

Rees / Dart Modelling

2021 Study



LANDRIVERSEA



CONSULTING

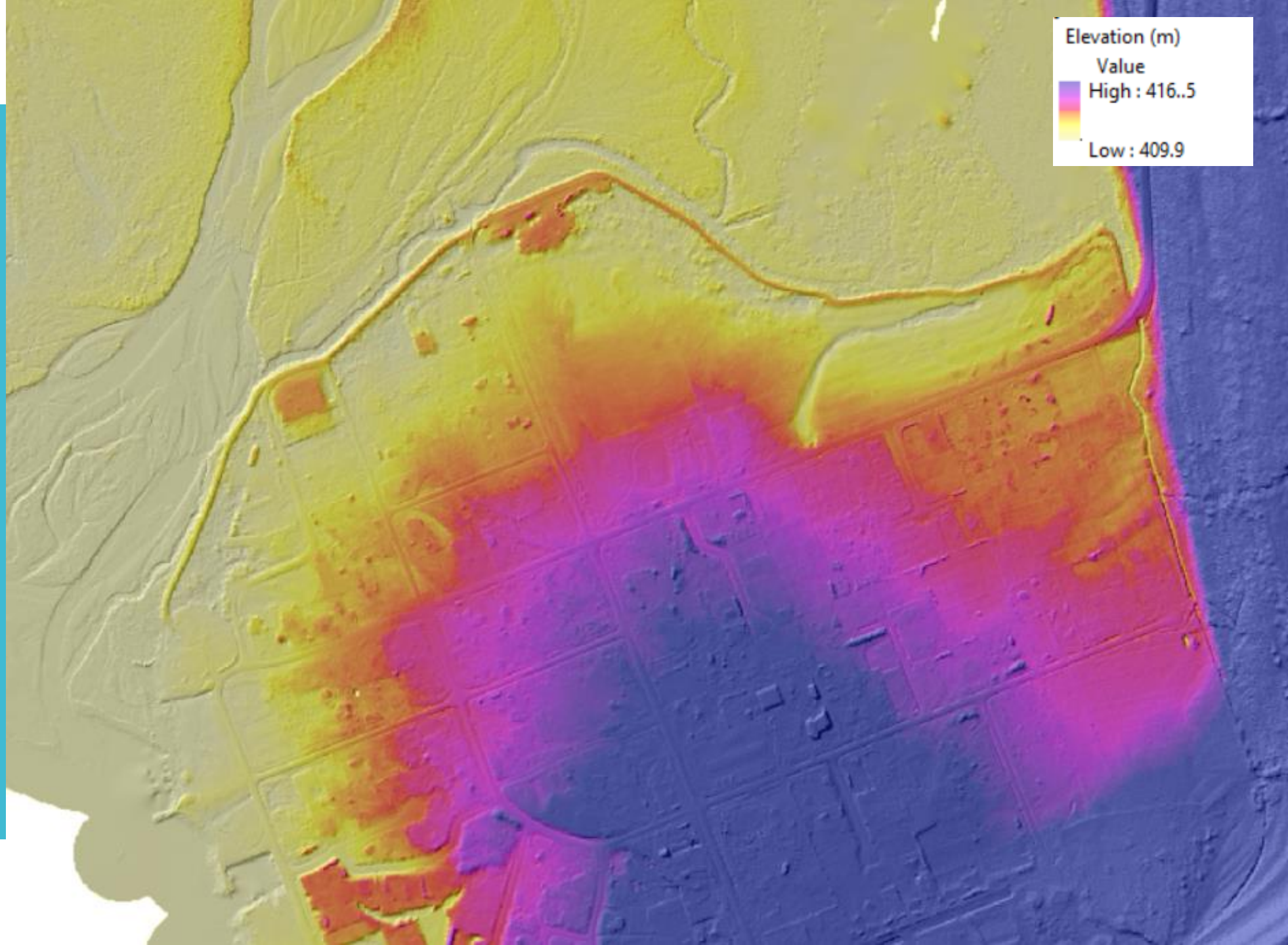
Model Extent



Model Setup

- Based on 2019 LiDAR DEM flow by LandPro
- Fixed bed model – so doesn't account for scour and aggradation – these effects need to be manually accounted for
- Main input is flow and downstream boundary level (ie Lake Level)
- Flow inputs developed ORC – complex hydrology due to lack of gauging information
- Model can output – Water Level – Depth – Velocity – Shear Stress – Hazard etc to help better understand dynamic nature of the hazard
- Model is only a tool to help understand the real world – must always be interpreted in light of limitations.

