Council Agenda 4 December 2024

Meeting will be held at the Council Chamber, Philip Laing House, 144 Rattray Street, Dunedin and live streamed at ORC YouTube Channel

Members:
Cr Gretchen Robertson, Chairperson
Cr Lloyd McCall, Deputy Chairperson
Cr Alexa Forbes
Cr Gary Kelliher
Cr Michael Laws
Cr Tim Mepham
Cr Kevin Malcolm
Cr Andrew Noone
Cr Alan Somerville
Cr Elliot Weir
Cr Kate Wilson

Senior Officer: Richard Saunders, Chief Executive
Meeting Support: Kylie Darragh, Governance Support Officer

04 December 2024 01:00 PM

Agenda Topic

Pierre Masrati on behalf of Extinction Rebellion will attend.

4. CONFIRMATION OF AGENDA

The agenda to be confirmed as published.

5. DECLARATIONS OF INTEREST

Members are reminded of the need to stand aside from decision-making when a conflict arises between their role as an elected representative and any private or other external interest they might have. The Register of Pecuniary Interests can be found on the ORC Website.

6. PRESENTATIONS

Clare Hadley from Waiora Manuherekia will present.

7. CONFIRMATION OF MINUTES

There are no minutes to be approved for this meeting.

11. NOTICES OF MOTION

12. RESOLUTION TO EXCLUDE THE PUBLIC 315

Recommendation that the public be excluded from the following parts of this meeting, namely:
1.1 Confirmation of the Public Excluded Council Meeting Minutes of 25 September 2024.
3.1 CS2441 Port Otago Resolution In Lieu of Annual Shareholders Meeting.
3.2 CS2451 ORC Office Accommodation in Queenstown and Wānaka: Changes

13. CLOSURE

	Meeting Date	Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
1	22/03/2023	Council Meeting 2023.03.22	GOV2306 Proposal to participate in CouncilMARK programme	In Progress	The Chief Executive will execute an agreement with CouncilMARK to undertake an independent assessment in 2024. **Res CM23-130**	Chief Executive	**13/09/2023 Governance Support Officer** Underway. Assessment likely to take place February 2024 **15/05/2024 Governance Support Officer** Te Korowai (formerly CouncilMARK) is underway and due to be completed in September 2024. The main data gathering exercise takes place between May and June. A Councillor Workshop for input into our assessment is due to take place by July. **19/07/2024 Governance Support Officer** Workshop took place on 3 July. Next workshop takes place on 7 August. **21/08/2024 General Manager Strategy and Customer** Workshop took place on 7 August. Te Korowai assessors onsite 3/4 September 2024. **11/10/2024 Governance Support Officer** 10/10/24 - CE Assessment has been completed and we are awaiting the final report which will be on a future Council agenda.	16/12/2024
2	29/05/2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	Assigned	**FIN24-138:** **32)** ***Directs*** *Council staff to make the following adjustments to the draft Long-Term Plan 2024-2034 detailed in paper 6.1.2 and including:* **d.** *Investigate within existing year one forecast*	General Manager Regional Planning and Transport		27/06/2025

	Meeting Date	Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
					budgets the feasibility of incorporating an Oamaru-Dunedin service within the 'Oamaru year two and three public transport trial.			
3	29/05/2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	In Progress	**FIN24-149:** **50)** ***Requests*** *that staff research and report on alternative community ownership models for flood and drainage schemes as a way of addressing financial unsustainability.*	General Manager Finance, General Manager Science and Resilience	**16/10/2024 General Manager Finance** Underway. Staff are considering the best approach for this work and will report back to Council early in 2025 along with FIN24-120.	27/06/2025
4	29/05/2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	In Progress	**FIN24-120:** **44)** ***Requests*** *staff undertake a review of all flood and drainage schemes to inform rate allocation and report back to Council on the Terms of Reference and timing for this review*	Chief Executive, General Manager Finance, General Manager Science and Resilience	**11/10/2024 Governance Support Officer** 10/10/24 CE Underway. Staff are considering the best approach for this work and will report back to Council early in 2025.	16/12/2024
5	29/05/2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	Assigned	**FIN24-139:** **32)** ***Directs*** *Council staff to make the following adjustments to the draft Long-Term Plan 2024-2034 detailed in paper 6.1.2 and including:* ***g.*** *Requests that staff complete a review of options for the allocation*	General Manager Finance, General Manager Regional Planning and Transport	**16/10/2024 General Manager Finance** In progress. Staff will provide an update and proposed next steps in the Annual Plan 2025-26 workshop on 30-Oct-2024.	06/12/2024

	Meeting Date	Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
					of Public Transport targeted rates and report back in time for the 25/26 annual plan.			
6	29/05/2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	Assigned	**FIN24-137:** **32)** ***Directs*** *Council staff to make the following adjustments to the draft Long-Term Plan 2024-2034 detailed in paper 6.1.2 and including:* **c.** *Allocate $50,000 in Year two Long-Term Plan 2024-2034 for potential sponsorship of the activity outlined in 'Dunedin Tracks and Trails' submission or other activity that would deliver on the Public and Active Transport Connectivity Strategy.*	General Manager Regional Planning and Transport		27/06/2025
7	28/08/2024	Council Meeting - 28 August 2024	POL2419 Waitaki River Update	Assigned	**CM24-167** Notes a further update will be provided in 2025, after the early engagement has been undertaken;	Executive Assistant - Regional Planning and Transport, General Manager Regional Planning and Transport		01/06/2025

9.1. Final Climate Strategy 2024 for adoption

Prepared for: Council

Report No. STG2406

Activity: Governance Report

Author: Hilary Lennox, Manager Strategy

Endorsed by: Amanda Vercoe, General Manager Strategy and Customer

Date: 4 December 2024

PURPOSE

[1] The purpose of this paper is to present Council with the final version of the Climate Strategy 2024 for consideration and adoption.

EXECUTIVE SUMMARY

[2] In June 2024, Council endorsed a draft climate strategy to be made available for public consultation from August-October. Around 250 public inputs were received. Key themes emerging from this feedback included a concern about the cost of implementation and this being additional to ORC's core business; demand for more climate action from ORC in the agriculture, transport, and education sectors; uncertainty on how the strategy relates to wider environmental quality and demand for this to be seamlessly connected and equally prioritised; and climate change denial.

[3] Reflecting on the public feedback received, and the adoption of ORC's Strategic Directions in June 2024 (which closely aligns in objectives and underlying implementation processes), staff revised the draft strategy to reflect the vision and goals of the Strategic Directions and demonstrate the inherent connection between these documents.

[4] The purpose of the climate strategy is now much clearer; it exists to show how ORC will give effect to the climate-related components of the Strategic Directions (rather than being a standalone action plan).

[5] By aligning the climate strategy to the Strategic Directions, these strategic documents will work together to amplify one another and present a coherent, easily understandable framework to the public. Notably, given the existing alignment between the two documents, limited wording and presentation changes were needed to produce the final Climate Strategy 2024 (attached).

RECOMMENDATION

That the Council:

1. ***Notes** the evolution of the climate strategy as described in this report.*
2. ***Adopts** the Climate Strategy 2024 attached.*

BACKGROUND

[6] The development of a climate strategy was committed to in the Long-Term Plan 2021 – 2031 and implementing the climate strategy was committed to in the Long-Term Plan 2024 - 2034. These actions in ORC's LTPs reflects the prominence of climate change related workstreams across the ORC, and the growing public expectation for ORC to take action to address climate change in a coordinated manner.

[7] In June 2024, Council endorsed a draft climate strategy to be made available for public consultation from August-October. The draft climate strategy had 11 goals corresponding to ORC's workstreams on climate change. It also provided a detailed action plan as a snapshot of all ORC's work on climate change as at Q3/4 2024. The draft strategy noted a corresponding monitoring and reporting plan would be developed following adoption.

[8] From August – October 2024, ORC welcomed public feedback on the draft strategy, facilitated through an online survey. ORC received 249 survey responses, and several written responses additional to the survey. Social media posts about the draft strategy also attracted significant attention online.

[9] Some key themes from the public feedback included:

a. Cost concern about increased rates to deliver climate action
b. Demand for more support to the agriculture sector to undertake climate action
c. Demand for more and improved public transport
d. Focus on wider environmental quality issues and their overlap with climate change
e. Demand for more education on climate impacts and emissions mitigation opportunities
f. Climate change denial

DISCUSSION

[10] The feedback received provided useful insights into the community views and expectations on climate action within the Otago region, and what aspects of our work are recognised as relating to climate change. Notably, it was clear across much of the feedback that the draft strategy needed to better communicate its role within ORC (how it informs and impacts our functions); and what our functions, role, and limitations are as a regional Council. For example, much of the feedback requested ORC to take actions to address climate change which go beyond our current functions, or which may be better suited to other actors (i.e., Territorial Authorities, or the private sector).

[11] Additionally, many responses sought clarity on how the draft strategy intersects with wider organisational strategies and workstreams, such as the Strategic Directions, and the biodiversity strategy.

[12] Reflecting on this feedback, the Strategy Team identified the need to improve how we articulate what ORC's functions are relating to climate change; and what the role of the climate strategy is in influencing our climate-related work. Identifying these needs, in combination with internal developments and the Council adoption of the Strategic Directions, led to the final Climate Strategy 2024 attached.

Integrating with the Strategic Directions

[13] In June 2024, Council adopted ORC's Strategic Directions, which includes climate as a focus area and several climate related goals. The Strategic Directions were developed by Councillors and mana whenua representatives, and public feedback was sought as part of the LTP 2024-2034 public consultation process Council developed the Strategic Directions with a view to providing a clear indication of the Council's priorities (goals) for the next 10 years. The goals will inform the alignment and prioritisation of ORC's work programmes.

[14] The implementation of the Strategic Directions is underway, with staff developing an implementation plan along with clear performance indicators. As noted in the Council paper dated 13 December 2023, the more aligned ORC's subject specific strategies are with the Strategic Directions, the more coherent and impactful they should be in advancing the Strategic Directions' goals.

[15] The draft strategy and the Strategic Directions were already aligned in what they sought to achieve, albeit goals were worded slightly differently. Both sought to drive change within the organisation for better outcomes for Otago. Building on this existing alignment, and insights from the public input (discussed above), staff have revised the strategy so the final version now clearly reflects the connection to the Strategic Directions and the implementation process underpinning all strategy development at ORC.

[16] The Vision of the final climate strategy reflects the Strategic Directions climate focus area, and the goals reflect the Strategic Directions climate-related goals (including those from the Environment and Resilience focus areas). Additionally, the focus areas of Partnership and Community, and their respective goals are incorporated throughout the final strategy, demonstrating how these elements of the Strategic Directions will inform all of ORC's work, including the climate strategy.

[17] This evolution of the climate strategy should ensure it is easily understood as a subject specific subset of the Strategic Directions and provide clarity to the public on how we're delivering on climate as a focus area of the ORC.

[18] Many of the key actions in the climate strategy are already underway. Further implementation will include an internal review of the organisation's work to identify where we may need to improve alignment of work programmes to deliver on our goals most effectively, and then embedding necessary changes through our internal planning process. Tracking progress on the climate strategy will occur as part the process for tracking progress against the broader Strategic Directions.

Further engagement with mana whenua and key stakeholders following revisions

[19] In developing the draft strategy, staff worked with Aukaha, Te Ao Marama, and Te Rūnanga o Ngāi Tahu. Feedback was also recieved from Kāti Huirapa Rūnaka ki Puketeraki. Since revising the strategy to closer reflect the Strategic Directions, staff have further engaged with Aukaha and Te Ao Marama to describe the changes to the final form.

[20] Key stakeholders involved in the early engagement of the strategy development process (which took place March-april 2024) have also been informed of the revised approach, noting many of these organisations and groups provided the feedback which informed the evolution of the final climate strategy.

[21] The Strategic Directions were also developed in partnership with mana whenua and consulted widely with the public.

Change of the name

[22] As above, many public inputs received on the draft strategy reflected an uncertainty about its purpose and how it fits within the wider organisation. The draft strategy's original name (Strategic Climate Action Plan) was likely a source of this confusion, as other 'plans' within ORC have either regulatory or budgetary implications (Regional Plans, and the Long-Term Plan and Annual Plan). Reflecting on this, ORC has renamed the strategy to the 'Climate Strategy 2024'.

OPTIONS

[23] Option 1: Council adopts the Climate Strategy 2024, which exists to show how ORC will give effect to the climate-related components of the Strategic Directions.

[24] Option 2: Council chooses not to adopt the Climate Strategy 2024.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[25] The final climate strategy proposes to be a supporting and connected component of ORCs wider Strategic Directions implementation. This approach strongly advances the intention of the Strategic Directions as an overarching framework to guide all ORC work towards strategic outcomes.

Financial Considerations

[26] Decisions about how to prioritise and resource work programmes to deliver on the climate strategy will be made through the ongoing implementation of the Strategic Directions, which will include influencing the LTP and Annual Plan processes.

Significance and Engagement

[27] As discussed above, ORC has sought to ensure mana whenua have had input into the climate strategy development process. This included engaging with Te Rūnanga o Ngāi Tahu, Aukaha, Te Ao Marama, and Kāti Huirapa Rūnaka ki Puketeraki.

Legislative and Risk Considerations

[28] The climate strategy is a non-statutory document which will guide ORC work to fulfil our legislated responsibilities.

Climate Change Considerations

[29] The purpose of the climate strategy is to advance ORC's Strategic Direction vision over the next 10 years to realise a climate resilient region that plans for and invests in initiatives that reduce emissions and help us adapt to our changing climate. The climate strategy communicates to the public how we are addressing climate change as an organisation, and support the Strategic Directions implementation to align ORC's work towards this climate vision (alongside the other visions within the Strategic Directions).

Communications Considerations

[30] The draft climate strategy was made available for public feedback from August – October this year. If Council adopts the final climate strategy, the final version will be published on the ORC website.

NEXT STEPS

[31] ORC staff will continue to progress the implementation of the climate strategy as part of the Strategic Directions implementation process.

ATTACHMENTS

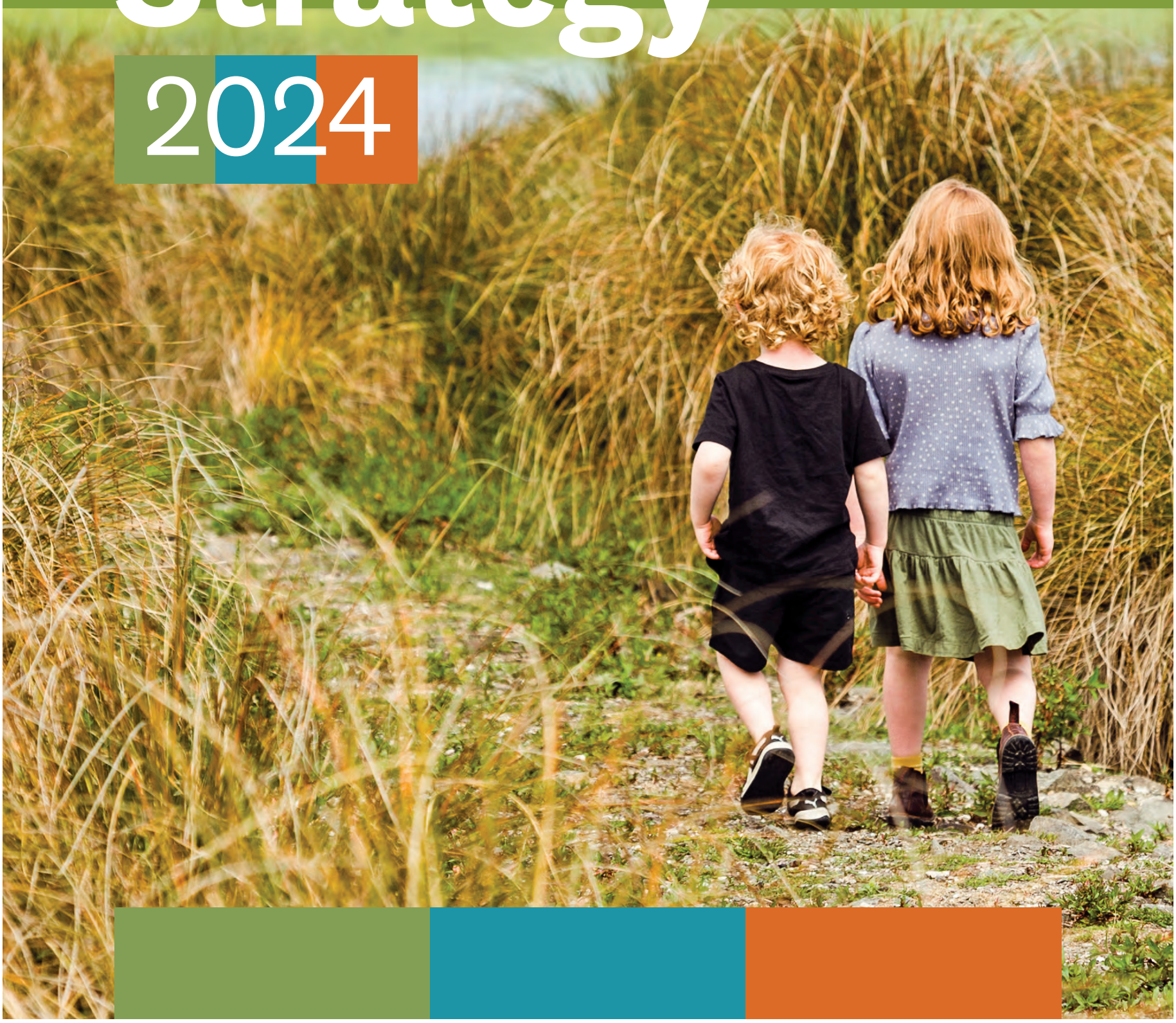
Otago Regional Council Climate Strategy 2024

1. Climate Strategy November 2024 201124 [**9.1.1** - 17 pages]

Otago Regional Council

Climate Strategy

2024




2
Balclutha

Contents

Foreword from the Chair

Otago is home to diverse communities, landscapes, and wildlife, all of which are already feeling the impacts of our changing climate.

Though we are taking action to reduce our greenhouse gas emissions, we can still expect the impacts to intensify over time. While the changing climate affects us all, it does not affect us all in the same ways.

We must adapt to manage the changes we are currently experiencing, and the changes yet to come. We can significantly reduce our greenhouse gas emissions while at the same time increasing our resilience, and this is a core theme of our Strategic Directions 2024–2034. This climate strategy complements the Strategic Directions, providing an overview of how ORC is addressing climate change through our work.

Gretchen Robertson
ORC Chair

Introduction

ORC has an aspiration for Otago to be a climate–resilient region that plans for and invests in initiatives that reduce emissions and help us adapt to our changing climate.

This aspiration is part of ORC's Strategic Directions 2024–2034. We have developed this climate strategy to provide more detail on what we're doing to deliver on this aspiration.

We're working towards our aspiration by focusing our actions on 10-year goals, which are also provided in the Strategic Directions 2024–2034.

In this strategy, we have detailed what we're currently doing towards each of these goals, as at 2024.

We'll update this strategy every three years — or more often if needed — to reflect on how we're making progress towards the goals. Our monitoring and reporting of this strategy will be part of a wider framework of outcome reporting undertaken for our Strategic Directions 2024–2034.

ORC's Strategic Directions 2024–2034

Our role as a regional council

We can all play our part in reducing emissions and building resilience to manage the impacts of climate change. This is challenging but also an opportunity to live and work in a more sustainable way.

As a regional council, our roles and responsibilities are defined by legislation. The Local Government Act 2002 sets our purpose, general powers, principles and processes. Other legislation — such the Resource Management Act, Biosecurity Act and Land Transport Management Act — defines the specifics of what we do.

ORC fulfils its roles and responsibilities as prescribed in these acts, guided by our Strategic Directions 2024–2034, which includes specific climate-related goals.

In relation to climate change, most of ORC's responsibilities relate to adaptation. This is where we can have significant impact in helping Otago adapt. For example, according to the Resource Management Act, we are required to consider the effects of a changing climate on communities and incorporate climate change into existing frameworks, plans, projects and standard decision-making procedures. This shows how climate change is already at the core of our everyday work. We will also be working on reducing our emissions and supporting others to do the same.

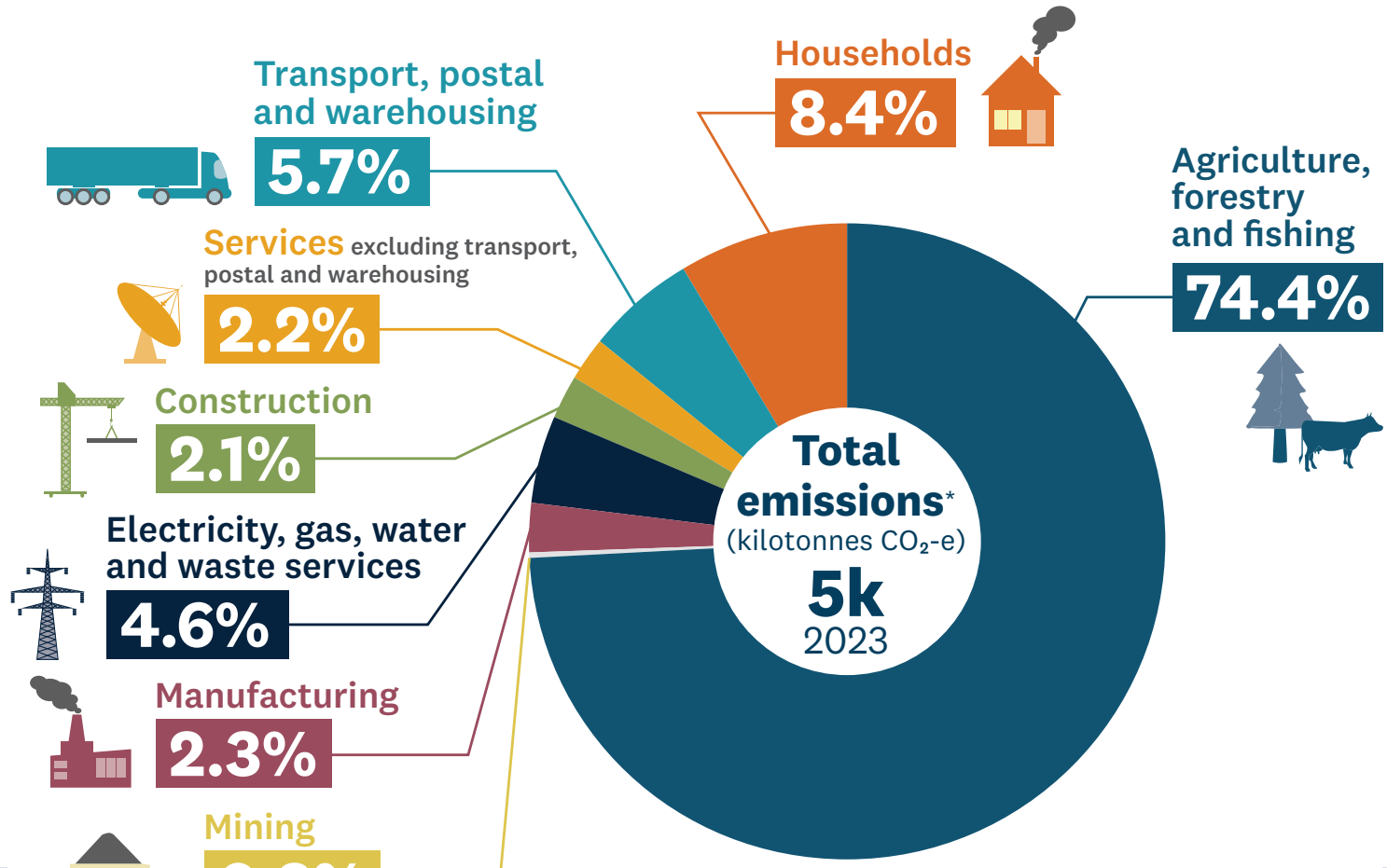
This strategy provides an overview of how we're implementing the climate-related components of Strategic Directions 2024–2034 to guide ORC's work to support the health, safety and wellbeing of our communities.

Importantly, ORC is part of a wider network of people and organisations working on climate change. This includes government, mana whenua, other councils, businesses and communities. We will be affected by climate change in different ways and have specific roles in addressing climate change. In developing this climate strategy, we received feedback from mana whenua and key stakeholders to understand what they are doing regarding climate change and how ORC can align our work so our roles are complementary.

Addressing climate change in Otago

Otago's emissions

The information below from Stats NZ helps us to understand the sources of greenhouse gas emissions in Otago. ORC has a role to play by reducing our organisation's emissions and helping others to do the same.



*Industry and household contributions to total emissions (CO_2-e), Otago region, 2023.
Source: Stats NZ

Bob's Cove, Queenstown

Climate change risks in Otago

Climate change will impact all areas of our lives, including our natural environment, communities, economy, built environment and governance structures.

Natural Environment	Built Environment	Governance	Communities	Economy
The ongoing survival and success of Otago's unique species and the ecosystems they rely on is at risk from climate change, as the environment faces increasing temperatures, changes in rainfall, snow and ice, flooding, extreme weather events, drought and ocean acidification.	For buildings, physical infrastructure, and transport, there are already a number of climate hazards and risks, including the ability of our infrastructure and open spaces to cope in the face of changing and extreme weather, sea-level rise and flooding. Many risks relate to reliability of our water supply infrastructure and irrigation systems, and stormwater and wastewater networks.	Governance (our structures and processes for decision making) face several risks from climate change and its impacts. There is the risk that existing planning and legislative frameworks may hinder an effective, long-term, focused response to the challenges of climate change. Another risk is that costs will rise due to climate change impacts, leading to insufficient funding for adaptation and risk reduction.	Climate change brings risks to community cohesion, human health and mental wellbeing from disrupted services, possible migration, housing and livelihood stresses, and other impacts such as food insecurity. Climate change impacts are not spread evenly, which also increases existing inequities and costs of living. Kāi Tahu cultural sites and practices and other cultural heritage sites also face risks from sea-level rise, extreme weather events, and increased wildfire.	There are wide and varied risks from climate change to the Otago economy, as the economy is closely linked to the community, natural environment, and built environment. Risks relate to the impacts of extreme weather, changing temperatures, and drought on the agriculture, forestry, aquaculture, and tourism sectors, among others. Also, there are risks of rising costs of doing business, and costs associated with repair and adaptation.

Dart River estuary near Glenorchy

Extreme weather and flooding
can damage homes, buildings, and recreation areas.

Health impacts
on communities dealing with the change, both physical and mental.

Hotter, drier weather
and changes in wind patterns will increase fire risks.

In 2021, the Otago Climate Change Risk Assessment summarised physical climatic changes we can expect at various levels of temperature rise.

This showed different areas of Otago will experience vastly different changes.

This information can help Otago prepare for the challenges and opportunities we face.

Warmer temperatures
will impact crops and animals, increase pests and diseases, and impact water storage.

Economic impacts
Environmental changes can impact jobs and the costs of doing business.

Rising sea levels
can cause floods and impact coastal communities and places of cultural significance.

ORC's Partnership and Communities aspirations guide all our work

PARTNERSHIP

Otago Regional Council has effective and meaningful partnerships with mana whenua, creating better outcomes for our region.

COMMUNITIES

Otago has cohesive and engaged communities that are connected to the environment and each other.

In practice, this means **we will work in partnership with mana whenua, and coordinate and collaborate with other organisations and communities to deliver cohesive climate action.** This recognises that ORC is part of a wider network of people and organisations working on climate change. We will be stronger and more effective if we work together. For example, we're partnering with mana whenua and collaborating with communities to understand which indigenous species and ecosystems are vulnerable to climate change and how we can work together to maintain them.

This also means we're focusing on how we can **enable mana whenua to exercise rakatirataka and increase their climate resilience through supporting the identification of risks to the values of mana whenua and collaborating on Māori-led adaptation planning.** We are committed to making mātauraka Māori an integral part of our work, including in climate adaptation actions. We will work in partnership with mana whenua and focus on the vulnerabilities and aspirations of local rūnaka.

Vision and goals

As described in our Strategic Directions 2024–2034, ORC's climate aspiration is 'Otago is a climate-resilient region that plans for and invests in initiatives that reduce emissions and help us adapt to our changing climate'.

Our climate-related goals define our role in contributing to our aspiration and define our priorities for climate action. Many are linked, which shows our commitment to working as a coordinated organisation.

Alongside these goals, you can see some of the actions we're already taking towards them. While some actions will contribute towards more than one goal, the table on the following pages shows the action alongside the goal that it most closely aligns with.

Despite the significant climate-related work we already do, we need to do more, and do some things differently if we want to achieve our aspirations. We'll be undertaking a gaps analysis to identify how ORC can — in partnership and in collaboration with others — most effectively deliver on our climate aspirations. We'll update this table every three years, or more often, if required, to reflect on our progress.

Bob's Cove, Queenstown

11

Strategic Directions 2024–2034 focus area	Climate-related goal	Actions we're taking towards the goal
Environment	**We predict and address emerging environmental issues before they arise**	• Undertake a review of the environmental monitoring network to ensure it is fit for purpose and includes additional climate monitoring parameters. • Develop drainage models for assessing scheme capacity against the impacts of climate change (East Taieri, West Taieri, Lower Clutha and Tokomairiro). • Collaborate with Otago's city and district councils to ensure civil defence and emergency management is informed by specific risks across the region. • Operate a network of near real-time rainfall and water level stations across the region to support flood forecasting and emergency response with a 24/7 duty roster to support forecasting duties and any necessary response. • Review the rainfall monitoring network to determine whether it can be used for purposes other than flood warning, e.g. drought predictions, management of water allocation, etc. • Undertake operational monitoring of coastal mouths and respond to channel flow and flood risks. • Collect data to inform assessments of climate-related impacts in Otago, including coastal, river cross-sections and morphology, landslide and sea-level rise. • Maintain a register of contaminated sites in Otago and advocate for risk assessments and remediation of contaminated sites vulnerable to the effects of climate change. • Undertake an Otago Natural Hazards Risk Assessment and develop a prioritisation framework to assess natural hazard exposure. • Administer the ECO Fund to deliver projects to improve the resilience of local ecosystems and indigenous biodiversity. • Expand ORC's biosecurity programme to better manage the impact of exotic pest species on indigenous biodiversity and improve the resilience and adaptive capacity of desirable ecosystems.

Strategic Directions 2024–2034 focus area	Climate-related goal	Actions we're taking towards the goal
Resilience	**Plans are in place to ensure that the region's most vulnerable communities (geographic and demographic) and ecosystems are resilient in the face of natural hazards**	• Work through Emergency Management Otago to support mana whenua-led approaches to emergency readiness and response by co-funding a two-year emergency management mana whenua facilitator. • Collaborate with Dunedin City Council on the South Dunedin Futures work programme by providing risk assessments, natural hazard investigations, environmental monitoring of groundwater, sea level and rainfall, and supporting the identification and execution of adaptation options. • Work through Emergency Management Otago to raise community awareness of climate hazards and how to prepare, including through the community response network, which provides training and resources to support communities' capabilities and capacity to manage emergency events. • Support mana whenua in undertaking climate change risk assessments and managing the exposure and vulnerability of taonga by providing technical information and guidance as needed. • Collaborate with Otago's city and district councils to build on the Otago Climate Change Risk Assessment to provide valuable adaptation information for the region. • Collaborate with Otago's city and district councils to co-design community education messaging on adaptation needs for the region. • Provide adaptation planning support to mana whenua at a rūnaka level. • Ensure that Catchment Action Plans for different freshwater management units include identification of climate adaptation needs. • Review the Otago Lifelines Infrastructure Vulnerability Assessment to inform ongoing emergency management work. • Collaborate with Otago's city and district councils to develop shared adaptation priorities based on a consistent risk assessment framework, and to agree on consistent use of dynamic adaptive pathways planning. • Collaborate with Queenstown Lakes District Council on adaptation needs, including regarding wildfire risk on Mount Iron, Ben Lomond and other red zone locations and Gorge Road alluvial fan risk. • Collaborate with Queenstown Lakes District Council on the Head of Lake Whakatipu Natural Hazard Adaptation Strategy to inform adaptation in Glenorchy and Kinloch, considering climate and other natural hazard risks. • Collaborate with Waitaki District Council on adaptation projects and initiatives for Waitaki coastal risk assessment and management.

