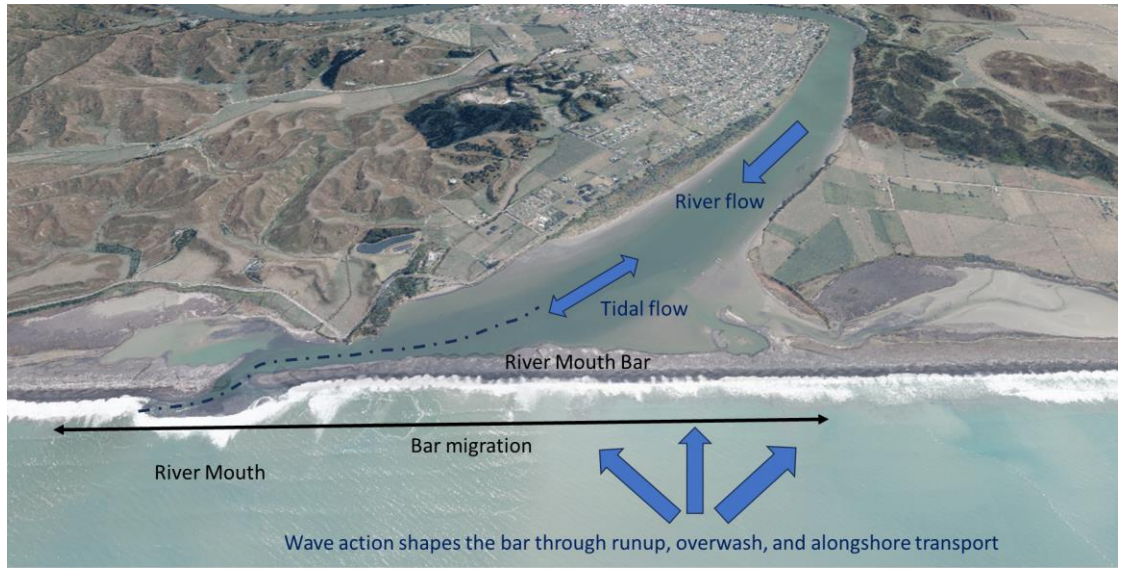
Bar / beach topography change



- Monitoring from 1997 – 2023
- LiDAR and beach profile surveys
- 9 – 12 surveys per profile location

Location	Average Crest level (mRL)	Crest level / position trend	Beach trend	Volume trend
Whakamahi	5.2	Accretion / landward	Eroding -0.43 m/yr	Dynamically stable
Mouth	4.8	Accreting / landward	Eroding -0.55 m/yr	Dynamically stable
Ngamotu	6.3	Consistent / landward	Eroding -0.7 m/yr	Loss in volume

Coastal process summary



- Alongshore transport direction very sensitive to supply and small changes to wave direction
- Bar migration typically to west with correlation to wave climate not established
- Once opening moves west of Pilot Hill, breaching is required to re-establish opening to the east
- Bar crest shaped by wave overwash
- Coast is generally eroding in a ‘barrier roll over’ response to sea level rise.
- Waves wash into river when mouth is open.

To improve understanding of coastal processes:

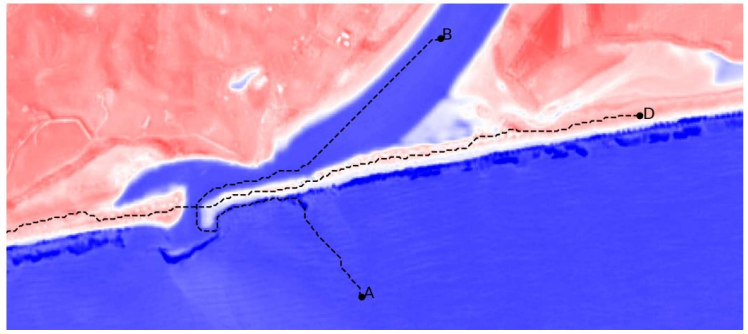
- Local wave climate: Wave buoy to calibrate regional models
- Bathymetry: nearshore surveys, but likely to be very dynamic and challenging
- Coastal change: UAV surveys could be undertaken

