Modelling Group
WATER NEW ZEALAND

Modelling Symposium

Waikato River Stop Bank Failure Modelling for Rangiriri West – 450-year ARI

Presented by
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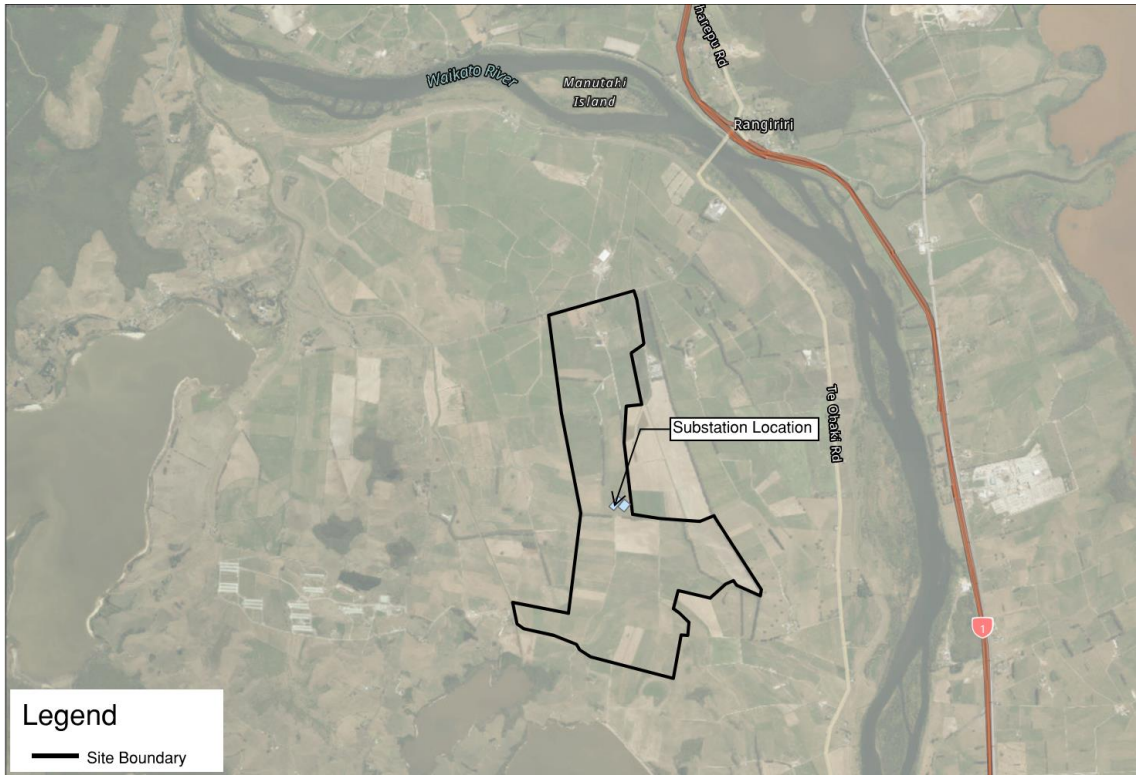
The New Zealand Water & Wastes Association Wai ora Aotearoa

Agenda

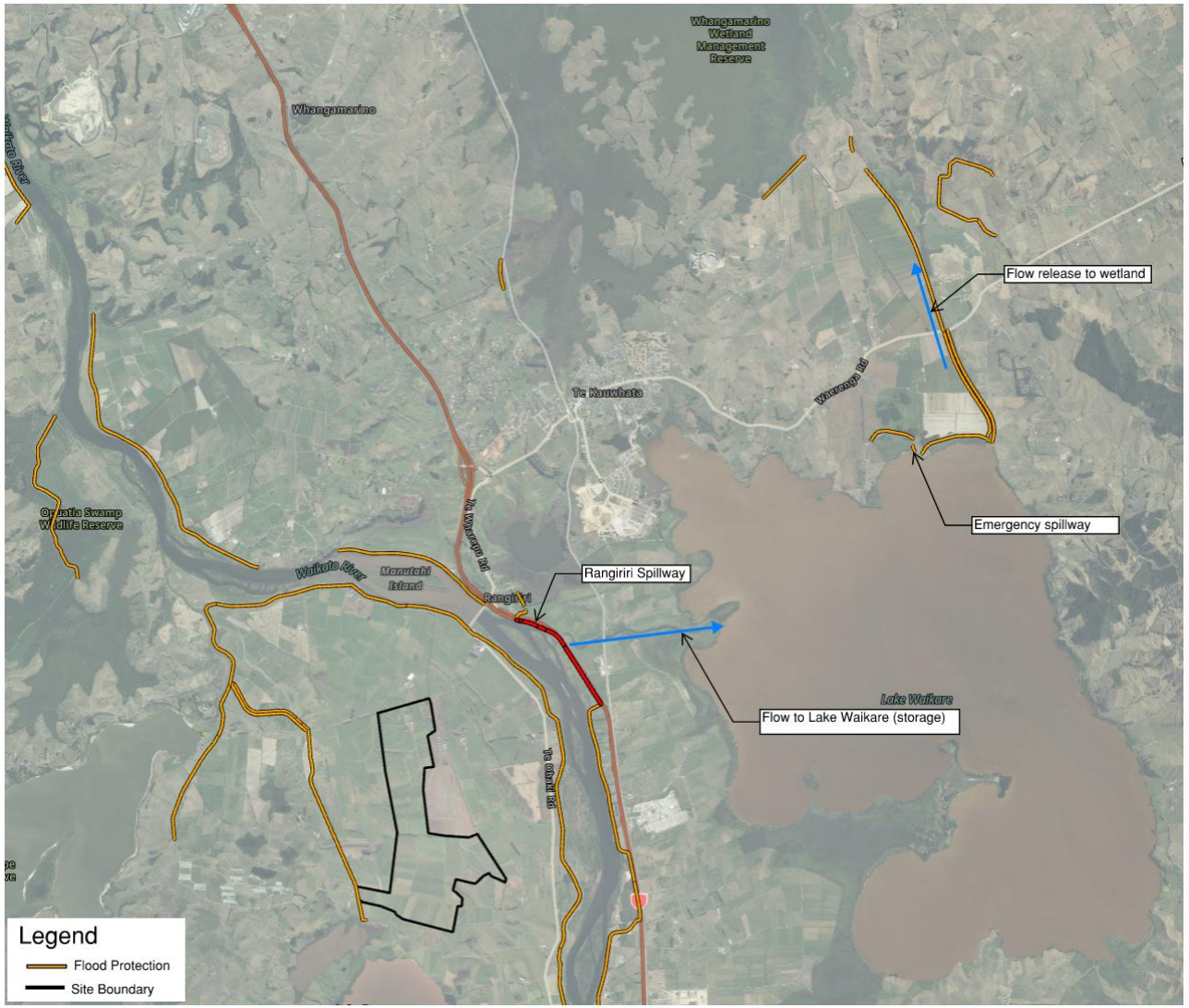
1. Introduction
2. Model Setup
3. Stop Bank Failure Scenario
4. Model Results
5. Conclusion
6. Project Challenge

Introduction



- Solar panel farm site in Rangiriri West.
- Flood modelling to understand impact on the proposed facility.
- Extra resilience required for the proposed substation.
- Extreme event modelling (450-year ARI) plus stop bank failure scenario modelled.