Strategic Directions 2024–2034 focus area	Climate-related goal	Actions we're taking towards the goal
Resilience	**Our infrastructure is designed and built to accommodate variability and uncertainty associated with changing weather patterns and sea level rise**	• Develop drainage models for assessing scheme capacity against the impacts of climate change (East Taieri, West Taieri, Lower Clutha and Tokomairiro). • Collaborate with Clutha District Council on a multi-hazard adaptation strategy, including reviewing the Lower Clutha Flood Protection scheme regarding engineering solutions compared to retreat, and considering adaptation risks relating to the wider Clutha Delta, including monitoring sea and groundwater levels and shoreline change. • Develop the Lower Taieri Plains Adaptation Strategy, which reviews the flood protection schemes and the impacts of increased climate impacts and natural hazard risks on existing infrastructure, including floodbanks, drainage systems and pump station adequacy. • Conduct an organisational climate change risk assessment (following the agreed regional framework) to scope the risk levels to various ORC assets, infrastructure and operations. • Ensure ORC's budgeting process builds in climate assumptions, including emergency funds for repairing/ replacing infrastructure and reviewing adaptation needs for ORC infrastructure. • Investigate adaptation needs as part of the Leith to Harbour Amenity Project.
Resilience	**Our Regional Policy Statement and regional plans control development in areas that are vulnerable to natural hazards**	• Ensure that climate-related impacts are understood when developing the proposed Regional Plan: Land and Water, and revising the Regional Plan: Coast. • Ensure that climate mitigation and adaptation policies are embedded in the Regional Policy Statement and Future Development Strategies and these reflect the natural hazard and climate impacts and risks for the region. • Advocate to central government for legislation to support local government with managed retreat and other adaptation actions. • Act as a conduit between Fire and Emergency NZ and research institutes to understand how we can best use regulatory settings and regional relationships to manage increased wildfire risk for the region.

Strategic Directions 2024–2034 focus area	Climate-related goal	Actions we're taking towards the goal
Climate	**The carbon footprint of our organisation is reduced in line with our climate strategy, and we are supporting and collaborating with others to do the same**	• Develop an organisational emissions inventory. • Develop and implement an organisational emissions reduction plan. • Support and collaborate with the Zero Carbon Alliance and Otago Climate Officers Group to understand shared emissions reduction priorities and ensure we're coordinating on common emissions reduction pathways and utilising common tools and methodologies. • Participate in the Enviroschools programme to promote environmentally friendly behaviour change in Otago communities. • Collaborate with Otago's city and district councils to fund the Regional Waste Officer role (employed by DCC) to pursue opportunities for regional-level approaches to waste management including resource recovery, waste reduction at source and sludge management.
Climate	**Climate change mitigation and adaptation are key considerations in all our decisions**	• Develop consistent assumptions on climate projections for Otago to underlie all ORC work. • Collaborate with Health New Zealand | Te Whatu Ora, National Public Health Service and the region's city and district councils to explore and better understand the impacts of climate change on human health, and explore how to incorporate these considerations into decision making. • Develop an Otago Natural Hazards Adaptation Plan. • Revise ORC's Biodiversity Strategy and ensure it is aligned to this strategy and factors in increased climate impacts and natural hazard risks and sets out actions ORC will deliver to enhance Otago's biodiversity. • Ensure that climate-related impacts and opportunities are understood when revising other regional plans.
Climate	**Our agriculture and horticulture systems are more climate resilient in the face of changing weather patterns, water availability and consumer choice**	• Provide education and advice through catchment advisor programmes to increase knowledge and interest in environmental issues and build community resilience to the impacts of climate change. • Engage with landowners in Otago to understand existing knowledge about nature-based solutions for water quality and flood hazard mitigation outcomes, with a view to exploring barriers and benefits for adoption at an individual property level.

Strategic Directions 2024–2034 focus area	Climate-related goal	Actions we're taking towards the goal
Transport	**Carbon emissions are reduced and air quality is improved across the region, supported by our efficient and affordable public transport services**	• Provide efficient, reliable and accessible public transport services to meet community needs. • Decarbonise the public transport fleet. • Coordinate public transport services with school travel plans. • Explore opportunities to support decarbonisation through the Total Mobility Scheme. • Undertake total mobility survey, bus user survey and annual survey to understand current modes of transport and community views on reliability, equitability, sustainability and safety.
Transport	**Active transport is the preferred mode for short journeys in urban areas**	• Collaborate with Otago's city and district councils to reduce car use and encourage public transport uptake through traffic demand management initiatives such as parking plans, active transport, micro-mobility and carpooling. • Submit on consent applications at the district level to maximise potential integration with the public transport network. • Develop and implement a public and active transport connectivity strategy to encourage active modes of travel and reduce vehicle emissions.

Tracking progress

Our monitoring and reporting of this strategy will be part of a wider framework of outcome reporting undertaken for our Strategic Directions 2024–2034.

When it’s ready, we’ll update this strategy to include this reporting information. We’ll then keep it updated every three years to reflect on how we’re making progress towards these climate goals.

9.2. Focus Areas and Objectives of the Regional Public Transport Plan

Prepared for:	Council
Report No.	POL2431
Activity:	Transport: Transport Planning
Author:	Daniel Basubas, Transport Planner; Grace Longson, Transport Planner; Jack Cowie, Senior Transport Planner
Endorsed by:	Anita Dawe, General Manager Regional Planning and Transport
Date:	4 December 2024

PURPOSE

[1] To update Council and receive formal response to the draft Focus Areas and Objectives of the draft Regional Public Transport Plan's (RPTP) (2025-2035).

[2] To update Council and receive feedback on select policies and actions of the draft RPTP.

EXECUTIVE SUMMARY

[3] A regional council must renew or vary its RPTP as soon as practicable after the approval or variation of a Regional Land Transport Plan (Part 5 Section 126 of the Land Transport Management Act 2003). On 24 June 2024, Council approved the mid-term review of the Otago Southland Regional Land Transport Plan (2021-2031), triggering a renewal or variation of the current RPTP (2021-2031).

[4] Transport staff held two Council workshops regarding key public transport challenges, opportunities and priorities in the region. Staff also presented a draft RPTP at the November Public and Active Transport Committee (PATC) meeting.

[5] Engagement with relevant stakeholders, including Territorial Authorities (TAs) is ongoing, with policies and actions being developed collaboratively.

[6] The current work programme has the completion of a full draft of the RPTP in preparation for the PATC meeting on 5 March 2025. The draft would then go out for consultation, and Council decisions on adoption of the RPTP in May 2025 following public consultation and hearings.

RECOMMENDATION

That the Council:

1. ***Notes** the report.*
2. ***Approves** the Focus Areas and Objectives for the draft Regional Public Transport Plan, subject to any changes requested.*

Focus Area	Objective	Council response
a) A Connected and Integrated Network	Deliver a reliable and convenient public transport system that improves personal freedom and access to opportunities.	**Support** (recommended) OR **Request** that staff revise the focus area / objective
b) Passenger Experience	Provide useful public transport services that respect the safety and wellbeing of passengers, particularly for people experiencing transport-disadvantages.	**Support** (recommended) OR **Request** that staff revise the focus area / objective
c) Value for Money	Provide public transport services in a manner that achieves good value for money.	**Support** (recommended) OR **Request** that staff revise the focus area / objective
d) Build Trust	Proactively engage with communities and organisations, including iwi, to foster trust and ensure public transport projects align with community priorities.	**Support** (recommended) OR **Request** that staff revise the focus area / objective
e) Environmental Sustainability	Invest in a public transport system that promotes the best possible environmental outcomes regarding greenhouse gas emissions, pollutants and land use.	**Support** (recommended) OR **Request** that staff revise the focus area / objective

3. ***Notes*** *the key policies and actions identified in the draft Regional Public Transport Plan*

BACKGROUND

[7] The Regional Public Transport Plan (RPTP) is the guiding document for the development of public transport in Otago, representing our commitment to our community as to what services we will deliver and the policies under which they will operate.

[8] Transport staff are working to develop a new RPTP, based on Resolution PAT24-114 (recommendation adopted by Council in Resolution CM24-177).

[9] Transport staff have held two Councillor workshops and provided a progress update with a working draft (50% complete) in the November PATC meeting.

[10] RPTP development is progressing through further drafting and stakeholder engagement, ahead of a March 2025 target for endorsement of a consultation draft.

DISCUSSION

[11] To support this process, staff are seeking Council's formal support for the Plan's Focus Areas and Objectives that were previously discussed in the workshops.

[12] Staff also seek feedback on the Plan's policies and actions that staff consider to be most important to the document. As stakeholder engagement is ongoing, formal Council support is not yet being sought.

Focus Areas and Objectives

[13] When structuring the RPTP, we have sought to minimise the number of Focus Areas to give the plan a strong narrative. This means, for example, that issues such as fares, which under the previous plan had their own objective, are considered part of the wider *Value for Money* Focus Area.

[14] We recommend this approach because we believe it helps us communicate a clear story about what we want to achieve with public transport.

[15] However, some topics do inevitably fall across the different focus areas. For example, while content on land use is focused into the final *Environmental Sustainability* Focus Area, the topic also has significant relevance to *A Connected and Integrated Network*, and *Value for Money*.

Policies and Actions

[16] Each policy and action sit within a single Objective. While several policies and actions have already been shown to Councillors in our 22 October workshop, they may have been further developed.

[17] These policies and actions will guide Transport staff's day-to-day decisions as we deliver ORC's public transport activities within our budgets. They will also form the basis for staff recommendations where decisions are made by elected councillors. Councillor input on these policies is important at this point. We offer this opportunity for feedback so we can be confident that the draft RPTP we prepare for the Public and Active Transport Committee in March has Councillor support.

[18] We include an attachment of selected policies and actions for Council to review and provide feedback on. These policies are of key political interest or require meaningful change from the 2021 RPTP.

[19] All policies and actions we have prepared to date can also be viewed in the attached draft RPTP.

OPTIONS

[20] Councillors may support these Focus Areas and Objectives. This would not preclude minor changes (editorial or minor changes in substance) through the process. Support would be treated as a finalisation of the Focus Areas and Objectives.

[21] Alternatively, Council may decline to support one or more of these focus areas and objectives. In this case, staff would consider the feedback received and come back with adjustment in the future.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[22] This RPTP is developed under the Otago-Southland Regional Land Transport Plan (RLTP), whose priorities are to:

- Optimise an efficient and accessible transport network through enhanced mode choice provision across the regions;
- Promote safety and wellbeing outcomes across the regional transport network; and
- Enhance network maintenance and resilience to ensure community access and connectivity.

[23] The RPTP is consistent with the 'Transport' Strategic Direction set by Council for "*an integrated transport system that contributes to the accessibility and connectivity of our community, reduces congestion and supports community wellbeing aspirations."* It also reflects the three corresponding Transport Goals:

- Congestion is reduced and connection is increased throughout the region.
- Carbon emissions are reduced and air quality is improved across the region, supported by our efficient and affordable public transport services.
- Active transport is the preferred mode for short journeys in urban areas.

Financial Considerations

[24] Development of the RPTP is a required activity by the LTMA. Funding of up to $200,000 is included in Council 2024/25 budget for RPTP work through the LTP and includes staff time, consultant support, stakeholder engagement and communications. It is expected that the development of the RPTP will be 51% funded by the National Land Transport Fund.

[25] Policies and investment intentions in the Plan should guide future investment decisions, but do not in their own right commit ORC to funding specific projects and interventions. However, if the Plan steers towards an enhanced level of service and increased capacity over time, then future investment in the network will be required.

Significance and Engagement

[26] In accordance with Council's He Mahi Rau Rika; Significance, Engagement and Māori Participation policy the review of the RPTP is deemed to be significant due to its "impact on community include costs [directly or] indirectly to the community or part of the community, whether though rates, fees or otherwise" and due to:

- Potential impacts on the delivery of outcomes of Council's policies and strategies;
- The degree to which the policies set out in the RPTP will contribute to the promoting of achieving particular community outcomes through public transport;
- Any inconsistency of new public transport policy, plans or levels of service with those as specified in the existing RPTP; and
- The level of community interest in the proposals, issues or decisions in the RPTP.

[27] Engagement and consultation is required and to be undertaken in accordance with s125 LTMA (including s82, s83 and s87 of the LGA 2002). More details about stakeholder engagement were outlined in the Discussion section above.

[28] Transport staff have developed a stakeholder engagement plan which provide collaborative partners (TAs and Mana Whenua) and other stakeholders (advocacy groups, organisations, people experiencing transport disadvantages, government agencies) multiple opportunities to contribute to the development of these objectives and their related policies and actions prior to public submission through workshops, one-on-one meetings and surveys.

[29] Transport staff have contacted roughly 100 stakeholders who may be interested in participating in the engagement process, with the understanding that stakeholders will have varying degrees of interest in the development of the RPTP, and thus varying degrees of participation.

Legislative and Risk Considerations

[30] The RPTP is the core statutory instrument for public transport planning under the Land Transport Management Act 2003. While the current RPTP is operational until 2031, having recently approved the public transport service components of the mid-term review of the Regional Land Transport Plan, ORC is now required to review its RPTP. From the review it was determined the RPTP requires a comprehensive update.

[31] Staff have identified strategic, operational, financial, reputational and regulatory risks in a risk register. Examples of these risks include stakeholders lacking capacity for full collaboration, challenges securing NLTF funding, and overlapping consultation between the RPTP and Annual Plans. Transport staff have also put controls in place to manage these risks and plan to review them throughout the process.

Climate Change Considerations

[32] Public transport is a key element in reducing Otago's transport emissions. The RPTP will develop policies that will influence the effectiveness of Otago's public transport network by providing an alternative to private car travel, decarbonising the public transport fleet and integrating land use planning with public transport.

Communications Considerations

[33] The consultation and engagement proposed to be undertaken is supported by a full communications plan. It outlines the challenges, goals, key messages and message channels and task details associated with renewing the RPTP.

NEXT STEPS

[34] A consultation-ready-draft, and consultation materials, will be submitted to the PATC meeting in March 2025, with public consultation in March-April 2025.

ATTACHMENTS

1. 4 December Council Report RPTP Key Policies and Actions [**9.2.1** - 3 pages]
2. RPTP v0 6 Draft for Council [**9.2.2** - 50 pages]

Draft Regional Public Transport Plan: Key Policies and Actions

*This is a summary of **key** policies and actions for Council feedback. Not all policies and actions are shown here. To view all policies, please refer to the full draft also attached.*

Network Design policies:

SD P2	The public transport network is simple and designed in a way that **prioritises ridership** while also acknowledging the need to **deliver quality coverage** to support equitable access as much as possible with the resources available.
SD P5	Public transport services will primarily be delivered using the **most practical and cost-effective mode.** In Otago this is predominantly buses (fixed-route or, in some cases, on-demand). Opportunities to invest in other modes in the long term will be evaluated.

Infrastructure policies and actions

Policies:

IN P1	A **collaborative and coordinated approach** with territorial authorities and partner agencies will be taken to improve the planning and delivery of public transport infrastructure and services.
IN P3	Provision of infrastructure supports a high-quality end-to-end journey experience that is accessible, safe and simple for everyone. This includes following best practice quality and safety standards for all infrastructure components along the journey, including vehicles, stop placement, stop design, shelteros, footpaths and crossings.

Actions:

PI A3	**Partner** with territorial authorities and NZTA to improve the design, implementation and maintenance of physical infrastructure necessary for a safe and easy-to-navigate end-to-end journey for all passengers**.**
PI A4	**Partner** with territorial authorities and NZTA to design city-centre infrastructure and interchanges in line with network and service planning.

Fares policies:

F P1	**Base fare level:** Fares for integral services should be structured around a base fare level that fairly balances affordability for users with maintaining the sustainability of services and supporting service improvements.
F P2	• **Fare structure**: From the base fare level, fares for integral services should be structured in a way that is as simple as possible, but also fairly shares the cost between different types of users according to their ability to pay and the cost of serving them. The structure will include the following elements: o *Concessions:* transport-disadvantaged people with less ability to pay will be charged lower fares, as outlined in FP3 below o *Free transfers*, ensures that people can travel in complex ways without being charged more than they would for a single trip o *Fare capping:* Regular use is incentivised and rewarded *[optional, subject to fare study and decisions]* o *Distance structure:* Trips within urban networks operate under flat fares. These flat fares form part of a wider system of zonal fares for regional services *[subject to fare study and decisions]* o *Use of cash:* Eliminate the use of cash payments upon the implementation of bank-card payments. Set higher cash fares to

	discourage use of cash until the implementation of bank-card payments

Funding policies:

PTF P1	**Private share:** Maintain and increase the private revenue contribution to the cost of public transport over time.
PTF P2	**Third party funding:** Develop and grow third party funding through identifying and implementing a range of initiatives such as: • Fareshare – businesses/entities fund fare concessions for nominated groups • Advertising – utilising advertising space on vehicles and infrastructure • Property development contributions • Retail opportunities
PTF P3	**Public transport activities without central government funding:** Fund public transport activities without central government funding only in cases where: • The activity represents outstanding value for money for ratepayers, even without a central government contribution; or • The activity is a trial service, where the success of the trial would create a strong case for future central government funding.

Land use policies:

LU P1	The ORC will work with TAs to support new urban development areas and existing urban area redevelopment/expansion that enable viable frequent public transport service provision through the following features: • Acknowledge the unique characteristics and challenges of places and • Is consistent with the urban form and transport design factors such as good proximity, linearity, connectivity and land use intensity.
LU P2	The ORC will not provide public transport services sufficient to enable well-functioning urban areas where the nature and location of the proposed urban development is inconsistent with the urban form and transport design factors of good proximity, linearity, connectivity and land use intensity.
LU P3	The ORC will prioritise providing useful and frequent public transport services to new and existing urban areas that align with well-functioning urban environment principles.

Equity policy:

EQ P1	Equity will be at the forefront of public transport decision-making.

Otago Regional Council

Otago Regional Public Transport Plan 2025-2035

Contents

Otago Regional Council

Otago Regional Council

Part 1

1 Overview

The Otago Regional Public Transport Plan (RPTP) is a key statutory document that guides the design and delivery of public transport services, information and infrastructure in the Otago region.

Public transport operates as a system, and in order for all elements to integrate and consistently deliver high quality journey experiences, a high degree of collaboration and commitment across agencies and operators is required. Otago Regional Council (ORC) works in partnership with the New Zealand Transport Agency (NZTA), and our region's territory authorities and operators to plan, fund and deliver public transport services and infrastructure.

This Plan takes a 10-year strategic view, with a particular focus on how funding and effort is spent over the first three years. It has been developed in accordance with guidelines outlined by Waka Kotahi and meets the requirements outlined in the Land Transport Management Act 2003. The policies and actions in this plan have been developed in collaboration with our partners and engagement with stakeholders across our region.

1.1 Why do we need this Plan?

The purpose of the RPTP and principles for providing public transport are set in the Land Transport Management Act 2003. The statutory purpose is:

- A means for encouraging regional councils and public transport operators to work together in developing public transport services and infrastructure.
- An instrument for engaging with the public in the region on the design and operation of the public transport network.
- A statement to:
    - Describe the public transport services that are integral to Otago's public transport network
    - Define the policies, procedures and actions that apply to those public transport services
    - Identify the information and infrastructure that support Otago's public transport services.

The Land Transport Management Act 2003, requires us to review our Regional Public Transport Plan as soon as practical after the finalisation of the Regional Land Transport Plan (RLTP) to incorporate its updated public transport components .

1.2 Strategic context

The RPTP sits within a broader strategic planning and investment framework and needs to consider, align and give effect to a wide range of local, regional and national strategies, plans and policies.

[graphic summarising national/regional and strategic policy context under development]

1.3 What is the role of public transport?

[under development - Link to ORC LTP community outcomes and LTMA principles]

Otago Regional Council

1.4 How is public transport funded?

Otago's public transport services are funded from both private and public revenue sources. Private revenue sources include fares, which are paid by passengers, and third-party revenue, which are other sources of non-public revenue, such as advertising or employer contributions. Public revenue is made up of local rates and central government funding.

[graphic similar to below being developed with Otago figures]

1.5 Otago's public transport system

Otago's public transport network consists of:

- The Orbus Dunedin network of 23 bus routes
- The Orbus Queenstown network of five bus routes and one ferry service
- Total Mobility services in Dunedin, Oamaru, Queenstown, Wanaka, and Balclutha
- "Exempt" services across the region, which are run without subsidy
- Ministry of Education school services, which primarily connect rural areas to their closest available schools.

Services in Otago have undergone significant changes in the last 10 years. These include:

- A redesign of the Dunedin network, removing complex service patterns to create a simple, navigable network with improved frequencies and more direct trips.
- The creation of an affordable, subsidised service in Queenstown in 2017, which has enabled a significant increase in service levels and patronage compared to the previous commercial service.
- Introduction of an affordable flat-fare model in Dunedin in 2020.
- Implementation of the interim Bee Card ticketing system across the region.
- Service improvements in 2020 to improve network capacity in both Queenstown and Dunedin. For example, direct services between Lake Hayes Estate and central Queenstown, and increased peak services between Mosgiel and Dunedin.

- Electrification of a number of bus services in Dunedin, with further electric buses scheduled to enter service in 2025.

1.6 Roles and responsibilities

Otago Regional Council is responsible for the delivery of public transport services in Otago. We set the bus routes, schedules, provide public transport information and we contract the service delivery to specialist public transport operators. The current operators in our region are Go Bus Transport (Dunedin), Ritchies Transport (Dunedin and Queenstown), Real NZ (Queenstown ferry). They provide the buses, ferries, drivers and depots and are responsible for ensuring services as delivered to the timetables. There are also several exempt operators, including Total Mobility operators (across Otago).

Public transport infrastructure such as bus stops, shelters and interchanges are provided in collaboration with our territorial authorities (Central Otago District Council, Clutha District Council, Dunedin City Council, Queenstown Lakes District Council and Waitaki District Council), and NZTA if they are on one of the State Highways. As Road Controlling Authorities for local roads, our territorial authorities also design and regulate the street environment including public transport corridors. We also collaborate with our territorial authorities in wider strategic planning including transport and spatial planning.

Recent examples of how we having been working together in Dunedin include integrating changes to bus routes with upgrades to stops in the tertiary area, including installation of high spec, double length bus stops, and rerouting buses away from George St, increasing the routes servicing the hospital and improving the infrastructure at the hospital stops and on Knox row.

The scope and delivery of public transport in the region is governed by legislation, and central government policy, regulation and funding processes. Otago Regional Council will continue to advocate to central government for policy and funding environment that supports good public transport outcomes.

1.7 Challenges and opportunities

[section under development]

1.8 What are our priorities?

This Plan is structured around five key focus areas:

1) A Connected and Integrated Network
2) Passenger Experience
3) Value for Money
4) Build Trust
5) Environmental Sustainability

Each focus area has an expanded objective statement and collectively they shape how we propose to manage our public transport system, including improving access, choice and increased use.

Each focus area forms a chapter of the Plan and a structure to understand our policies. **Policies** refer to ORC's position on a particular topic that we will refer to when we make decisions about our public transport network, while **Actions** refer to our work plans for the next 3-10 years.

After these chapters, there is a further Implementation chapter, which sets out our programme for implementing the various Actions of the Plan, and then a set of Appendices. These

Otago Regional Council

Appendices provide further information that is required to complete the legal requirements of this Plan. [Appendices in development]

This document has been directly informed by conversations with many key stakeholders, direct customer feedback, and 2024 LTP and AP public submissions.

Otago Regional Council

Part 2

2 Focus Area 1: A Connected and Integrated Network

Objective: Deliver a reliable and convenient public transport system that enhances personal freedom and access to opportunities.

Our two Orbus urban networks in Dunedin and Queenstown provide bus and ferry services to help get you to where you need to go. These are supported by Total Mobility subsidised door-to-door transport services for people with long-term mobility impairments, and specialist school services. Connecting our region's smaller towns with traditional public transport is more challenging. We have some services that operate without subsidy, and we are exploring new ways to improve our regional connectivity.

The key aspects of our first objective are:

Reliable: The service is dependable and available when we say it will be

Convenient: The service fits with people's needs

Access to opportunities: Our services allow people to get to where they want to go to participate in education, employment, social and recreational activities

Personal freedom: The service allows people to travel to meet not just essential needs such as education, employment, medical care, and shopping, but supports people to connect and meet wider lifestyle needs too.

Achieving this objective will support 'more people to be able to use public transport more often'.

2.1 Service design principles

The design of public transport requires a great level of care. A change to a public transport service could change whether people can get to work, school, or a medical appointment. Services need to be consistent and easy to understand; they also need to be reliable. Service design also needs to be done in a manner that balances the limited resources (vehicles, drivers, funding) that we have.

We aim to achieve the greatest public benefit possible by designing our region's public transport network around several service design principles.

2.1.1 Service design principle: Serve many trip types

Public transport design often focuses on serving the types of travel that we think are important. For example, we might want to support travel-to-work, travel-to-school, or access for people with few transport options, such as elderly or disabled people. We may also focus on key locations, such as a central city, university or activity hub.

These different types of trips are certainly important, but we want to go beyond targeting such specific trips, and support people's freedom. Our first principle is to design our services so that people are able to travel **where they want, when they want**. Instead of picking winners (such as a central business district), we want our services to connect to destinations right across a city: restaurants, shops, beaches, parks, libraries, and many more, serving as many trips as possible day and night, seven days a week. We can't provide a separate service for every

Otago Regional Council

type of trip that we can imagine – there are far too many – but we can design services to **support complex travel patterns in a simple way,** where travelling by public transport is time- and cost-competitive with private car journeys.

2.1.2 Service design principle: Balance ridership and coverage outcomes

"Be truthful in what we value – and understand the consequences "

Public transport network planning, generally targets either **ridership** or **coverage**.

A network designed only around **ridership** focuses service on areas with high actual or potential demand, so for a given budget, the level of usage is high. This will mean not serving areas where a lot of resources are required to serve a very small number of passengers. A ridership-focused service may still serve a large part of an urban area but will avoid making compromises to closely serve the hardest-to-serve areas. It may be less equitable, but it may also achieve equitable goals by meeting people's needs more fully.

A network designed only around **coverage** would have significant compromises of frequency and directness of service; it may also include more bus stops, closer together but of lesser quality. Fully coverage-oriented service may be regarded as meeting goals of equity or geographic fairness, but would be of insufficient quality to provide an adequate transport option for most users.

Coverage and ridership are both important and most public transport networks are designed with both in mind. Typically, areas with weaker public transport fundamentals (population, density and urban form) are forced to put a larger proportion of resource into delivering a basic level of coverage. There is a tendency for public transport networks to drift "by default" towards a more coverage-oriented design over time, as coverage-oriented decisions are often easier to implement quickly, and made in isolation with the negative impacts taking time to emerge.

Drawing on ORC's vision for our environment and communities in Otago to be healthy and connected ki uta ki tai (from mountains to the sea), we see improving ridership to improve environmental outcomes as the greatest priority. As such, our policy below focuses on improving ridership while maintaining existing coverage and enhancing it to the extent that resources allow.

2.1.3 Service design principle: Mode-neutrality

"Don't put the cart before the horse"

Public transport debates can often centre on modes: buses vs trains vs trams vs ferries, and so on.

Different modes of public transport have different capabilities. For example, trains can move a much larger number of people per vehicle than buses, and can be significantly more comfortable for longer-distance travel. Ferries, although they can only serve a limited geographic area around the water's edge, can provide connections across water that are not available by road.

We take a mode-neutral approach to public transport decision making and delivery. Specifically, we do not inherently prefer one mode over any other. Bus transport is currently the dominant public transport mode in Otago (with only minor exceptions such as the Queenstown Ferry). Future considerations of alternative modes (or vehicles) will need to address how another mode will deliver the same (or better) outcomes for an equivalent (or less) cost of a bus.

There may be potential places in Otago where alternative modes are more feasible and cost effective than buses at some point in the future, but there has not been sufficient study of such options for us to make commitments in this Plan.

must specify any objectives and policies that are to apply to— any units; and any services referred to in paragraph (a)(vii); relating to financial assistance for small passenger service vehicles

2.2 Service design policies and actions

The policies and actions in this section reflect…

Service Design Policies	
SP P1	Public transport services are designed in a way that: • Maximises frequencies • Avoids unnecessary duplication of service • Serves diverse trip patterns in a simple way • Operates full frequencies across long service hours. This will include the following design practices (where these come into conflict, a reasonable balance will be sought): • Services are direct, with travel times as competitive with private vehicle travel times as practical • Services aim to maximise access and travel options to urban, town centre and key service and activity areas. • Services integrate with surrounding land use and operate through the heart of communities, rather than the edges, to maximise the number of people and destinations within walking distance of a service. • Services operate on suitable streets, avoiding diverting around narrow back streets and staying on wider main roads. • Service design reasonably minimises the number of transfers customers need to make. • Services support seamless transfers, network function and efficiency. • Service design supports connections with other modes of transport, including walking for all trips, cycling (particularly in areas with strong identified demand or potential demand for cycling), and private vehicles (in the cases of longer trips, or to divert carparking away from central areas). • Services that overlap for significant sections of their route will be designed and timetabled in such a way to provide a more frequent combined service over the common section.
SD P2	The public transport network is simple and designed in a way that prioritises ridership while also acknowledging the need to deliver quality coverage to support equitable access as much as possible with the resources available.

Otago Regional Council

SD P3	When analysing coverage in service design, ORC will consider the following factors: • Walking distance to the nearest stops • Steepness of streets used to access stops • The quality of the walking infrastructure • Access to return trips • Cycling access to bus stops in flat areas • Private vehicle access to bus stops for longer-distance trips
SD P4	**Change in service provision.** Decisions on service changes or the introduction of new services will be based on the following principles: **New services** i. must improve accessibility and be supported by the community ii. potential for the service to generate patronage, at present and under expected growth in the next 10 years iii. consistency of the area to be served with well-functioning urban environment principles. iv. the quality and extent of supporting public transport infrastructure and multi-modal access v. The adherence of a new service's area with the service design principles in SD P1 above vi. Cost, revenue and funding projection support the long-term viability of the new service. vii. new services may initially be implemented on a trial basis to better understand ii and vi, before integrating them into the network on an ongoing basis. **Existing services** – where a service fails to consistently meet patronage expectations, ORC will take the following actions before reducing the level of service or ending the service: i. investigate the customer potential of the service ii. identify and assess options to improve the service to attract patronage (for example, route changes, promotional activities or infrastructure improvements) iii. consider other ways of delivering the service (for example, an on demand service, or a targeted service) iv. consider combining the service with others or truncating the service at a key stop or destination.
SD P5	Public transport services will be delivered using the most practical and cost-effective mode. In Otago this is predominantly buses (fixed-route or, in some cases, on-demand). Opportunities to invest in other modes in the long term will be evaluated based on: xxxxx.