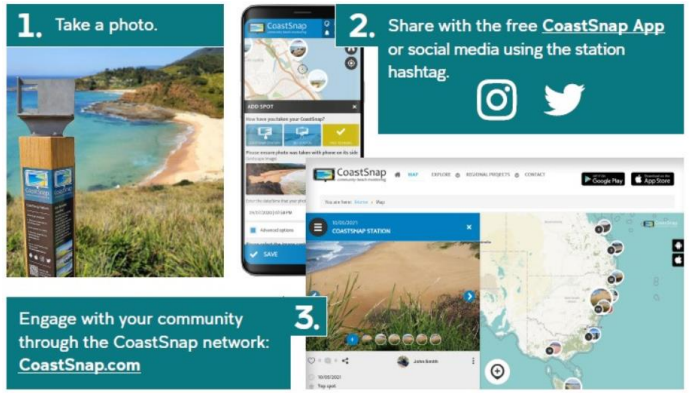
Options

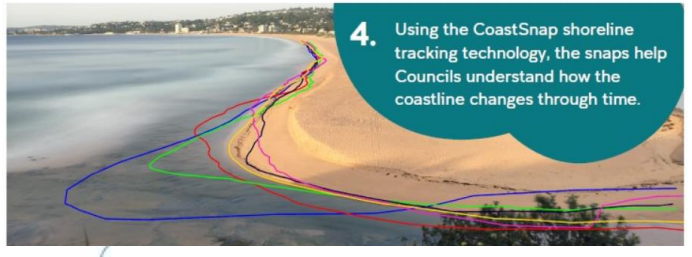
1. Mechanical openings informed by monitoring
2. Coastal engineering structures for the river mouth
3. Land based flood resilience

Monitoring to inform openings

- **Bar position**
  - Is the bar in a position that elevates flooding risk?
  - Monitoring options:
    - Satellites (delay 1 – 2 weeks, weather sensitive)
    - Fixed cameras (live video or timelapse photo)
    - Community / citizen science photos
    - Visual inspection by council or community





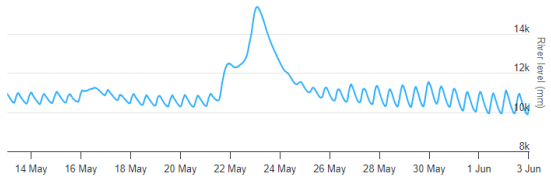


Monitoring to inform openings

Rainfall and river level

Monitor to understand risk of flooding

- Rainfall forecast
- River level measurements
- On the ground observations / experience



Waves and tide

Monitor to plan opening event

- Tide conditions for prep / opening
- Wave conditions for prep / opening

Thresholds

Thresholds to be confirmed based on local knowledge, available data, through consultation with contractors, community, and councils:

- Bar position to understand risk profile
- Rainfall accumulation for mobilising contractor
- River level for operational opening
- Waves and tide for operational opening

Actions

- Open bar (using local knowledge and experience)
- **Review**
  - Risk levels
  - Thresholds
  - Actions / effects / effectiveness

Coastal / river engineering options

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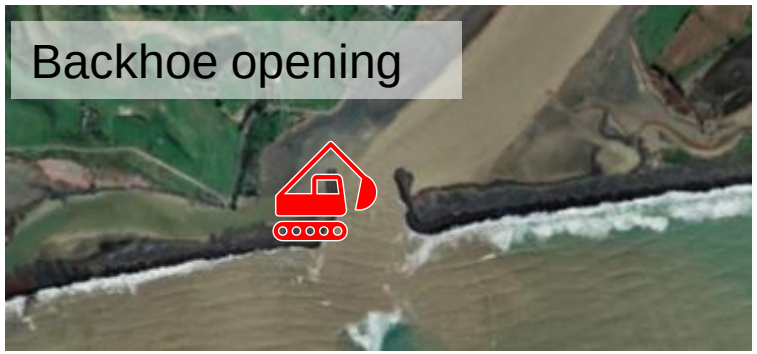

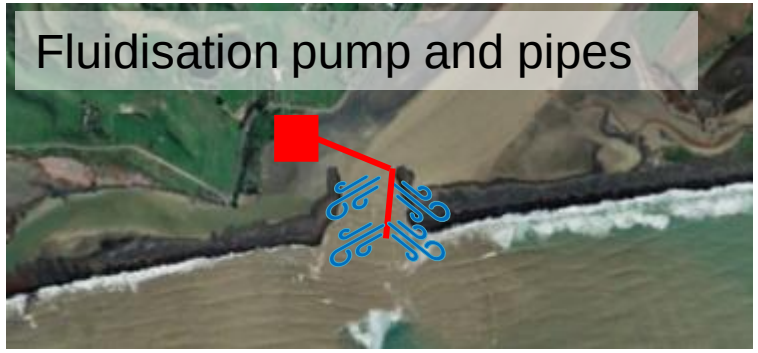

Modern training walls

Objective to stabilise river mouth in preferred location for river discharge

Limitations

- Environmental complexity
- Complex design (coastal, river, seismic, environmental)
- Ongoing maintenance dredging
- Sea level rise and coastal inundation still pose a risk
- Cost: Ōpōtiki approx. $100M with business case based on navigation for open ocean aquaculture
- Timeframe can be 10+ years from initial site feasibility to construction. (Ōpōtiki was approx. 20 years)

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