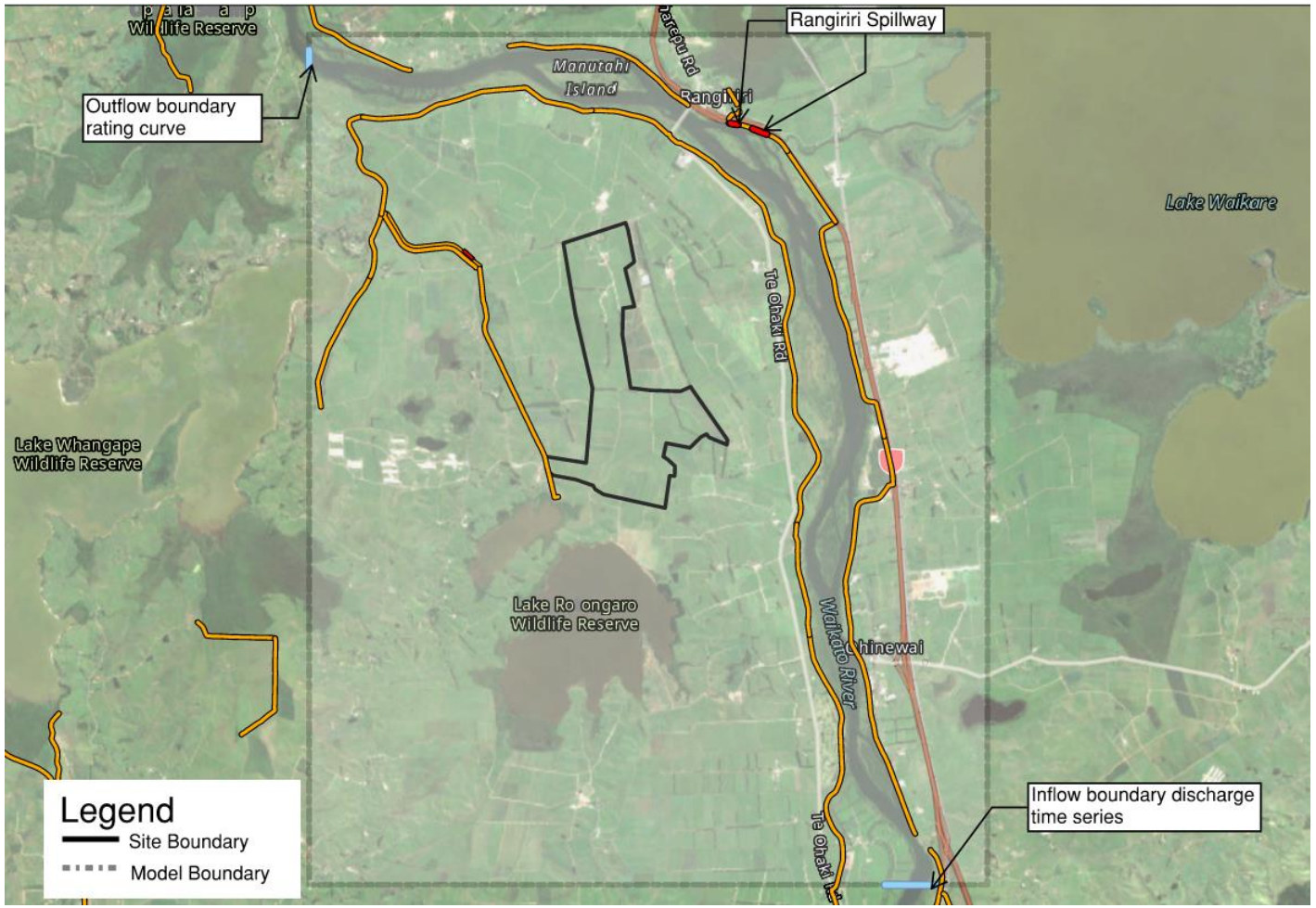
Flood Protection Scheme



- Stop banks are captured by the LiDAR and represented by the raised ground level.