Otago Regional Council

	Service quality policy
Service Design Action	
SP A1	Periodically review the design of existing services, considering factors such as: • Performance of services • Adherence to service design principles in [SD P1] • Contractual cycles • Changes in the funding environment • Changes to the distribution of people, jobs, and key services within urban areas and the wider region Depending on what level of review is seen as necessary, service reviews may be localized to a part of the network, or cover the whole network.

2.3 Network form and function

Central to this plan is the goal to improve access and opportunities for the people of Otago through a connected and integrated regional public transport network. This section uses the framework of *network layering*, to show how various types of urban and regional services are combined to form an efficient regional network.

2.3.1 Network layering

The foundation of our network are our well-performing urban networks in Dunedin and Queenstown. These urban networks primarily consist of integral services operating under subsidy.

Urban services are classified according to their network function as **rapid, frequent,** or **connector** services, supplemented by **targeted** services to fulfil special purposes.

Regional services in Otago primarily consist of exempt services operating without subsidy (the exception being the current Palmerston-Dunedin service). These services are integral to the wider regional network, and ORC has an interest in enhancing the regional network with subsidised services through this plan. The Regional network is classified as consisting of **Regional Link** or **City Link** services at **primary**, **regular**, or **daily service** levels, along with targeted services.

The tables below detail these network service layers in greater detail including how they are incorporated into Otago's network.

Urban Rapid service *No current or planned services in Otago approach full rapid service characteristics, but combinations of services on key spines deliver some elements of rapid services.*			
Role and function	**Key characteristics**	**Service hours and frequency targets**	**Infrastructure requirements**

Otago Regional Council

Moves a very high number of people Strongly shapes the urban area's public transport network, urban form and development Primarily delivers ridership outcomes	Turn-up-and-go frequencies (no need to check the timetable) High-capacity vehicles Travel times competitive or better than private vehicles	6am – 8pm: every 10 minutes or better 4am-6am, 8pm – 1am : every 15 minutes or better *[could set a long-term target of 24 hour service]*	Delivered high-capacity vehicle (bus or other) on fixed route Dedicated right-of-way, little to no interactions with other traffic, especially in areas of congestion. High quality stations (for buses, intermediate or premium grade).
Urban Frequent service *In some instances, multiple overlapping Connector services are coordinated to deliver Frequent service standards on their common section. We aim to increase the number of people served by Frequent services in Otago.*			
Role and function	**Key characteristics**	**Service hours and frequency targets**	**Infrastructure requirements**
Moves a significant number of people Influences the shape of the public transport network, and urban form/ development, in its catchment area Primarily delivers ridership outcomes	High frequencies all day long; there is always a trip coming soon. Direct routing on main roads to minimise running time	6am – 8pm: every 15 minutes or better 4am-6am, 8pm – 1am : every 30 minutes *[could set a long-term target of 24 hour service]*	Delivered by buses on fixed routes Bus priority infrastructure in areas of high congestion Higher-quality bus stops, Intermediate or Standard grade
Urban Connector service *We aim to convert the strongest Connector services into Frequent services, and to coordinate multiple Connector services to provide strong combined service in key corridors, where practical*			
Role and function	**Key characteristics**	**Service hours and frequency targets**	**Infrastructure requirements**

Otago Regional Council

Moves a reasonable number of people, but insufficient to justify higher frequencies Completes the local public transport network Supports but does not shape urban development Delivers a mix of ridership and coverage outcomes	Regular frequencies: service is available when needed, but user generally needs to consult timetable Direct routing on main roads to minimise running time	6am – 8pm: every 30 or 60 minutes (extra peak services when needed to meet capacity requirements) 8pm – 12am: every 60 minutes On-demand services have expected waiting times similar to these frequencies *[could set a long-term target of 24 hour service]*	Delivered by buses or ferries, generally on fixed routes but harder-to-serve areas may be served in an on-demand manner Operates in mixed traffic Generally uses standard-quality bus stops

Regional service types

City Link Connects major urban areas to each other	**Regional Link** Connects smaller urban areas to a larger city

Primary (City Link or Regional Link) Same service aspirations as Frequent urban services *No examples in Otago*	**Secondary (City Link or Regional Link)** Similar service aspirations to Connector services, but frequency could be reduced below hourly service level to 3-6 trips per day.	**Daily (City Link or Regional Link)** 1-2 trips per day.

Targeted services

Targeted services meet specific transport needs that are integral to the network but best served in a targeted manner. In order to be eligible for subsidy, they must represent value for money in meeting such needs.

Examples of targeted services in Otago may include:

- Total Mobility services for people with long-term mobility impairments (discussed in further detail in **Error! Reference source not found.**
- School services targeting school students may be needed because some schools are located in places that cannot be effectively served by the current all-day public transport network.
- Commuter-hour services to meet peak demand from workers
- Community transport services
- Event transport.

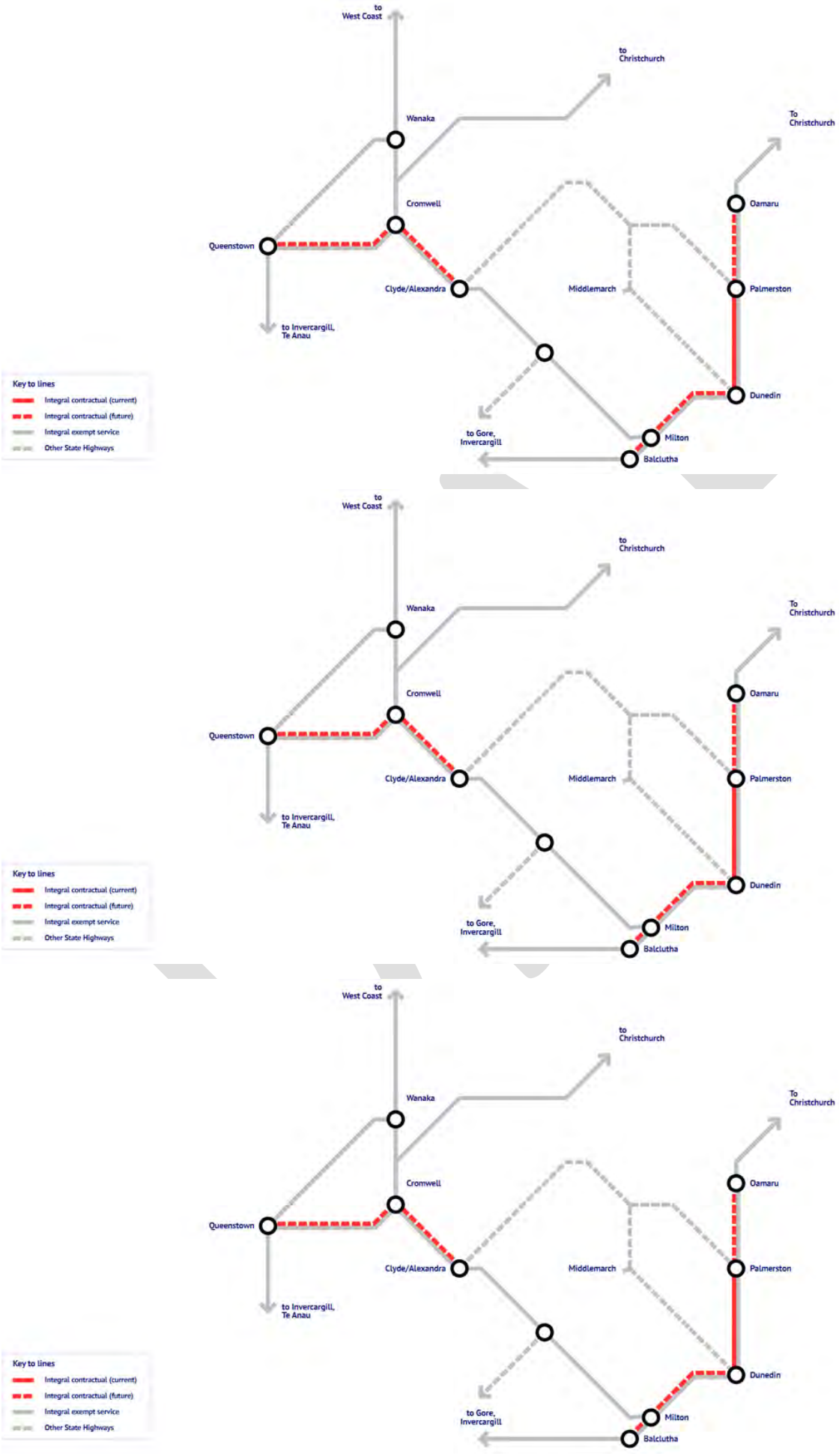
Operate in the urban networks and wider regional network, with characteristics specific to the service.

Otago Regional Council

2.3.2 Development of the regional network

Regional connectivity is a priority for our community and a priority for us. We will be trialing a service from Ōamaru to Dunedin, as well as investigating options to connect Balclutha to existing Dunedin services. We will also work with our communities to find solutions to improve public transport options for Wānaka/Upper Clutha, Alexandra, Cromwell and Clyde.

We will continue to advocate for central government funding to support connections and alternatives to the private car for our smaller regional communities.



Otago Regional Council

2.3.3 Our urban network aspirations

Increasing frequency and reliability across our two urban networks is our core strategy to increasing our ridership.

State Highway 6A from Frankton to Queenstown and South Dunedin to Great King Street, via Princes Street in Dunedin are two key spines where many services overlap. We aim to develop these corridors over time in a way that the combined service moves towards Rapid standards.

High capacity and rapid service options to serve Queenstown's rapid growth including an "off line" solution are being considered. Further work is needed to fully understand the triggers, integration with the existing network and possible operating models for such a service. We will approach Queenstown's unique challenges and needs with an agile and dynamic approach.

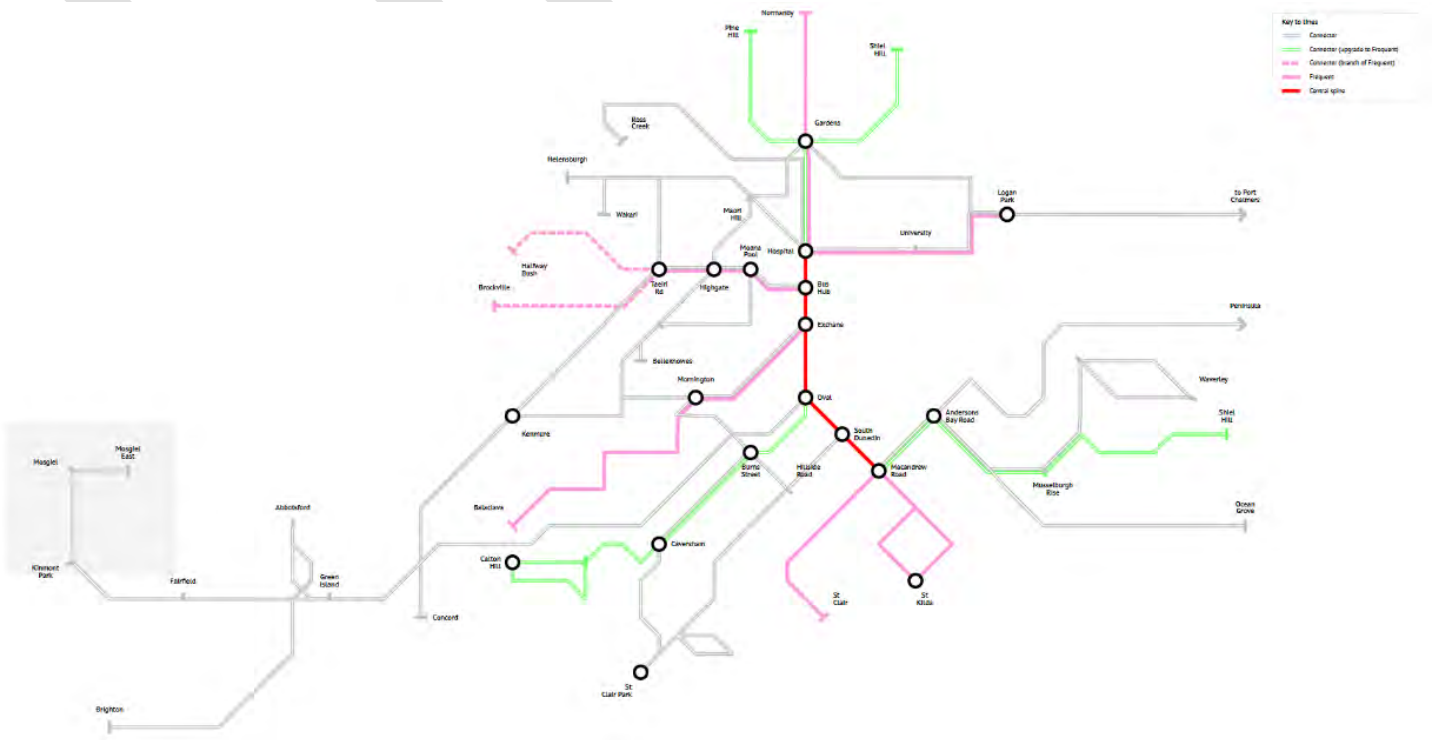
Putting more resources into the Frequent service category across both urban networks to improve frequency can occur through:

- Upgrading individual Connector services to Frequent service standards by upgrading of an existing service from a 30 or 60 minute frequency to 15 minute frequency or better.
- Coordinating multiple Connector services in a way that they operate as a combined frequent service. An example where this is already done is the two St Kilda routes (44 and 55) in Dunedin, which together form a combined Frequent service from St Kilda to Taieri Road.

The Queenstown Public Transport Services Business Case envisions that this will eventually occur across the Queenstown network, and the Fares and Frequencies Business Case identifies priority areas for implementing frequency improvements in Dunedin

Funding over the next three years will limit our ability to implement service improvements, but we will be seeking to roll out increased service levels where possible, and to build on our existing evidence base to support future service improvements and funding applications.

2.3.3.1 Dunedin urban network



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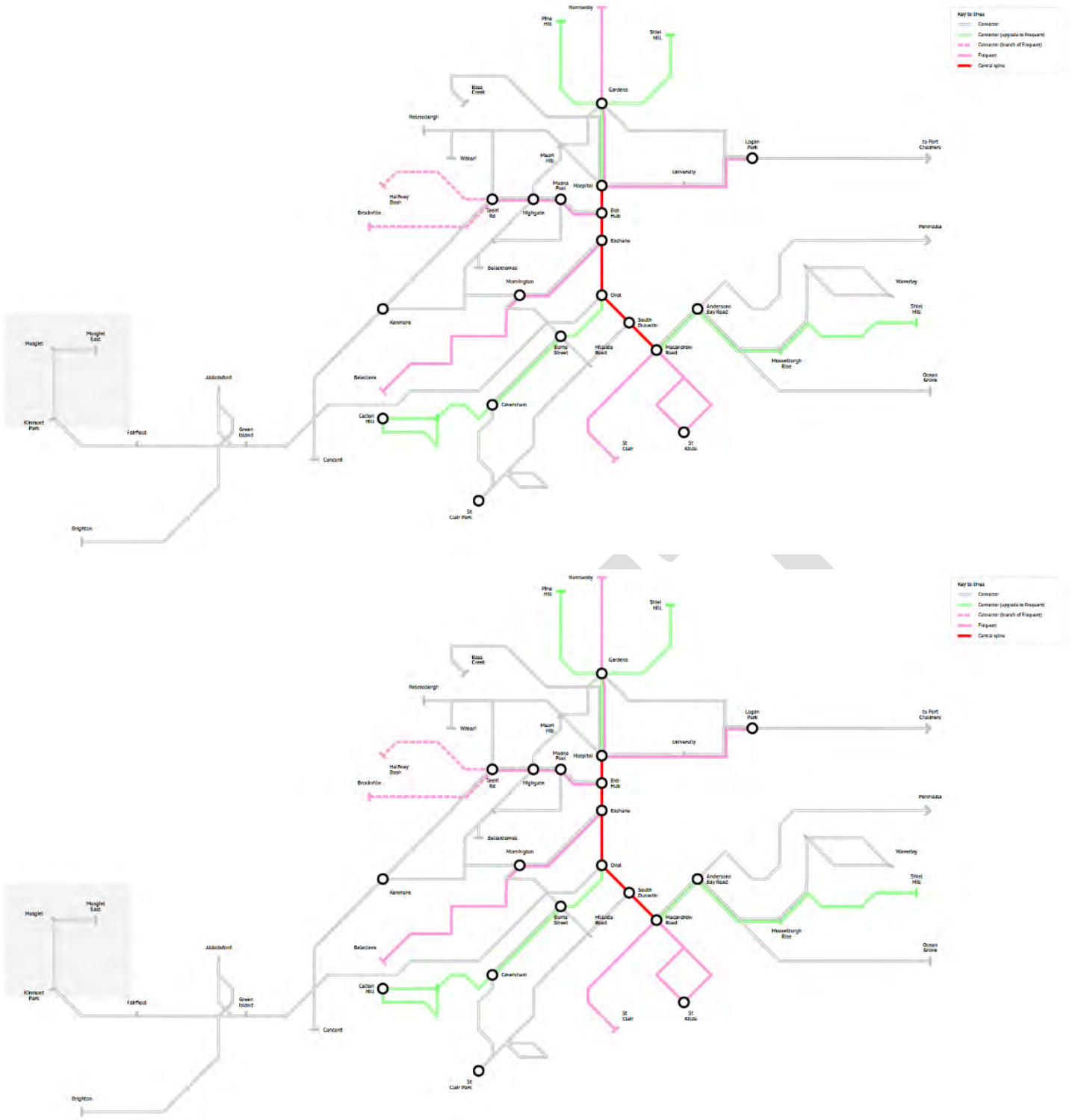

2.3.3.2 Whakatipu urban network

[3 year map]

[10 year map]

[30 year map]

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2.3.4 Integral and exempt services

Integral Services

Public transport services in (table X) are integral to Otago's public transport network.

These services are identified as integral on the basis that they deliver a part of Otago's public transport network identified in sections **Error! Reference source not found.** and **Error! Reference source not found.Error! Reference source not found.** above. Services where ORC has indicated support for subsidy1 through the Annual Plan or Long-Term plan are identified as integral contracted services.

Exempt Services

An exempt service is a service that is available to the public, operates to a regular timetable or schedule and provided on a commercial basis (operates without subsidy).

A list of Otago's public transport services along with their service descriptions, hours of operation and unit details are included in Appendix B [in development].

Integral Exempt Services

Integral services (including targeted services) for which ORC has not indicated support for subsidy**Error! Bookmark not defined.** through the Annual Plan or Long-Term Plan, are identified as integral exempt services.

Notwithstanding the above, ORC may provide limited financial assistance for integral exempt services in the cases of:

- Funding for small-vehicle operations (Total Mobility and Community transport operations)
- Funding to reduce exempt-service fare levels to be more in line with the fare levels of comparable integral contracted services.

2.3.5 Network Form and Function policies and actions

Network Form and Function Policies	
NF P1	**Integral contracted services** Provide public transport services in accordance with this plan and as listed in Appendix B [in development]. Urban and regional public transport services identified as Integral Contracted on the integral services table [reference] will be delivered and subsidised: • In networks as outlined in sections **Error! Reference source not found.**, **Error! Reference source not found.**, and **Error! Reference source not found.**

[1]Under the Land Transport Management Act 2003 , the term "subsidy" specifically excludes:

i. anything done under an agreement between the relevant regional council and an operator to reduce passenger fares; or

ii. financial assistance provided by the relevant regional council for a passenger service identified in the council's regional public transport plan under section 120(1)(a)(vii)

As such, these forms of financial assistance are available for exempt services identified in this Plan

	• With forms and functions levels outlined in sections **Error! Reference source not found.** and **Error! Reference source not found.**
NF P2	**Approach to delivery** Integral contracted services will be allocated into Contractual Units and delivered through service contracts to the ORC. Integral exempt services will be allocated into Exempt Units according to their mode, function, and geographic area, and will be delivered by private operators (on a commercial or not-for-profit basis).
NF P3	**Exempt services** Exempt service applications will be assessed and LTMA requirements followed. ORC will not support the registration of services that would undermine the performance of an existing contracted service, and will support the development of exempt services that deliver a part of the regional network not currently operated by contracted services.
NF P4	**Financial assistance of exempt services** Subject to value for money considerations, ORC may provide financial assistance to exempt services on the basis of: • Supporting Total Mobility and Community Transport services • Supporting the availability of passenger fares that are more in line with similar contracted services
NF P5	**Targeted services** The need for targeted services will be minimised by accommodating as many trips as possible on our core network. However, subject to value for money, targeted services may be provided under the following conditions: • In the shorter term, the service supports trips that cannot currently be met through other public transport services. • In the longer term, the public transport network cannot be reasonably adapted to support these needs.
NF P6	**Urban areas** Prioritise the development of Frequent services (subject to funding availability) to support mode shift and increased ridership. The Connector service layer will be maintained to ensure wide availability of service.
NF P7	**Smaller communities** Transport solutions to improve connectivity for our smaller regional centres and communities will be prioritised and tailored for each community, matching community need with availability of resources and funding.

Network Form and Function Actions

The Council will:	
NF A1	Develop and design service improvements in line with future network structures outlined in sections **Error! Reference source not found.**, **Error! Reference source not found.**, and **Error! Reference source not found.**.

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NF A2	Support Otago's regional public transport network by: • Coordinating with central government agencies, territorial authorities and local communities to identify opportunities where there is willingness to financially support feasible regional and inter-regional services • Implementing regional services which are funded • Providing financial and logistical support to Community Transport operators across the region • Identifying and promoting exempt public transport services which form an integral part of the regional network.
NF A3	Work with territorial authorities to ensure that appropriate supporting physical infrastructure, pedestrian facilities and wayfinding information is in the right places to support easy and safe access to the public transport network. Develop a Joint Work programme to align capital projects.
NF A4	Work collaboratively with partners to implement integrated packages of activities designed to achieve mode shift in urban areas. These will include a mix of public transport service provision, bus priority infrastructure and pricing mechanisms (fares and parking) integrated with plans for urban intensification and active transport provision.
NF A5	Design timetables in a manner that: • Have timing points and accurate running times to avoid early or excessively late running • To the extent that is practical, adheres to a repeating clockface structure • Has sufficient, but not excessive, layover between trips so that: o There is sufficient recovery time between trips to ensure recovery from late running o The timetable represents value for money o Drivers have sufficient breaks to meet Employment Relations Act requirements
NF A6	Periodically review the configuration of services (in preparation for contract renewals) based on: • their adherence to network design principles • Patronage • Land-use changes (including location of key services and destinations) • Travel behaviour patterns (for example working from home) • Change in the legislative and regulatory environment of public transport
	Travel demand management – Policy around what is in the QT BC.

2.4 Multi modal access

[Section under development].

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Will speak to work to be completed as part of the Public and Active Transport Connectivity Strategy

2.5 Infrastructure

High quality infrastructure supports easy and safe access to the public transport system. It includes bus stops and shelters for waiting and transferring, accessible footpaths and crossings for people walking, as well as facilities like secure bike parking or park and ride to support model integration.

Infrastructure plays a key role in the end-to-end trip (from origin to destination and back) and influences a person's decision to use public transport. Removing barriers to using public transport is critical to growing the number of people using public transport.

2.5.1 Bus stops (integral services)

Bus stops and interchanges in Otago are key pieces of the strategic network infrastructure. The comfort, convenience, and safety (perceived and real) of these waiting areas has a significant impact on how users interact with public transport. In developing our network of bus stops, we will consider:

- **Stop spacing** Close-together stops make public transport more accessible, but will significantly slow down a service, and the increased number of stops may mean that investment in the quality of stops needs to be spread more thinly.
- **How we prioritise investment in stops?** We want to deliver high-quality stops for all users, but with limited resources we need to set realistic and achievable targets, putting the greatest resources into locations where we get the greatest value for money in our investments.
- **How we will improve accessibility?** The design of bus stops and their surrounding environments have a disproportionate impact on disabled and transport-disadvantaged people. Improving accessibility features can be expensive and take time, but there may be some "quick wins".
- **Maintaining or enhancing public transport's place on streets:** Public transport infrastructure shapes the urban environment of the streets it runs on, particularly at higher service levels where the infrastructure is significant. Such infrastructure also gives public transport a sense of permanence.

Service frequency and supporting infrastructure need to align. Bus stops are classified based on levels of service as shown in **Error! Reference source not found.** below. Most stops in Otago are Standard or Intermediate service levels, with some premium stops on frequent routes and rapid corridors.

Responsibility sits with the TA. The decision around placement and specifications etc lies with the RTA. Management of the road corridor still remains with the TA. As far as practical, aligning with – funding, strategies, safety, engineering etc.

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Table 1 Bus stop descriptions

Bus stop type	Description	Typical bus stop design
Interchange	Key network location where many services meet and connections between services across a wide area of the network are available. An interchange will be used by many buses at once, and sees a very high level of foot traffic, requiring a sophisticated design with significant facilities which are given strong priority. Otago's urban networks will not have more than 1-2 interchanges.	[diagram]
Premium	A very heavily used bus stop, operating in a place with very high amenity. The quality of the facilities is of high priority. May operate as an interchange for a small set of services. Only a small number of premium stops are expected across the network.	[diagram]
Intermediate	A heavily used bus stop, operating in a place with high amenity. Facilities are of increased quality. A minority of stops, but not an insignificant number, are expected to be Intermediate.	[diagram]
Standard	A moderately used bus stop with a standard level of service. Infrastructure is of a standard design. Most stops are expected to be standard.	[diagram]
Basic	A very lightly used stop with a low level of service and requiring minimal infrastructure. Only a minority of stops are at a Basic level.	[diagram]

[bus stop elements table from Bus Stop Audit]

Bus stops (exempt and excluded services)

We will coordinate with road controlling authorities to support the provision of stops for exempt and excluded services. For these stops, our priorities are:

- Sufficient capacity for vehicles and passengers on the street
- Safety

- Connectivity between integral and exempt/excluded services

Priority measures

On-street charging

Case Study: Dunedin City Centre Interchange [Bus Hub]

- Infrastructure cost
- Accessibility
- Safety
- Integration into future network/routes

2.5.2 Enabling infrastructure

Depots

Infrastructure Policies	
IN P1	A **collaborative and coordinated approach** with territorial authorities and partner agencies will be taken to improve the planning and delivery of public transport infrastructure and services.
IN P2	Public transport infrastructure and facilities, as well as supporting infrastructure like footpaths, are designed and constructed in a way that **prioritises accessibility**, safety and comfortable of all passengers.
IN P3	Provision of infrastructure supports a high-quality **end-to-end journey experience** that is accessible, safe and simple for everyone. This includes following best practice quality and safety standards for all infrastructure components along the journey, including vehicles, stop placement, stop design, shelters, footpaths and crossings.

Infrastructure Actions	
The Council will:	
PI A1	Implement Waka Kotahi NZTA public transport **design guidance** and New Zealand Crime Prevention Through Environmental Design guidelines when planning and designing public transport infrastructure and facilities.
PI A2	Ensure that all infrastructure is **accessible** to disabled people and the transport disadvantaged community by following Universal Design Principles such as having audio buttons on bus sign poles, ensuring kerb ramps grades are gentle and providing wheelchair accessible toilets at bus hubs.

PI A3	**Partner** with territorial authorities and NZTA to improve the design, implementation and maintenance of physical infrastructure necessary for a safe and easy-to-navigate end-to-end journey for all passengers.
PI A4	**Partner** with territorial authorities and NZTA to design city-centre infrastructure and interchanges in line with network and service planning.

2.6 Integral Infrastructure

Table of integral infrastructure (if this makes sense) – identify integral infrastructure necessary to support integral services.

Include how and who will provide identified enabling infrastructure and assets to support services.

2.7 Travel demand and Parking Management

[Underdevelopment – Content will focus on Parking being managed in a way that does not disincentivise PT].

3 Focus Area 2: Passenger Experience

Objective:

Provide useful public transport services that respect the safety and wellbeing of passengers, particularly for people who are transport-disadvantaged.

Our goal is to drive positive passenger experience to attract more users to use public transport more often. We strive to deliver passengers journeys, from origin to destination, that embody the following principles:

Useful: The service is well-functioning and reliable

Safety: The service induces passengers to feel both real and perceived safety

Wellbeing: The service enables passengers to travel with comfort and dignity

Transport disadvantaged: The service enables people who are less able to get around easily a suitable way to travel

[Boxes of direct quotes from our customer satisfaction surveys here that speak to passenger wellbeing and usefulness of the services]

3.1 Service and Vehicle Standards

3.1.1 Service Performance Standards

Reliability and punctuality are fundamental traits of good public transport. Passengers must trust that the bus will get them where they want to go, on time every time.

The reliability of public transport depends on a wide range of factors functioning well, such as:

- Data-driven timetabling that realistically predicts trip duration;
- Explicit contract provisions surrounding reliability so service operators are incentivised to run trips reliability and punctually.
- Well trained drivers who use established methods to stay on-schedule; and
- Good real-time information so passengers know when their trip will start and end, even if the trip is off-schedule.

Reliable and punctual services increase the service quality without increasing frequency. In this way, improving service reliability is a low-cost way to improve passenger experience.

The following tables explain reliability and punctuality as defined by our service operator contracts:

Service Performance Standards	
Reliability	The reliability of a bus service is measured by whether the trip is completed in full within a specified tolerance. The level of tolerance will be in the range of 59 seconds before to 9 minutes and 59 seconds minutes after the departure time.
	Operators must have contingency measures in place to ensure that, should a bus trip not run due to matters deemed to be within the operator's control, passengers are not left stranded unless weather or road conditions preclude this.
Punctuality	The punctuality of a bus service is dependent on meeting scheduled times. Scheduled bus services in an integrated network must conform, within a specified tolerance, with officially designated times set by the ORC, which may include some timing points not included in published timetables. The level of tolerance will be in the range of 59 seconds before to 4 minutes and 59 seconds minutes after the departure time.
	No bus must depart the terminus before the specified departure time.
	Traffic conditions and the number of passenger loadings may affect journey duration.

Service Performance Standards Policies	
SPS P1	Public transport is reliable and punctual to build passengers' trust in the service and induce mode share.
	Without limiting subsection (1)(b), a regional council must, in relation to any units, include in a regional public transport plan policies on—(a) accessibility**, quality,** and performance; and **[Quality policy to be developed]**

Service Performance Standards Actions

The Council will:	
SPS A1	**Timetables:** Develop, monitor and evaluate data-driven and resource-efficient timetables that support reliable journey times.
SPS A2	**Contracts:** Ensure that measurable and enforceable reliability provisions are included in all public transport service contract. (ORC 2021)
SPS A3	**Drivers:** Work with service operators to train drivers in best practices of reliability and punctuality.
SPS A4	**RTI:** Maintain, optimise and promote real-time information so passengers can accurately predict trip times and durations.
SPS A5	**Advocacy:** Advocate for public transport priority measures known to improve reliability and punctuality with territorial authorities.