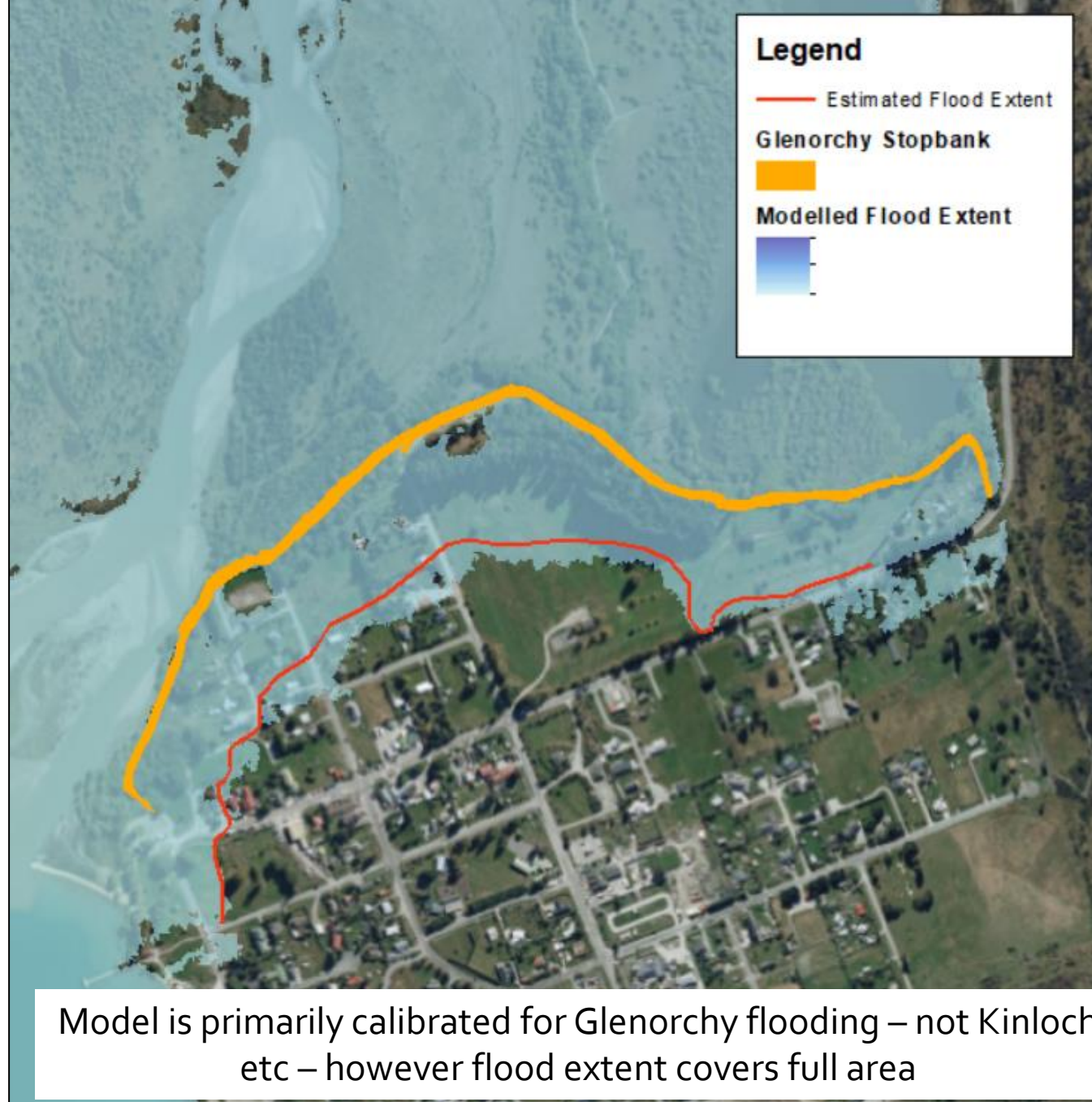
Underlying LiDAR data



Model Calibration

Feb 2020 Event

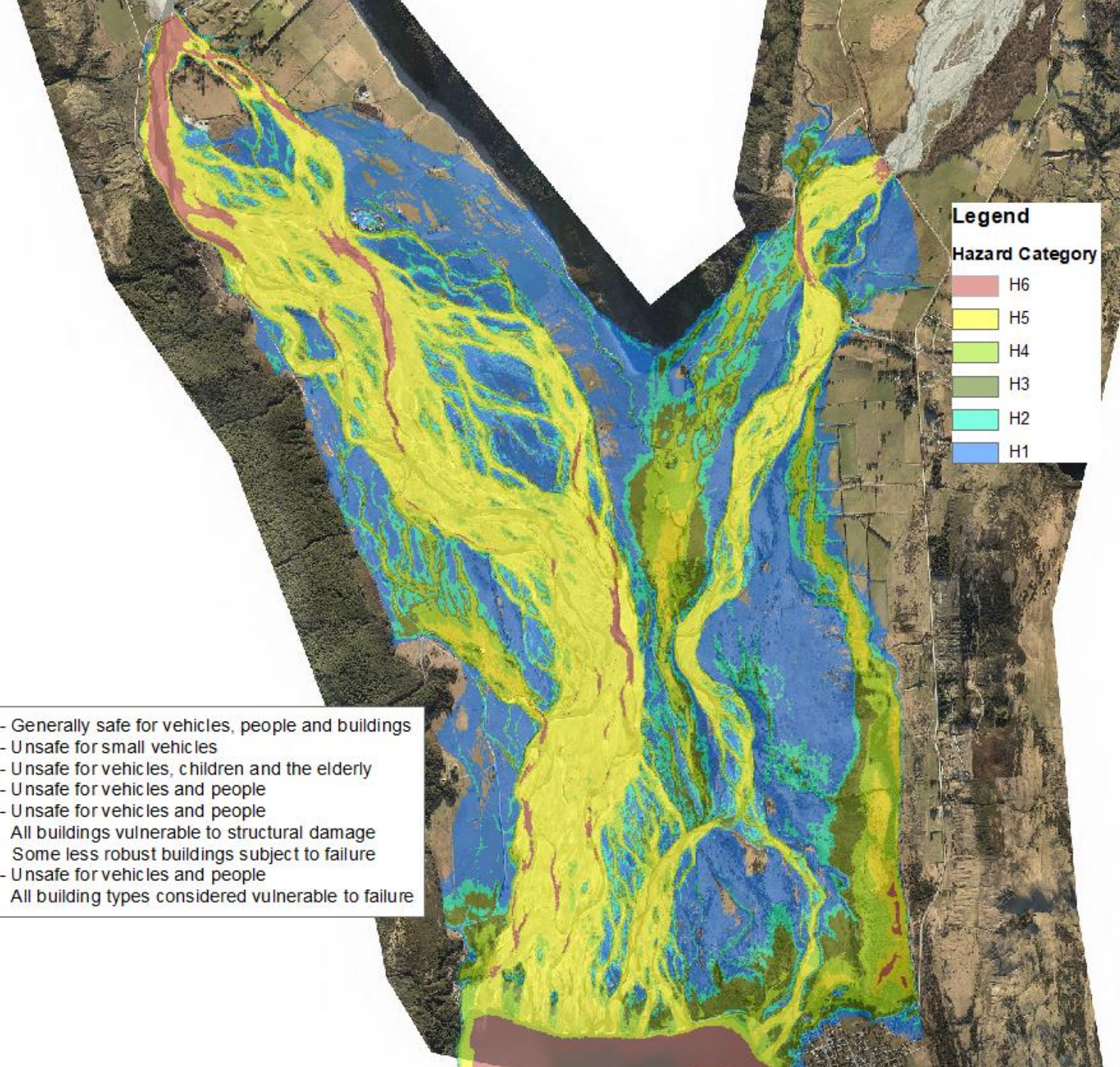
Calibration – Feb 2020 event



Animation (Glenorchy)