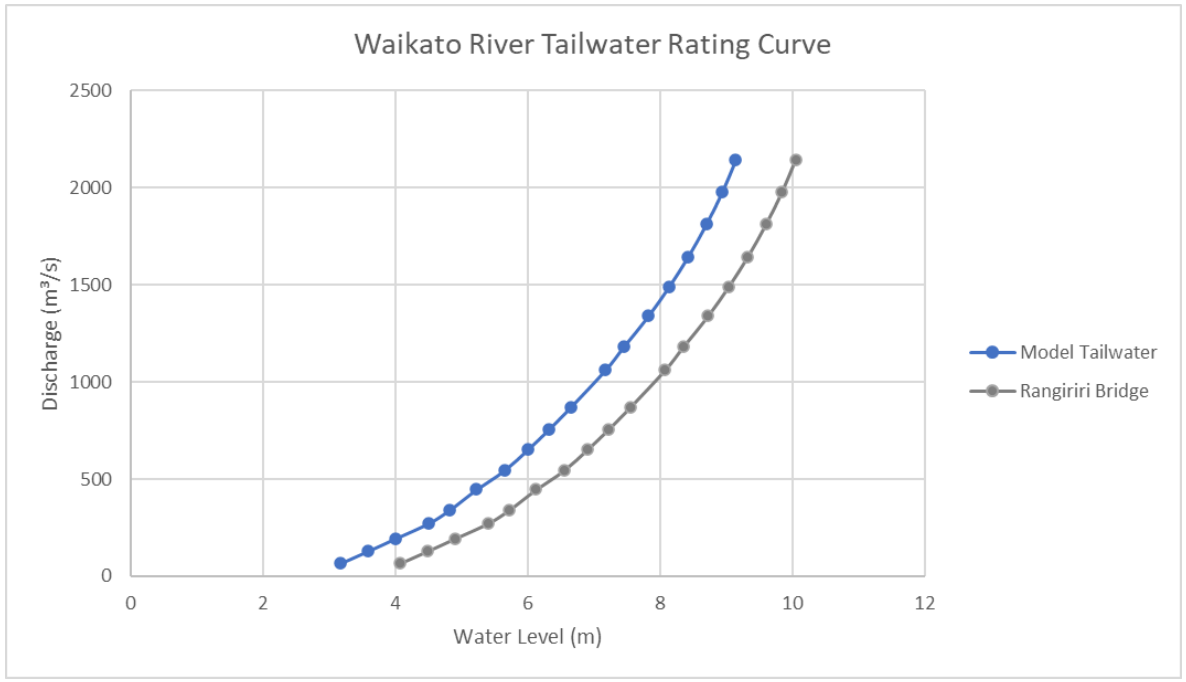
Model Setup

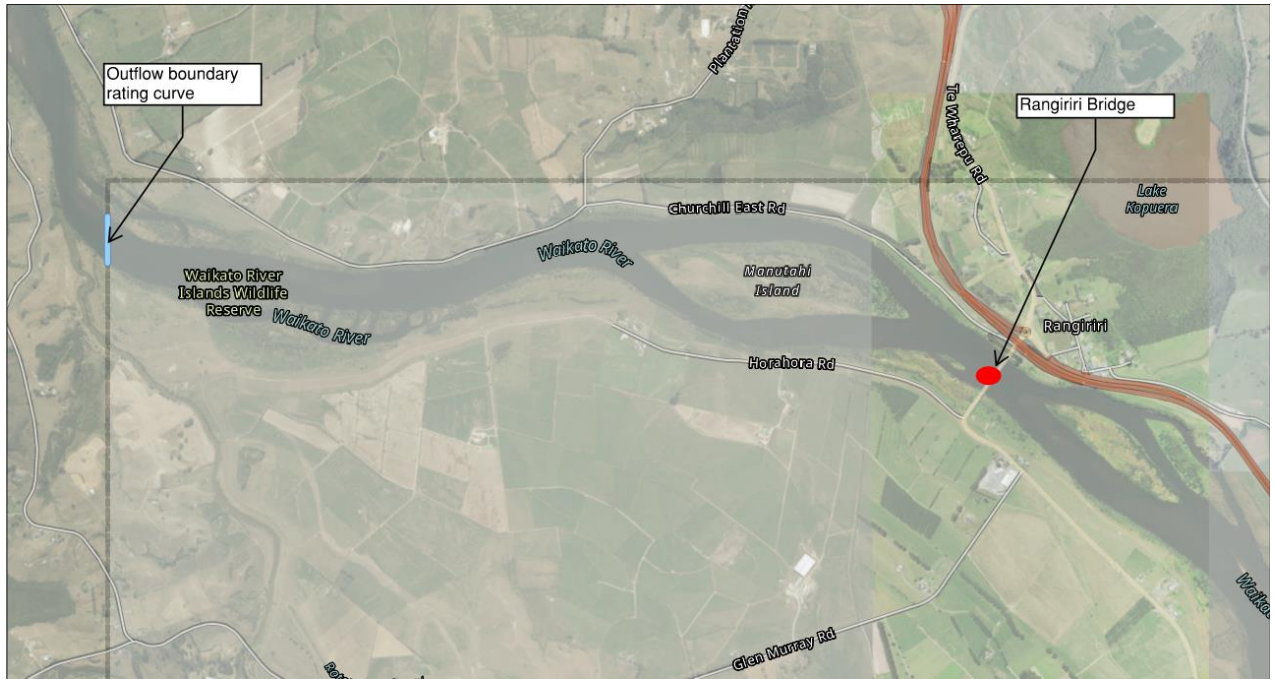
Model Setup – General



- MIKE 21 FM, square mesh 5m*5m
- Model extent limited by the available LiDAR
- Terrain data obtained from published LiDAR
- Waikato River inflow boundary condition represented as discharge time series.
- Waikato River outflow represented by water level rating curve.
- Rest of the boundary set as free flow open boundary. Particularly allowing retention function at Lake Waikare.
- Values used for boundary condition are representing the 450-year event.

Model Boundary Condition –
Waikato River Tail Water Level

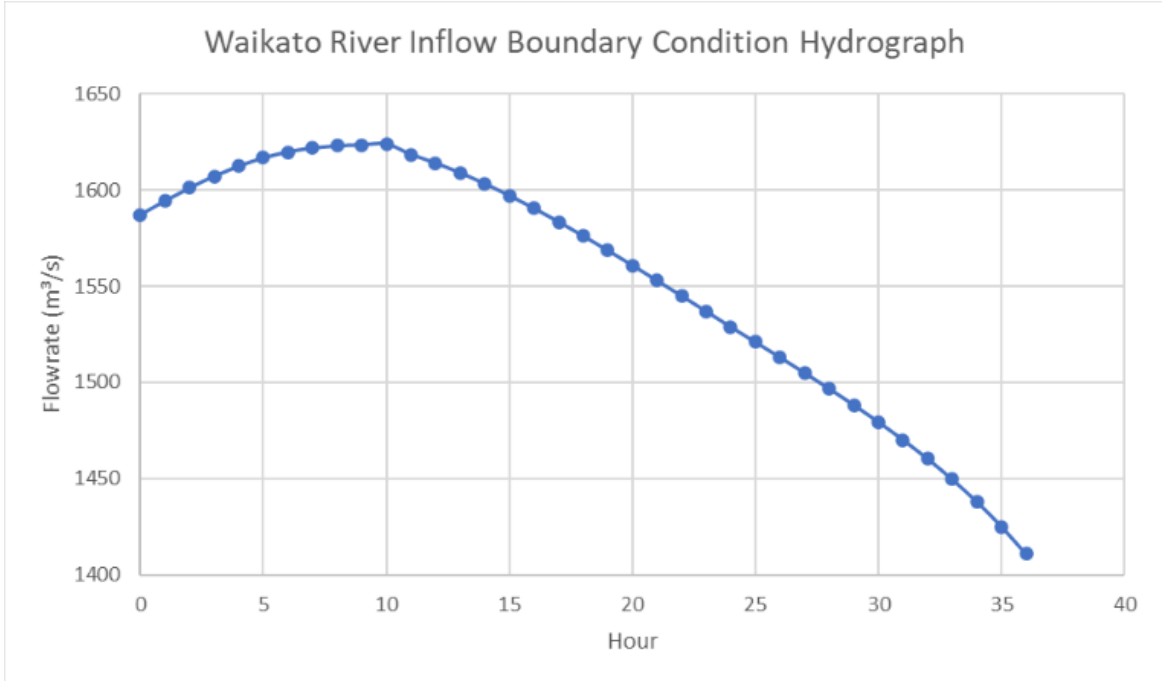




- Tailwater level boundary condition derived from level at Rangiriri Bridge.
- The water level is applied as rating curve in the model.

