LOOKING AHEAD

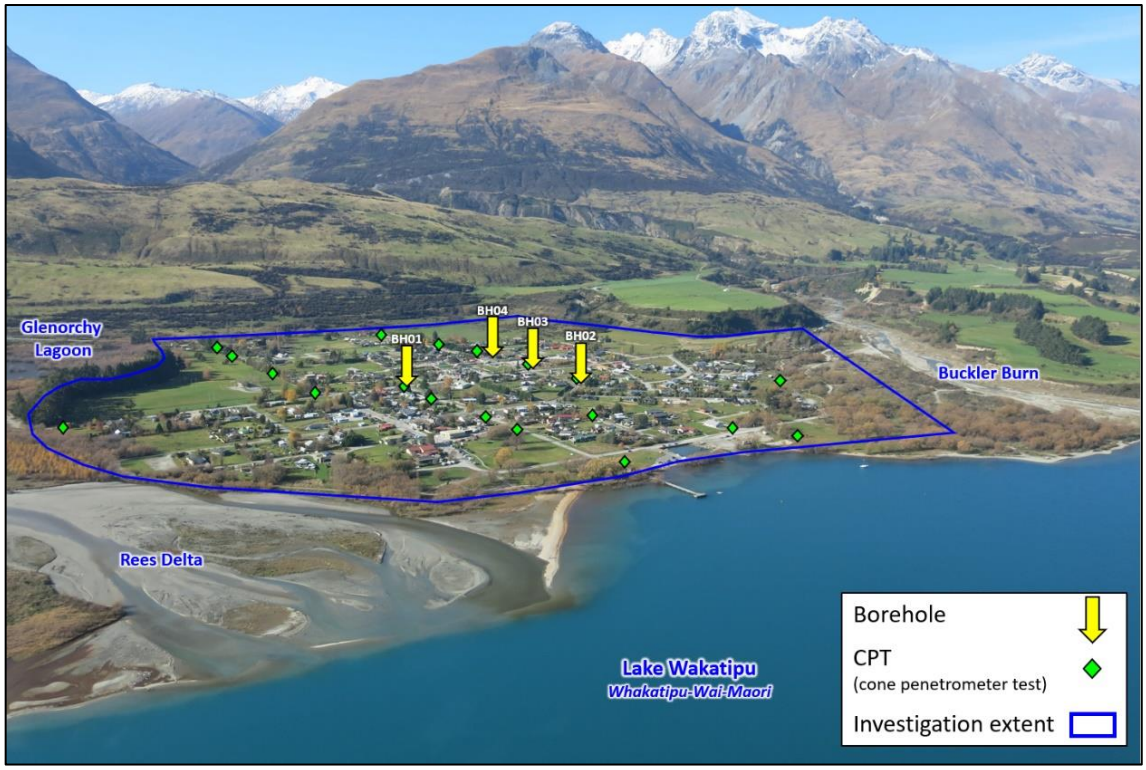
Summary of hazard report findings for Glenorchy township at the head of Lake Wakatipu

Liquefaction, lateral spreading and flood hazards

Recent natural hazards investigations commissioned by the Otago Regional Council confirm that the Glenorchy township at the head of Lake Wakatipu is susceptible to both river and lake flooding, and liquefaction or lateral spreading triggered by shaking from a moderate to major earthquake.

This dynamic and seismically-active environment including Kinloch, and the surrounding rural areas of the Dart and Rees Valleys, Paradise, and Greenstone is regularly impacted by natural hazard events such as flooding and has a long history of large-scale environmental changes to the rivers and floodplains. These new flood hazard and geotechnical investigations with detailed modelling and analysis provide a much better understanding and modelled data of the area's natural hazards challenges.

They show that a moderate to major earthquake or flooding event could have severe impacts for the township and its residents.



Glenorchy township showing the locations of geotechnical investigations completed for the liquefaction vulnerability study.