3.1.2 Vehicle Quality Standards

Delivering our public transport service with high-quality vehicles directly improves passenger safety, accessibility, sustainability and comfort. Features like high visibility handrails, minimum aisle widths, defined seating standards and real-time driving evaluation technology ensure our vehicles meet our passengers' needs.

We work closely with our operators to meet the Waka Kotahi NZTA Requirements for Urban Buses (2022). As urban buses make up 99% of our urban public transport network fleet, we strive to meet these requirements across as many services as possible. Fulfilling these requirements improves our passengers' wellbeing and our eligibility for Waka Kotahi NZTA funding.

[Note of Vehicle Capacity]

[Note of Vehicle Quality Standards exceptions?]

Vehicle Quality Standards Policies	
VQS P1	All vehicles and vessels used to operate contracted services are of high quality and compliant with industry and regulatory standards.

Vehicle Quality Standards Actions
The Council will:

Otago Regional Council

VQS A1	Enforce bus operators to meet Waka Kotahi NZTA's Requirements for Urban Buses (2022) with all contracted vehicles where possible. [How do we do this now, and how do we want to do this in the future?]
VQS A2	Incentivise higher vehicle quality and seating capacity, improved technology and lower emissions through contract procurement.
VQS A3	Enforce all existing ferries on contracted services to comply with required Maritime NZ standards and encourage using established best practices.

3.2 Improving accessibility for people experiencing transport disadvantages

Public transport systems often fail to meet the needs of everyone due to factors such as affordability, isolation, safety and a lack of modal choice, depriving people of access to life-enhancing opportunities. Those who may experience transport disadvantages include:

- People with accessibility needs;
- People with mobility impairments;
- People who do not have driver licenses, including children;
- People with low incomes;
- People in isolated rural locations; and
- People with inadequate access to private vehicles.

The ORC is committed to delivering an equitable public transport system that provides opportunities in line with Te Tiriti obligations. This system can produce significant social and economic benefits for everyone, including people experiencing transport disadvantages.

This section details our policies and actions aimed at addressing the needs of people experiencing transport disadvantages through the Total Mobility scheme and Community Transport. It should be noted that other sections of this RPTP outline other ways we aim to address the needs of people experiencing transport disadvantages, such as improving affordability through fair fares (Section xx), delivering a useful bus network (Section xx), increasing modal choices by integrating land-use planning with public transport (Section xx) and our equity-focused approach to decision-making (Section xx).

3.2.1 Total Mobility

Some people with disabilities and long-term impairments have transport needs that cannot be fully met by a generally available public transport service. To support these people in meeting their daily needs and enhancing their community participation, local and Central Government jointly fund Total Mobility, a nationwide scheme that provides subsidised door to door transport services for eligible people through approved commercial taxi and mobility operators.

Total Mobility is an exempt integral service in Otago's public transport network that currently comprises 16 operators who serve 8660 registered clients in Dunedin, Queenstown, Wānaka, Ōamaru and Balclutha. The ORC also provides additional financial support to operators with the installation of wheelchair hoists and ramps into their vehicles. Local agencies and social

support groups act as agencies by completing and reviewing people's eligibility to Total Mobility. This is a crucial component of delivering Total Mobility as these agencies are the primary point of contact for Total Mobility users.

An ongoing challenge is that many of Otago's small communities lack suitable Total Mobility operators, leaving them with limited access to opportunities. The ORC will continue to explore ways to bring transport services to these communities, including through expanding Total Mobility services and Community Transport (see Section **Error! Reference source not found.**).

Central Government will be undertaking a review of Total Mobility in 2025. It is therefore important that the ORC be flexible in its approach to Total Mobility, as the nature and details of the scheme may change.

Total Mobility Policies	
TMPE P1	Total Mobility services are accessible, useful and available for people with long-term impairments that are unable to access regular public transport safely, reliably and with dignity.

Total Mobility Actions	
The Council will:	
TM A1	**Wheelchair accessible vehicles:** Support operators in a way that enables them to invest in wheelchair accessible vehicles, to improve the Total Mobility fleet.
TM A2	**Onboarding:** Investigate ways to bring on potential new operators and mobility agencies, particularly focusing on a diverse range of disabilities and impairments. Implement a procurement strategy for operator and agency contracts and investigate methods of auditing operators for compliance with contractual obligations.
TM A3	**Raise the fare cap?**
TM A4	[Policy to be developed] Supporting Total Mobility agencies policy to complete assessment to avoid agencies withdrawing from the scheme.

[How do we ensure value for money in the delivery of Total Mobility? Potential to explore raising the fare cap]

[Considering the inclusion of an ORC interpretation of NZTA's Total Mobility eligibility criteria]

3.2.2 Community Transport in isolated communities

Community transport is a not-for-profit service established, funded and operated by community entities to enhance transport access in areas where traditional public transport is not feasible. While there are several community transport providers in Otago, they currently receive no financial support. This leaves many of our isolated communities with limited access to essential services, such as Dunedin or Queenstown hospitals.

Otago Regional Council

The 2023 Otago Community and Accessible Transport Study provides insight into potential community transport models that we can co-design with community entities so they can run their own community transport operations. The following policies and actions indicate how we plan to establish a community transport programme as part of the core public transport network.

Community Transport Policies	
CT P1	Provide support for community transport services where: a) There is a demonstrated need for a transport service in the community b) There is no alternative public transport service available to the community c) There is willingness by members of the community to set up, operate and maintain a trust or similar non-profit structure to oversee the governance of the service, and for people to volunteer to be drivers d) There is sufficient funding available to support the establishment and administration of the trust and the purchase of vehicle(s) e) The establishment of the trust has the support of the relevant territorial authority
CT P2	Support for community transport services will be assessed on a case-by-case basis and may include: a) Council staff assisting local groups to establish a trust or service in a new area b) Financial grants towards vehicle purchase/replacement and operation, and trust administration costs, subject to availability of funding c) Provision of necessary supporting technology to make community transport services easier to manage and more accessible for users, subject to available of funding d) Where possible, leverage the ORC's purchasing ability to obtain best value for community vehicle/hoist purchase, and/or other professional services such as driver training

Community Transport Actions	
The Council will:	
CT A1	Develop a framework for identifying and prioritising a community transport programme as part of our core public transport network.
CT A2	Collaborate with territorial authorities and community organisations to develop a shared vision for community transport, applying data-driven approaches and community engagement to identify challenges and opportunities and co-design solutions.
CT A3	Trial a community transport service in a selected area with the intention to scale up the service based on the trial's outcomes and community needs.

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CT A4	Develop a framework to fund and support a robust community transport system in Otago in alignment with policies CT P1 and CT P2.
CT A5	Prepare community transport projects for inclusion in future Annual Plans, Long-Term Plans, Regional Public Transport Plans, Regional Land Transport Plans and relevant business cases.

Case study: Pīkau community transport programme in rural Northland

In 2024, the mobility company Liftango collaborated with Ngātiwai iwi to launch a pilot community transport programme providing an on-demand bus service to under-served Māori communities in rural Northland. Named Pīkau, which means 'to carry on the back', the community-led programme facilitates access to maraes, hospitals and supermarkets between Whangaruru and Whangārei, 71 kilometres away. The programme is co-designed, led and owned by Ngātiwai iwi and is funded by the Hoe ki angitū-Waka Kotahi Innovation Fund. The programme has produced significant community benefits, according to Ainsley Hughes, Liftango's Project Lead for Pīkau:

"My time in Northland working with community members on the co-design of Pīkau only reinforced how vital transport is for creating better health, well-being and social outcomes. All too often we see industry conversations about transport focusing on cost savings and efficiency metrics, ignoring so many of the critical social benefits a service like Pīkau brings to the community. The willingness and enthusiasm of our project partners to support Pīkau is an excellent step forward in refocusing this narrative on equity."

Many of Otago's communities face similar transport disadvantages as those in Whangaruru, and the Pīkau case study demonstrates the potential benefits community transport can bring to under-served areas.

Otago Regional Council

3.3 Public Information

Our services are only as good as the public information we provide for them. We are committed to providing public information including wayfinding, fares, ticketing, code of conduct, timetable, accessibility and real-time information that:

- Is easy for users and the wider community to understand;
- Is accurate and up to date, so users can make transport choices with confidence; and
- Is accessible for people of all abilities.

We use a range of methods to communicate with users and the wider community including social media, the Transit wayfinding app, on-bus posters, electronic real-time signage, 24-hour customer experience phone and the Orbus website.

Wayfinding, the process of passengers selecting routes, evaluating travel times and navigating the journey is a core part of the journey experience and requires consistently accurate information to be successful. We prioritise providing reliable wayfinding information with digital mapping tools, real-time alerts and physical electronic real-time bus timetables.

Exempt service info: In addition to providing information on our contracted/integral services, we know exempt (and excluded?) services are essential to the wider region's public transport network. We will promote information about these services to improve passengers understanding of all transport options in Otago where they do not compete with our integral services.

New technology to communicate/share public transport information poses exciting opportunities for improving our passenger experience. We will continue to explore investing in new technology where it adds meaningful value to our services.

Case study: Our Orbus Website [and images]

We launched an Orbus-specific webpage in 2024 to improve the ease of use, accessibility and brand identity of our online public information. The site is easy to navigate, prioritising most frequently searched topics and mobile friendly. Being specifically Orbus branded, it enables our public information to be easy to find and distinct from the ORC's other activity areas.

Public Information Policies	
PI P1	Clear, accurate and accessible public information is provided through up-to-date channels.

Public Information Actions

The Council will:	
PI A1	**Work with territorial authorities and stakeholders** to provide public and wayfinding information related to the public transport network that is:

	• Intuitive and easy to understand; • Accessible and widely available; • Accurate and up-to-date; and • Meets ORC and Orbus' branding and communication standards.
PI A2	**Exempt services:** Provide relevant public information about exempt services that form a part of Otago's regional network. where they do not compete with our integral services.
PI A3	**Technology:** Explore technologies that meaningfully improve the accuracy, clarity and accessibility of public information.
PIA4	**RTI:** Continue optimising our real-time passenger information system to improve wayfinding and reliability.
PI A5	**Digital:** Encourage passengers to access public transport information via digital channels.
PI A6	**Public information:** Develop accessible formats of public transport information like NZ Sign Language, Easy Read, Braille, large print and audio. Accessible public information, vehicles and physical infrastructure;

3.4 Ticketing System

An accessible and easy to use public transport service is dependent on an intuitive and integrated ticketing system. Since 2020, we have implemented and optimised our Bee Card ticketing system, a simple smartcard system shared among ten other public transport networks across the country. The Bee Card system has provided passengers with benefits like tagging on and off trips, topping up money to the card online, and managing multiple cards through one online account.

In the coming years, a National Ticketing Solution, Motu Move, will be implemented in Otago. Motu Move will bring more convenience and integration to passengers through features including:

- Contactless debit or credit card on-board payment;
- A mobile app;
- Immediately available top-ups;
- Integration across all public transport networks in New Zealand Aotearoa; and
- Locally set fares to achieve the greatest outcomes for both users and the community.

As we transition from the Bee Card to Motu Move, we will provide a well-communicated and simple transition for passengers.

Otago Regional Council

Ticketing System Policies	
TS P1	The public transport service will use an integrated, accessible and intuitive ticketing system to streamline all passengers' experience.
TS P2	The implementation of the integrated National Ticketing Solution, Motu Move, across the public transport network is intuitive and beneficial to users.

Ticketing System Actions	
The Council will:	
TS A1	Work with external partners to implement Motu Move in a convenient and intuitive way for users. Collaborate on activities including public education campaigns and Bee Card replacement schemes to minimise disruption.
TS A2	Provide a common integrated ticketing system that is simple, easy to use, and allows integrated fares.

3.5 Customer Service

Customer service shapes the public perception of public transport in ways branding, marketing and service performance cannot. When passengers feel respected and well-served, they are more likely to use public transport more often and recommend it to others. We strive for all drivers, ticketing retailer staff, and ORC staff to deliver consistently outstanding customer service to build trust with existing passengers and attract new ones.

Any instances of poor customer service reported to us are recorded and addressed as soon as possible to prevent further issues and restore trust. Passengers and the public can provide feedback on our website, by phone, by email and in-person. We record all public transport-related complaints, requests, enquiries and compliments received and continuously analyse them to inform improvements in our services.

Customer Service Policies	
CS P1	All staff involved in public transport deliver outstanding customer service to meet passengers' needs and expectations.

Customer Service Actions	
The Council will:	
CS A1	**Training:** Ensure that operators train both management and service staff in customer service, including specialised training in: • Assisting passengers with different access and mobility requirements, including those with disabilities, mobility aids, prams, or strollers;

	• De-escalating anti-social behaviour or customer dissatisfaction, where safe to do so; and • Providing route and wayfinding assistance, especially to passengers unfamiliar with the public transport network.
CS A2	**Bee card retailers:** Work with Bee Card retailers, including drivers, to provide up-to-date training on ticketing system processes to improve passenger understanding of fares and the Bee Card system.
CS A3	**Customer feedback:** Continually monitor customer service feedback and annual surveys to understand and improve our services' customer service.

3.6 Branding and Marketing

Maintaining an easily identifiable, unified and highly regarded brand is essential to retaining existing passengers and attracting new ones. The Orbus brand has enabled our services to be consistent and marketable, as well as to create a sense of place and public transport identity in our region. Notably, the launch of our Orbus branded website in 2024 was a major step in making our public information easier to access and understand. We will continue to develop our branding and marketing to promote the benefits of public transport and the Orbus network. Our goal is to encourage increased use of Orbus services in a way that aligns with ORC values.

Branding and Marketing Policies	
BM P1	**Branding:** Public transport services operate under a strong, consistent and regionally integrated brand.
BM P2	**Marketing:** The Otago Regional Council engages in strategic marketing campaigns to improve public awareness and perception of public transport services.

Branding and Marketing Actions	
The Council will:	
BM A1	**Branding:** Work with external partners to implement and maintain a strong and regionally aligned Orbus brand so that it is consistently applied across public transport services and supporting infrastructure.
BM A2	**Marketing:** Design and execute strategic marketing campaigns to promote and improve public awareness of Orbus services.

3.7 Special Events

Supporting special events provides a great opportunity to bring people and revenue to our region. We are committed to working with event organisers and venues to provide detours, additional services and ticketing agreements when it is logistically and financially feasible to do so.

Otago Regional Council

By providing targeted event travel, we make events more accessible, safer, less disruptive to other road users including other public transport services, and more sustainable. They also encourage new users to our services.

Case Study: Serving Cruise Ship Passengers in Dunedin

From November to April, cruise ships dock in Port Chalmers,

Cruise ship guests have generated an estimated 15,669 additional trips

On the busiest days, in excess of 5,000 cruise ship passengers disembark at Port Chalmers

Customised fare and ticket retailers present in Port Chalmers

Serving the influx of tourists while also meeting residents' needs

Additional 275 trips were added to accommodate increased demand on days which high capacity (2000+) ships docked.

Leaflets containing important information like ticketing, maps, timetables

Funding?

Special Events Policies	
SE P1	Public transport supports access to events to reduce congestion, improve safety, and maintain the operational performance of the transport network.

Special Events Actions

The Council will:	
SE A1	Where funding for targeted public transport services is secured by event organisers, support **special events** by: • Contracting and managing service provision on behalf of event organisers, • Providing discounted fares for use of the existing public transport network; and • Undertaking promotional/marketing activities.
SE A2	Financially contribute to the provision of public transport services for **large scale special events**, subject to: • Sufficient public funding being available. • The event is expected to have more than 15,000 attendees on any one day; • The event takes place within Otago Regional Council boundaries; and • The wider community would meaningfully benefit from event-related public transport services.

Otago Regional Council

SE A3	Work with territorial authorities, event organisers and other relevant groups to plan and implement **targeted services for special events** in a way that reduce congestion, improve safety, and maintain the operational performance of the transport network.
SE A4	**Maintain an annual calendar** of planned events to assist with the planning and provision of public transport.

4 Focus Area 3: Value for Money

Objective: Provide public transport services in a manner that achieves good value for money.

Delivering value for money is about providing a public transport system that uses our limited resources to best serve the transport needs of our community. Achieving value for money requires us to ensure our future investments focus on what people need, what they value and what we can afford.

The ORC aims to provide public transport that achieves good value for money by delivering efficient, reliable and accessible services that increase ridership (value) that are cost-effective and fairly distribute costs between passengers, NZTA and ratepayers (money). Achieving value for money is particularly challenging in Otago, where the low-density of our communities and high private vehicle usage are barriers to cost-effective public transport. We are also operating in a challenging funding environment with available funds falling well short of our aspirations for future investment. This Focus Area outlines our strategy to achieve good value for money through six key components: increasing third-party revenue, setting fares, procurement, network optimisation, workforce sustainability and service performance monitoring and evaluation.

4.1 Our funding strategy

Public transport is funded by both public revenue (central government and targeted rates) and private revenue (fares and third-party revenue).

[Content here under development]

Funding Strategy Policies

PTF P1	**Private share:** Maintain and increase the private revenue contribution to the cost of public transport over time.
PTF P2	**Public transport activities without central government funding:** Support public transport activities without central government funding only in cases where: • The activity achieves good value for money, even without a central government contribution; or

	The activity is a trial service, where the success of the trial would create a strong case for future central government funding.
PTF P3	**Third-party funding:** Develop and grow third party funding by identifying and implementing initiatives such as: • Fareshare – employers and other entities subsidising fares for nominated groups • Advertising – using advertising space on vehicles and infrastructure • Property development contributions Retail opportunities.
Funding Strategy Actions	
The Council will	
PTF A1	Work with territorial authorities, NZTA, and other stakeholders to increase private revenue sources and develop alternative opportunities to fund the public transport network.
PTF A2	Develop a public transport revenue plan to consider progressive changes to fares and revenue.
PTF A3	Undertake research and regional market analysis to understand passengers' and potential passengers' willingness to pay for public transport.
PTF A4	Develop a public transport revenue plan to consider progressive changes to fares and revenue.
PTF A5	Undertake research and regional market analysis to understand passengers' and potential passengers' willingness to pay for public transport.
PTF A6	Develop an evidence base to inform viability of potential third-party funding initiatives and assist with setting private share targets with NZTA.

4.1.1 Setting fares

[Section dependent on current ongoing discussions with NZTA]

Setting fares is a key factor in how we make decisions around public transport. We set fares based on two main considerations:

1. How much should a passenger pay for a trip? This is the **base fare level**, which requires us to balance affordability for the passenger, the ORC and our funding partners.

Otago Regional Council

2. What system should we use to determine how fares are calculated? This is the **fare structure** and involves ways we choose to vary the price of a trip from the **base fare level**.

In setting our base fare level and fare structure, we have to consider and balance the following principles:

- **Simplicity**: We want to set fares that are easy to understand and consistent across services and networks.
- **Incentives**: We want our fares to support long-term ridership growth and reward regular users. We also want to attract new users, including young people, and to encourage strong land-use patterns that support the long-term sustainability of public transport in Otago.
- **Equitability**: We want to include fare mechanisms that ensure people pay a fair amount. People who get more benefit from the service should pay more, but transport-disadvantaged people who are most negatively affected by the cost of travel, should pay less.
- **Sustainability**: We want sufficient fare revenue to sustain our service levels and attract investment for service improvements.

<table>
<tr><th colspan="2">Fare Policy</th></tr>
<tr><td>FP 1</td><td>Base fare level: Fares for integral services should be structured around a base fare level that fairly balances affordability for users with maintaining the sustainability of services and supporting service improvements.</td></tr>
<tr><td>FP2</td><td>Fare structure: From the base fare level, fares for integral services should be structured in a way that is as simple as possible, but also fairly shares the cost between different types of users according to their ability to pay and the cost of serving them. The structure will include the following elements:
Concessions: transport-disadvantaged people with less ability to pay will be charged lower fares, as outlined in FP3 below.
Free transfers, ensures that people can travel in complex ways without being charged more than they would for a single trip
Fare capping: Regular use is incentivised and rewarded. [optional, subject to fare study and decisions]
Distance structure: Trips within urban networks operate under flat fares. These flat fares form part of a wider system of zonal fares for regional services. [optional, subject to fare study and decisions]
Time of day: Charge less for off-peak travel (times other than 7am-9am and 3pm-6pm on weekdays) [optional, subject to fare study and decisions]
Use of cash: Eliminate the use of cash payments upon the implementation of bank-card payments. Set higher cash fares to discourage use of cash until the implementation of bank-card payments.</td></tr>
<tr><td>FP3</td><td>Discounted travel for transport-disadvantaged groups: Offer the following concessions off the price of travel for an adult with no discounts:<table><tr><th>Concession</th><th>Relative cost to full fare</th></tr></table></td></tr>
</table>

Otago Regional Council

	Infant (under 5 years)	0% (free)
	Child (age 5 to 12)	60%
	Youth (age 13 to 18)	60%
	Under 25	80%
	Community Services Card	50%
	Super Gold Card	0% (free) in off-peak only *Could offer a peak discount at other times at ORC's cost*
	(any other ORC-funded concessions – e.g. student, disability). Recommend that any student discount matches an under-25 discount; we need to be careful with any disability concession if it deflects us away from Community Connect (which we get Crown funding on)	
FP4	**Third party concessions:** Support the implementation of concessions funded by third parties, such as workplace or student travel schemes	
FP5	**Fare reviews:** Regular reviews of base fare level and fare structure will be conducted to ensure that: • The base fare level is adjusted in line with inflation • The base fare level and fare structures remain in line with policies FP1, FP2, and FP3	
Fare Actions		
The Council will:		
FA 1	Undertake region-wide fare analysis to give effect to the RPTP fares and funding policies and establish a base fare level that adequately balances affordability to users, and our funding partners.	
FA 2	Review the base fare level annually as a part of Annual Plan and Long Term Plan processes and the fare structure at least every six years.	
FA 3	Partner with Territorial Authorities to co-ordinate public transport fare policy and parking management policy to support mode shift and improved liveability outcomes.	
FA 4	Continue to provide funding to enable concession fares for use of the Total Mobility service.	

Otago Regional Council

FA 5	Investigate the feasibility of increasing fare cap in Otago, subject to the financial environment and government review [this text taken from TM section. Can keep or remove it as necessary]

What about free fares?

One suggestion we hear a lot is to make public transport free. A free service would be popular and increase ridership. However, we don't think free public transport works for Otago at present for five reasons:

1) **Fare revenue can buy more service:** The money we get from fares allows us to run more buses, which increases ridership. Implementing free fares would likely require us to increase rates or reduce our services.

2) **It's fair to the community:** When someone rides public transport, they are doing a lot of good for the whole community – they are a potential car off the road, reducing congestion, carbon emissions, and much else. For this reason, we think that it's reasonable that they do not pay the full cost – it's worth subsidising the service. However, riding public transport is not an act of charity: people choose to ride the bus because it is useful to them. It's reasonable to ask them to pay a fair share of the cost.

3) **We believe in our service:** We think public transport should be good enough to be worth paying for.

4) **We don't want success to be a problem:** When public transport is free or excessively cheap, usage becomes a problem. When buses get too full, it is hard to increase capacity. In the long term, it will put us in a position where the success of public transport is a problem rather than good news. We really don't like this – we want to succeed.

5) **Government policy:** Not only would free/ultracheap fares cost us money directly, they would also put our central government funding share at risk. The government has made it clear that a reasonable share of the cost of public transport needs to be recovered from users and third parties.

However, we still think affordability of public transport to its users is important. If free or ultra-cheap fares are not possible, what can we do?

1) **Improving land use patterns:** Ultimately, the best way to make public transport affordable is to serve more people with it. In the long-term, if we can get more people living within easy reach of a high-quality, frequent public transport service, then public transport will become much easier to fund. We would have more ratepayers and more users to share the cost between – and the cost to all can be reduced.

2) **Reduced costs for those who are most sensitive to price:** We can provide reduce fare in a targeted way through concessions.

3) **Third-party funded concessions:** There are groups of people – other than its immediate users – who benefit from public transport. For example, workplaces and educational institutions receive significant benefits when workers and students can access their locations with public transport. When these organisations put high value on the affordability of public transport, we can partner with them to share the cost fairly.

4) **Fare capping**: Although it's fair for people using the service more to pay more, even affordable costs can multiply to become unaffordable for people who are using the service the most. We can minimise this by setting caps on fares per day and per week, which will make the service attractive to our most regular users.

4.2 Procurement approach

The ORC delivers public transport services through *service contracts*. This means that, although we take responsibility for planning and designing public transport, our services are delivered under contract by private specialist public transport operators.

The details of how we design, award and manage these contracts are outlined in a separate document, our Transport Activities Procurement Strategy 2024-2027. For procurement of our services we group them into **contractual units**. A contractual unit contains a group of services

Otago Regional Council

that serve a particular geographic area. This may be a single service, but more often is a grouping of services that it makes sense (strategically and operationally) to award as a single contract.

The way we procure our service contracts and other activities such as ticketing, customer information and support, play a key role in ensuring our we achieve value and efficiency from our transport investment.

Procurement Policy	
PP 1	Integral services will be grouped into contractual units on the basis of: • Effectively meeting network outcomes • Operational efficiency of services • Supporting a competitive and efficient market
PP 2	Public transport contractual units will be procured in accordance with the NZTA Procurement Manual and the ORC's Transport Activities Procurement Strategy, with a focus on achieving value for money through: • Competitively tendered partnering contracts as the primary method of supplier selection • Directly negotiated contracts in instances where this supports a competitive market in the long term.
PP 3	Maintain a partnering approach to network planning, development and service delivery with our operators.
Procurement Actions	
The Council will:	
PA 1	Transition to the new Unit structure outlined in Table X through a combination of competitive tenders, directly negotiated contracts, and/or variations to existing contracts.
PA 2	Design service contracts and undertake procurement in a manner that: • Is open and transparent • Creates opportunities for market entry by new and capable suppliers • Provides adequate lead times to allow operators sufficient time to secure necessary resources • Provides service continuity to the public transport customer • Where possible, supports the continuing operation of multiple suppliers across Otago, and within the Dunedin network • Appropriately allocate roles, responsibilities and risk between the ORC and operators within the contract framework • Includes fair and open mechanisms for contracts to be varied to implement service changes within the life of contracts • Considers the whole-of-network impact of procurement processes, beyond the routes being immediately procured • Aligns future contract expiry dates so that related Units can be contracted in a single process

4.3 Network optimisation

In the design and operation of our services, there are opportunities for optimisation – that is, to deliver more for the same amount of money (or the same, for less money). Service

Otago Regional Council

optimisation ensures that we are delivering strong value for money and not missing “easy wins”.

Network Optimisation Policies	
NO P1	[under development]
NO P2	

Network Optimisation Actions	
NO A1	**Service design:** Design routes and timetables in a way that reduces excessive out-of-service time and distance
NO A2	**Data collection:** Collect and organise data that is needed to understand our network.
NO A3	**Data usage:** Make use of available data sources (such as ticketing and real-time data) to optimise the use of assets, manage services efficiently, and analyse problems and opportunities.
NO A4	**Data sharing:** Mutually share data with territorial authorities in order to form a basis for understanding our public transport network
NO A5	**Priority measures: [**Under development]
NO A6	**Harnessing technology: [**Under development]

4.4 Workforce sustainability

The sustainability of the public transport workforce has been a central issue in recent years. Bus drivers have a hard, physical job, and represent the public face of our service. It is crucial that we have a workforce with experience, skill, and the enthusiasm to deliver a service that is both safe, and delivers a positive experience to users. To achieve this, we need to attract and hold onto great drivers.

Through the intervention of ORC, and with the support of operators and central government, Otago’s bus contracts now include a “Base Wage Requirement” that is significantly above the Living Wage, and increases year-by-year in line with the labour market. We are satisfied that this represents a strong, sustainable basis for a sustainable workforce. However, in some areas, there is still work to do. ORC will continue to work with operators and territorial authorities to make sure that the job of driving buses is as attractive as we can make it.

The Whakatipu network has particularly significant issues with workforce sustainability. High housing costs make it a difficult place to live with a family even at increased wage rates, and there is a significantly higher dependence on overseas workers to form the core of the

workforce. This is not unique to the passenger transport industry in Whakatipu, but it makes it important that accommodation is available, particularly for drivers who are new to the area.

Workforce Sustainability Policies	
WS P1	The ORC will plan, procure and deliver public transport services in a way that ensures employment and engagement of the public transport workforce is fair and equitable, providing for a sustainable labour market and sustainable provision of public transport services.
WS P2	Public transport contracts will continue to include a base wage requirement which ensures that at least the current wage levels of bus drivers are maintained, with annual adjustments based on labour cost indices.
Workforce Sustainability Actions	
The Council will…	
WS A1	Partner with operators and territorial authorities to enhance driver access to basic facilities such as toilets at the termini of bus routes.
WS A2	Partner with NZTA, territorial authorities, and operators to develop driver break facilities at key network locations such as interchanges.

5 Focus Area 4: Build Trust

Objective: Proactively engage with communities and organisations, including iwi, to foster trust and ensure public transport investments align with stakeholder priorities.

ORC Strategic Direction Goals: Partnership Goals 1, 2 and 3; Communities Goals 1 and 2

A well-functioning public transport system requires a high degree of collaboration and coordination of effort across our partner agencies and organisations. This requires the cultivation of strong working relationships. Trust is the foundation of these relationships; without it, we will struggle to navigate challenges and deliver the efficient public transport system Otago communities deserve.

We aim to build trust with our partners and stakeholders through three mechanisms: embracing meaningful stakeholder engagement processes, adopting an equity-focused approach for improving access for people experiencing transport disadvantages, and developing strategic partnerships.

5.1 Our equity-focused approach for improving access for people experiencing transport disadvantages

The ORC employs an equity-focused approach in delivering public transport, allocating resources fairly to improve access to opportunities for people experiencing transport disadvantages. This differs from an ‘equality’ approach, where resources are allocated on an equal basis for all but may not adequately address the specific needs of people experiencing transport disadvantages (**Error! Reference source not found.**).

Otago Regional Council

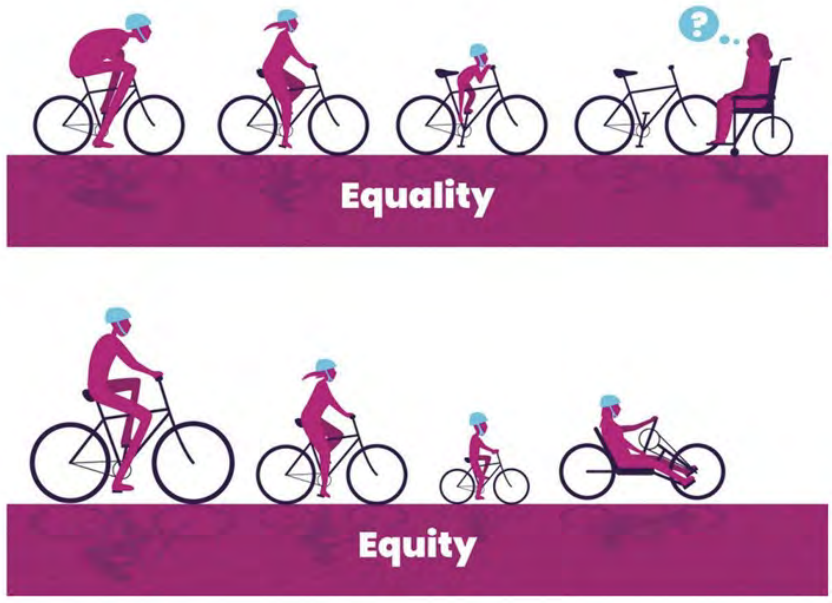

Figure 1 The difference between equality, which treats everyone the same regardless of their specific circumstances, and equity, which involves addressing individual needs to achieve fairness. (Source: Robert Wood Johnson Foundation, 2017)

The ORC's equity-focused approach is based on three principles:

1. **Community Engagement:** The ORC will be proactive to engage communities that may be underrepresented in decision-making processes regarding public transportation.
2. **Access:** Residents across Otago can safely access multiple transportation options to reach their destination.
3. **Address Historical Disinvestment**: The ORC will invest in areas that are historically underserved by transportation funding and projects that improve safety for people walking, biking and using mobility assistance.