Reference: Rangiriri Spillway and Lake Waikare Hydraulic review – 13 July 2005

Model Boundary Condition – Waikato River Inflow



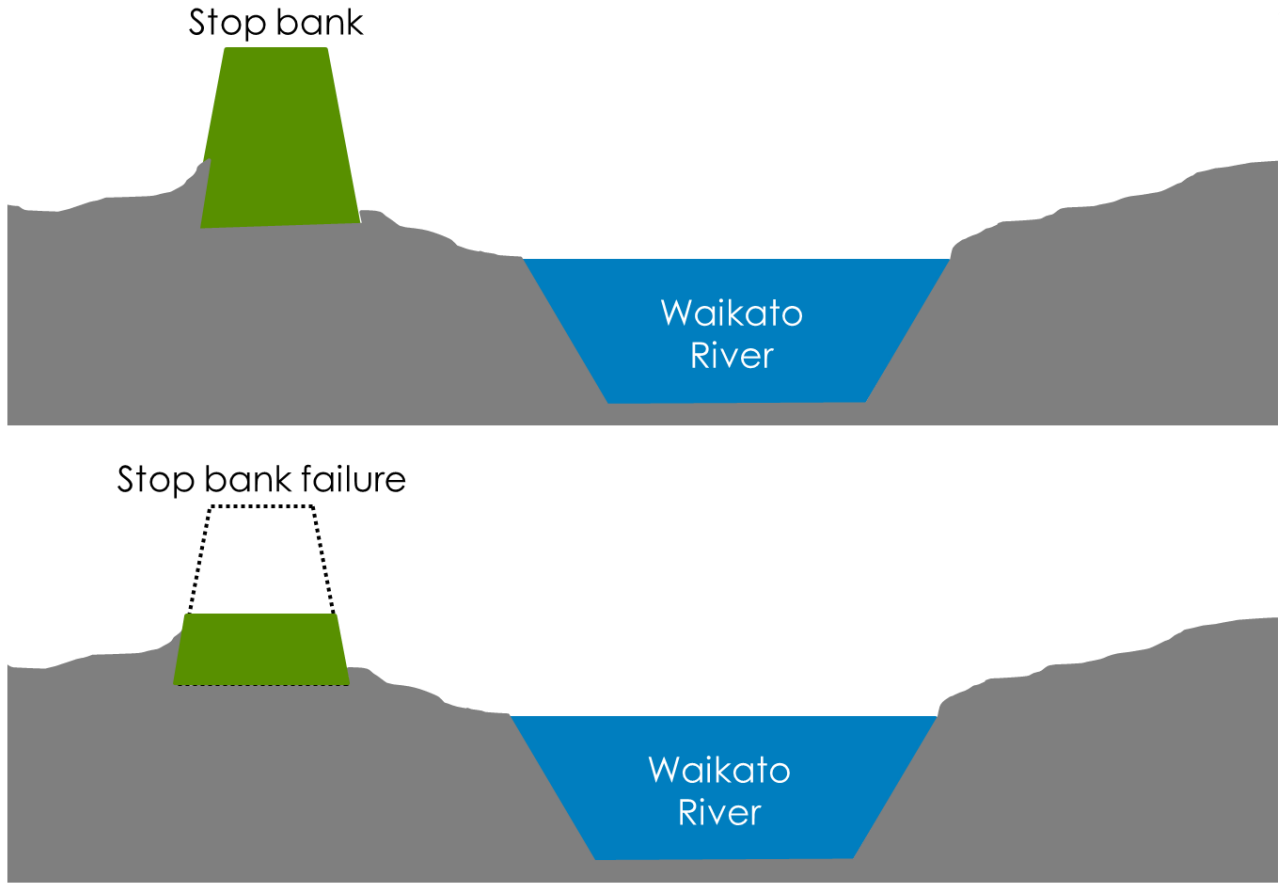
- Inflow taken from Huntly Power Station.
- Inflow reduced for water level accounted in LiDAR.
- The difference in discharge is not expected to be significant in respect to scale of the assessment.

Reference: Rangiriri Spillway and Lake Waikare Hydraulic review – 13 July 2005

Stop Bank Failure Scenario

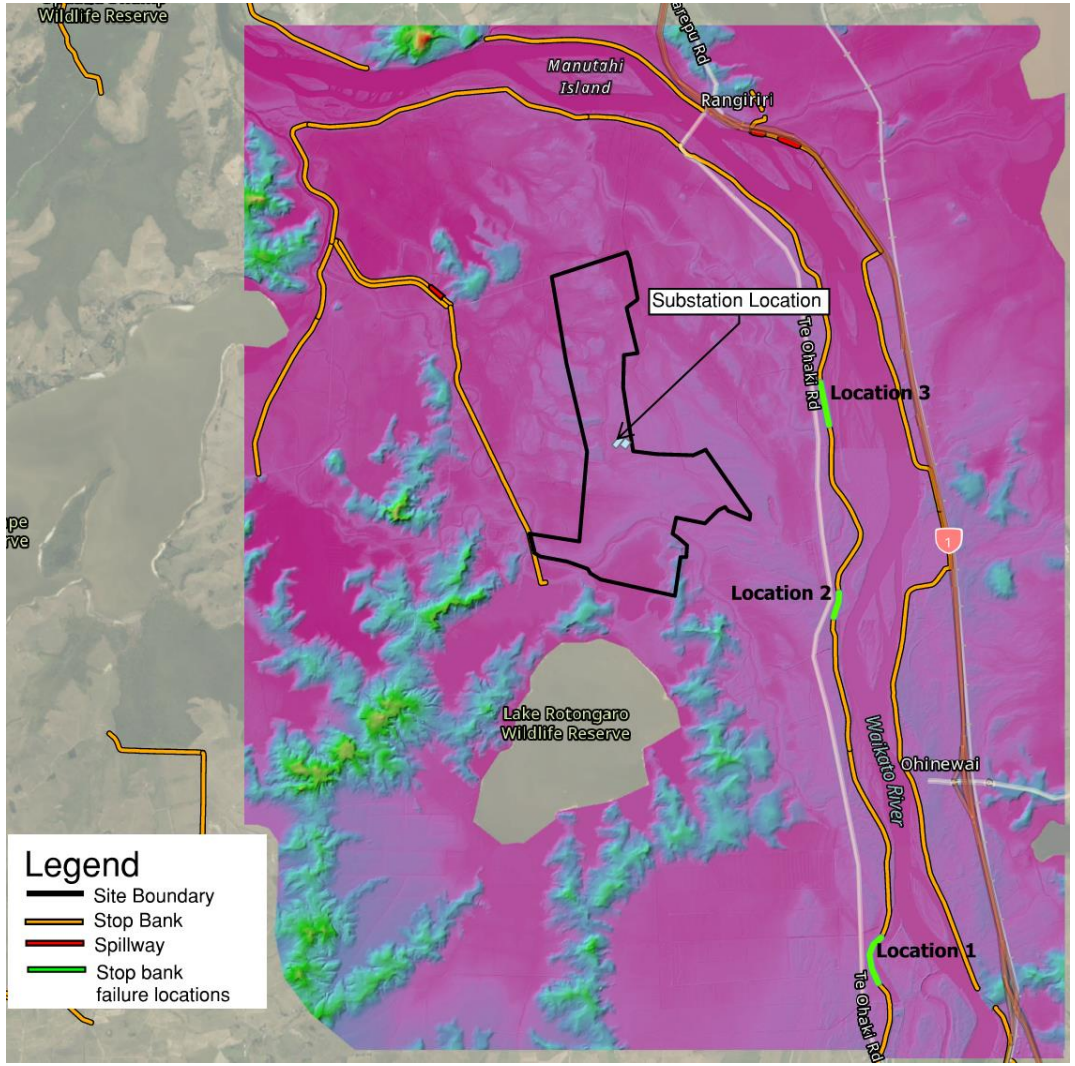
Reference: Rangiriri Spillway and Lake Waikare Hydraulic review – 13 July 2005