The studies

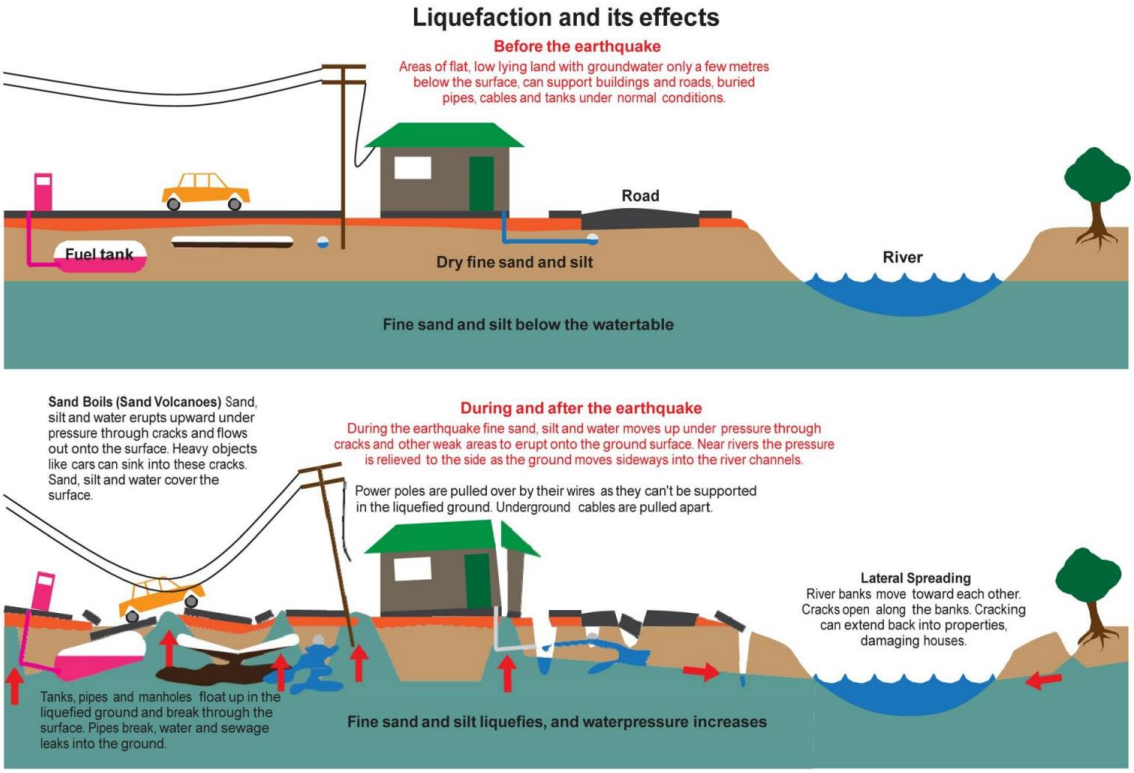
The geotechnical investigation, completed by Tonkin + Taylor Ltd (T+T), assessed the vulnerability of the township area to liquefaction and lateral spreading caused by a major earthquake, and the anticipated impacts of these hazards. Read a summary of the findings below.

At the same time, Land River Sea Consulting Ltd (LRS) assessed the flood hazard to the Dart-Rees floodplain and Glenorchy from the Dart and Rees Rivers, and high levels in Lake Wakatipu. Read a summary of the findings below.

Both of these reports were peer reviewed by independent experts, and review comments have been addressed in the finalised reports.

Liquefaction hazard findings

Liquefaction and lateral spreading can occur when strong ground shaking during an earthquake disturbs ground sediments, causing them to behave as fluid. This can deform the surface of the ground, affecting buildings, roads and underground infrastructure such as water supply and septic systems at varying degrees.