These three equity principles are put into practice through the following policy and actions:

Equity Policies	
EQ P1	Equity will be at the forefront of public transport decision-making.
Equity Actions	
The Council will:	
EQ A1	Review and analyse public transportation data, including patronage statistics, service frequency and coverage, to identify patterns of inequity in service provision.
EQ A2	Leverage technology, such as mobile apps and GIS, to conduct spatial analysis and identify areas in need of transportation investments.

Otago Regional Council

EQ A3	Collect data on diversity of participation on streets and public transport services to understand the barriers communities face in accessing public transport as their primary mode of urban travel.
EQ A4	Conduct meaningful engagement with people experiencing transport disadvantages that goes beyond requesting feedback, encouraging them to articulate their public transport needs and co-create solutions through workshops, meetings, focus groups and surveys.
EQ A5	Engage with social service organisations to review programmes, projects and decisions to refine public transport investment options to address inequities.
EQ A6	Prioritise public transport investments and policies to boost patronage for people experiencing transport disadvantages, such as improving affordability through concessions and increasing service frequency and coverage in underserved areas.

5.2 How we will engage

Our public transport decisions will be informed through meaningful engagement processes that involve open and honest dialogue with stakeholders. Through this dialogue we hope to build the trust necessary to deliver a successful public transport system now and in the future.

[we will follow legislative requirements and the ORC's significance and engagement…policy]

Engagement Policies	
SE P1	Strong partnerships with diverse stakeholders, including iwi, territorial authorities, communities and people experiencing transport disadvantages are developed and maintained so our public transport priorities and investments align with stakeholder needs and interests.
SE P2	Our stakeholder engagement processes are accessible and transparent and will inform the decisions we make around public transport investments and service provision.

Engagement Actions	
The Council will:	
SE A1	Engage in meaningful dialogue with diverse stakeholders interested in public transport to understand their transport needs.

Otago Regional Council

SE A2	Encourage the sharing of information and data with and between our territorial authorities, operators and partner agencies to support future planning, transport trends, changing demands, growth and technological change, amongst others.
SE A3	Establish a collaboration framework and joint work programmes with territorial authorities to integrate public transport projects and investments that align with each party's respective priorities and capabilities.
SE A4	Regularly review and improve our stakeholder engagement strategies based on feedback and evolving needs.

5.2.1 Collaborative work practices

[under development]

5.3 Community awareness, promotion, community outreach

[under development]

6 Focus Area 5: Environmental Sustainability

Objective: Invest in a public transport system that promotes the best possible environmental outcomes regarding greenhouse gas emissions, pollutants and land use.

ORC Strategic Direction Goals: Transport Goals 2, 3; Climate Goals 1, 2; Environment Goals 1, 3

Transportation is a major source of Otago's greenhouse gas emissions. Dependence on private vehicles has significant impacts on our environment and communities. For example, it exacerbates the climate emergency which damages our homes, increases the cost of doing business and threatens our places of cultural significance. Additionally, the competition for road space among private vehicles leads to increased congestion and the emission of harmful pollutants, resulting in poor air quality and an elevated risk of respiratory illnesses in our communities.

The ORC is committed to supporting a public transport system that achieves better environmental outcomes regarding greenhouse gas emissions, pollutants and land use. Achieving these outcomes will require us to take a holistic view of the transport sector's environmental impacts. This means we must consider not just the environmental impact of our public transport system's assets and operations, but also the various factors impacting how Otago's communities travel, including urban design. Our approach to delivering environmental sustainability is focused on two key topics: decarbonising our public transport fleet and improving the integration of land-use planning with public transport systems.

Otago Regional Council

6.1 Decarbonising our bus fleet and related infrastructure

Decarbonising our bus fleet and related infrastructure is a crucial step toward reducing our environmental impact, as it limits harmful pollutants and carbon emissions, improves air quality and reduces noise in our communities.

In 2021, the ORC trialled one electric bus on select routes in Dunedin, travelling 3148 km and carrying over 3000 passengers. The trial yielded promising results and was estimated to have saved 2511 kg of CO_2 emissions[2], a > 90% reduction in CO_2 emissions compared to diesel buses! This successful trial paves the way for the complete electrification of our bus fleets in Dunedin and Queenstown.

Urban Area	2025	Expected (2026)	Expected (2030)
Dunedin	27 electric buses (37% of fleet)	X buses (?% of fleet)	X buses (100% of fleet)
Queenstown	0 electric buses (0% of fleet electric)	X buses (?% of fleet electric)	X buses (100% of fleet)

[further work being undertaken here]

Decarbonisation Policies	
DC P1	Decisions on the makeup of the public transport fleet will include consideration of the whole-of-life carbon emissions of the fleet, including emissions embedded in the construction of vehicles. Carbon emissions will be valued according to current carbon prices.
DC P2	New and existing charging infrastructure will align with NZTA charging design principles and, when feasible, be powered by renewable energy sources.
Decarbonisation Actions	
The Council will:	
DC A1	Negotiate with bus operators to facilitate the phasing out of diesel buses to zero emission electric buses from 2024 onwards.
DC A2	Coordinate with service operators, territorial authorities and other relevant stakeholders, including through procurement processes, to ensure the bus fleet,

[2] Otago Regional Council (2021) Electric Bus Popular with Passengers, Produced Fewer Carbon Emissions. (online: https://www.orc.govt.nz/your-council/latest-news/news/2021/december/electric-bus-popular-with-passengers-produced-fewer-carbon-emissions/)

	charging stations and supporting infrastructure, including roads and bridges, are strategically planned in a way that maximise operational efficiencies.
DC A3	Investigate and implement strategies to ensure the electricity used for charging stations is sourced from renewable energy.

6.2 Integrating land-use planning with public transport

Reducing the environmental impact of Otago's transport sector will require the provision of useful and frequent public transport services in urban areas. The viability of providing these services in a way that produces good value for money is dependent on well-planned urban growth and development, which in turn relies on urban form principles of proximity, linearity, connectivity and density (see Appendix E) [in development].

[Add in trade-offs Venn Diagram]

The policies and actions in this section outline the ORC's commitment to planning well-functioning urban environments which include public transport services that are useful, frequent and minimise environmental impact. They are supported by government policies and strategies calling for changes to urban form that increase accessibility to public transport, including: the National Policy Statement on Urban Development (2020), the Urban Growth Agenda, the Otago Regional Policy Statement (2019), the joint DCC/ORC Future Development Strategy for Dunedin and the Queenstown Lakes Spatial Plan (2021).

Land-use planning policies	
LU P1	The ORC will work with TAs to support new urban development areas and existing urban area redevelopment/expansion that enable viable frequent public transport service provision through the following features: • Acknowledge the unique characteristics and challenges of places and • Is consistent with the urban form and transport design factors such as good proximity, linearity, connectivity and land use intensity.
LU P2	The ORC will not provide public transport services sufficient to enable well-functioning urban areas where the nature and location of the proposed urban development is inconsistent with the urban form and transport design factors of good proximity, linearity, connectivity and land use intensity.
LU P3	The ORC will prioritise providing useful and frequent public transport services to new and existing urban areas that align with well-functioning urban environment principles.
Land-use planning actions	
The Council will:	

Otago Regional Council

LU A1	Proactively engage with relevant stakeholders, including developers and territorial authorities, to ensure decisions regarding land-use, the development of new urban areas, redevelopment and/or the expansion of existing urban areas are well integrated with existing and potential public transport services and infrastructure in line with well-functioning urban environment principles.
LU A2	Coordinate with stakeholders involved in land use, urban development and transport planning around policy and investment to support useful and frequent public transport services in urban areas that align with well-functioning urban environment principles.

Case study: Queenstown Lakes Spatial Plan: Whaiora Grow Well Partnership

The Whaiora Grow Well Partnership between Queenstown Lakes District Council, Kāi Tahu and Central Government was established in 2021 to develop a long-term strategy and investment plan for future development in the Queenstown Lakes area. The Partnership delivered the Queenstown Lakes Spatial Plan (2021), which sought to make public and active transport people's first travel choice, among other things. Achieving this goal will require coordination between the ORC and relevant stakeholders to ensure land use is concentrated, mixed and integrates well with public and active transport networks. The ORC's policies and actions to integrate land-use planning with public transport complement those in the Queenstown Lakes Spatial Plan, and will be crucial to meeting our Transport, Climate and Environmental goals outlined in the ORC's Strategic Directions (2024-2034).

Otago Regional Council

7 Implementation

7.1 Implementation timeline

7.2 Performance and monitoring

Otago Regional Council

9.3. Flood Recovery Update

Prepared for:	Council
Report No.	OPS2440
Activity:	Governance Report
Author:	Brett Paterson, Team Leader Project Delivery Tim van Woerden, Senior Natural Hazards Analyst Ken Tarboton, Flood Repair and Recovery Programme Manager (Contractor) Pam Wilson, Infrastructure Engineering Lead Michelle Mifflin, Manager Engineering
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	4 December 2024

PURPOSE

[1] To provide information on the October 2024 flood event, response and initial damage assessment and update on the existing 2020, 2022 and 2023 flood repair and recovery programmes.

RECOMMENDATION

That the Council:

1) ***Receives*** *this report.*
2) ***Notes*** *the recent flood damage from the October 2024 weather event and specifically that the Puerua Training Line infrastructure requires urgent repair.*
3) ***Approves*** *the award of a contract to Southroads Limited to undertake urgent repairs to the Puerua Training Line up to a total amount not exceeding $1,000,000 (excl. GST). This is comprised of the estimate of $750,000 (excl. GST) and contingency of $250,000 (excl. GST).*
4) ***Authorises*** *the Chief Executive, in consultation with the Chairperson, to award contracts including variations up to a total amount not exceeding $2,540,000 (excl. GST) for the repairs identified as a priority as set out in Table 6.*
5) ***Authorises*** *the Chief Executive and the General Manager Science & Resilience to make payments against approved project progress claims up to a cumulative amount not exceeding $2,540,000 (excl. GST).*
6) ***Notes*** *that the October 2024 flood damage repairs are unbudgeted expenditure in FY 2024/2025 as a result of the flood event and will be funded by scheme reserves.*
7) ***Notes*** *the progress with ORC's Flood repair and recovery from the 2020, 2022 and 2023 flood events.*
8) ***Requests*** *that staff provide an update on the October 2024 flood repairs and the financial implications to the March 2025 Council meeting.*

Introduction

[2] In October 2024 a heavy rainfall event caused flood damage spread widely across the Otago region. ORC staff are still in the process of evaluating the extent of asset damage and implementing a flood recovery programme to prioritise and undertake repairs to damage from this event. Information on flood response, an initial summary of damage

and some urgent repair works underway, including at the confluence of the Puerua River and Koau branch of the Clutha River/Mata-Au, are presented.

[3] Flood recovery from severe weather events in 2020 through to 2023 is nearing completion. A summary of progress and updated cost estimates is provided of those flood repair programmes.

OCTOBER 2024 WEATHER EVENT

Event

[4] In early October 2024, an easterly weather system delivered significant rainfall to coastal Otago, in a weather event which resulted in the first MetService 'red warning' for the Otago region since that colour-coded system was introduced in 2019.

[5] The weather event occurred over a three-day period (2nd through to 4th October 2024), with the highest rainfall totals in the coastal margin from Palmerston to the Catlins, and the coastal hills in the Dunedin City, Waitaki and Clutha Districts (Figure 1). Rainfall totals at a number of ORC monitoring sites exceeded 100 mm for the event, with the highest totals recorded at the following locations:

- Sullivans Dam (207 mm)
- Pinehill (191 mm)
- Inch Clutha (186 mm)
- Swampy Spur (130 mm)

[6] Figure 2 provides a preliminary estimate of the rainfall event return period, based on comparison with data from NIWA's High Intensity Rainfall Design System (HIRDS).[1] This shows a broad area assessed as exceeding a 50-year ARI (2% AEP) event. This area of higher return period rainfall includes the Dunedin City coastline from Sandfly Bay to Blackhead, the area around Taieri Mouth, coastal parts of the Tokomairiro, Puerua and Owaka Catchments, and much of the Clutha Delta.

[7] In areas of high rainfall, the more consequential impacts were local inundation and flooding from surface water, rather than from high river flows. Rivers in the Otago coastal catchments (e.g., Waikouaiti River, Water of Leith-Lindsay Creek, Tokomairiro River) generally experienced only moderate flows during the weather event.

[8] The Clutha River/Mata-Au reached a peak flow of 1940 cumecs during this event (Figure 3), driven by the combination of inflows from the upper catchment (i.e., Lakes Wanaka and Whakatipu catchments), and the lower Clutha catchment (e.g., Pomahaka River). Although these Clutha peak flows are not exceptional, the river has remained at moderately high flows for a sustained period since early September 2024, caused by a succession of fronts bringing rainfall to the southern South Island.

[9] The lower Puerua River reached its highest water level on record (102.8m, Otago Metric Datum) since monitoring at the Paretai Pump Station commenced in mid-1993 (Figure 4).

[1] For post-event analysis, the main purpose of this HIRDS tool is to provide reliable estimates of return periods at ungauged locations, but is not intended to replace site-specific extreme value analysis at gauged locations.

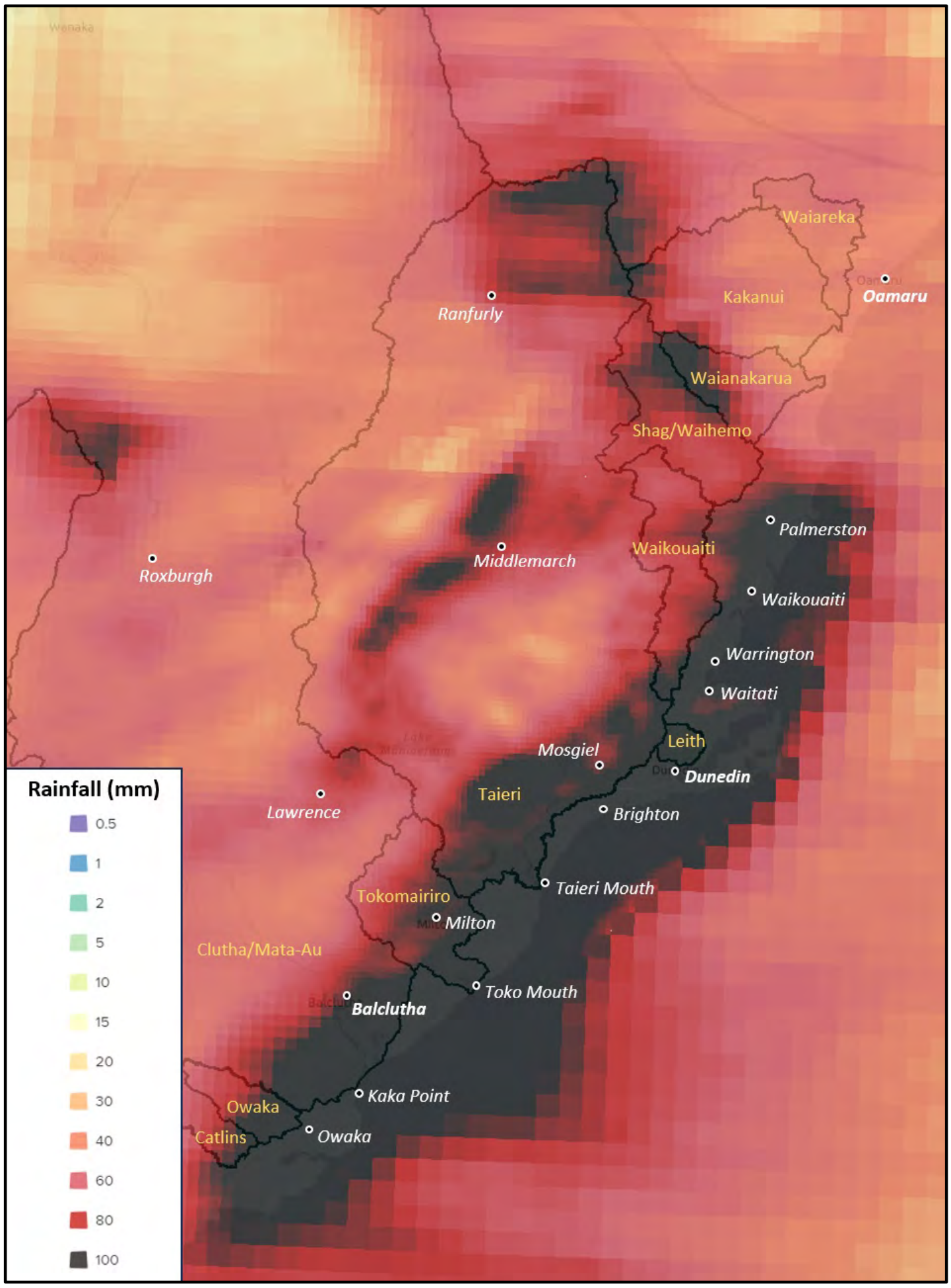

Figure 1: Rainfall totals and distribution for 60-hour period from 9am on 2 October to 9pm on 4 October, with settlements (white text) and catchment boundaries (orange text) annotated.[2]

[2]Image source: MetService rain radar processed by Mott MacDonald Ltd.

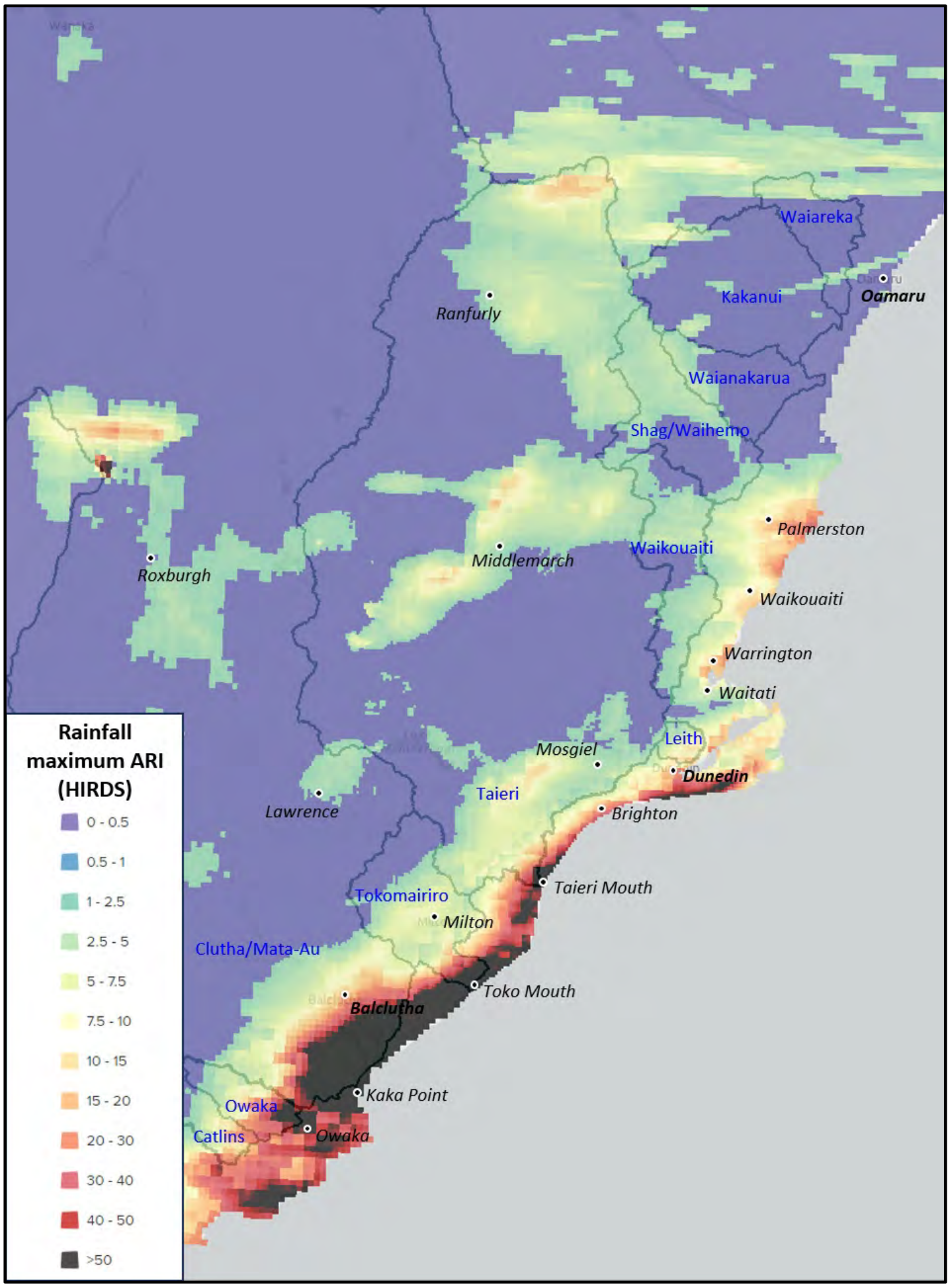

Figure 2: Preliminary assessment of rainfall likelihood for 60-hour period from 9am on 2 October to 9pm on 4 October, with settlements (black text) and catchment boundaries (blue text) annotated.[3]

[3] Image source: MetService rain radar processed by Mott MacDonald Ltd to compare to event rainfall with likelihood derived from NIWA's HIRDS dataset.

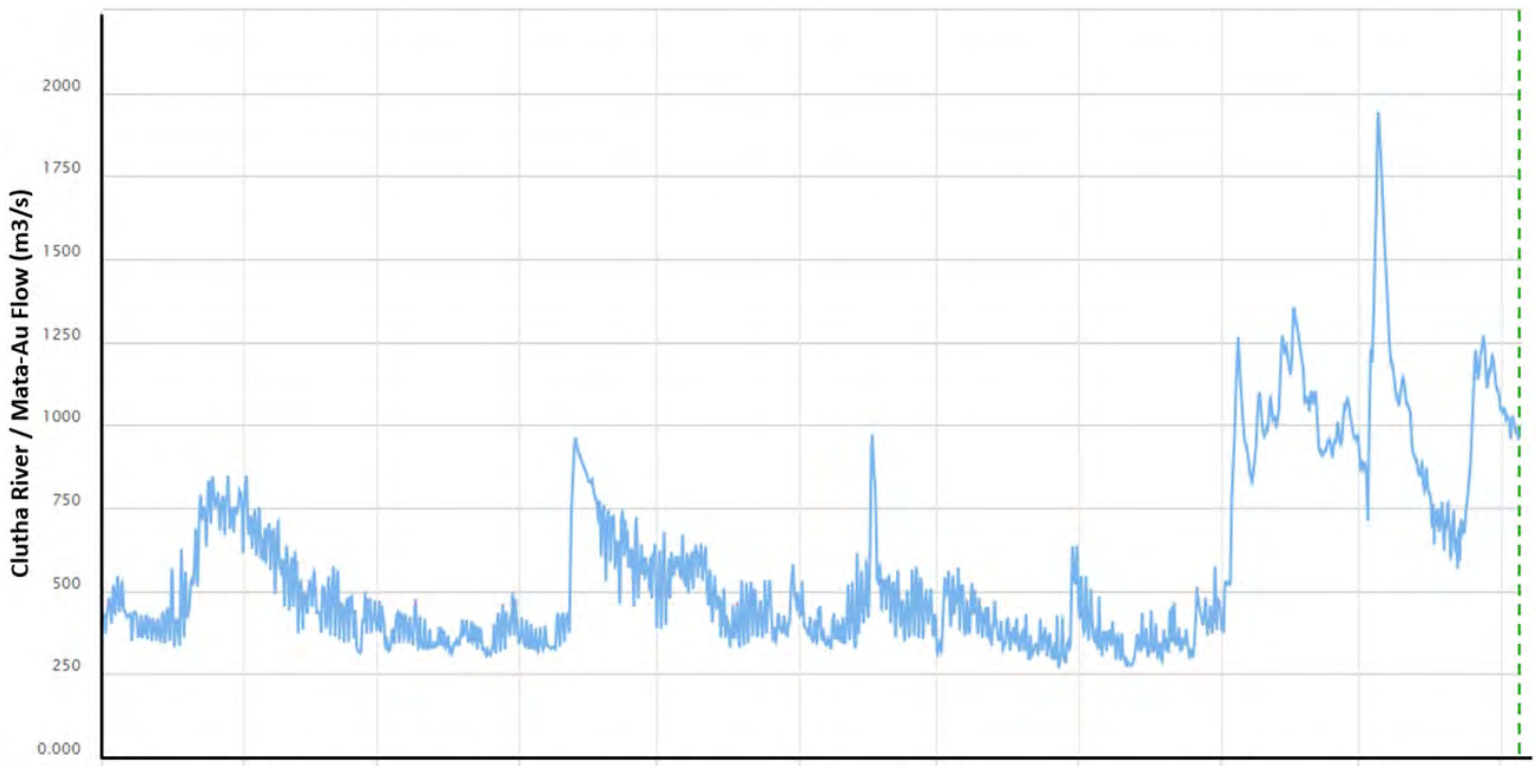

Figure 3: Clutha River/Mata-Au flows (at Balclutha) for the 2024 year to date.

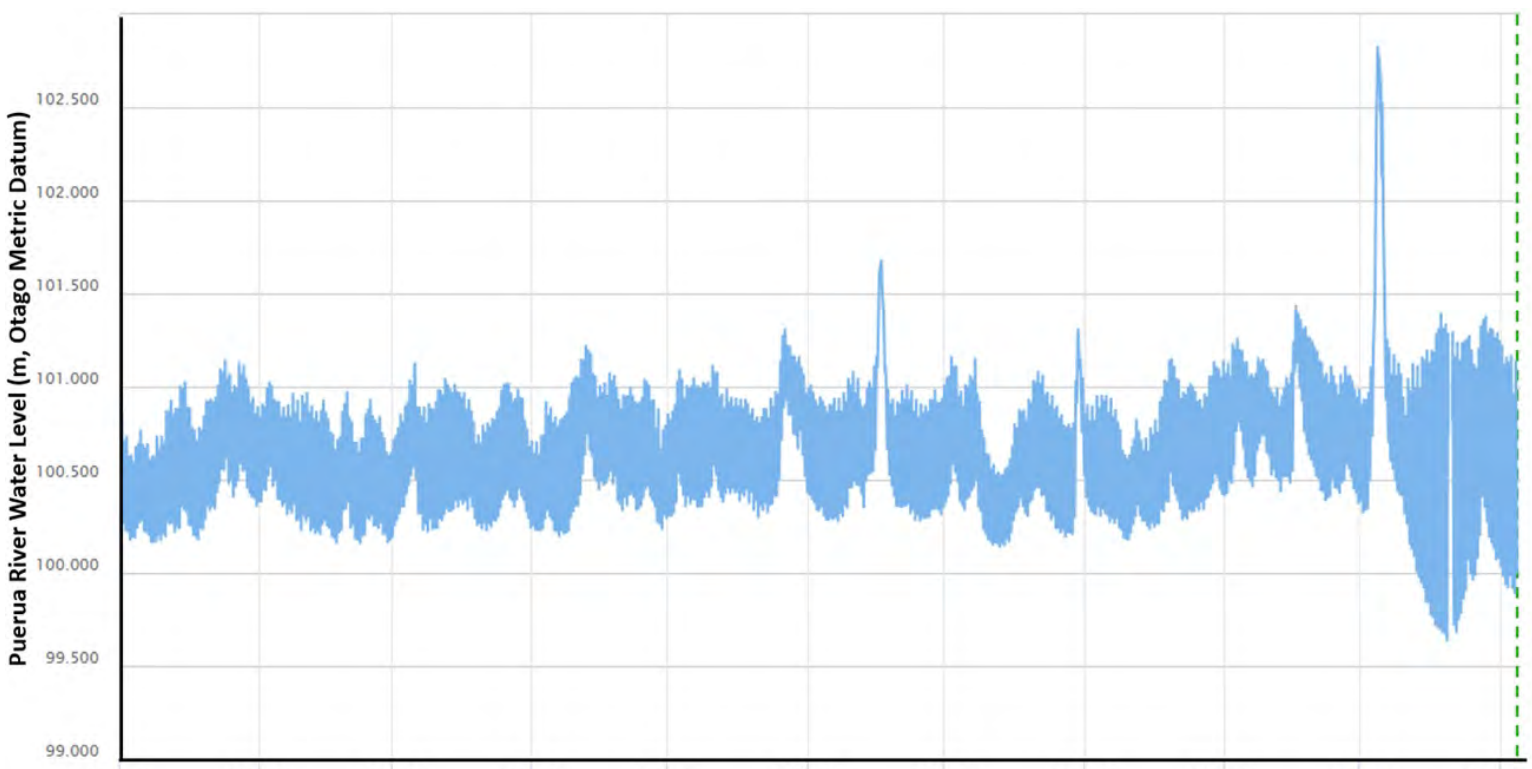

Figure 4: Puerua River at Paretai Pump Station, water level for the 2024 year to date.

Response

[10] The Engineering team mobilised in the days leading up to the event with inspections of key sites, including pump stations, outfalls, and river mouths. A roster was prepared to help manage fatigue and ensure adequate staffing levels. This roster was supported by other ORC staff and contractors as needed.

[11] Regular internal briefings were held with Engineering staff to discuss scheme and river response, check in on staffing levels and fatigue, and plan ahead as the weather situation changed. Engineering also maintained a presence in the Emergency Coordination Centre (ECC) for the duration of the event.

[12] The QuickCapture application was used by the Engineering team to capture field observations of potential sites of interest during and post the event. This allowed field observers to communicate photos, urgency, and a brief description, to those monitoring the dashboard in the Engineering team, and to the ECC. Information captured by members of the public was also added using this app in other areas such as Middlemarch.

[13] In conjunction with river level and flow data, the information captured using QuickCapture and displayed on the Flood Event dashboard (Figure 5) provided valuable information on how rivers behaved, and how the schemes performed in real time during the event. This information was highly relevant for responding to queries from CDEM and members of the public and can be used by operations field staff to ascertain priorities for ongoing inspections.

Figure 5: Screenshot of Engineering's Flood Event Dashboard showing an overview of the flood incident points collected before, during and after the event.

[14] Following the event, the information captured in the dashboard has been used to prepare an initial snapshot of potential flood recovery sites and serves as a useful reference to understand the potential impacts of future events.

[15] A total of 492 incident points were collected during the event and immediately following the event. These incident points included 363 observation sites, and 67 low, 26 medium and 36 urgent priority sites. Flood recovery sites that require a repair to be undertaken are being determined from the incident points. These incident points will form the flood repair programme. Note that some sites have more than one incident point.