Stop Bank Failure Mechanism



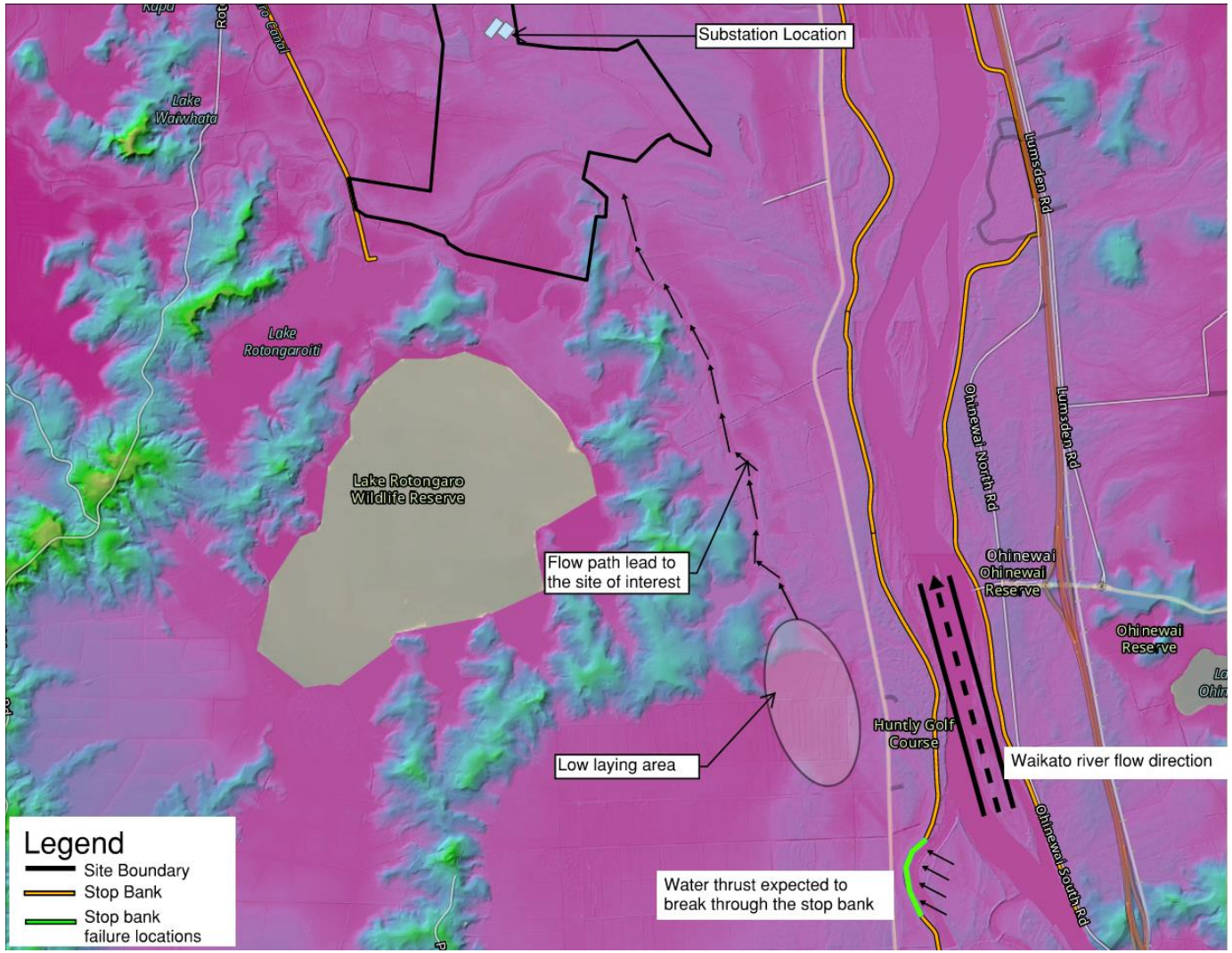
Stop Bank Failure Locations – Location Overview

- Three locations selected expecting most server flooding at the substation location
- The locations were selected based on the river flow directions and topography.



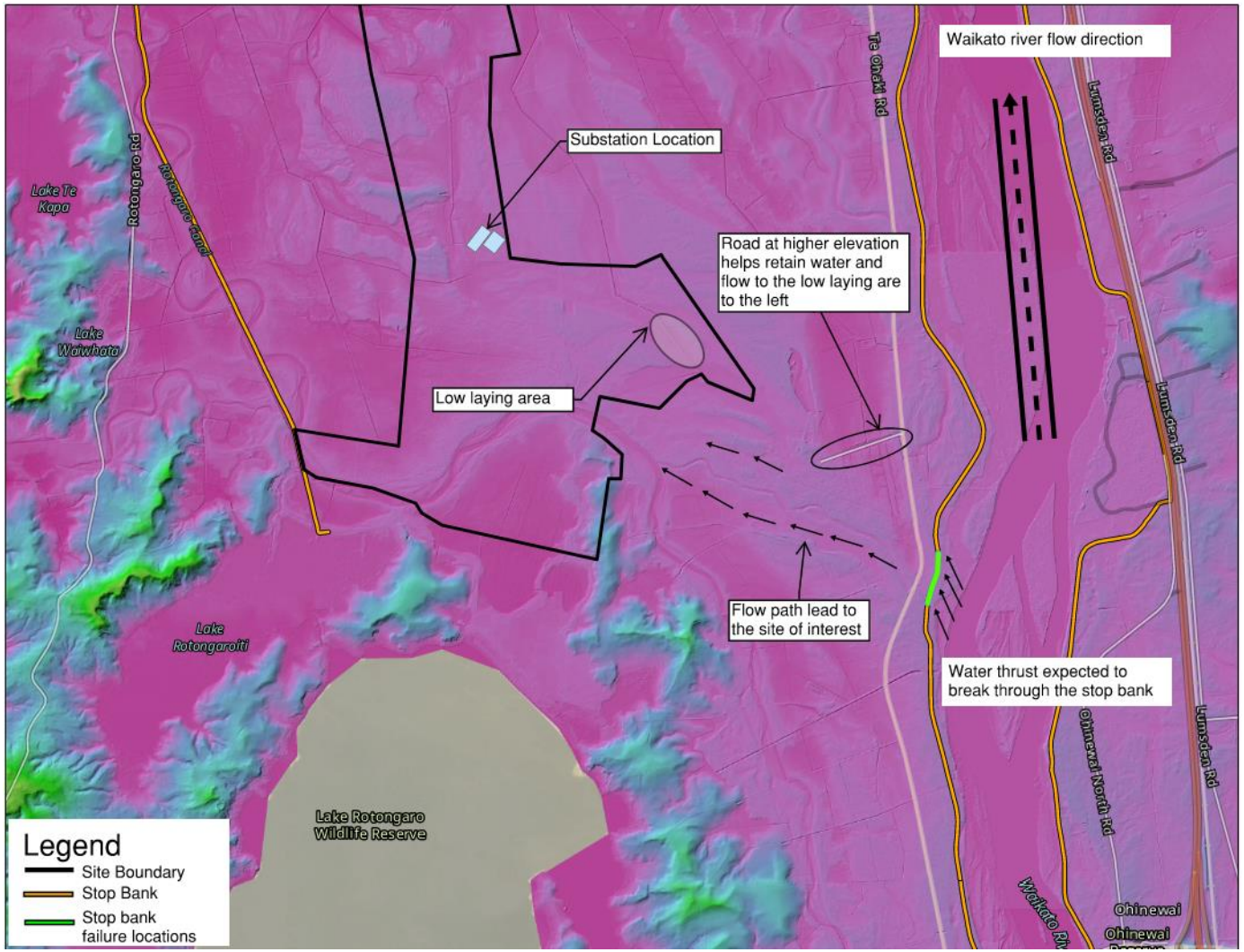
Stop Bank Failure Locations – Location 1

- The location is at a river curvature and hydraulic energy is expected to be high.
- The location also followed by a low laying area and water courses leading to the site.