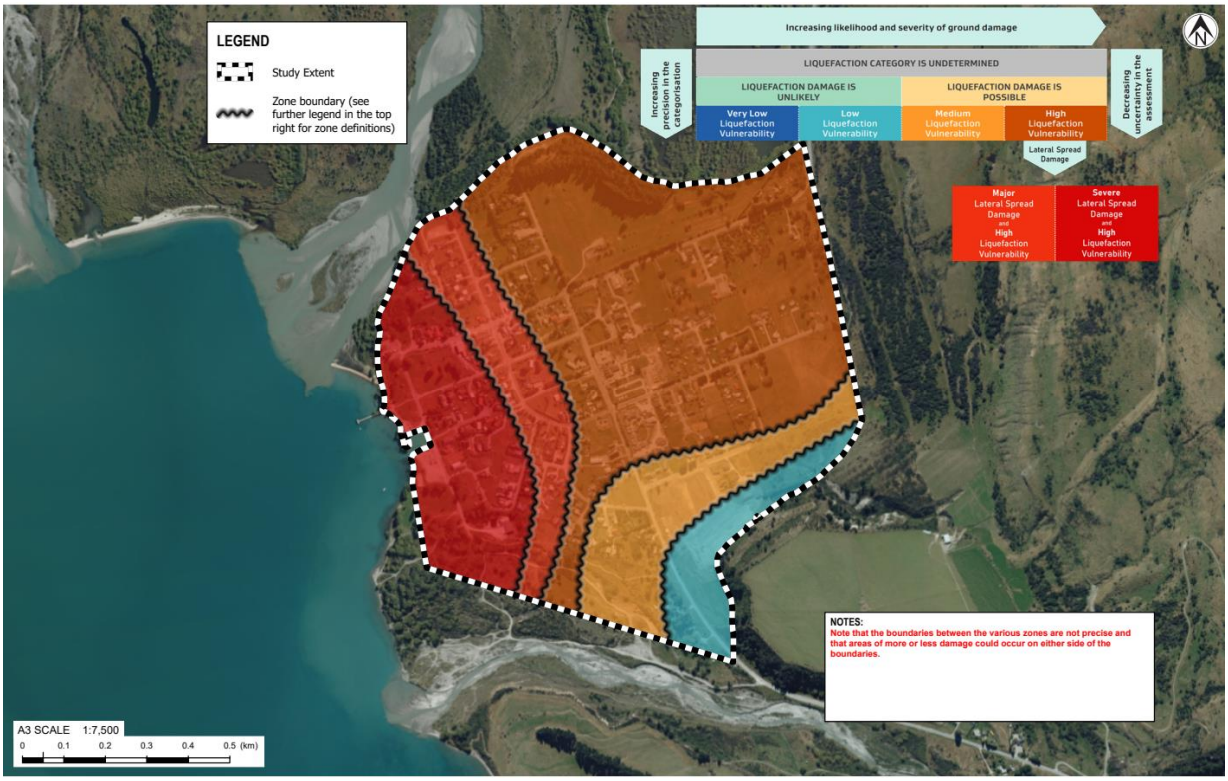


An illustration of liquefaction and lateral spreading processes and their effects (IPENZ, 2012).

The geological investigations show that Glenorchy township is underlain by a thick sequence of delta and alluvial sediments, overlain by a surficial layer (3-7m thick) of gravels deposited by the Buckler Burn. All of the sediments underlying the surficial Buckler Burn gravels are highly susceptible to liquefaction.

A moderate to major earthquake and Alpine Fault rupture would likely cause 'High to Severe' liquefaction damage, comparable even to the 2010-2011 Christchurch earthquakes. In addition, lateral spreading would also cause severe ground deformation and damages in the western areas nearer the lakefront.

The map below shows the hazard categorisation developed by T+T for liquefaction and lateral spreading hazards at Glenorchy. The hazard categorisation is based on NZ guidance from MBIE and MfE, shown in more detail below.



Tonkin + Taylor image with combined results for both liquefaction and lateral spreading hazard.

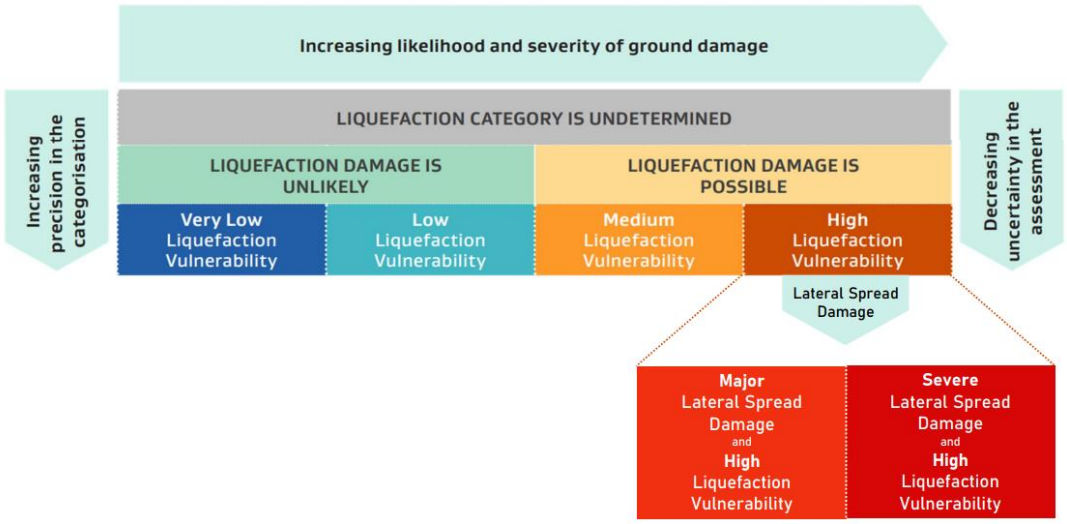


Image showing the hazard categorisation used for assessment of both liquefaction and lateral spreading hazard.