[16] In addition to the above, a further 37 observations were made at the river mouths that ORC monitors across the Dunedin and Clutha coastal areas. These are captured using a routine survey in a different application and are displayed on a separate dashboard as part of ongoing monitoring of river mouth behaviour. This information was also valuable

for responding to queries from CDEM and members of the public, as well as post event analysis.

Scheme Performance

[17] Overall, the schemes mostly performed to expected levels of service throughout the duration of this event. Table 1 summarises the current design standards for each scheme, the river level or flow recorded during the event, and confirms that the level of service was met.

Table 1. Summary of scheme design standards and whether the level of service was met for the event.

Design standard	Level of service met	Level / flow recorded (date)
Alexandra Flood Protection Scheme		
Protect the lower part of Alexandra against river levels up to **142.75 m** at the Alexandra bridge, with freeboard. Represents the worst known flood (1878).	Yes	135 m (05/10/2024)
Leith Flood Protection Scheme		
No flooding in all flows up to **171 m³/s** (measured at St David Street footbridge). Represents 1 in 100-year flood with freeboard.	Yes	71 m³/s (04/10/2024)
Lower Clutha Flood Protection and Drainage Scheme		
No flooding of Barnego in all flows up to **2,850 m³/s**.	Yes	1940 m³/s (04/10/2024)
No flooding of Kaitangata, Inch Clutha and Paretai in all flows up to **4,000 m³/s**.	Yes[1]	
No flooding of Balclutha in all flows up to **5,600 m³/s**.	Yes	
Lower Taieri Flood Protection and Drainage Scheme		
No flooding of the East Taieri Upper Ponding area from Taieri River flows up to **800 m³/s**.	Yes	667 m³/s (05/10/2024)
No flooding of the East Taieri lower ponding area from Taieri River flows up to **2,500 m³/s**.	Yes	
No flooding of West Taieri from Taieri River flows up to **2,500 m³/s**.	Yes	
No flooding of the East Taieri Upper Ponding area from Silver Stream flows up to **160 m³/s**.	Yes	43 m³/s (04/10/2024)
No flooding of the East Taieri lower ponding area from Silver Stream flows up to **260 m³/s**.	Yes	
No flooding of Mosgiel from Silver Stream flows up to **260 m³/s**, (Silver Stream flows measured at Gordon Road), being equivalent to the 1980 flood, nominally a 100-year event.	Yes	

[1] In the Paretai area there was internal flooding from local runoff.

[18] Within the Lower Taieri Flood Protection Scheme, the Otokia Spillway operated as expected at the flows experienced in the Taieri River. Flows in the Taieri River and Silver Stream were not high enough for flow over the Riverside Road and Gordon Road spillways respectively. Areas of surface ponding occurred within the East and West Taieri Drainage Schemes, as is expected with the rainfall intensities experienced. All pump stations remained operational and performed well throughout the duration of the event.

[19] Within the Lower Clutha Flood Protection and Drainage Scheme there was significant pressure on scheme infrastructure within the Puerua River catchment due to a combination of significant rainfall and river outlet conditions. This resulted in extensive flooding within the Paretai area. Portable pumps including those owned by ORC were brought in to help supplement the pumping capacity in this area, and floodbanks were strategically lowered in two locations to aid in relieving flooding in this area. Both cuts

have since been temporarily repaired and await inspection and longer-term repair as required.

Initial damage assessment

[20] ORC staff are still in the process of assessing damage to ORC assets as a result of this event. Subsequent rainfall has hampered and delayed these efforts.

[21] An initial assessment of the location and type of damage is presented in Table 2 below. Initially 68 potential flood damage sites were identified. Initial assessment of these sites indicated that at 31 of the sites, only debris removal was required. Figure 6 shows the extent of food damage and debris sites across the Otago Region.

[22] Photos of flood damage at a number of sites across Otago are shown in the photos Appendix A.

[23] Much of the debris removal has already been completed, some by other parties or at their expense (e.g., Territorial Authorities or NZTA).

[24] The 30 flood recovery sites included in Table 2 below and shown in Figure 6 are ORC assets or fall withing ORC responsibility to maintain and manage.

Table 2. Initial assessment of damage from October 2024 flood event

2024 Flood Repair	Number of sites and type to repair required at site			
Location	**Flood bank**	**Structure**	**Erosion**	**Total**
Central Otago			2	2
Dunedin			1	1
Lower Clutha	6	1	6	13
Lower Taieri	1		12	13
Tokomairiro			1	1
Total	**7**	**1**	**22**	**30**

[25] Prioritisation of the 30 flood damage repair sites into a 2024 Flood Repair Programme has started, with the repair to the Puerua outfall / Clutha Koau training line structure the highest priority. Repairs to this structure are described further below.

[26] Repair to the seven floodbanks is the next highest priority. Temporary repairs have already been made to the floodbanks that were lowered (cut) during the event to allow ponded water to return to the Puerua River (See photos in Appendix A).

[27] A very rough initial cost estimate for repairs to the 30 sites that form the 2024 Flood Repair Programme is included in the financial impacts below.

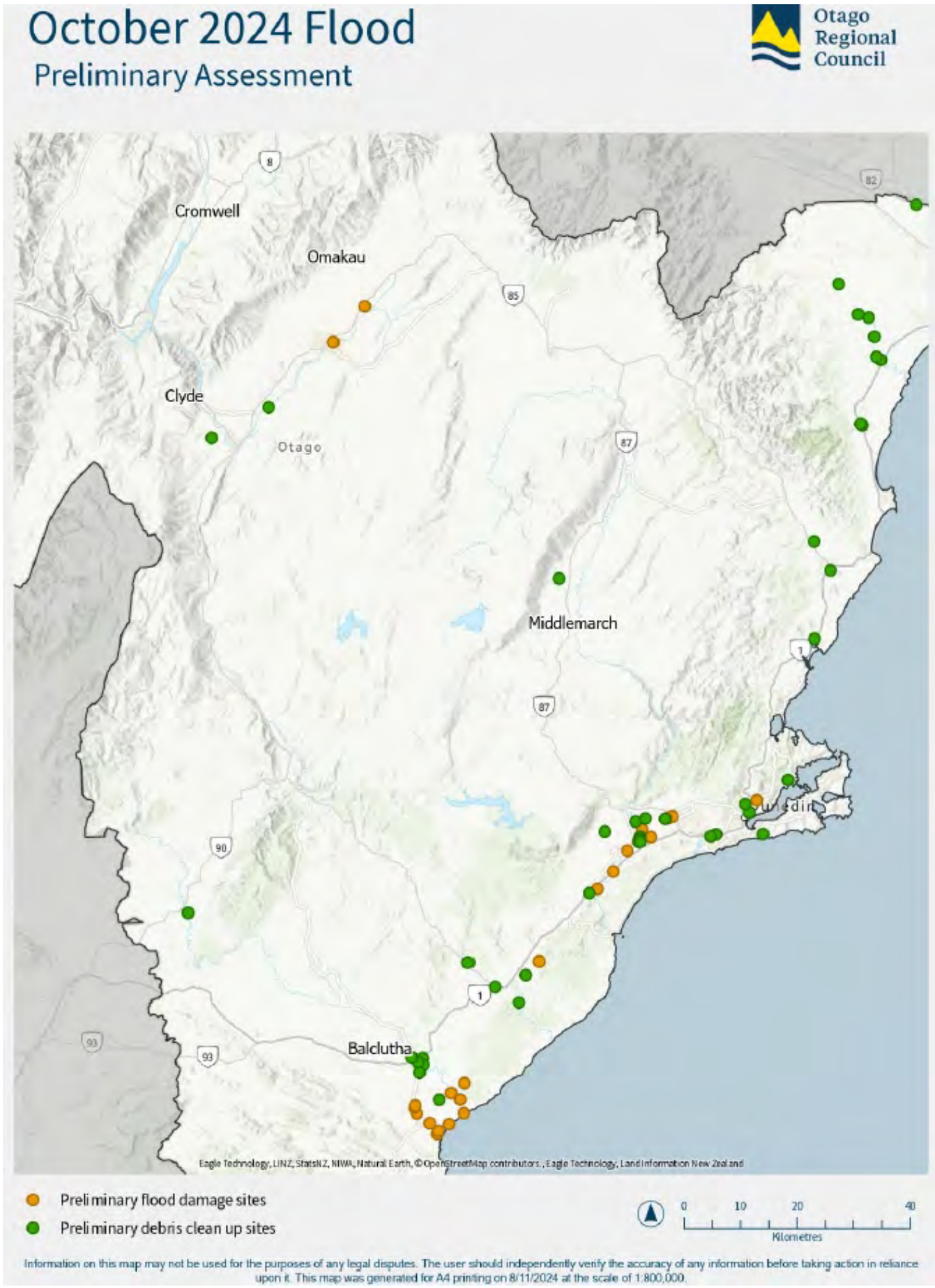

Figure 6: Location of October 2024 flood damage and debris sites.

2024 Flood Repair works being progressed.
Puerua outfall / Clutha Koau training line

[28] During the flood event significant damage occurred to the training line at the mouth of the Koau branch of the Clutha River.

[29] On Saturday 5th Oct 2024, Tom Dyer (General Manager Science and Resilience) and Michelle Mifflin (Manager Engineering) attended a community organised meeting in Paretai with over 40 attendees including Hon. Minister Patterson, MPI, Dairy NZ, and landowners to address concerns over flooding and infrastructure function.

[30] A request was made by the community for ORC to urgently consider action to alleviate the extensive farmland flooding due to the high Puerua River levels impeding flood drainage combined with heavy persistent rainfall. The request was to allow the training line to be able to provide increased drainage for the Puerua.

[31] ORC undertook a spillway style cut across the training line on the evening of the Saturday the 5th October 2024. The cut was successful in relieving flood water from the Puerua River, however over the course of the night the cut eroded to form an open channel approximately 50m wide through the causeway (see Figure 9). Significant work is now required to reinstate the training line ensuring the continued function of both the drainage for the Puerua River, and to maintain the mouth of the Koau branch of the Clutha/Mata Au River.

[32] In its current state Koau/Puerua training line is at risk of further damage from erosion from the Clutha/Mata Au or Puerua River. Further erosion will increase the risk of the Koau Mouth of the Clutha/Mata Au partially or fully closing. This will reduce capacity of the wider Lower Clutha Flood Scheme. Additionally, the training line structure itself is a valuable asset with a substantial replacement cost. Erosion of a greater extent of the training line structure in the seaward direction would increase repair cost substantially.

[33] The existing Puerua training line is consented under resource consent RC2006.69. The emergency works will be undertaken under s330 of the Resource Management Act, however it is anticipated the existing resource consent provides for the reinstatement works as it is a like-for-like reinstatement.

[34] Emergency works to reinstate the training line have been proceeding. The following activities have occurred in accordance with current financial delegations and procurement processes:

a. Survey work has been undertaken by Landpro Limited to inform reinstatement design and hydraulic modelling. Landpro have recently undertaken survey works at this location and the required survey was an extension of the existing work.

b. Jacobs Limited have been engaged to provide engineering consulting support and have completed hydraulic modelling to assess drainage requirements and sizing of culverts to be installed with the reinstatement works. Jacobs currently have a workstream with ORC through the Clutha Delta Natural Hazards Adaptation Programme, led by the Natural Hazards team. Part of that workstream includes a natural hazards and engineering investigation focused on the Koau Mouth, Puerua outfall and Paretai areas to inform future management for the ORC scheme

infrastructure. Through this work, Jacobs staff have an existing in-depth knowledge of the training line, Puerua river and estuary as well as operating hydraulic models.

c. Replacement culverts to be installed in the training line have been ordered through Hynds Pipe Systems Limited. The culverts are long lead items and required early procurement to allow the repair works to proceed with minimal delay. Two suppliers were approached to provide pricing and availability for supply of the required culverts. Hynds have been selected as they have provided the best price of $330,000 and shortest lead time for the culvert supply.

d. Reinstatement of the training line by a Contractor has been progressing through planning stages, which will involve installation of culverts sufficient to reinstate the culvert capacity to be comparable to that prior to the 2023 weather event. The training line causeway will be repaired using rock fill and armoured with large riprap similar to the existing structure. The function of the Puerua training line substantially reduced following the 2023 event. This is shown in Figure 7.

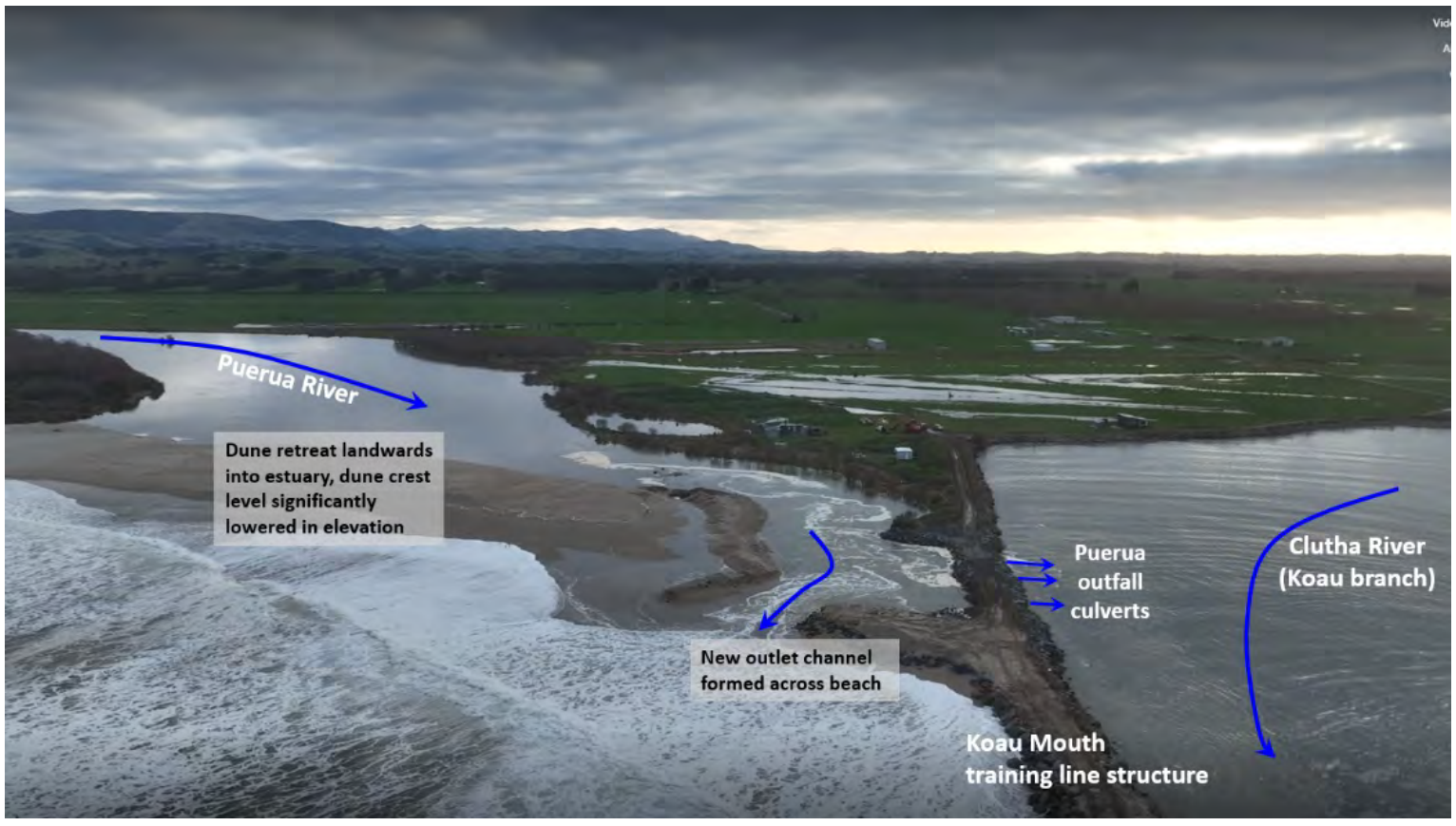

Figure 7: The function of the Puerua Estuary and Lower Clutha Flood Protection and Drainage Scheme following the 2023 event.

[35] ORC staff have approached the contractor Southroads Limited to provide advice on undertaking emergency construction works on the training line. That advice included confirmation if a supply of rock was available and appropriate equipment and personal were available. Southroads confirmed that the work is able to be undertaken and has been working with ORC staff to expedite a reinstatement methodology and provide an estimate based on quantities provided by ORC. The estimate provided to date is approximately $750,000 to supply and place the rock fill and riprap. It should be noted that this is a high-level estimate only and may be subject to change as the environment of reinstatement requires working with two flowing rivers and under water construction management. The installation of the culverts and site reinstatement works are yet to be estimated but are included within the $250,000 contingency value.

[36] Southroads were approached as they have undertaken emergency works and flood repair works previously for ORC. Their experience and capability have been demonstrated through this previous work undertaken for ORC. This includes contracts that have been competitively tendered and successfully delivered for like works including rock revetment works within the Clutha River and coastal environment. Southroads have confirmed that they have the necessary plant and equipment available to undertake the works urgently.

[37] ORC staff recommend that the direct engagement of Southroads as the primary construction contractor to undertake the emergency works proceeds. If approved, it is intended to engage Southroads under a NZS3910:2013 contract on a time and materials basis. The primary reason for this recommendation is expediency to reduce the risk of further damage to the training line.

[38] To ensure cost control and impartial oversight it is also proposed that an independent quantity surveyor be engaged to ensure fair pricing of the work.

[39] The following procurement options were considered in progressing the Emergency Works to the Puerua training line are summarised in Table 3 below:

Table 3. Procurement options for emergency repairs to Puerua training line.

Option	Benefit	Risks
Direct engagement of a contractor	• Early engagement and development of methodology with Contractor • Streamlined approach to engagement given emergency requirements of reinstatement. • Known capability and experience. • Confirmation of ability to respond. • Reinstatement will occur within 2 – 3 months. • Ability to respond at pace to repair the training line. • The Puerua and Clutha (Koau Mouth) Rivers have open flow capacity maintained expediently. • The functionality of the flood protection and land drainage scheme is maintained.	• Contractor dependence / single sourced • Lack of competitive pricing (noting this is not planned annual plan budgeted works) • Long term market relationships
Open tender process	• Competitive pricing • Transparency and Fairness • Alignment with procurement policy	• Time delay (3 months) and increased cost in preparing design and documentation suitable for tender process. • Tender process will take 2-3 months following completion of tender documentation. • Cost risk through tender process. Tender respondents will price in risk of working in coastal environment. • Delay in reinstatement, the training line is currently under considerable risk exposure to further erosion. • Further weather events (coastal and river impacts) have the potential to remove the remainder of the training

Option	Benefit	Risks
		structure. If this was to occur the township of Balclutha may be subject increased flooding risk along with the functionality of the flood protection and drainage scheme level of service being significantly reduced.

Figure 8: Arial photo of the Koau training line, 4 October 2024 prior to cut being undertaken.

Figure 9: Drone photo of breach of the Koau training line 8th October 2024.

Existing Flood Repair and Recovery Programmes

[40] ORC currently has three (3) active flood repair and recovery programmes. The flood damage resulted from significant weather events in the years of 2020, 2022 and 2023.

a. Otago experienced significant weather events in February 2020. Thirty-five flood damage sites requiring repair were identified and a programme of repair and recovery was established.
b. There were four successive weather events throughout July and August 2022 that resulted in elevated flows in rivers across and resulting in further widespread flood damage across Otago. A further seventy-one sites requiring flood damage repairs were identified from the 2022 event.
c. A weather event in July 2023 resulted in flood damage at 13 sites in the Queenstown Lakes and Wanaka area. The same event resulted in storm surge and high flows in the Puerua River and caused coastal damage to the Puerua River and Koau training line.

[41] Flood damage sites from the 2020, 2022 and 2023 events have been included in the flood repair and recovery programme which is available to the public online as an interactive map showing repair sites, their programmed completion, and their status. This live dashboard can be viewed on the ORC Flood Repair Programmes web page at: https://www.orc.govt.nz/managing-natural-hazards/flood-defences/flood-repair-programmes/ and then by selecting “Flood Recovery Works” at the bottom of the page. The programme remains subject to changes as the investigations and repair works are undertaken and the dashboard updated regularly.

[42] Table 4 below shows a snapshot summary of the 120 flood damage sites in the programme at the end of October 2024, by location for all three events. It also shows the location of the 9 remaining sites at which repairs still need to be completed.

Table 4: Summary of 2020, 2022 and 2023 flood damage sites by area.

Area	Number of repair sites for each flood event with repairs still to be completed in ( )			Total
	2020	2022	2023	
Central Otago		12		12
Clutha	5	4		9 (1)
Dunedin		2		2
Lower Clutha	27 (1)	11 (1)		39 (2)
Lower Taieri		9 (1)		9 (1)
Waitaki		32 (2)		32 (1)
Wakatipu	2		4	6
Wanaka	1	1	9 (4)	11 (4)
Total	**35 (1)**	**71 (4)**	**13 (4)**	**120 (9)**

Remaining repairs from 2020 to 2023 floods on 31 October 2024

[43] Of the 35 identified 2020 flood damaged sites, only repairs to the Balclutha pressure relief wells remains to be completed. Works on this repair are underway and should be completed by the end of 2024 or early in 2025.

[44] Of the 71 identified 2022 flood damage sites, repairs are still required at 4 sites.

[45] Final design for erosion and slumping over a 400m section of the Kaitangata floodbank is nearing completion with repairs expected to be completed in the first quarter of 2025.

[46] Procurement to secure a contractor to undertake earthwork to reduce scour on the outside banks of the Waipori River is progressing and works are expected to be undertaken before the end of 2024.

[47] Tree planting is being undertaken in November 2024 at two sites on the Kakanui River, Waitaki, to stabilise the riverbanks.

[48] Of the 13 identified 2023 flood damage sites, repairs still need to be completed at 4 sites in the Wanaka Area. These include bank erosion repairs and channel realignment. Procurement to secure a contractor is underway and works are expected to be completed by the end of the first quarter in 2025.

Flood Repair Programme costs

[49] The estimated costs of flood repairs from the 2020 and 2022 event, were reported to the Council Safety and Resilience Committee on 10 August 2023.
Storm damage from the July 2023 event was also reported at the same meeting.

[50] Table 5 below updates the cost estimates previously reported and includes the costs of the 2023 flood damage. The 2024 flood damage estimate is not included in the table as it is a very preliminary rough cost estimate. The remaining 2020 to 2023 repairs are expected to cost approximately $1 million with the revised overall cost for the 2020 to

2023 flood damage now expected to be $5.7 million, down from the $6.4 million previously estimated for 2020 and 2022 flood damage only.

Table 5: Summary of ORC Flood Repair Costs from 2020, 2022 and 2023 events.

Weather event	Est. cost of repairs as reported 10/08/23	Cost to ORC Schemes & Rivers at 31/10/24	Contributions from others at 31/10/24		Forecast expenditure to complete FY2024/25	Revised estimated cost at completion
February 2020	$4,500,000	$4,029,866	NEMA[1]	$426,183	$583,000	$4,612,866
			MBIE[2]	$608,000		
			CEL[3]	$14,631		
July to August 2022	$1,855,309	$628,401	CEL[3]	$45,440	$345,000	$973,401
July 2023		$31,500			$79,000	$110,500
Total	**$6,355,309**	**$4,689,767**		**$1,094,254**	**$1,007,000**	**$5,696,767**

[1] National Emergency Management Agency partial contribution towards eligible costs above threshold.

[2] MBIE contribution as part of Climate Resilience Programme.

[3] Contact Energy maintenance contribution as part of their consent conditions partial.

[51] The current October 2024 flood repair programme is being established, with the extent of flood damage being confirmed, and the costs of repairs estimated. An initial draft of the estimated cost for the October 2024 flood repairs is approximately $2.54 million as indicated in the Table 6 below.

Table 6. Initial estimate of 2024 Flood Repair costs

Repair Type	Estimated cost	Comments
Structure repair	$1,500,000 [4]	Puerua training line structure. Includes repairs, materials (culverts and rock), consultant advice and contingency.
Flood bank repair	$735,000	At 7 locations in Lower Clutha
Erosion	$305,000	Across Otago
Total	**$2,540,000**	

Financial Impacts

[52] The flood protection schemes, and river channels damaged by weather outlined in this paper are not insured[5] by the ORC. The flood protection and river management schemes are structured as self-insured funding models. The schemes and river management budgets fund additional and unforeseen events, such as flooding, from reserves[6].

[53] As presented previously in the 10 August 2023 report to Council, ORC has various choices available for funding to reduce scheme reserve deficits. Funding may be available through accessing the ORC Emergency Response fund, borrowing against the

[4] This amount includes the emergency works set out in paras [33] and [34]

[5] The ORC does insure some flood protection infrastructure; Pump Stations are insured, including pump station buildings, associated infrastructure, and pump station foundations.

[6] Reserves are the surplus or deficit associated with each scheme and/or river management budget. The reserve at the end of each Financial Year will rollover into the new Financial Year and Annual Plan.

Flood Protection and Drainage Schemes, or changing the Kuriwao Fund contribution to the Lower Clutha Flood Protection & Drainage Scheme.

[54] Contact Energy Limited (CEL) through their consents [7] have historically contributed to repairs which have been deemed as reasonable costs for maintain the coastal mouths of the Matau and Koau branches and Koau training line. This also includes instability and erosion of riverbanks downstream, from Roxburgh Dam. CEL contributions towards 2020 and 2022 flood damage repairs are included in Table 5.

[55] Contact Energy were notified of the action undertaken and damage occurring on the Koau training line on 8th October 2024. CEL have remained engaged with ORC on our progress with reinstatement of the training line and cooperative with cost considerations.

[56] Government funding through the National Emergency Management Agency (NEMA) is available to repair essential infrastructure following emergencies. This is claimable at a 60% subsidy for eligible costs above a threshold which is 0.002% of the Rateable Value of Council infrastructure in the financial year in which the damage occurred.

[57] The threshold for the 2020 flood damage was $1.92 million. The NEMA contribution to ORC 2020 flood repair expenses has been $0.4 million to date, with $0.6 million from MBIE through the Climate Resilience Programme.

[58] Costs for flood damage from both the 2022 and 2023 events were below the required threshold to be eligible for NEMA funding.

[59] The estimated NEMA threshold for the 2024 event is calculated at $2.83 million based on the Capital Value of Otago Regional Council Assets for the 24/25 rates, so it is unlikely that ORC will be in a position to claim significant funding assistance from NEMA.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[60] There are no policy considerations associated with receiving this report.

Financial Considerations

[61] Flood repair costs are described above. These costs are unbudgeted and will be incurred as deficit to the schemes and/or rivers management reserves.

[62] Cost estimates for October 2024 flood damage are very preliminary and uncertain. At this stage it appears they will be close but not significantly above the NEMA threshold that would enable a claim for partial central government subsidy.

[63] The development of the flood repair programme and undertaking repair works may require further repairs in the future and that this presents an ongoing cost risk to Council.

Significance and Engagement Considerations

[64] Staff will communicate work programmes and associated timeframes with affected communities.

[7] Resource Consent 2001.394

Legislative and Risk Considerations

[65] The nature and setting of the assets that have been damaged during the flood events, particularly within the flood protection scheme, are such that they are vulnerable to future damage. This is a cost risk for ORC.

Climate Change Considerations

[66] Flood repair and recovery has focused on reinstating like-for-like damaged infrastructure. Climate change considerations, particularly in the Lower Clutha Flood Protection and Drainage Scheme are being investigated by ORC as part of a separate programme of work.

Communications Considerations

[67] There are no communications considerations with receiving this report.

NEXT STEPS

[68] Complete the 2020, 2022 and 2023 flood repair and recovery programme before the end of the 2024/25 financial year.

[69] Proceed with the urgent repairs to the existing Puerua Training Line to reinstate the training line infrastructure to prevent further erosion risk from future weather events and coastal action that may accelerate loss of the structure.

[70] Continue development of a flood repair and recovery programme to assess and repair damage from the recent October 2024 flood.

[71] Continue with high priority repairs identified as damage to scheme infrastructure from the October 2024 weather event.

[72] Update Council on the October 2024 flood repair programme including refined costs as the development of programme progresses.

[73] Continue to communicate with key agency NEMA on the progression of the existing flood repair programmes and October 2024 flood repair programme.

[74] Continue to communicate with Contact Energy on consent contribution for the reinstatement of the Puerua Training Line.

ATTACHMENTS

1. Appendix A. Otago 2024 Flood Damage Photos [**9.3.1** - 8 pages]

Appendix

A. 2024 Flood Damage Photos

List of Figures

Appendix A. Otago 2024 Flood Damage Photos

(a)

(b)

Figure A-1: (a) Flow across access track to Puerua Training Line, and (b) washed out training line following cut and development of wider breach.

Figure A-2: Barrata Creek floodbank Puerua (a) cut to relieve interior flooding and (b) after temporary repair.

Appendix A. Otago 2024 Flood Damage Photos

(a)

(b)

Figure A-3: Puerua River floodbank (a) cut to relieve interior flooding and (b) after temporary repair.

Appendix A. Otago 2024 Flood Damage Photos

(a)

(b)

Figure A-4: Puerua River left floodbank slump downstream of Owaka Highway (a) looking upstream and (b) looking downstream.

Appendix A. Otago 2024 Flood Damage Photos

Figure A-5: Puerua River left floodbank piping.

Figure A-6: Taieri River right bank berm erosion and slumping.

Appendix A. Otago 2024 Flood Damage Photos

Figure A-7: Taieri River woody debris on berms requiring removal.

Figure A-8: Silver stream at Gordon Rd spillway showing bank erosion and high water debris line.

Appendix A. Otago 2024 Flood Damage Photos

(a)

(b)

Figure A-9: Manuherikia River (a) bank erosion and (b) loss of river edge tree protection

9.4. Taieri Trails on Floodbanks

Prepared for:	Council
Report No.	GOV2446
Activity:	Governance Report
Author:	Michelle Mifflin Manager Engineering Kirsten Tebbutt Engagement, Strategy & Planning Lead
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	4 December 2024

PURPOSE

[1] To seek a policy decision from Council regarding the use of its flood protection assets for the establishment of shared use paths (SUP).

EXECUTIVE SUMMARY

[2] Council has been increasingly approached by groups seeking contributions to trails and access to ORC assets. Staff have been collaborating with these groups to date. It has become clear that a policy decision of Council regarding an ownership and maintenance structure is required to progress these proposals.

[3] The two SUPs that are in development and that have led to this issue arising are:

- The proposed Taieri Trail, which is proposed to use the Lower Taieri Flood Protection and East Taieri Drainage Schemes.
- The proposed construction of a SUP by the Clutha District Council on sections of the Lower Clutha Flood Protection & Drainage Scheme.

[4] This paper presents options for managing the development of SUPs on flood protection assets ranging from taking ownership for development and maintenance of SUPs where a proposal arises to not allowing the development of SUPs on flood protection assets.

[5] Staff recommend Option 3 as it strikes a balance between taking an enabling approach, managing the cost to ratepayers and the risk to flood infrastructure associated with a future lack of maintenance.