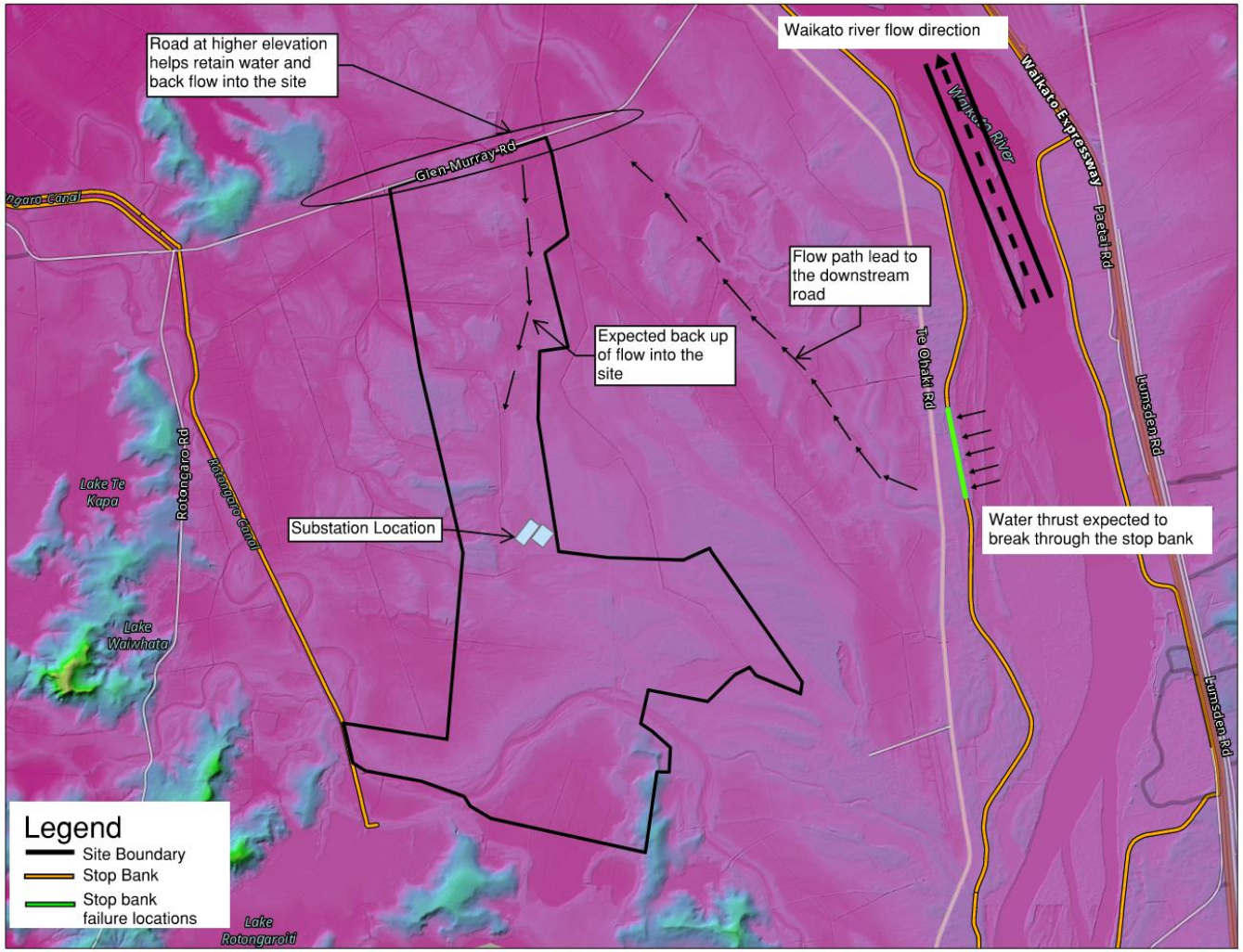
Stop Bank Failure Locations – Location 2

- The location is followed by a diagonal access road at higher elevation.
- The location also followed by a low laying area and water courses leading to the site.



Stop Bank Failure Locations – Location 3

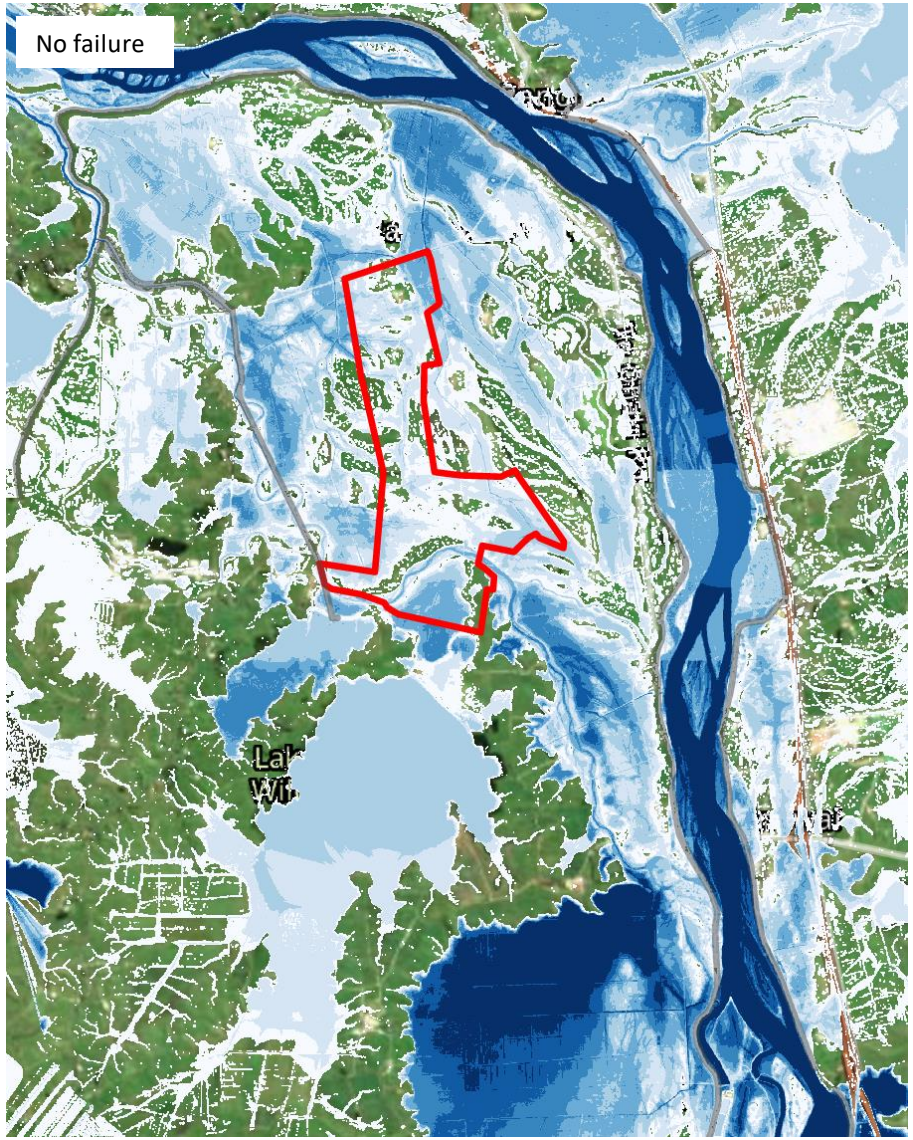
- Flow is expected to accumulate at Glen-Murray Rd which would back up into the site.