Flooding hazard findings

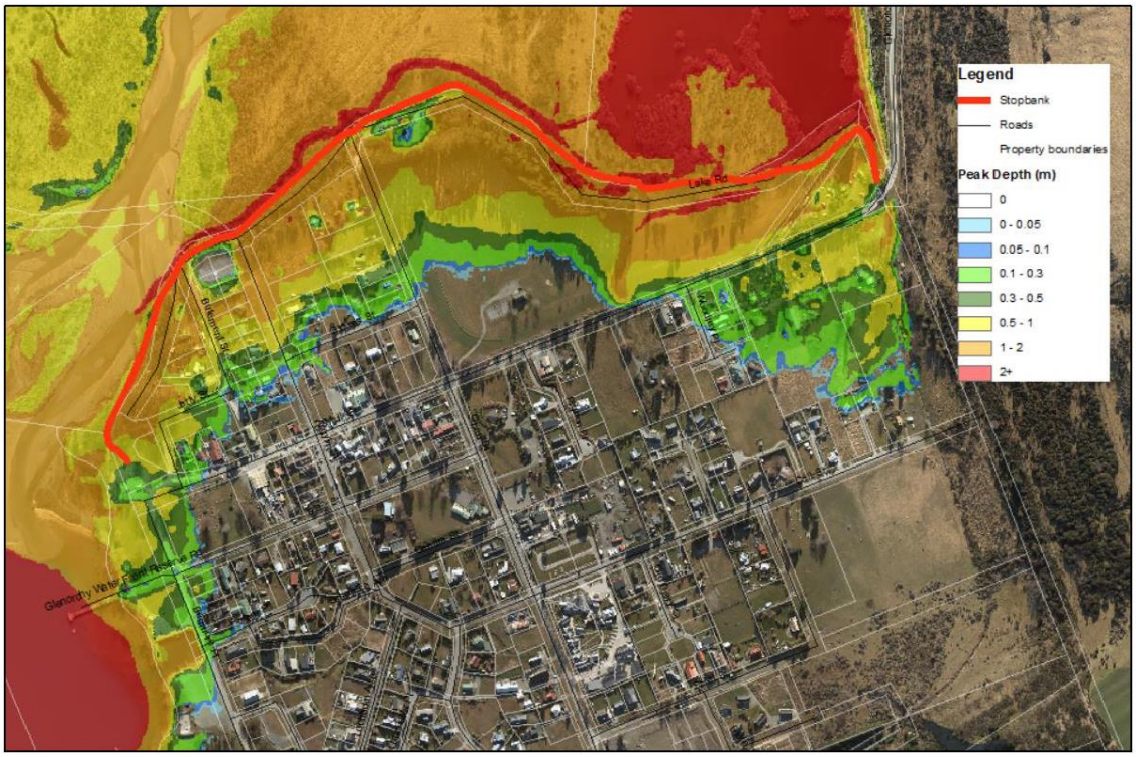
Glenorchy township is exposed to flooding from the Rees River and Buckler Burn, and from high levels in Lake Wakatipu. The town was most recently flooded in November 1999 and in February 2020 (as pictured).

The new investigation models a range of very large flood event scenarios - those with a 1% chance of occurring in any one year, sometimes called the '100-year' flood.

Modelled scenarios also looked at the effects of climate changes on river flows, or a breakout flood (avulsion) from the lower channel of the Rees River.