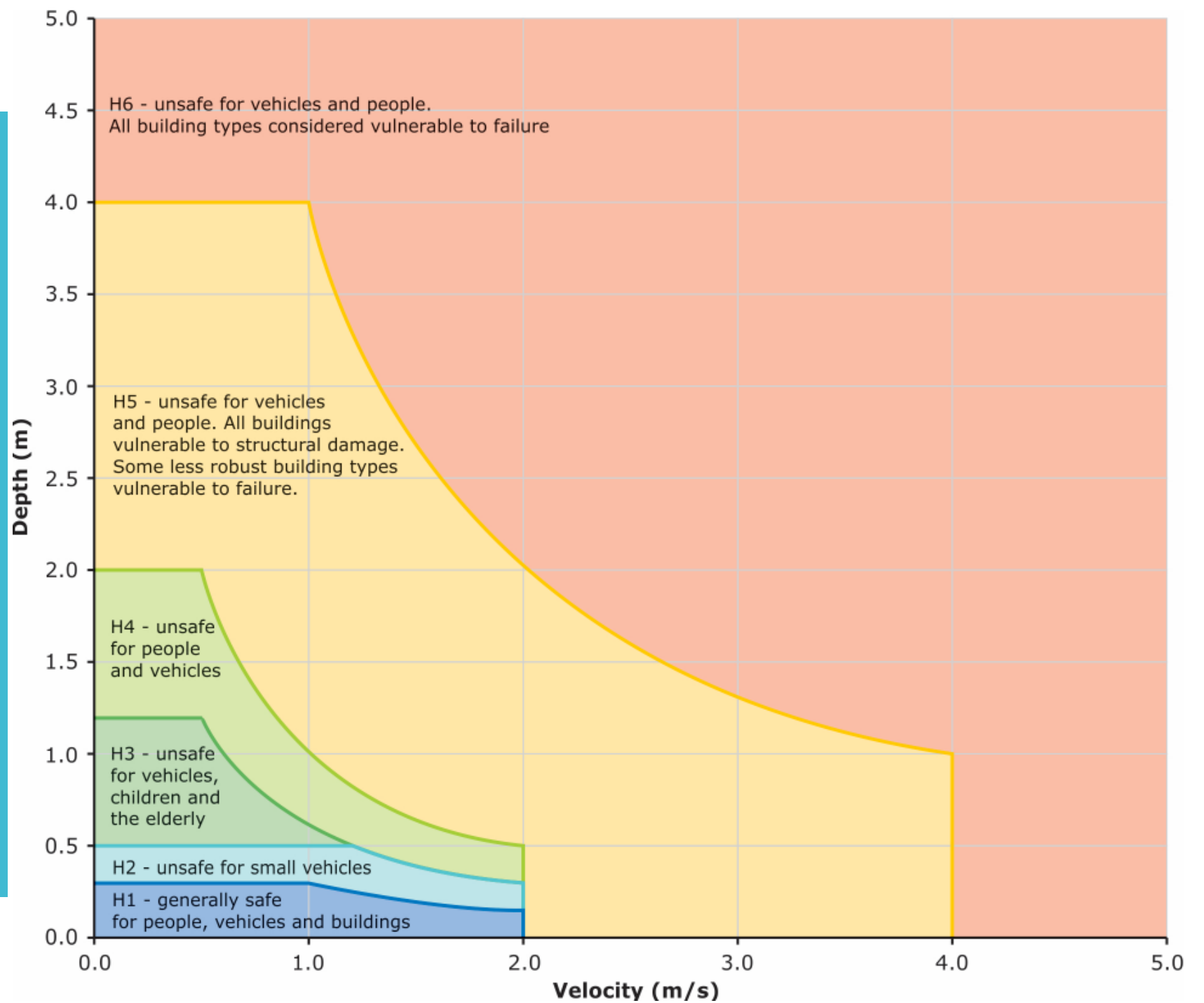
100 year ARI (1%AEP) Estimated Extent / Hazard Map

H1 - Generally safe for vehicles, people and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for vehicles and people
H5 - Unsafe for vehicles and people
All buildings vulnerable to structural damage
Some less robust buildings subject to failure
H6 - Unsafe for vehicles and people
All building types considered vulnerable to failure