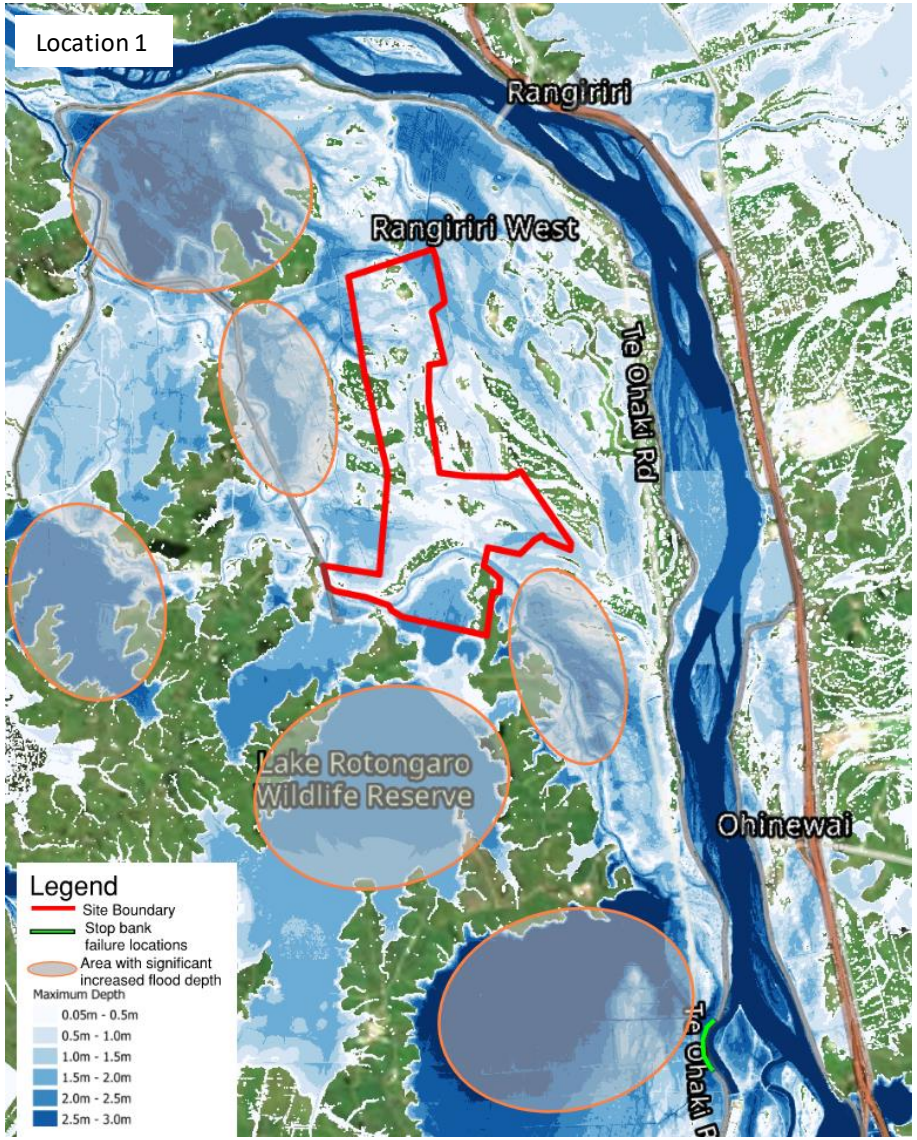


Model Results

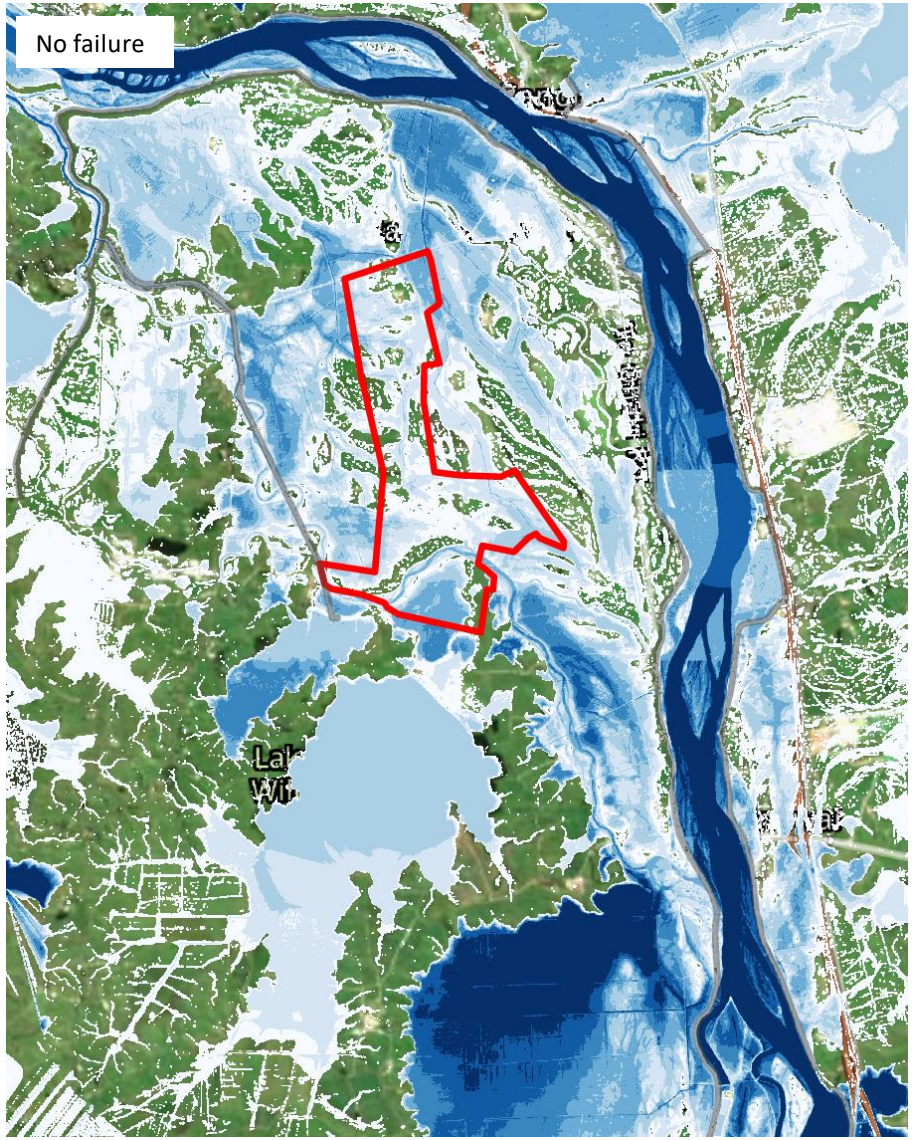
Reference: Rangiriri Spillway and Lake Waikare Hydraulic review – 13 July 2005