RECOMMENDATION

That the Council:

1) ***Notes*** *this report.*
2) ***Approves*** *the use (of) and access to ORC owned assets and land for the purpose of recreational activities through the construction of shared use pathways by the third parties.*
3) ***Endorses*** *Option 3: ORC enables the development of SUPs on suitable flood assets and takes ownership for trail maintenance.*
4) ***Notes*** *that staff will develop guidance for construction standards which must be met to ensure the integrity of assets are maintained.*
5) ***Directs*** *staff to continue working with the Taieri Trails Group and Clutha District Council to finalise their proposals for Council consideration.*

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*6) **Notes** that the current Long-Term Plan 2024 – 2034 does not include specific funding towards supporting the investigation, construction and maintenance of ORC owned assets to be used for shared use pathways.*

BACKGROUND

[6] In November 2020 the Strategy and Planning Committee received a report that considered opportunities to facilitate assistance with continued development of an integrated trail network throughout Otago. The report highlighted that a regional trails investigation had been prepared, and that the opportunities identified in the report would be new business for the Council and would require additional resources and funding to implement.

[7] The ORC receives requests to access its land and assets on occasion. In recent years, the ORC has received requests to consider use of land and assets by the Clutha District Council and the Taieri Trails Group (TTG). The ORC has been working collaboratively with these groups and now needs to confirm its position on responsibilities associated with the development and maintenance of trails on Council assets, and the associated cost implications.

[8] Generally, these proposals seek funding from Council. Primarily for a portion of construction costs and ongoing maintenance. With out a clear policy for trail development and ongoing maintenance cost apportionment becomes challenging for both the proposal development and acceptance process.

DISCUSSION

National Learnings

[9] SUP development on flood scheme assets is not uncommon nationally. It is important to note that the potential for flood asset degradation and conflicting activities exists and must be managed carefully in all circumstances.

[10] This matter has been specifically considered by the Report of the Hawke's Bay Independent Flood Review, where the Review Panel specifically recommended that:

(10) Hawke's Bay Regional Council (HBRC) should undertake a review of activities allowed on river floodway berms and stop banks to ensure that the flood management infrastructure is protected from damage or ongoing maintenance requirements that would otherwise not be required. For example, the use of motorbikes and 4WD vehicles on the Waipawa and Ngaruroro Rivers…

(12) HBRC should review the alignment of access tracks over the crests of stop banks, with a preference for their starting from the downstream end and heading up the stop bank to reduce turbulence that may affect stop bank performance.

(13) HBRC should undertake regular monitoring and topping up of the stop bank crests around access tracks to ensure crest levels are maintained. The most notable example of this was the access track immediately upstream of the bridge across the Ngaruroro River at Omahu, where a breach occurred.

[11] The dual functionality of these assets will require ongoing management from ORC to ensure that liability and risk is mitigated and managed where practicable.

Asset Suitability Summary

[12] Some of the assets that make up a flood scheme are more suitable than others. The table below provides a summary of the typical assets that would be considered suitable

for SUP development. This table provides and indicative assessment only, each proposal would need to be considered on merit.

Asset type	Suitable	Not suitable
Flood bank		
Large	✓	
Small		✓
Floodway and Spillways		✓
Ponding Areas	✓	
Pump Stations		✓
Gravity Gates		✓
Relief Wells	✓	

[13] The issues set out in Attachment C represent a snapshot of the key considerations that Council staff will need to work through systematically in respect of the proposed use of Council assets for SUPs, with particular reference to the TTG proposal. None of the issues listed are considered likely to be fatal to the proposal however are indicative of the nature of considerations that will need to be factored into how the Council will manage its assets for use by SUPs.

Standards for using and maintaining Council assets

[14] In addition, given the potential impacts of inappropriately formed trails on the functionality and integrity of Council owned assets, if the Council is prepared to enable the use of its assets for recreational activities, it will be necessary to develop a set of standards to ensure that any construction of a trail is undertaken to an acceptable standard, considering the potential limitations set out above, and the guidance provided by the Hawkes Bay Review (set out in paragraph 9).

[15] Clarity regarding the minimum standard of formation for the trail is also necessary and should maintain a balance between trail useability and maintaining the integrity of the Council's flood defences, which needs to have primacy. Trails that are formed and maintained to a high standard do not impact on the integrity of flood protection infrastructure, as indicated in Figures 1 and 2.

Figure 1: Taradale Stop Bank, Hawkes Bay showing SUP and floodwaters during the 2023 Cyclone Gabrielle event

Figure 2: Post Cyclone Gabrielle Hawkes Bay showing a damaged stop bank with a SUP

Process to progress use of Council assets for SUP

[16] Council will need to consider each formal proposal and its funding impact.

[17] Upon receiving approval for the proposed development of a SUP that uses Council assets in whole or in part, it will be necessary for the project proponent to obtain all approvals required for the project. Such approvals may include resource consents under the applicable planning framework, or approval under the Flood Protection Management Bylaw.

Funding and LTP implications

[18] To date, proposals and their associated funding models have been disconnected. Largely due to uncertainty around ORCs position on where costs for development and ongoing maintenance should fall.

[19] Some SUP enabling budget has been proposed in previous Long-Term Plans, but this has not aligned well with the community proposals or ability to fund.

[20] Whilst SUP development was raised by various community groups and entities during the Long-Term Plan consultation, budget expenditure dedicated to SUPs on flood banks did not eventuate.

[21] Typically, the construction of SUPs on flood banks requires grazing leases to be reviewed (or removed) including fencing of these sections of flood banks, so that that stock cannot access the SUP. The table below shows the estimated cost implication associated the TTG Proposal.

Description	Preliminary cost estimate/annum	Comment
Reduction of Lease Revenue	-$1,413.73	Based on current lease agreements
Additional Mechanical Maintenance of flood banks	$115,000.00	Based on known rates with current mechanical maintenance contracts.

[22] Funding models where other authorities or parties such as, Clutha District Council, Dunedin City Council and NZTA contribute to the construction or on-going maintenance have not been investigated to date. Transport funding from either entity is understood to not presently be available for this type of SUP.

[23] Both the Lower Clutha Flood Protection & Drainage and Lower Taieri Flood Protection Schemes are funded by targeted and general rates. The targeted rates represent 80% of funding and general rates at 20%. The drainage schemes are funded 90% targeted rates and 10% general rates.

[24] It is envisaged that any costs associated with SUP development and maintenance would fall into a category of works 100% funded by general rates revenue.

OPTIONS

[25] Options for policy development are laid out in this section.

[26] **Option 1:** Do not allow use of ORC assets and/or land for SUPs and communicate to parties requesting use of ORC assets to consider other alternatives.

a. This could have a negative impact with community perception and ORC's reputation.
b. Potential that informal path development continues.

[27] **Option 2:** Enable development of SUPs on flood assets without taking formal ownership for maintenance

a. Low upfront cost to ORC

b. Potential for poor maintenance compromising flood bank integrity
c. Potential for conflict as other parties seek to maintain or alter trails that are developed
d. Potential for conflict associated with poor asset maintenance resulting in a requirement for ORC intervention and resulting potential for heightened costs to rectify defects.

[28] **Option 3:** ORC enables the development of SUPs on suitable flood assets and takes ownership for trail maintenance.
a. Greater scope for involvement in and inputs to the standards of construction that apply to SUP development, reducing risk to flood assets.
b. Certainty of ongoing costs to the Council associated with maintenance of SUPs.
c. The costs associated with on-going maintenance will require consideration in the new Long Term Plan process.

[29] **Option 4:** ORC enables the development of SUPs on suitable flood assets with funding considered for capital development and ongoing maintenance.
a. A high level of control regarding the standards of construction that apply to SUP development, minimising risk to flood assets.
b. Certainty for ongoing costs to the Council associated with maintenance of SUPs.
c. The costs associated with development and on-going maintenance will require consideration in the new Long Term Plan process.

[30] Staff recommend Option 3 as it strikes a balance between taking an enabling approach with regard to active transport development and managing the risk to flood infrastructure associated with a future lack of maintenance and the associated cost to ratepayers.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[31] The use of Council owned assets and land for shared use pathways is broadly consistent with ORC's strategic framework. In particular, the proposal supports the connectedness of the Otago community, and, providing that adequate mitigation measures are put in place, it will also accord with infrastructure that is designed and built to accommodate variability and uncertainty associated with changing weather patterns. Budgeting for increased costs associated with planning for and responding to natural hazards and repairing damage will be key.

Financial Considerations

[32] There are cost implications with the approval to use ORC owned assets and land for recreational use by allowing the construction of shared use paths on and around the assets. This has been discussed in this paper. Further detail and final financial implications will become clearer as individual proposals are finalised.

Significance and Engagement Considerations

[33] The approval of the use of Council owned assets does not trigger any specific engagement requirements under Council's Significance and Engagement Policy, however the next steps may result in some requirement for engagement that aligns with the Policy. While the TTG has undertaken some communications regarding the

proposal, it is unclear whether that approach fulfils the Council's obligations for engagement. Staff will ensure that stakeholders and communities are engaged with appropriately on the development of the proposed use of Council assets and land for public recreational use. The reinstatement of the Taieri Liaison Group will be an appropriate mechanism to communicate to on progress with the TTG and use of ORC assets.

Legislative and Risk Considerations

[34] The are no statutory obligations to be considered in the approval of using Council owned assets to be modified for use as Shared Use Pathways.

[35] There are risks associated with the use of assets for recreational purposes including, but not limited to, the following key areas:

a. Public Safety on and around Council owned infrastructure, and
b. Management of accessibility to flood banks during weather and flood events.

[36] The current 2024 – 2034 Long term plan includes (Engineering) a programme of work across the schemes for a Public Safety Assessment, which will include the above areas of risk for assessment.

[37] Communication and awareness of these risks through the respective community groups and public will be crucial.

[38] Infrastructure resilience has been identified as a Strategic Risk for ORC and the importance of ensuring any modifications or access to ORC infrastructure considers foremost resilience of those assets.

Climate Change Considerations

[39] Climate change considerations are discussed in the Draft Infrastructure Strategy 2024-2054. The change in use of Council owned assets will need to consider and factor in an effects of future climate change on the ORC's assets in respect of flood risk.

Communications Considerations

[40] The progression of community led projects to establish shared use pathways will require assistance and support from the ORC Communications team to ensure meetings and updates are well publicised.

NEXT STEPS

[41] The next steps are:

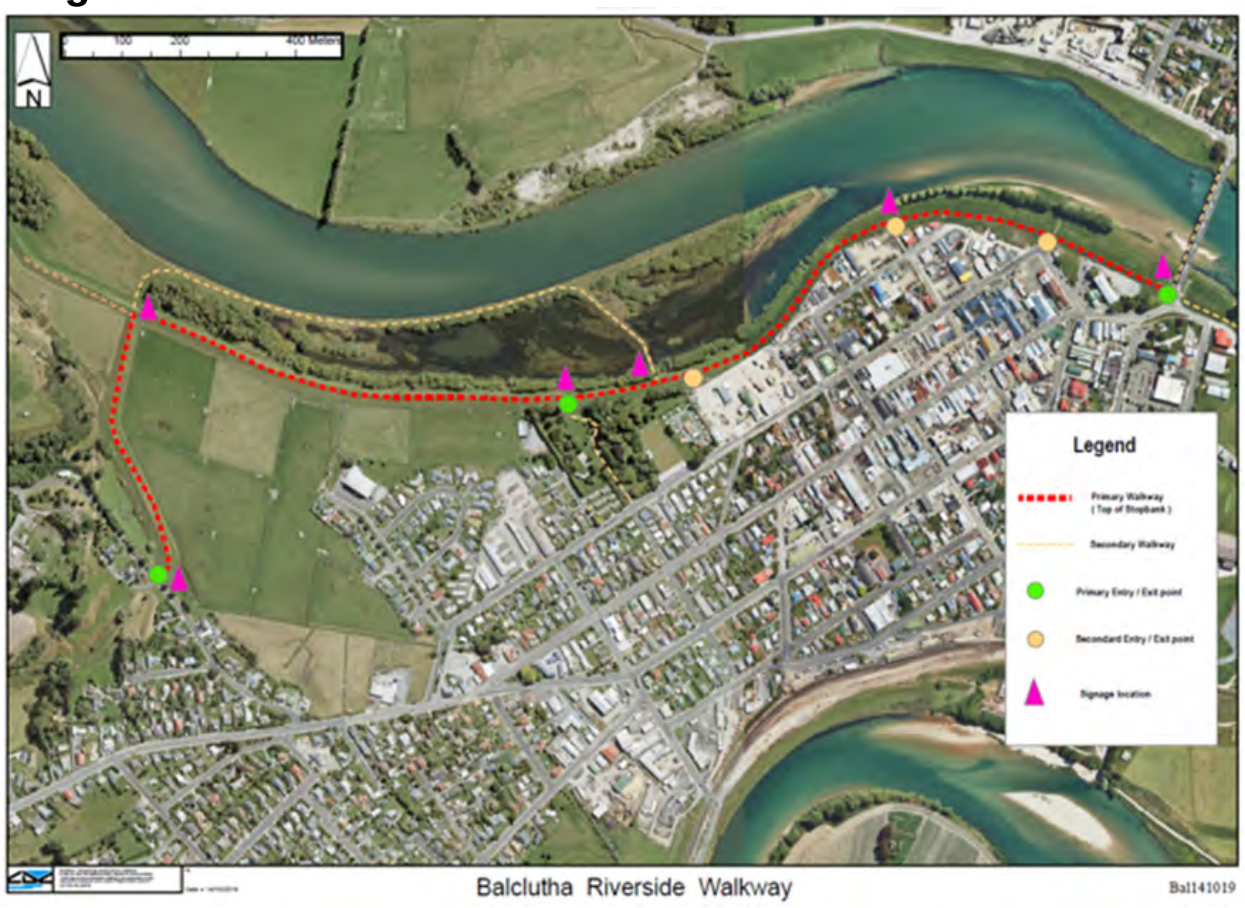
a. ORC will continue with an impact assessment (technical and financial) of any shared use path on Council owned assets and land.
b. ORC staff to ensure stakeholders and communities are updated on the Council's decision and work with TTG and Clutha District Council to advance their proposals.
c. ORC staff proceed to seek specialist advice on development of appropriate design and standard specification of shared use paths on Council flood bank assets.

ATTACHMENTS

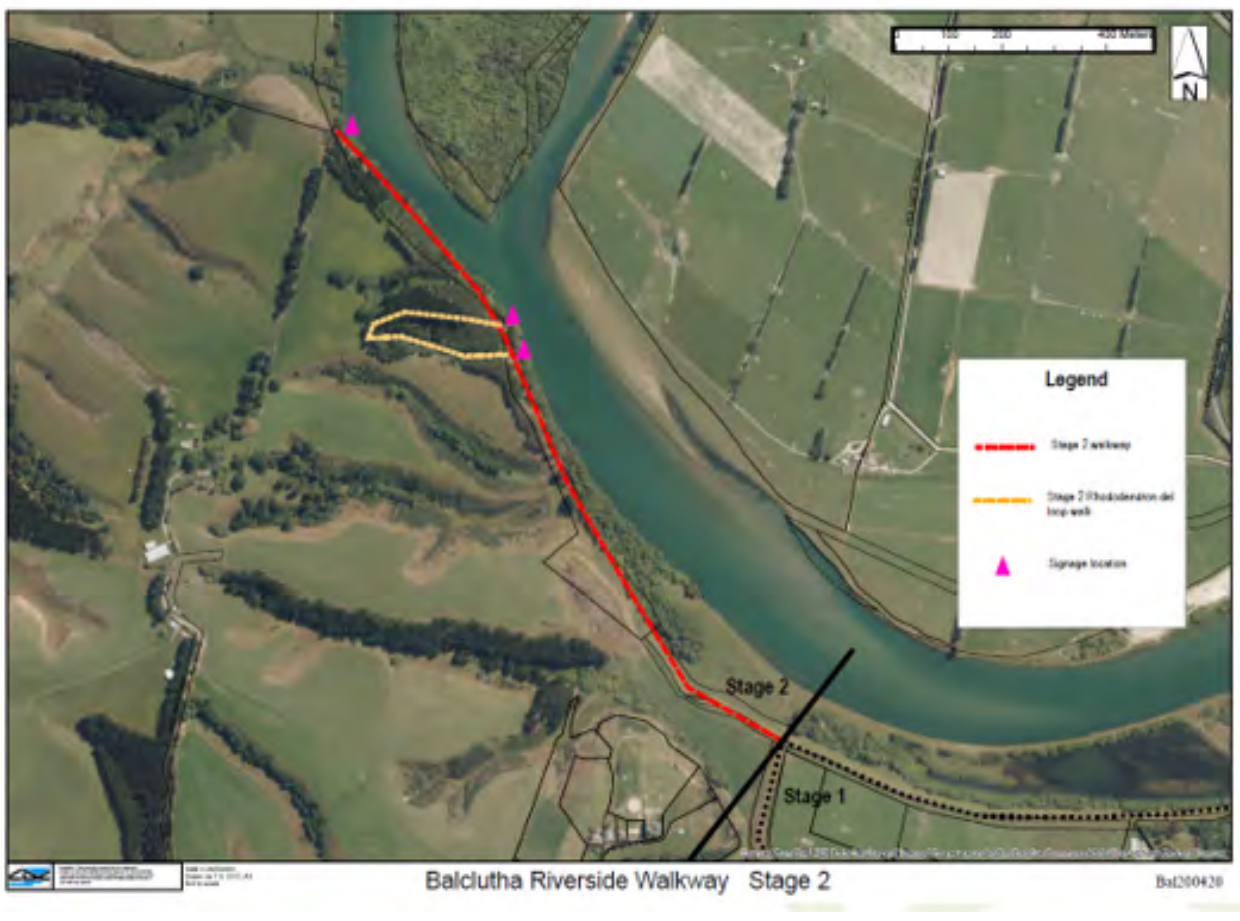
1. Attachment A Balclutha Trail Proposal [**9.4.1** - 2 pages]
2. Attachment B Taieri Trail Proposal [**9.4.2** - 3 pages]
3. Attachment C Summary of Taieri Trails considerations [**9.4.3** - 2 pages]

Attachment A: Balclutha Trails Proposal (based on 2020 communications with CDC)

Stage 1



Stage 2



Stage 3


Stage 1
Stage 3
Legend
Balclutha Riverside Walkway Stage 3
Bal210420

Attachment B: Map of Taieri proposed Shared Use Path (SUP) and interface with ORC assets

Locations of interest			
No.	**Issue**	**Comment**	**ORC preference**
1	Outram bridge	The trail passes under the SH87, then rises on to the floodbank before linking to the bridge. The link to Outram has not been finalised, but one option is to pass along the floodbank crest then on to Holyhead St.	The short link is acceptable. A trail on the floodbank crest from SH87 to Holyhead St may be acceptable but could require closure during floods.
2	Floodbank crossing	After passing alongside an oxbow within the floodway, the trail passes over the floodbank, with ramps to be constructed on both sides. Water within the floodway is low-velocity.	Providing that the crossing is appropriately engineered, this approach is likely to be acceptable.
3	South Fork Farm Ring Bank	Taieri Trails Group has indicated it would like to locally re-route the ring bank to enable the trail to pass power poles. Possibly applies in three places.	Any trail detour would be best located around the poles on to the edge of Riverside Rd.
4	Floodbank at Lindsay Rd	Access issues – provide trail access whilst maintaining access to the river. TTG has indicated the farmer is wanting to graze the floodbank (there is no grazing lease at present). That may create stock separation issues.	Access to the river should be maintained. No changes should occur to grazing, and no fences should be established on the floodbank (or within 7m of the floodbank toe, as per the Bylaw).
5	A1 Gravity Gates	The trail will pass over the gravity gates. There may be safety issues regarding handrails, etc.	Specialist inputs will be required to confirm the suitability of any mitigation proposed.
6	Silver Stream Pump Station	TTG's proposal is to pass the pump station along the floodbank crest and bridge over the gravity gates. TTG has recently expressed interest in passing the across the lower bridge at the screens, which would avoid most of the problems. It would require a ramp on the landward side of the floodbank downstream of the pump station, as our access road is too steep. North of the pump station, the land should allow the trail to be constructed relatively easily.	Due to concerns with the proposal in respect of security, stock exclusion, public safety requirements (eg handrails), and staff access to the pump station, the proposed option is not supported. A lower crossing would resolve many of these concerns.
7	Grazing lease	There is an existing grazing lease on the Silver Stream (both floodbanks), from Gladfield Rd to the Taieri River confluence. There is provision for grazing leases further upstream, but apparently no leases are currently in place.	Detailed engagement with the landowner will be required. No fences should be established on the floodbank (or within 7m of the floodbank toe, as per the Bylaw). Any changes to lease arrangements may impact on maintenance costs, and a

Locations of interest			
No.	**Issue**	**Comment**	**ORC preference**
			decision will need to be made whether these costs are paid out of targeted or general rates.
8	Riccarton Rd bridge	There is an existing informal track under this bridge. TTG has indicated there is insufficient headroom under the bridge for cyclists, and has suggested a solution may involve digging down locally about 300 mm. A local hole may fill up every time there is a flood.	Appropriate consideration can be given to this proposal and the design updated to address any ongoing concerns.
9	Gordon Rd bridge	TTG has indicated a preference for a second path under this bridge. Following a site meeting on 16/10/24, it is likely the final proposal will be to widen the existing track to 3.0 m wide, and regrade the ramps up to the floodbank crest. This proposal is likely to be acceptable to NZTA, but the first proposal was not. The ramp upstream of the bridge should be straightforward to engineer, but the downstream one may be difficult because the floodbank is narrow and water velocity can be high during a flood. The bridge can cause a standing wave to develop. Hydraulic analysis is expected to be necessary.	The single path is preferred, and will require appropriate design and approval by the ORC and NZTA.

Attachment C: Summary of key considerations, Taieri

Outram to Mosgiel Trail
August 2024 Proposal
Land and Property Details

Trail Section		Length (km)	Land				Leases					ORC Assets				
Start	Finish		Type	Owner	Legal Description	Comment	No.	Type	Expiry Date	Lease Revenue Amount / Annum	Comment	Type	Name	Asset features	Estimated Maintenance Costs / Annum	ORC Comment
Outram Glen	SH87 Bridge	0.2	Hydro Parcel Road									Floodbank	LTFFB021 - Parent Taieri Right Bank Outram To Allanton			Extreme upstream end of the floodbank only.
Outram township	SH87 Bridge	0.8	Road	Public ownership		Actual route not finalised here	CA122	Land lease	Lapsed	$0.00	TTG has not yet declared if this is their preferred route.	Floodbank	LTFFB021 - Parent Taieri Right Bank Outram To Allanton		$50,000.00	Possibly trail along the floodbank crest and down the side to Holyhead St
							CA702	Land Lease	3 Months notice	$165.39						
SH87 Bridge	749 Outram-Mosgiel Rd	0.8	Road	Public ownership		May possibly be on private land instead of SH88.										
749 Outram-Mosgiel Rd	Riverside Rd	1.0		Private Ownership	Section 89 Irregular Block East Taieri Survey District	Looks like it used to be a paper road.										
				Private Ownership	Part Section 88 Irregular Block East Taieri Survey District	Looks like it used to be a paper road.										
				Private Ownership	Part Section 46 River Sections East Taieri Survey District	Within the floodway, but very low water velocities. Includes some concrete path beside the oxbow, as it is prone to flooding and siltation may lead to weed growth.										
			Floodbank	Public ownership	Section 60 River Sections East Taieri Survey District	Only passes over the floodbank at the southern end of this land.	CA402	Land	3 Months notice	$58.49		Floodbank	LTFFB018BN01 - Taieri Left Bank Outram to Upper Pond Spillway		$15,000.00	Crossing needs to be engineered, but probably straightforward
				Private Ownership	Part Section 46 River Sections East Taieri Survey District	Comes off the floodbank and heads to Riverside Rd, beside but not on the ring bank.						Floodbank	LTFFB016BN01 - South Fork Farm Ring Bank			Close to, but not on the ring bank.
Beside Riverside Rd	Riverside/Lindsay Rd intersect.	2.6		Combination Public and Private Ownership		TTG advise this will be on private property but not on the ring bank, which is not possible. Assume it is on the road reserve between the ring bank and the formed road. Will be concreted in the vicinity of the Riverside Spillway.						Floodbank	LTFFB016BN01 - South Fork Farm Ring Bank			TTG has indicated it will ask for the bank to be realligned to enable the trail to pass power poles. TTG's desire to put kinks in the floodbank to go around power poles. Legal effects of taking more land for the ring bank?
Riverside/Lindsay Rd intersect.	ORC Floodbank	0.5	Road	Public ownership		Very low traffic volumes.						Floodbank	LTFFB018 - Parent Taieri Left Bank U/S Silver Stream			
Lindsay Rd	Riverside Rd bridge underpass	1.7	Road	Public ownership		ORC floodbank						Floodbank	LTFFB018 - Parent Taieri Left Bank U/S Silver Stream			
			Floodbank	Public ownership	Section 1 SO 24821							Floodbank	LTFFB018 - Parent Taieri Left Bank U/S Silver Stream			
			Road	Public ownership								Floodbank	LTFFB018 - Parent Taieri Left Bank U/S Silver Stream			
			Hydro Parcel	Public ownership			CA410	Land lease	3-monthly	$1,189.85	This lease covers both floodbanks. The cycleway affects only one floodbank.	A1 Gravity Gates Floodbank	ETDST002 - Parent A1 Gravity Outfall LTFFB014 - Parent Silver Stream Right Bank		$50,000.00	May require safety barrier upgrade and/or cattle stop. Floodbank crest overtopping.
			Road	Public ownership		Riverside Rd						Floodbank	LTFFB014 - Parent Silver Stream Right Bank			Floodbank crest overtopping.
			Floodbank	Public ownership	Part Section 35 River Sections East Taieri Survey District		CA410	Land lease	3-monthly			Floodbank	LTFFB014 - Parent Silver Stream Right Bank			Floodbank crest overtopping.
			Floodbank	Public ownership	Part Section 36 River Sections East Taieri Survey District	The bridge (and presumably the land under the bridge) is a road.	CA410	Land lease	3-monthly			Floodbank	LTFFB014 - Parent Silver Stream Right Bank			Floodbank crest overtopping.
			Floodbank	Public ownership	Part Section 84 Irregular Block East Taieri Survey District		CA410	Land lease	3-monthly			Floodbank	LTFFB014 - Parent Silver Stream Right Bank			Floodbank crest overtopping.
			Floodbank	Public ownership	Part Section 79 Irregular Block East Taieri Survey District		CA410	Land lease	3-monthly			Floodbank	LTFFB014 - Parent Silver Stream Right Bank			Floodbank crest overtopping.

Riverside Rd bridge underpass	Gladfield Rd	1.8	Floodbank	Public ownership	Part Section 80 Irregular Block East Taieri Survey District	Includes Silver Stream Pump Station	CA410	Land lease	3-monthly			Pump Station	ETDPSSLS - Silverstream PS & Outfall			Access and security at the pump station. At the October 2024 site meeting, TTG appeared to be interested in the idea of creating a ramp on the landward side of the floodbank, and crossing the pump station at the screens.
			Floodbank	Public ownership	Section 108 Irregular Block East Taieri Survey District		CA410	Land lease	3-monthly			Floodbank	LTFFB014 - Parent Silver Stream Right Bank			Floodbank crest overtopping.
			Private land (nominally). Actually administered by ORC/DCC.	Private Ownership	Part Section 64 Irregular Block East Taieri Survey District	Includes DCC footbridge and part of the True Left bank. Has TTG spoken to Mr Bekkers, or do they think it's only ORC/DCC?						Floodbank	LTFFB014 - Parent Silver Stream Right Bank LTFFB015 - Parent Silverstream Left Bank			
Gladfield Rd	Gladfield Rd	0.0	Road	Public ownership								Floodbank	LTFFB015 - Parent Silverstream Left Bank			
Gladfield Rd	Riccarton Rd underpass	1.8	Floodbank	Public ownership	Section 13 Block VIII East Taieri SD							Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership	Part Section 8 Block VIII East Taieri SD	Two part sections						Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership								Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership	Lot 1 DP 5017							Floodbank	LTFFB015 - Parent Silverstream Left Bank			
Riccartion Rd		0.0	Road	Public ownership								Floodbank	LTFFB015 - Parent Silverstream Left Bank			We understand there is limited headroom under the bridge - will the gravel removal project solve this issue? What are the implications of future agradation - will TTG/ORC be forever removing gravel/sediment locally at this bridge?
Riccarton Rd underpass	Gordon Rd underpass	1.8	Floodbank	Public ownership	Part Lot 19 DP 1846							Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership	Part Lot 20 DP 1846		CA406	Land Lease		$0.00	"ORC Occupy" - this means it used to be leased, but ORC now occupies the land.	Floodbank	LTFFB015 - Parent Silverstream Left Bank		$0.00	
				Public ownership	Part Section 10 Block VII East Taieri SD	Adjacent to DCC Carlyle Rd plant	CA406	Land Lease			"ORC Occupy" - this means it used to be leased, but ORC now occupies the land.	Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership	Part Section 10 Block VII East Taieri SD		CA406	Land Lease			"ORC Occupy" - this means it used to be leased, but ORC now occupies the land.	Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership	Part Section 4 Block VII East Taieri SD		CA406	Land Lease			"ORC Occupy" - this means it used to be leased, but ORC now occupies the land.	Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership		Looks like it is a paper road.	CA406	Land Lease			"ORC Occupy" - this means it used to be leased, but ORC now occupies the land.	Floodbank	LTFFB015 - Parent Silverstream Left Bank			
				Public ownership	Several different plots		CA406	ORC occupy			"ORC Occupy" - this means it used to be leased, but ORC now occupies the land.	Floodbank	LTFFB015 - Parent Silverstream Left Bank			Is rather narrow immediately downstream of Gordon Rd, so may be some pressure to encroach onto the river side of the crest.
Gordon Rd			Road	Public ownership								Floodbank	LTFFB015 - Parent Silverstream Left Bank			Track details under the bridge, plus ramps up to the floodbank. This appears to be suitable to engineering, but space might be tight downstream of the bridge.
Gordon Rd underpass	Wingatui Rd	1.8		Public ownership	Various DCC-owned blocks, plus the oldrailway reserve							Floodbank	LTFFB015 - Parent Silverstream Left Bank			May require detailed hydraulic design because of the bridge's effect on flood flows.
		TOTALS								**$1,413.73**					**$115,000.00**	

9.5. Head of Lake Whakatipu Natural Hazards Adaptation Programme

Prepared for:	Council
Report No.	HAZ2406
Activity:	Governance Report
Author:	Ann Conroy, Team Leader Natural Hazards Adaptation Toan Nguyen, Senior Natural Hazards Adaptation Specialist Tim van Woerden, Senior Natural Hazards Analyst Jean-Luc Payan, Manager Natural Hazards
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	4 December 2024

PURPOSE

[1] To update the Council on the progress related to the development of a natural hazards adaptation strategy for the Head of Lake Whakatipu area.

[2] To seek Council endorsement to seek public feedback on the draft Head of Lake Whakatipu Natural Hazards Adaptation Strategy, including 'summary and survey' documents. If endorsed, public feedback activities will commence from 5 December.

EXECUTIVE SUMMARY

[3] This paper provides an update on the Head of Lake Whakatipu Natural hazards Adaptation programme's activities since the Safety & Resilience Committee paper in November 2024[1] mainly focusing on the drafting of the natural hazards adaptation strategy (the Strategy).