HAZARD MAP

Function of $D \times V$



Modelled Avulsions / Outbreaks

REES-DART RELATIVE ELEVATION MODEL

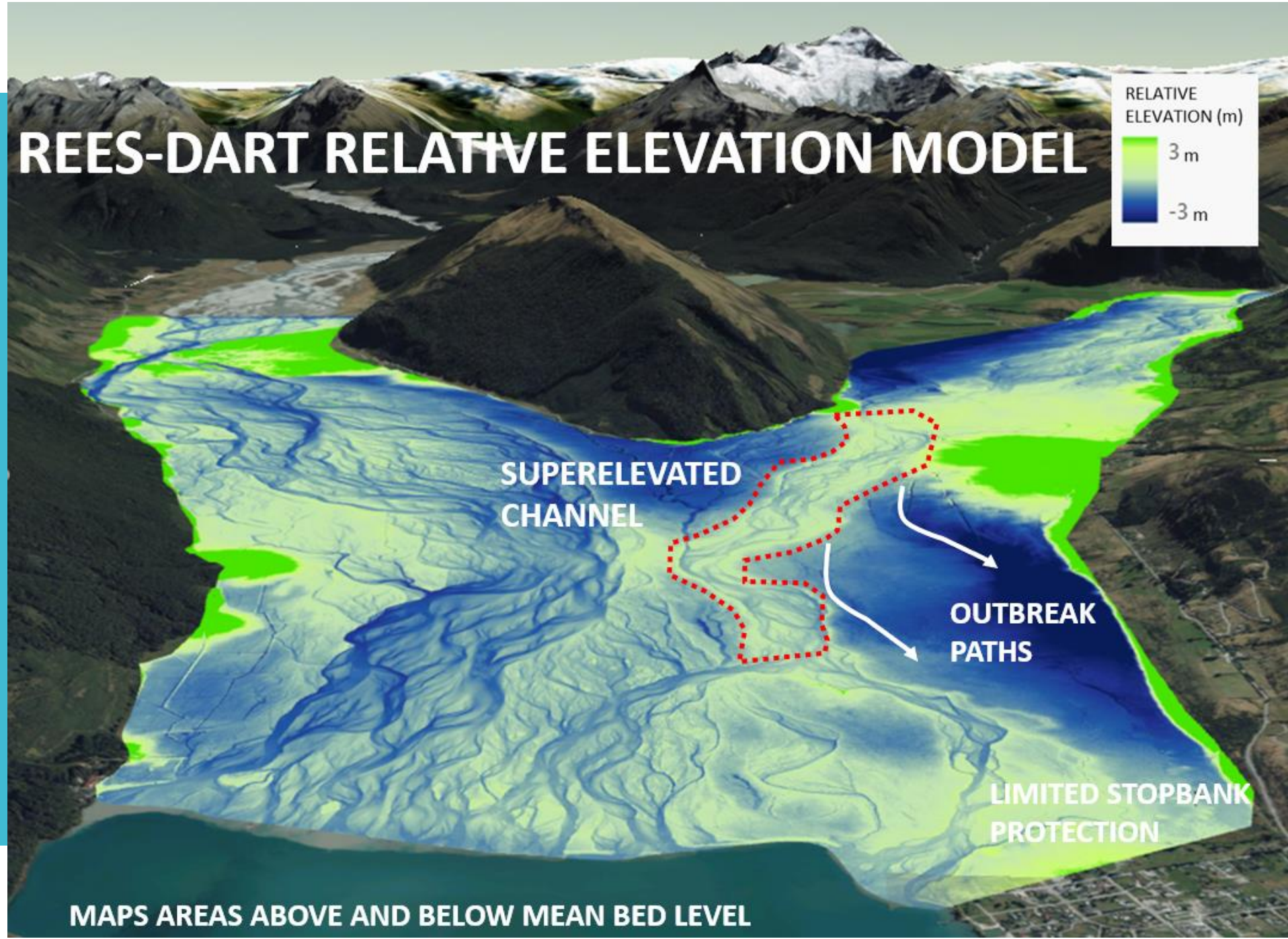


SUPERELEVATED CHANNEL

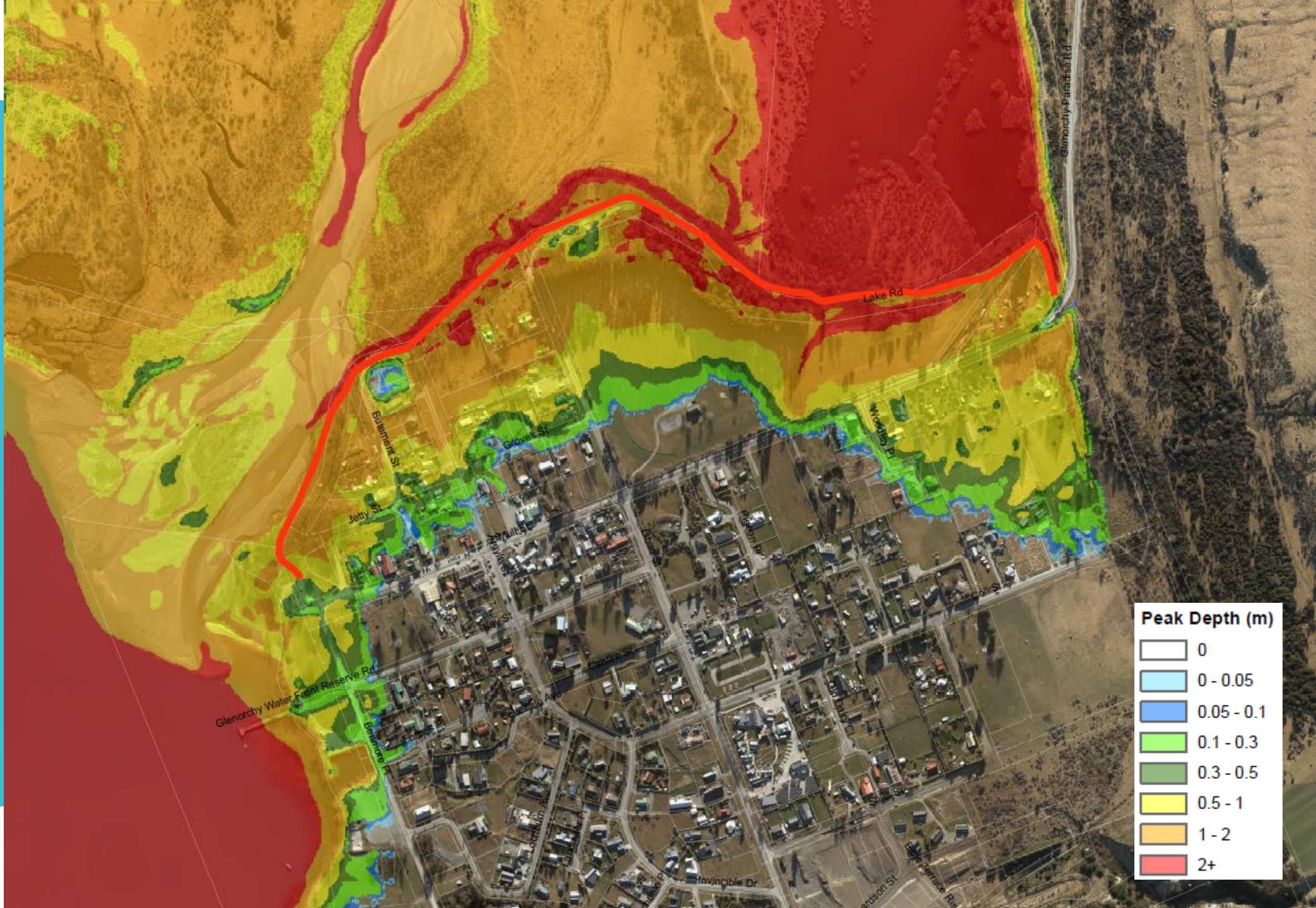
OUTBREAK PATHS

LIMITED STOPBANK PROTECTION

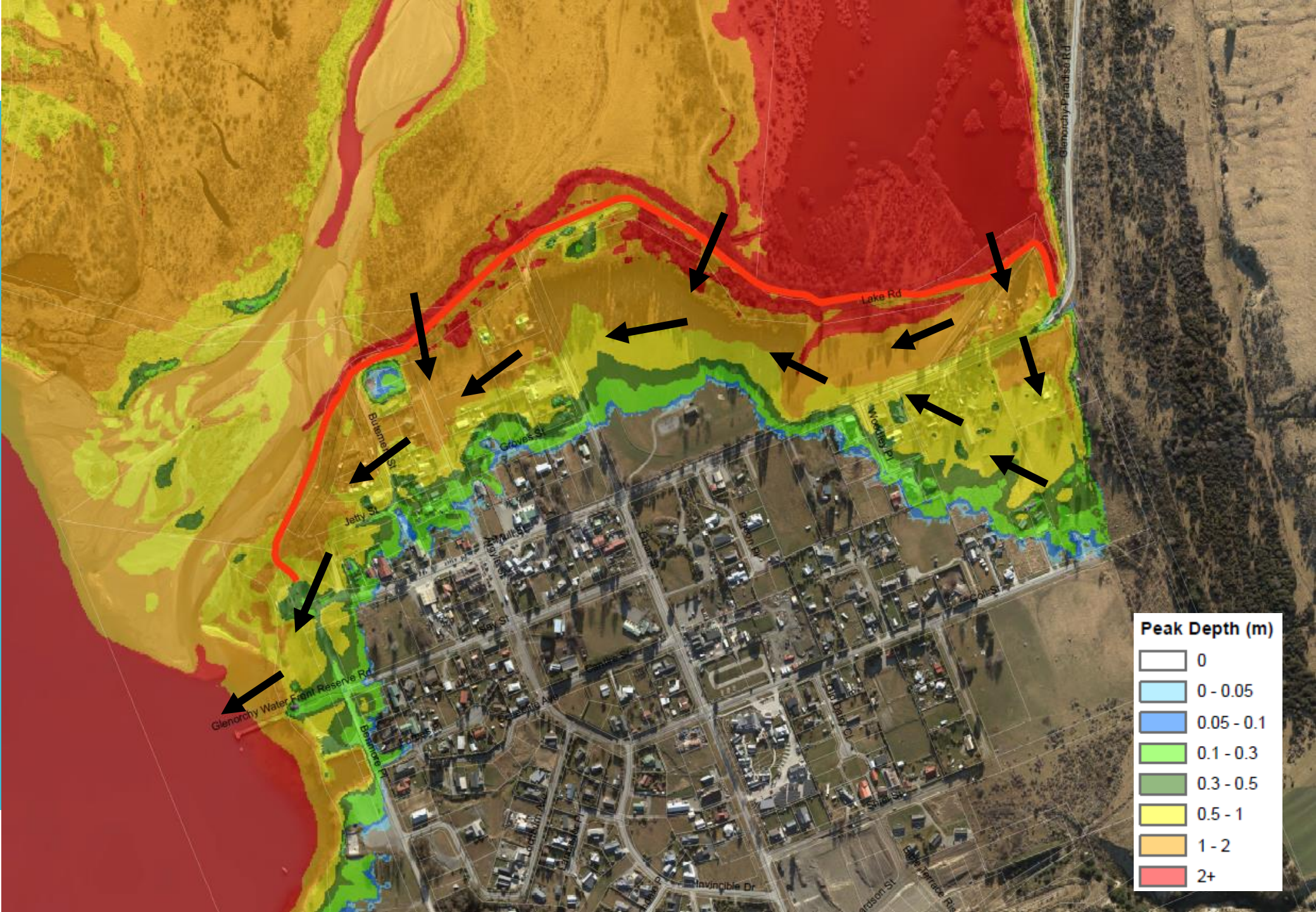
MAPS AREAS ABOVE AND BELOW MEAN BED LEVEL