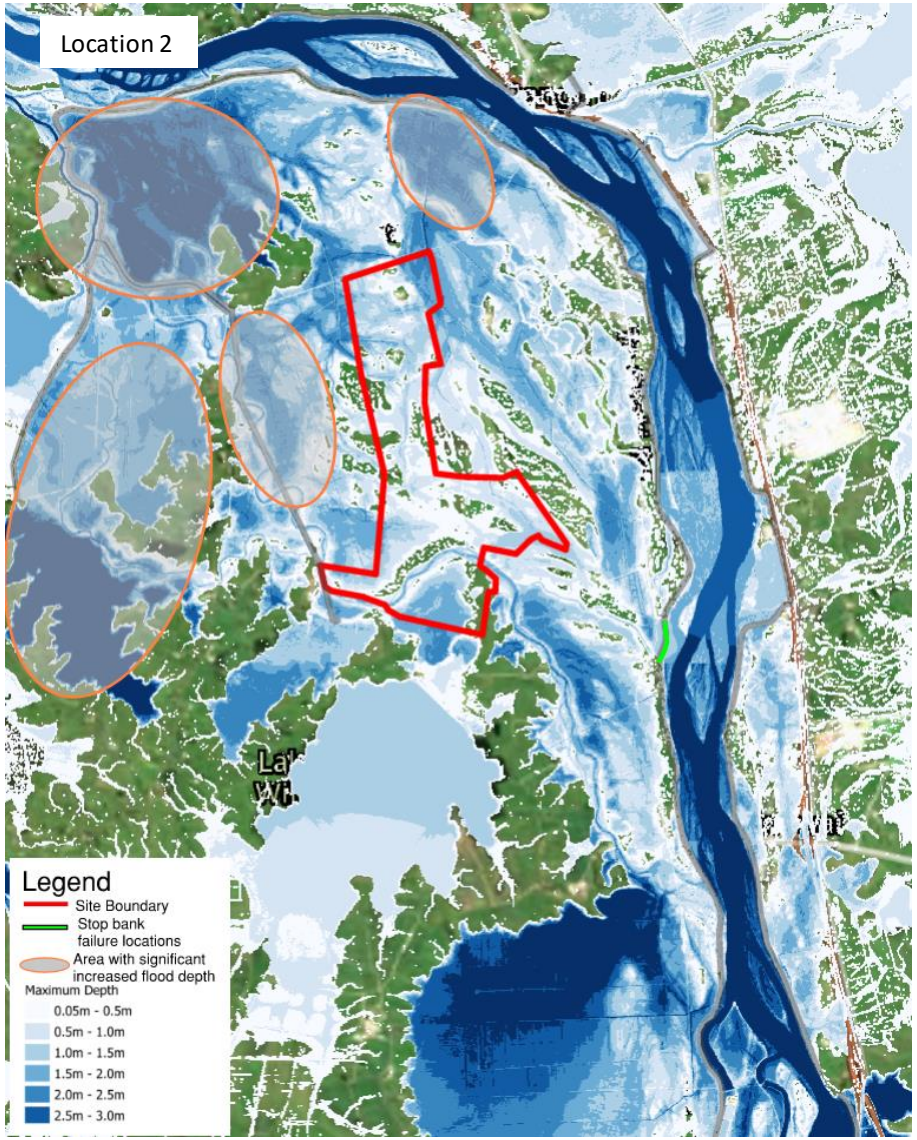
Model Results - 450-year ARI Failure Location 1



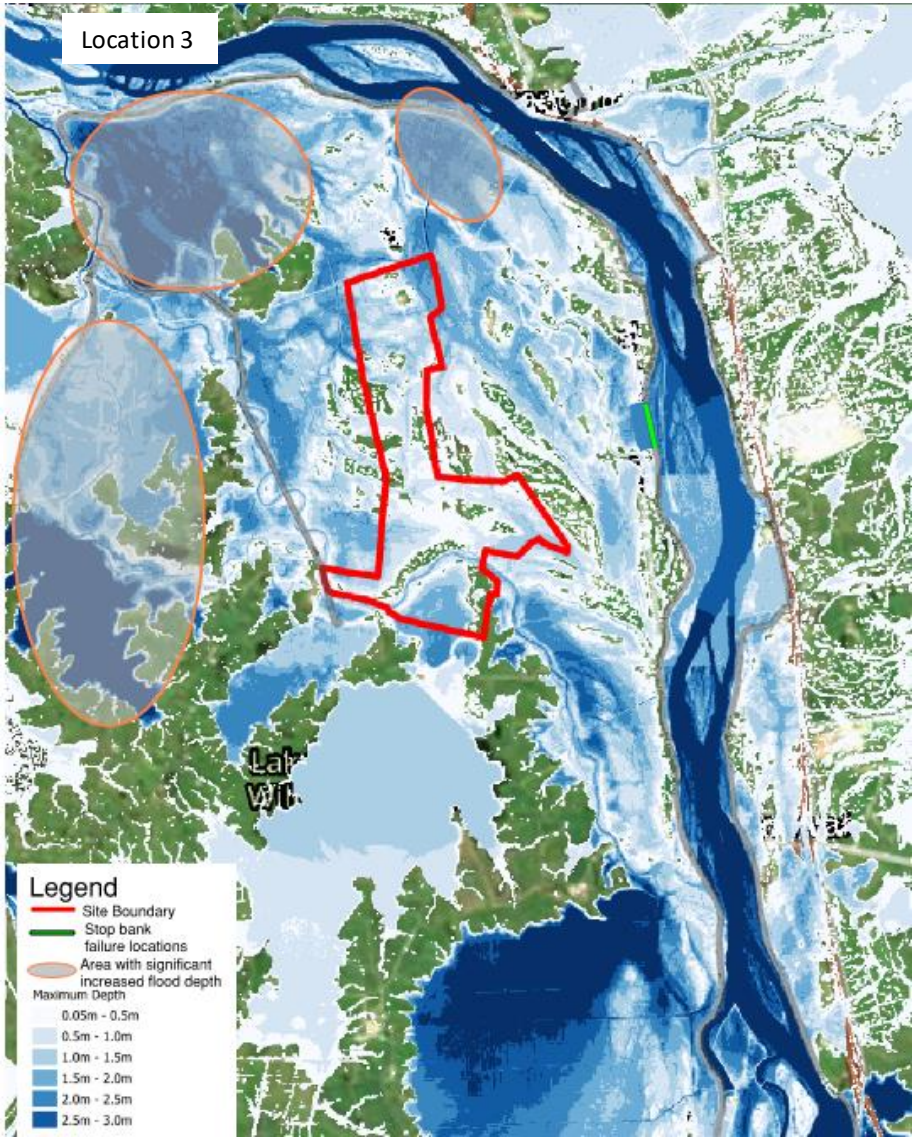


Model Results - 450-year ARI Failure Location 2





Model Results - 450-year ARI Failure Location 3



Conclusion

- Failure location 1 caused most severe flooding at the site of interest.
- The site location is at a relatively higher ground and the impact of the stop bank failure is not significant in terms of the flood depth.
- The three different failure locations show significant increase in flood depth in similar locations.
- From the no failure results, we can see spill of stop banks near the inflow boundary condition which may have potential effects on the results. Extent of model extent may improve the situation with better transition of inflow.

Project Challenges

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Thank you!
Questions? Patai?

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