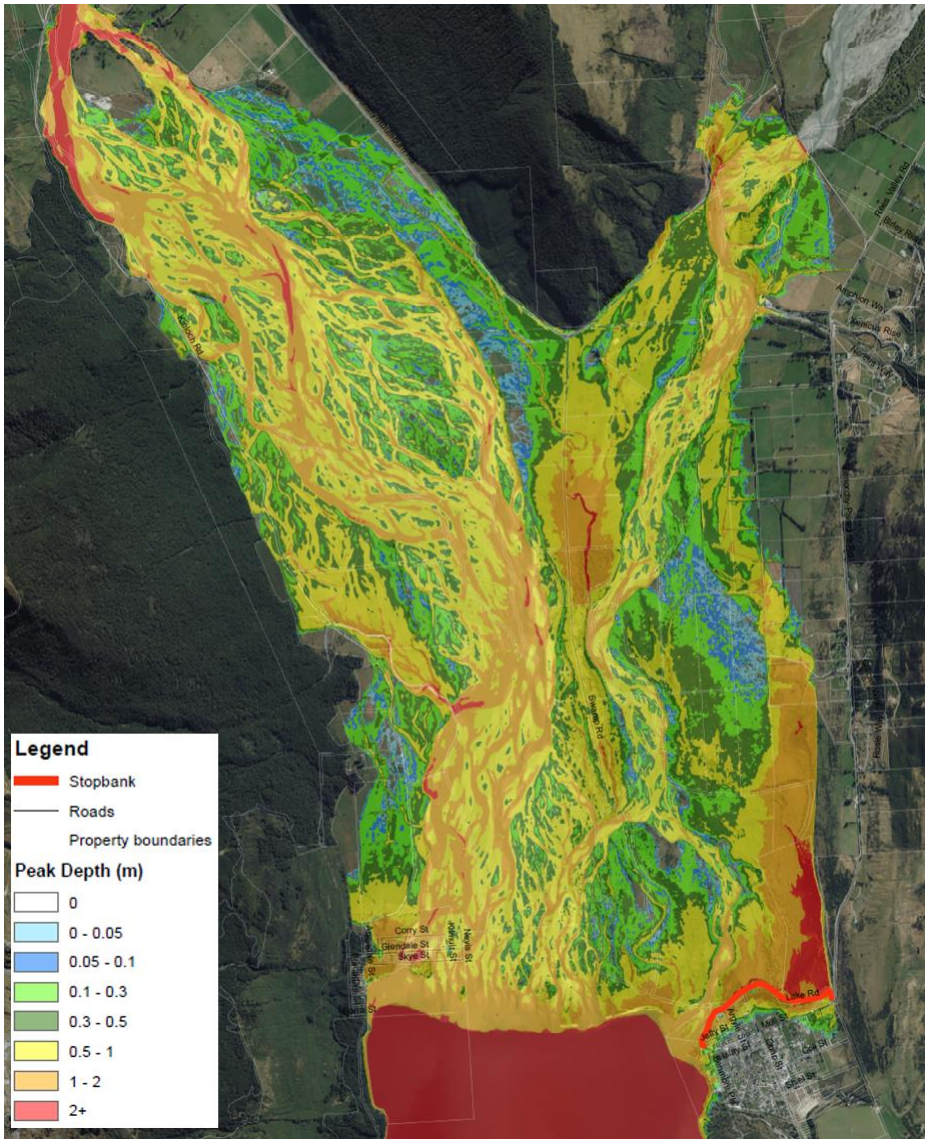
Modelling results for major flood events show flooding of northern parts of the township, for example the map below showing floodwater depths for one scenario. This is a similar flooding extent, but a slightly larger area, to that seen in the February 2020 flood.

The assessment shows the areas of worst flooding, where the floodwaters are deepest and fastest, would have severe impacts. These floodwaters would be unsafe for vehicles and residents, and buildings may be flooded or vulnerable to structural damage.



Model results for a flooding scenario at Glenorchy, these are coloured by floodwater depth.

Model results for the wider Dart-Rees floodplain area, show large sections of the Kinloch Road, as well as parts of the Glenorchy-Routeburn road at the foot of Mount Alfred, would be inundated in a major flood event – these modelled events would be similar but even larger events to the Dart River flooding in March 2019 and February 2020.