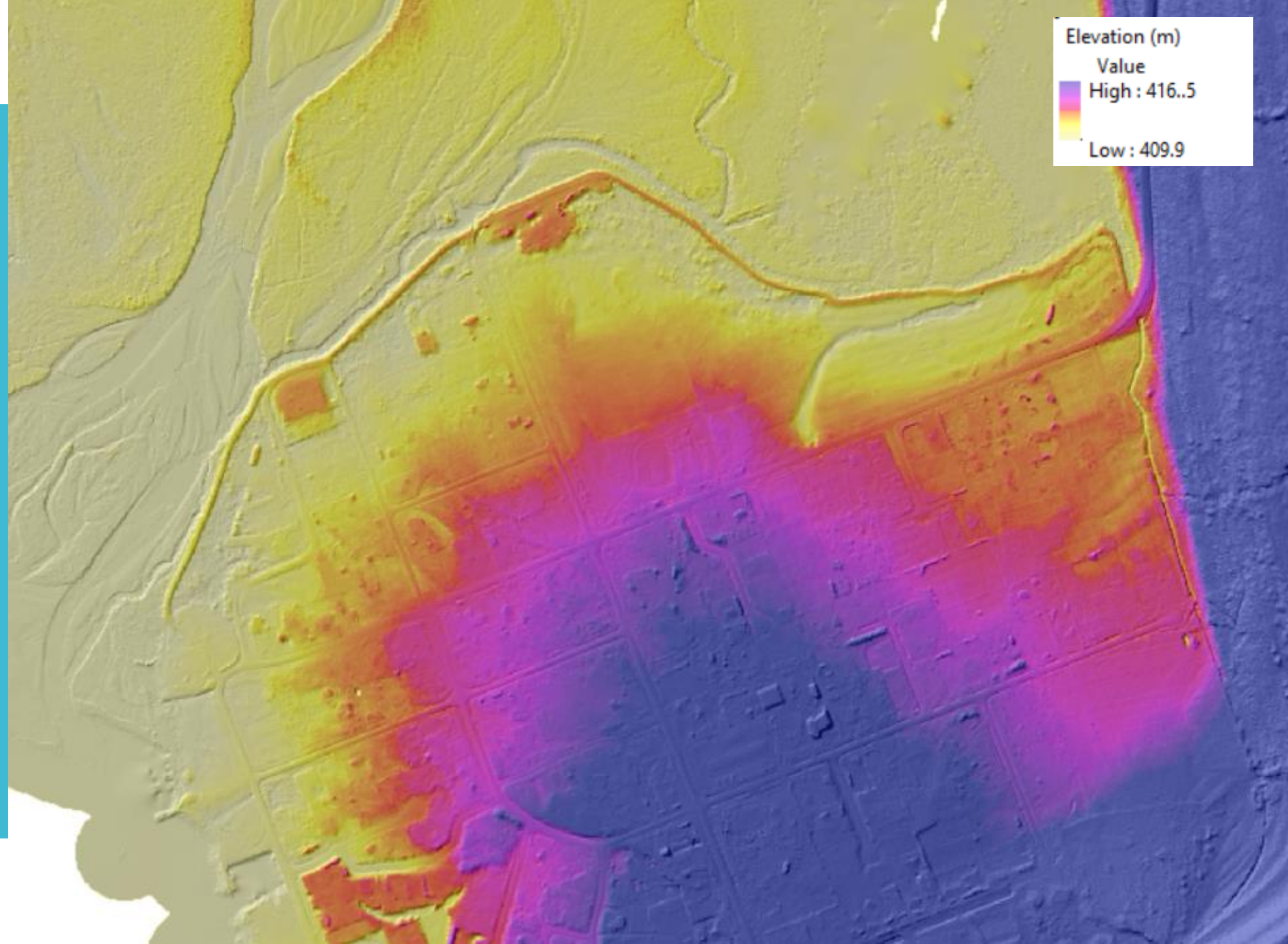
100yrARI Future Climate Avulsion



Direction
of flow



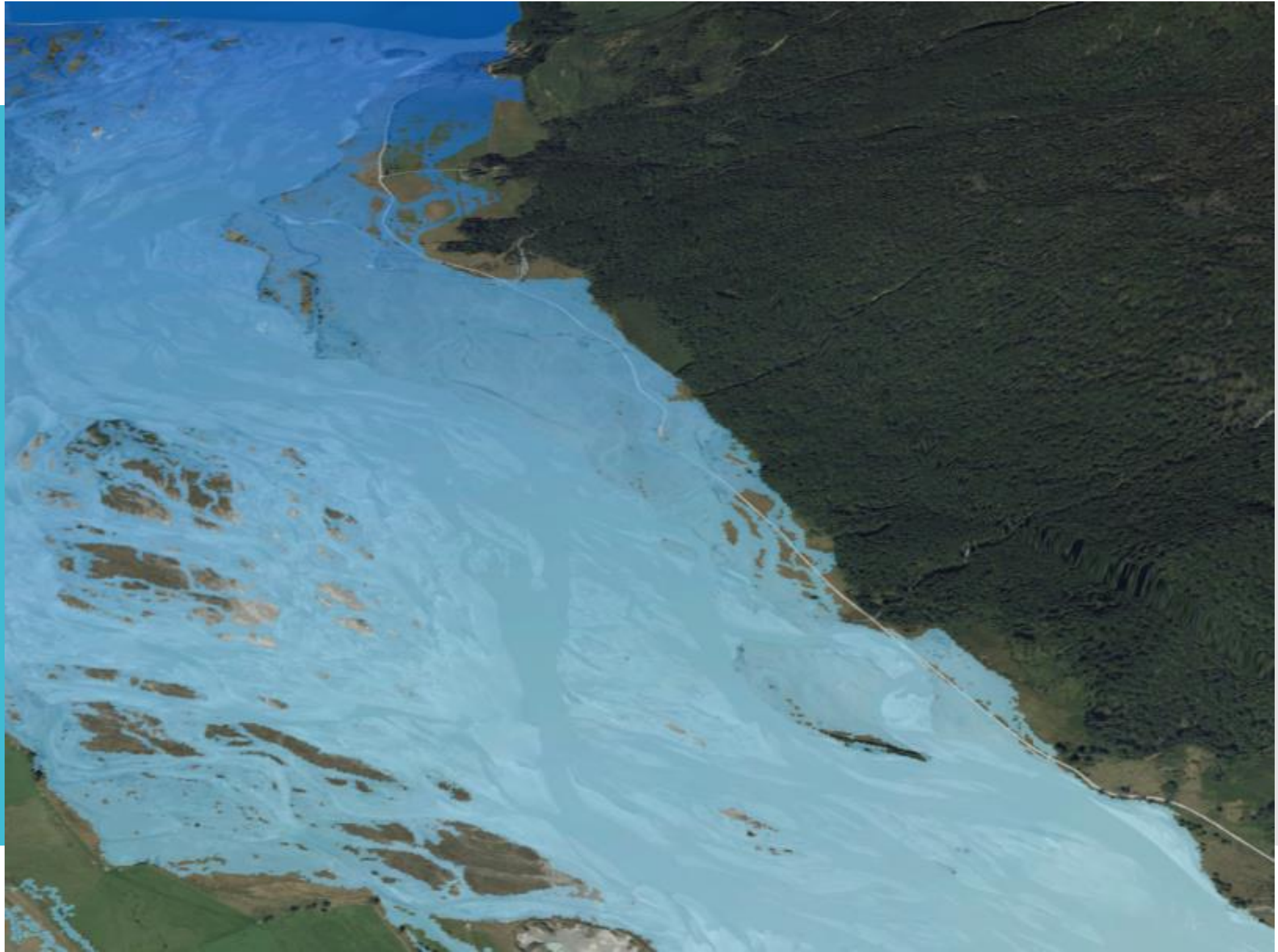
Natural
topography
controls the
flow



Sensitivity

- Roughness
- Water Levels in Lagoon (limited difference for event of size of Feb 2020 event)
- Main cause of excess water heading towards Glenorchy is likely due to diversion of flows from upstream, rather than lagoon capacity

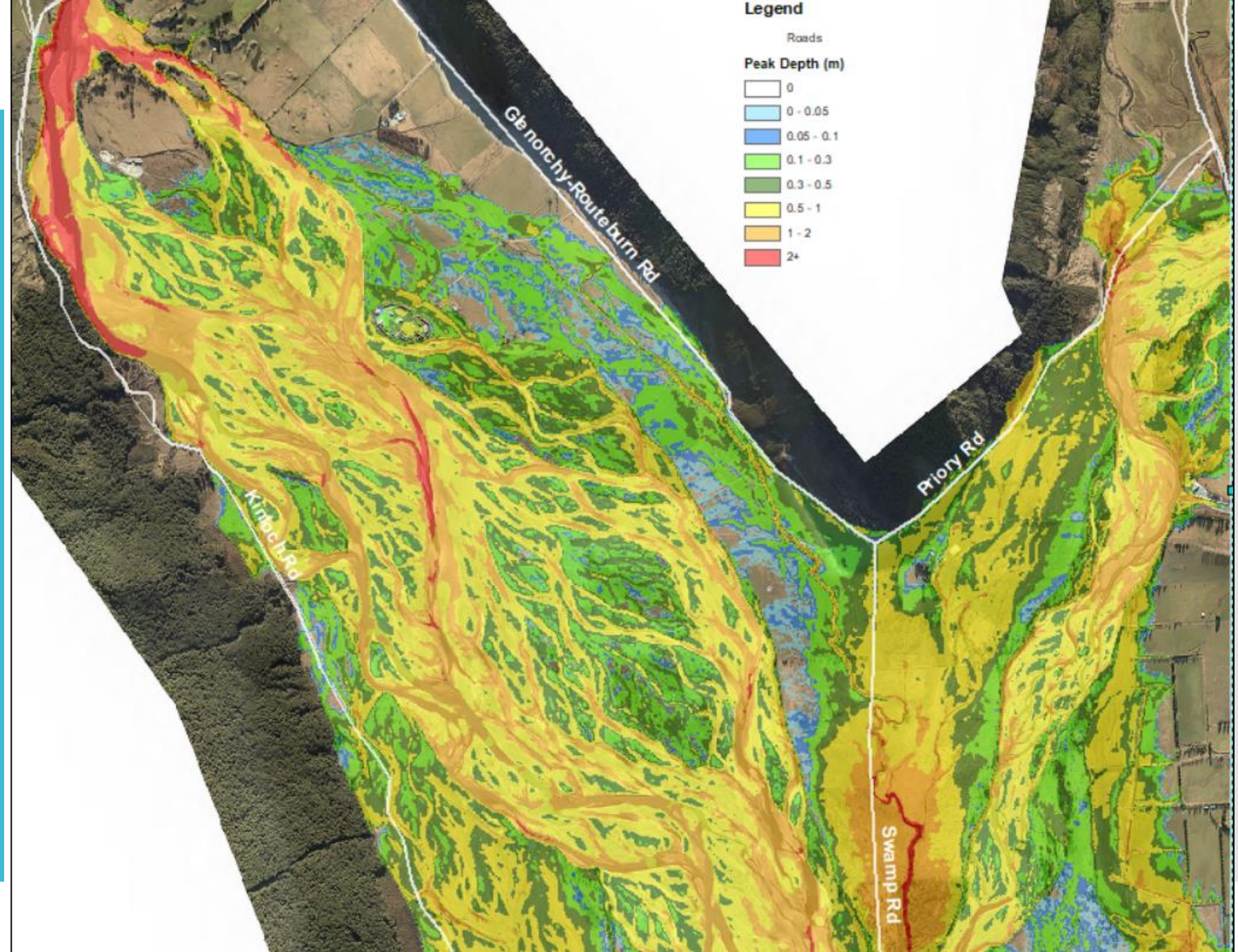
Road access issues - Dart



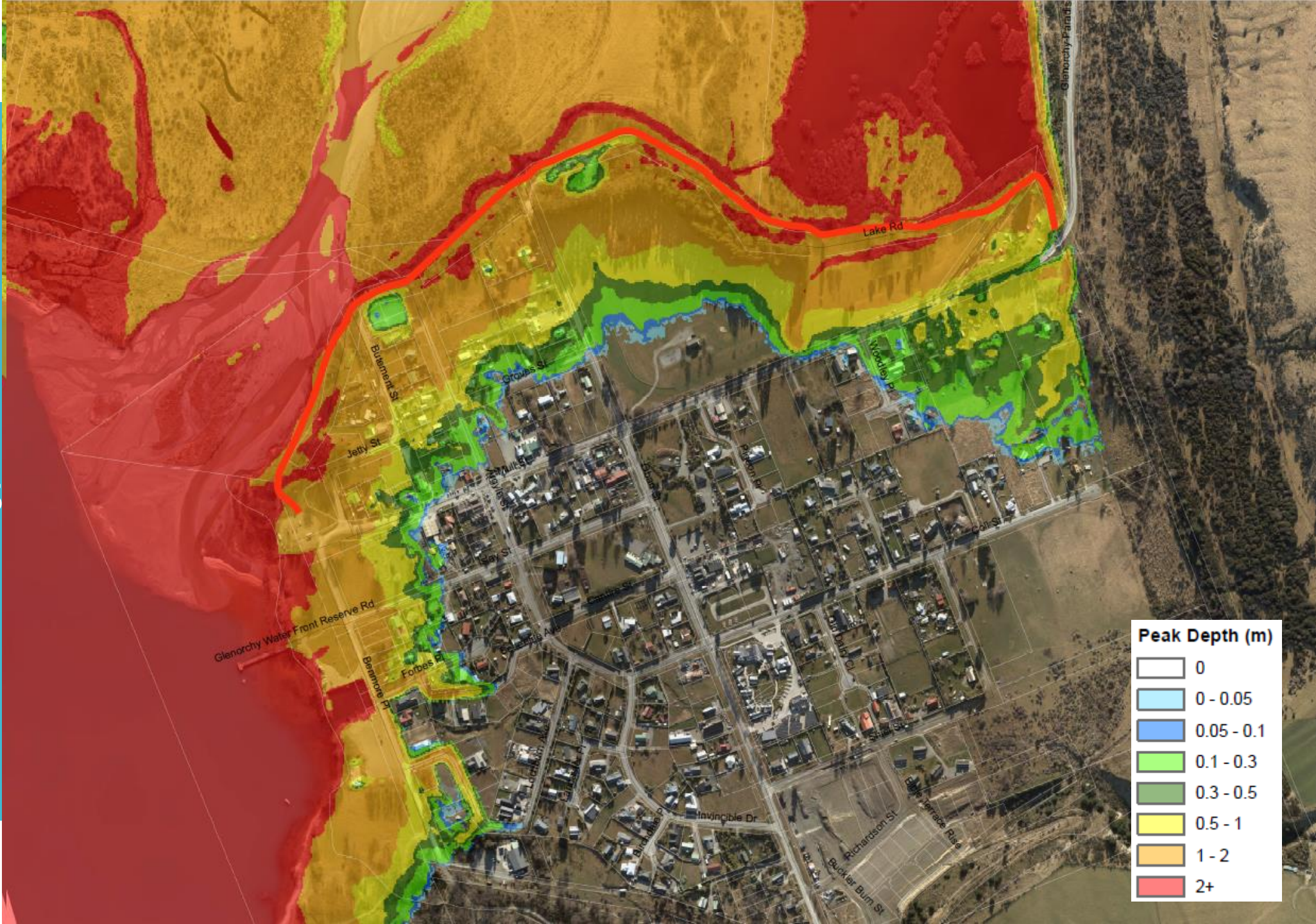
Road access issues - Rees



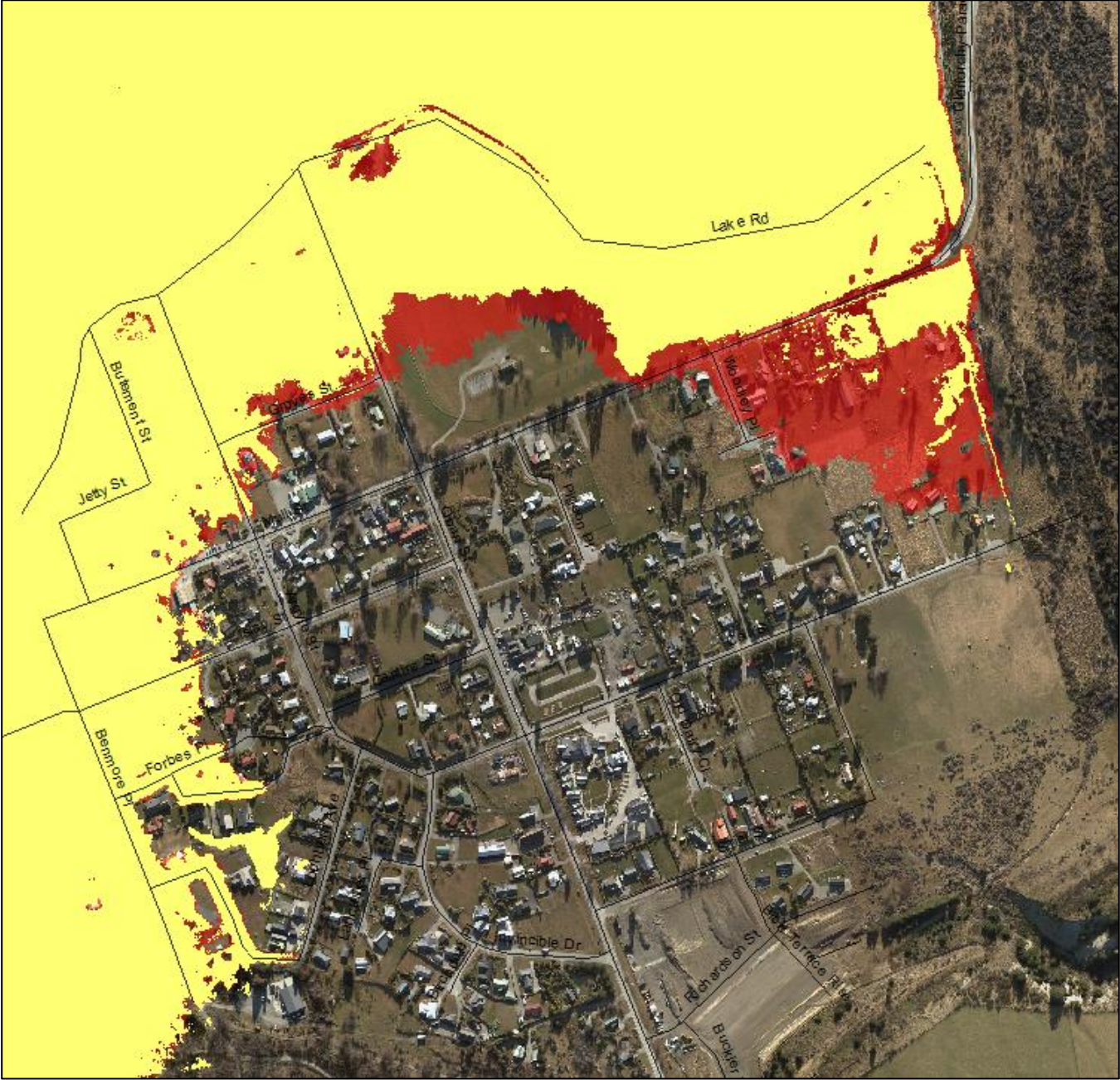
Access Road Inundation



Impact of Lake Levels



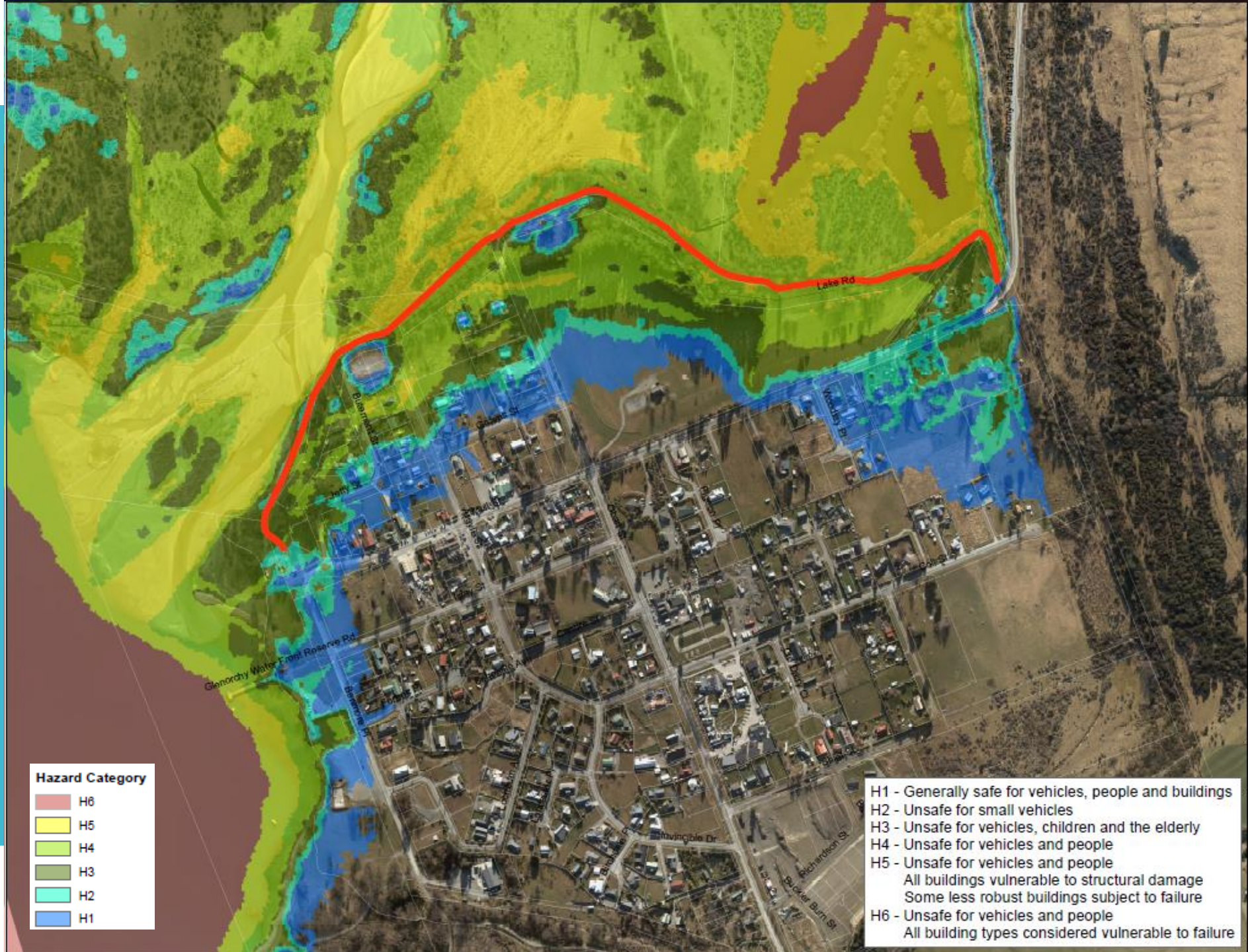
Impact of Lake Levels



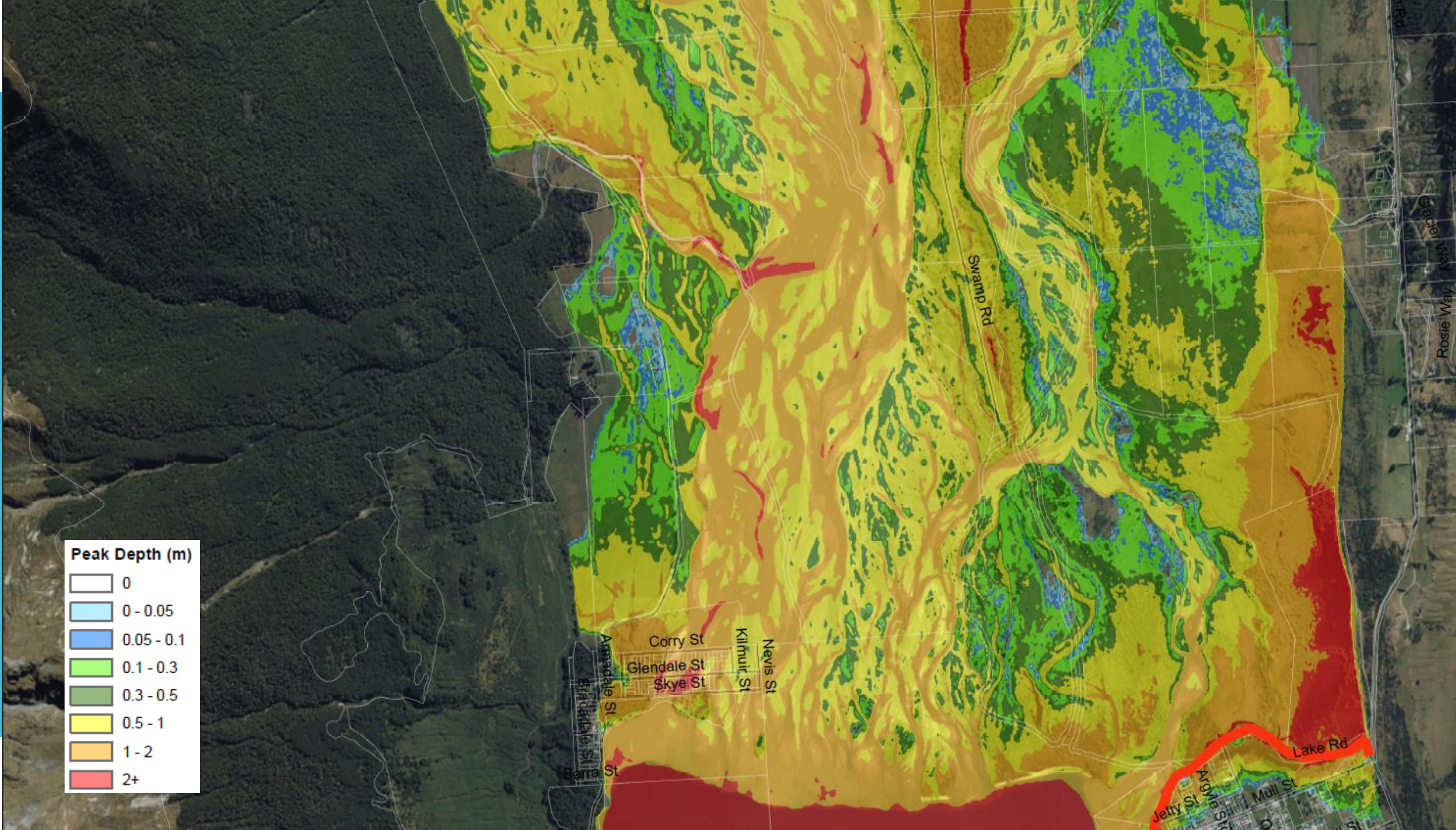
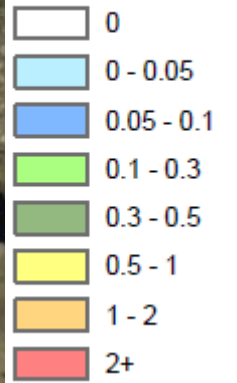
Climate Change

- Only impact on peak flow has been considered
- Impact on lake levels has not been investigated..in reality very complex as climate change likely to impact on entire long term climate cycle as well as intensity and duration of storms
- Climate change will have significant impact on geomorphology impacting volume of material entering the river
- This may effect level of both Dart and Rees as well as bed levels of river such as Kawarau which control the outflows from the lake and hence act as a control on lake levels.

Impact of Climate Change (Glenorchy)



Peak Depth (m)



Summary

- Flooding to Glenorchy significant, but confined by topography
- Existing Glenorchy stopbank will not prevent flooding and will likely overtop in the future as seen in Feb 2020
- Access roads cut off during large flood event
- Flood extent dominated by lake levels
- Significant risk of avulsion – will increase flood extent and cause entire stopbank to be overwhelmed
- Stopbank breach only impacts time of inundation, limited impact on extent due to the fact that it already overtops in a relatively small event
- Flood risk not static..Modelling is on 2019 topography, however river is aggrading
- Increased flows due to climate change likely to increase flood depths and velocities, however extent is largely controlled by topography