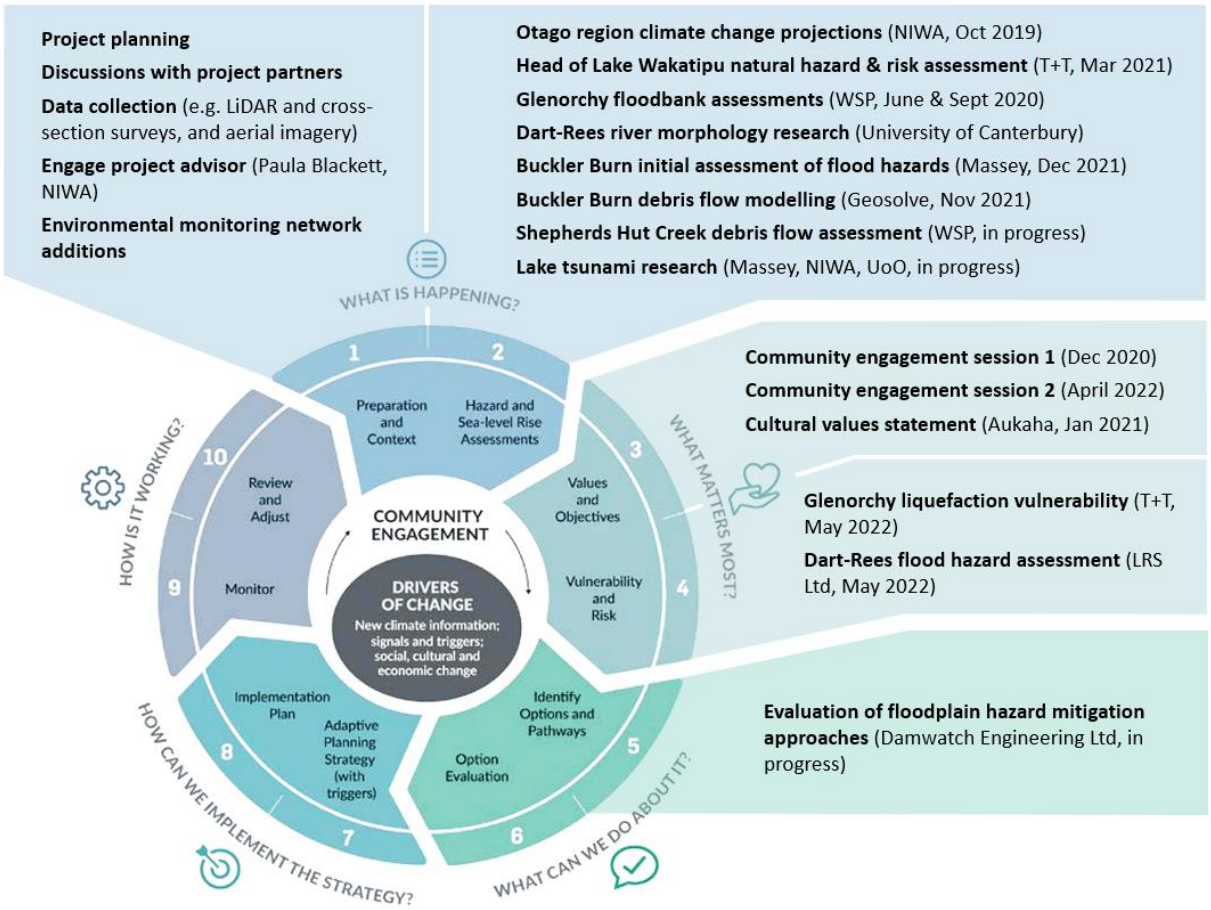


Overview of model results for a flooding scenario of the Dart-Rees floodplain, these are coloured by floodwater depth

How we can adapt

An adaptation response at the Dart-Rees floodplain and Glenorchy township will require a strategic, holistic approach with the community working together with the ORC and other stakeholders.

ORC, with partners including QLDC, are leading the adaptation strategy for the head of Lake Wakatipu following a ten-step decision-making cycle (pictured below), based on the Ministry for Environment's national guidance.



Hazards investigations like these are project steps to better understand natural hazards and their risks, and provide a solid basis for any decision-making.

The next steps (5 and 6 in the cycle shown above) will identify and evaluate 'pathways' of adaptation actions.

One of these studies is already underway by Damwatch Engineering Ltd to assess possible strategies for mitigation of floodplain hazards at the Dart and Rees rivers and Glenorchy.

Community and stakeholder input and collaboration is central to the Adaptation Pathways approach. ORC will make all investigation findings available to the head of Lake Wakatipu community, with opportunities for consultant experts to directly discuss findings with community members.

Talk to us, get involved

We will have follow up sessions (as many as needed) with the community throughout this adaptation process. These will be opportunities to discuss findings and let us know your feedback – we value your input.

Information on our project and the reports can be found here. This will be updated with answers to questions, the reports as well as community sessions.

You can also subscribe to our monthly newsletter here or contact us on Headofthelake@orc.govt.nz. We will provide responses to any emailed questions and facilitate answers from our consultants if needed.

Thank you

We want to thank the community of Glenorchy, Paradise, Greenstone and Kinloch for working with us and participating in our community initiatives so far. We also thank the consultants working on the project for their valuable expertise and advice.