[4] The draft Strategy document was written by the ORC Natural Hazards team with key inputs from other ORC teams, Queenstown Lakes District Council, Civil Defence Emergency Management Otago, and Aukaha. Dr Paula Blackett (adaptation expert) contributed to the development of the document.

[5] The next step is to publish the draft Strategy and seek feedback from the community and stakeholders. A three-month public feedback period is planned from December 2024 to February 2025. The detailed draft report and a summary will be published on the website and distributed in the community.

[6] Feedback methods will include online and paper survey; email; and post. A variety of communications channels will be used to share information about the feedback period and process.

[7] A community engagement activity is planned for February 2025 to present the draft strategy, answer questions, and allow the opportunity for in-person feedback. Public feedback will be considered and help us to improve the Strategy.

[1] Nguyen T, Conroy A, van Woerden T, 2024. Head of the Lake Whakatipu Natural Hazards Adaptation. Report HAZ2403 to the Otago Regional Council Safety and Resilience Committee, 7 November 2024.

[8] The first iteration of the Strategy will be finalised in early 2025, with timing subject to the feedback on the draft documents.

RECOMMENDATION

That the Council:

1. ***Notes** this report.*
2. ***Notes** the Head of Lake Whakatipu natural hazards adaptation work programme progress.*
3. ***Endorses** the use of the detailed Draft Strategy document; and summary and survey document; for public feedback.*

BACKGROUND

[9] Otago Regional Council (ORC), in collaboration with programme partners, is leading a programme of work to develop a natural hazards adaptation strategy for the Head of Lake Whakatipu area (the Strategy).

[10] The area at the Head of Lake Whakatipu (Whakatipu-Wai-Māori) is exposed to multiple natural hazard risks, including those due to seismic events, flooding and slope-related processes (e.g. landsliding and debris flow). This risk setting is compounded by a changing climate and large-scale landscape change (e.g. river channel migration and sedimentation) as well as socio-economic changes.

[11] The adaptation programme progress and completed activities are detailed in a series of papers presented between 2021 and 2024[1].

[12] Figure 1 shows an overview of key activities in the Head of Lake Whakatipu adaptation work programme, with the programme currently focussing on the fourth phase "Make it happen" and building towards delivery of a first iteration of the strategy document.

ADAPTATION STRATEGY DEVELOPMENT

[13] The draft Head of Lake Whakatipu Natural Hazards Adaptation Strategy (Appendix 1) is a comprehensive report, structured as follows:

- **Vision, goals, principles**, and **scope**
- **Setting the scene** – background and context
- **Drivers for adaptation**
- **Legislative and Strategic Context**
- **Strategy governance** – including partnerships; and roles and responsibilities for implementation.
- **Adaptation cycle approach to planning** – guides the reader through the adaptation process using the five key questions as a framework:
  1) *What is happening?* – foundation information about natural hazard processes, characteristics, and potential impacts.
  2) *What matters most?* – values, aspirations, fears and concerns we have heard from community, partners and stakeholders; socio-economic vulnerability and resilience; Kinloch and Glenorchy risk analysis findings; and tolerability discussion.

[1] Reports to Council (27 May 2021), the ORC Data and Information Committee (9 June 2022) and the ORC Safety and Resilience Committee (10 May 2023, 10 August 2023, 9 November 2023, 8 February 2024, 8 May 2024, 7 August 2024 and 7 November 2024).

3) *What can we do about it?* – long-list of possible response, including existing and possible future responses; high level evaluation of possible responses and mana whenua assessment.
4) *How can we implement the strategy?* – adaptation pathways with signals and triggers; implementation framework
5) *How is it working?* – a review framework

- **Action Plan** – outlines the relevant work of strategy partners in progress, planned and committed.
- **Appendices** – including project deliverables; and supporting information about existing responses and future toolbox

[14] The draft Strategy document was written by the ORC Natural Hazards team in collaboration with other ORC teams, Queenstown Lakes District Council, Civil Defence Emergency Management Otago, and Aukaha. Dr Paula Blackett (adaptation expert) contributed to the development of the document. An early draft of the report was distributed for internal and partner review in October, and suggestions were used to improve the document in November.

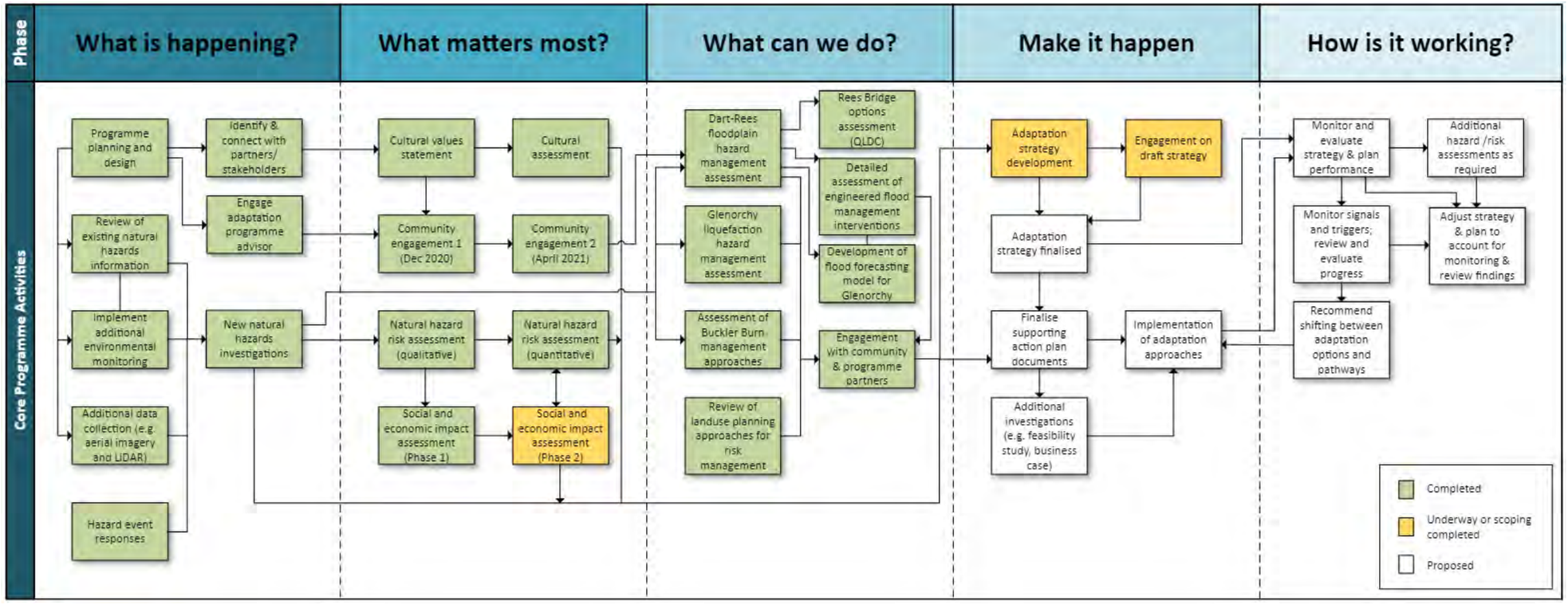


Figure 1: Head of Lake Whakatipu programme overview of key activities. No change from the previous committee paper (November 2024) paper

COMMUNITY ENGAGEMENT

[15] Proposed engagement activities from late 2024 into 2025 are outlined in Table 1. In addition to these activities, regular programme updates are provided to the community through the monthly newsletter and programme webpage[3]

Table 1: Overview of proposed engagement activities for the delivery of the programme

Engagement activity (and level of participation[4])	Purpose	Late 2024 - early 2025	mid 2025
Gain feedback on draft strategy document; One feedback method is 'Summary and survey' ➢ *Consult*	Receive feedback on the draft Strategy, strategic framework and Action Plan. Consider feedback and adjust so that the Strategy is efficient and works for the community		
Share first iteration of strategy Share how public feedback was considered ➢ *Inform*	Update the community on the first iteration of the Strategy and let the community know how their feedback was considered		

[16] Planning is underway for community engagement activities in late 2024 and early 2025 to share the draft adaptation strategy with the public and communities at the Head of Lake Whakatipu and seek their feedback and input. Public feedback will then be considered and help us to improve the Strategy.

[17] The brief 'summary and survey' (Appendix 2) document will be used to invite feedback in a more accessible way than the comprehensive report. The summary provides an overview of the Strategy at a high level, with targeted survey questions.

[18] A three-month public feedback period is planned to kick off from December. The feedback plan includes:

- Publishing the detailed draft report, and the 'summary and survey' document, on the ORC website, and hard-copy distribution in the community.
- Feedback methods including online and paper survey; email; and post.
- Community engagement activity in February to present the draft strategy, answer questions, and allow the opportunity for in-person feedback.
- Communications using a variety of channels to let people know about the feedback period and the upcoming engagement activities.

[19] A multi-pronged approach to engagement[5] aims to provide opportunities for different parts of the community to better understand what the draft strategy means for them, and to provide feedback on how best to respond and adapt for the future.

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[3] https://www.orc.govt.nz/get-involved/projects-in-your-area/head-of-lake-whakatipu/

[4] IAP2 Spectrum of Public Participation (as committed to in He Mahi Rau Rika) describes levels of participation, that define the public's role in any public participation process Inform → Consult →Involve → Collaborate → Empower

[5] A multi-pronged approach to engagement means using different ways to reach and involve people. This could include public meetings, newsletter, surveys and drop-in sessions. The aim is to hear from a wide range of people by giving them different options to share their thoughts.

[20] Engagement planning is a collaborative process, working with QLDC and the community. Engagement planning is considering other community engagement programmes across Queenstown Lakes District or that local communities may be interested over the same time period. This aims to avoid engagement fatigue and better support alignment across ORC community engagement programmes.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[21] The information presented and the adaptation approach discussed in this paper reflects Council's Strategic Directions, *"Otago builds resilience in a way that contributes to the wellbeing of our communities and environment through planned and well-managed responses to shocks and stresses, including natural hazards"*[6].

[22] The proposed Otago Regional Policy Statement June 2021[7], notified in late March 2024[8], states that ORC and territorial authorities are both responsible for specifying objectives, policies, and methods in regional and district plans for managing land subject to natural hazard risk. ORC specifically is responsible for "*identifying areas in the region subject to natural hazards and describing their characteristics as required by Policy HAZ– NH–P1, mapping the extent of those areas in the relevant regional plan(s) and including those maps on a natural hazard register or database*."[9]

Financial Considerations

[23] The budget in the 2024-34 Long Term Plan provides funding towards delivery, implementation and monitoring of actions in the Head of Lake Whakatipu natural hazards adaptation strategy. The proposed budget for the 2024/25 financial year is approximately $175,000.

Significance and Engagement

[24] Engagement planning considers and is designed to be consistent with organisational commitments made through He Mahi Rau Rika: ORC Significance, Engagement and Māori Participation Policy.

Legislative and Risk Considerations

[25] The work described in this paper helps ORC fulfil its responsibilities under sections 30 and 35 of the RMA.

[26] There is not currently a formalised programme governance agreement between ORC and QLDC for this adaptation programme, although there is a strong collaborative relationship at staff level. It will be critical to the successful delivery and implementation of the strategy that both councils endorse the strategy. Joint ELT discussions occurred in late May. It was agreed that having a joint Natural Hazards Steering Group would be useful and staff are working on standing it up.

[27] Both the QLDC 2024-2034 Long-Term Plan (LTP)[10] and QLDC 30-year Infrastructure Strategy[11] have been approved. The 'Community Associations Work Programme' of the

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[6] ORC Draft Strategic Directions: https://www.orc.govt.nz/your-council/our-team/strategic-directions/

[7] Section HAZ-NH-M1

[8] Note that the RPS is still subject to appeal.

[9] ORC Natural Hazards Portal: http://hazards.orc.govt.nz

[10] https://www.qldc.govt.nz/your-council/council-documents/long-term-plan-ltp/

LTP includes support for ORC's Head of Lake Whakatipu natural hazards project. The QLDC Infrastructure Strategy also highlights the area in its key initiatives; for example, Glenorchy/Kinloch area resilience of the transportation network; and Glenorchy adaptation in the response to natural hazard risks and the effects of climate change.

[28] Central government has repealed the Natural and Built Environment Act and the Spatial Planning Act.

[29] The Finance and Expenditure Committee has completed its cross-party inquiry into climate adaptation and its final report[12] has been released. The report includes recommendations on adaptation objectives such as minimising expected long-term costs, improving information flows about climate risks and responses; of principles such as fairness and equity, local flexibility and co-benefits; of roles and responsibilities of stakeholders as well as adaptation costs and data. ORC is considering the implications of this report.

[30] The National Direction for Natural Hazards[13] is being developed under the Resource Management Act. This is to ensure the risks are handled consistently across the country. It is expected to provide direction to councils on how to identify natural hazards, assess the risk they pose now and in the future, and respond through their planning and consenting processes.

[31] There is no clear, specific, mandated requirement to reduce risk through planning and implementation of adaptation or relocation. Gaps identified in the current adaptation planning and planned relocation frameworks include the lack of national direction, insufficient powers, tools and mechanisms, and the lack of articulated roles and responsibilities[14].

Climate Change Considerations

[32] The effects of climate change have been considered in flood hazard assessments for Dart and Rees Rivers, and Buckler Burn, and in the assessment of risks and potential hazard management responses for those hazards.

Communications Considerations

[33] ORC will continue to make all investigation findings available to the Head of Lake Whakatipu community and provide regular programme updates via the email newsletter[15].

[34] A communications plan has been developed as part of this work programme. The programme team is working closely with the Communications team to ensure communications and engagement planning is integrated, complementary and build off each other.

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[11] https://www.qldc.govt.nz/media/o5bprma2/qldc_infrastructure-strategy_2024-2034_final.pdf
[12] Inquiry into climate adaptation (selectcommittees.parliament.nz)
[13] https://environment.govt.nz/acts-and-regulations/national-direction/natural-hazards/#:~:text=The%20Government%20has%20since%20decided,National%20Direction%20for%20Natural%20Hazards.
[14] Expert Working Group on Managed Retreat. 2023. Report of the Expert Working Group on Managed Retreat: A Proposed System for Te Hekenga Rauora/Planned Relocation. Wellington: Expert Working Group on Managed Retreat.
[15] https://www.orc.govt.nz/get-involved/projects-in-your-area/head-of-lake-whakatipu/holw-community-get-in-touch-be-involved/

NEXT STEPS

[35] The key next step activities for the work programme which are in progress or scheduled are identified in Figure 1.

[36] A high-level timeline for key programme and engagement activities, and development of an adaptation strategy, is given in Table 2.

Table 2: High-level timeline for key programme and engagement activities, and development of an adaptation strategy, for the Head of Lake Whakatipu programme.

	Programme Activity	Community Engagement
December 2024	Deliver draft strategy and action plan Request approval from Council to distribute detailed draft report and 'summary and survey' document for public feedback (December 4 Council meeting) Go-live on public feedback period	Distribution of draft strategy for feedback
Early 2025	Continue feedback period for draft strategy. The feedback period will close on 23 February 2025. Consider feedback to help us to improve the strategy Deliver finalised strategy document to Council	Focus of community engagement: • Draft strategy • Final strategy

ATTACHMENTS

1. Draft HOTL Strategy 27 Nov [**9.5.1** - 144 pages]
2. Feedback Document- Summary and Survey Questions 21 Nov with cover [**9.5.2** - 29 pages]

Head of Lake Whakatipu Natural Hazards Adaptation Strategy

Draft report for public feedback | December 2024

COVER ARTWORK: CONNIE ANDERSON

Otago Regional Council

QUEENSTOWN LAKES DISTRICT COUNCIL

Emergency Management Otago
Te Rākau Whakamarumaru Ōtākou

Contents

Otago Regional Council

QUEENSTOWN LAKES DISTRICT COUNCIL

Emergency Management Otago
Te Rākau Whakamarumaru Ōtākou

Thank you to everyone whose time, expertise and inputs have helped to shape the Head of Lake Whakatipu Natural Hazard Adaptation Strategy so far.

We look forward to your feedback and suggestions on this draft.

orc.govt.nz 0800 474 082 Private Bag 1954, Dunedin 9054

1 Introduction

At the head of Lake Whakatipu (Whakatipu-wai-Māori)[1] (Figure 1.1), the townships of Glenorchy (Tāhuna) and Kinloch, and surrounding rural areas of the Dart (Te Awa Whakatipu), Rees (Puahiri/Puahere), Paradise and Greenstone valleys are exposed to a complex range of flooding, landslide, and earthquake related hazards. The landscape is very dynamic and with the changing climate, the natural hazard challenges at Head of Lake Whakatipu are complex resulting in no simple solutions.

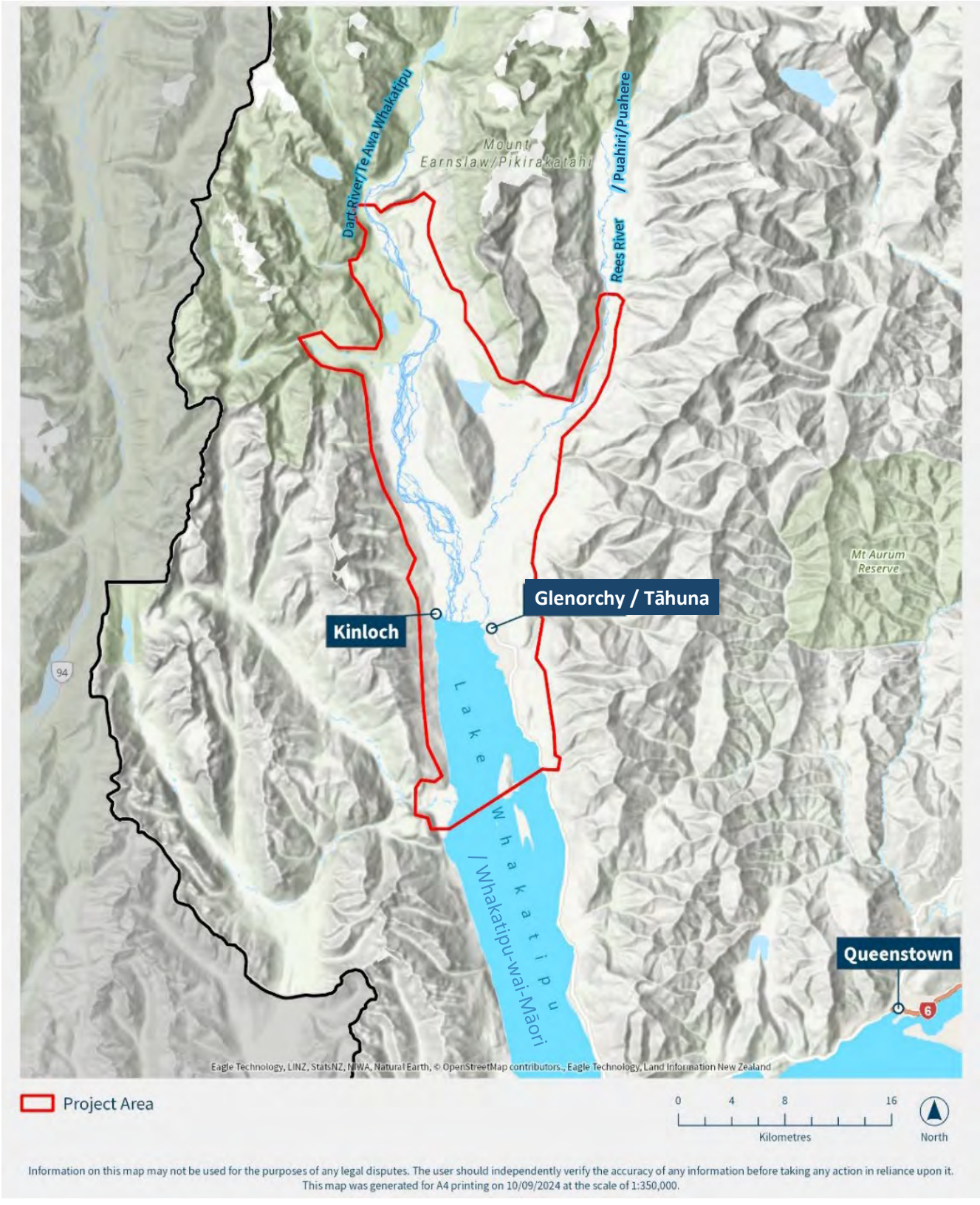


Figure 1.1 Overview of the head of Lake Whakatipu, showing the programme area of interest outlined in red.

[1] The preferred Kāi Tahu spelling of Whakatipu has been adopted throughout report

To develop holistic, longer term natural hazards management plans, Otago Regional Council is using an approach in line with the Ministry for the Environment 10-Step adaptation cycle. This cycle incorporates a method known as Dynamic Adaptative Pathways Planning (DAPP) or 'Adaptation Pathways'. The cycle has been promoted by the Ministry for the Environment as a blueprint for community-influenced decision making in areas affected by natural hazards and considering potential future uncertainties (e.g. landscape and climate changes).

Working together and taking account of natural hazard and climate risk in everything we do sets the foundation for more resilient communities. Current actions form the basis of our efforts to manage hazards, and we will need adjust or pivot as conditions change. We are inspired by the history of the area, which is full of adaption stories, as communities adjusted to changes in economic fortunes and ease of access.

This is the first iteration of a Head of Lake Whakatipu Natural Hazards Adaptation Strategy (The Strategy) and is the result of five years of work. The body of work is broad including; hazards and risk assessments; possible mitigation and management; place, people and economy; and feedback and input from engagement. This detailed report summarizes the work that has been done, integrates the pieces, and places them in a strategic framework that assists implementation through existing systems and processes, as much as possible.

The Strategy is a partnership between ORC, Queenstown Lakes District Council, Civil Defence Emergency Management Otago, and the local community, and has been developed in collaboration with mana whenua representatives. While ORC led the development of this Strategy, it would not be possible without input from our partners, mana whenua, and natural hazards and adaptation experts.

The Strategy is structured as follows:

- Section 2-3 – Defines the vision, goals, and principles to guide natural hazards adaptation
- Section 4 – Defines the scope of the strategy.
- Section 5-8 – Describes the background and context information on the importance of tackling natural hazards and the impacts of climate change together.
- Section 9 – Guides the reader through the adaptation process using the five key questions as a framework: 1) what is happening, 2) what matters most, 3) what can we do about it, 4) how can we implement the strategy, and 5) how is it working?
- Section 10 - Action Plans – Outlines the work that strategy partners are planning to do.

2 Vision and Goals

Our vision is a resilient and sustainable Head of Lake Whakatipu, where proactive natural hazard and climate adaptation enhance community wellbeing and safety, and contribute to a flourishing environment.

Goal 1: Adaptation is woven into our everyday work

- Make plans and recommendations that align with council strategies, policies, and processes, and integrate with business-as-usual workstreams.
- Work in partnership with mana whenua, and coordinate and collaborate with other agencies and communities with a common purpose to incorporate adaptation into what we do.
- Build connections across and between agencies and work together effectively across work programmes.
- Encourage and amplify existing good practice and initiatives.

Goal 2: Lay a robust foundation for decision-making

- Point us in the same direction with a common understanding of the physical environment to build from.
- Continue to build understanding of natural hazard risks, uncertainties and opportunities now and in the future that come with natural hazards and climate change.
- Increase awareness around current and future natural hazards risks and impacts of climate change, as well as effective adaptation responses.
- Build capacity around adaptation and support communities and decision makers to take advantage of opportunities.
- Consider ways to incorporate mātauraka Kāi Tahu into the decision-making frameworks.
- Share new information as it becomes available.

Goal 3: Healthy and resilient communities

- Lead and support others to actively manage and reduce risk to natural hazard and impacts of climate change.
- Support and enable community-led action and behavioural change.
- Promote community safety by managing and reducing risk from natural hazards and impacts of climate change.
- Strengthen communities, businesses, and organisations so that they are well-prepared for natural hazard events and are better able to cope and recover.

Goal 4: Resilient built places, infrastructure, and systems

- Lead the way and support others to increase the resilience of infrastructure, resources, and systems.
- Encourage responsible management of resources and infrastructure that prioritises resilience, sustainability, and avoids maladaptation, such as unintentional negative outcomes.
- Provide information for individuals, businesses, and agencies to consider natural hazard risks and the impacts of climate change as part of planning and development processes.
- Support integration of traditional and modern local knowledge into planning and development of local infrastructure.

Goal 5: A flourishing environment

- Support and enable nature-based solutions and principles to adapt to natural hazard risks and climate change and deliver other socio-economic and environmental benefits.
- Integrate adaptation across Councils' work programmes to deliver natural hazards, biodiversity, and wider environmental outcomes.

3 Principles

In seeking to achieve these goals, the development and implementation of the Head of Lake Whakatipu Natural Hazards Adaptation Strategy is guided by key principles. These principles have been developed with input from best-practice research, national guidance, and what we have heard from partners and the community.

Key principles are as follows:

- Take a **holistic and long-term view** to natural hazards risk management and adaptation efforts.
- **Partner and collaborate** with mana whenua, Queenstown Lakes District Council, Civil Defence Emergency Management Otago, communities, and stakeholders. Work together to maximise the use of resources, expertise, knowledge, and ideas to achieve better outcomes.
- Make **robust decisions** using the best available evidence including mātauraka Māori, local knowledge, western-based science, information, and data.
- **Be community-centered** by enabling and empowering the community to actively participate in the process, by being inclusive, accessible, and transparent.
- **Be flexible** and adjust as we go, but avoid maladaptation.
- Consider **co-benefits** (such as improving community capacity, enhancing biodiversity, emissions reduction, and celebrating and reinforcing Kāi Tahu connections to place) for adaptation efforts to achieve complementary goals, while avoiding maladaptation.
- Promote **fairness and equity** for and between communities and across generations.
- **Uphold te Tiriti o Waitangi** – the adaptation Strategy should ensure Otago Regional Council is fulfilling its obligations as a meaningful Treaty partner, as supported by ORC's He Mahi Rau Rika: Significance, Engagement and Māori Participation policy.
- **Align with national-level direction and policies,** including the 10-step adaptation cycle approach, Dynamic Adaptive Pathways Planning (DAPP) and best-practice research.
- Adaptation efforts should **work with nature** as much as possible to protect, enhance, and restore our natural environment.
- Be **open and accountable.** Ensure progress is transparently communicated to partners, stakeholders, and the community.
- Consider **cost-effectiveness and practicality** to ensure that resources are used efficiently and that they reduce risks to what is reasonable, practicable, and acceptable to partners and the community.

4 Scope

This first iteration of the Strategy has a defined scope that is tied to what the named partners can implement using current systems and processes.

- The Strategy does not have any decision-making power or create any obligations. It is intended to lay a good foundation, provide a common direction, and support the integration of adaptation into partners everyday work.
- The Strategy takes a ***multi-hazard perspective*** to build a holistic understanding of a complex and highly dynamic environment.
- The Strategy focuses on ***adapting to natural hazards only,*** as the partner agencies and systems for implementation are best positioned to deliver effective actions for these risks.
- Action plans describe the ***current commitments and activities of key partners***, namely Otago Regional Council, Queenstown Lakes District Council, Civil Defence Emergency Management Otago, mana whenua and local communities.
- Action plans focus on ***planning time horizons*** to align with councils' 10-year Long-Term Plans and 30-year infrastructure strategies. Where appropriate, longer time horizons are considered for natural hazards impacts and climate change information.
- Action Plans are based on ***currently defined roles and responsibilities*** and are aligned with legislation, systems, processes, and policies.
- The Strategy is ***not an equivalent or substitute for people's ability to participate in other statutory processes*** (such as the statutory frameworks for Regional Policy Statement, regional and district plans, and Councils long-term plans)
- ***Foundational information*** will guide and influence a wide range of stakeholders with interests in adaptation, but only the actions of named partners are identified and tracked.
- ***Possible responses in the future toolbox*** are not commitments, as they do not have business cases or future funding identified at this stage. Some possible responses fall outside the current roles and responsibilities of partner agencies.
- The Strategy is a ***result of a collective effort and belongs to everyone.*** ORC's lead role in its development will continue for monitor, review, and adjust phases. Mana whenua, key stakeholders, and the community are encouraged to influence and advocate throughout its implementation and future iterations. This highlights the collective effort and shared responsibility in managing natural hazards in the area, now and in the future.

5 Setting the Scene

5.1 Geographical

The 'Head of Lake Whakatipu' area, or 'Head of the Lake', as referred to in this Strategy, is the area centered on the Rees-Dart floodplain located at the northern end ('head') of Lake Whakatipu in the Queenstown Lakes District of Otago.

The project area considered by the Strategy is approximated by the boundary shown in Figure 1.1 which is designed to include all significant residential and infrastructure locations in the vicinity. The project area boundary is approximated as the 600-metre elevation contour and upstream in the major valleys (Routeburn, Dart, Rees) to the ends of the roads.

The major geographical features at the head of Lake Whakatipu are the broad braided river systems and floodplains of the Dart and Rees Rivers, which form a combined delta at the lake, lying between the Humboldt and Richardson mountains to the west and east, respectively.

5.2 Mana whenua connections to place

Mana whenua are Māori who hold traditional customary authority and are representatives of Treaty partners within an area and whose traditions and histories are as determined by whakapapa, resource use, and ahikāroa (the long burning fires of occupation). In Otago, Kāi Tahu[2] are mana whenua.

The wider Whakatipu-wai-Māori (Lake Whakatipu) area is of strong significance to mana whenua (Takau, 2021). The histories of Kāi Tahu are embedded throughout the landscapes, as told through creation narratives, pūrakau (stories), ikoa wāhi (place names), and are upheld through values.

According to Kāi Tahu tradition, the Waitaha were the first people to arrive in Te Wai Pounamu (the South Island) (Takau, 2021). It is written that the Waitaha arrived in Te Wai Pounamu on a great canoe called Uruao, which was captained by Rākaihautū. It is said that Rākaihautū used his famous kō (Polynesian digging tool) to form the major lakes of Te Wai Pounamu, which included Whakatipu-Wai-Māori (Takau, 2021). The genealogies of the Waitaha people can be traced from Rākaihautū through to his living descendants, the modern day Kāi Tahu.

- "Ko Rākaihautū te takata nāna i timata te ahi ki tenei motu." (It was Rākaihautū who lit the first fires on this island.)

Kāi Tahu taoka (treasures) cover the landscape; from the ancestral mauka (mountains), large flowing awa (rivers), tūpuna roto (great inland lakes), pounamu, and ara tawhito (traditional travel routes/trails), which connected kāika (settlements) and nohoaka (seasonal settlements) and mahika kai resources (Takau, 2021). These all make the area immensely significant to mana whenua.

[2] The use of the term 'Kāi Tahu' should be considered to include the four integrate indigenous iwi to the South Island, being Kāi Tahu, Kāti Mamoe, Waitaha and Rapuwai (Takau, 2021). In this Strategy 'ng' is changed to 'k' as is consistent with Kāi Tahu dialect, unless 'ng' is used in the official name of an entity, place name or area, or is directly quoted.

There are many important ikoa wāhi (place names) which are embedded into the landscape of the programme area and beyond. Place names tell stories of Kāi Tahu people. Kā Huru Manu Ngāi Tahu Atlas shows a subset of the traditional names embedded in the landscape of the wider Whakatipu-wai-Māori delta (Te Rūnanga o Ngāi Tahu, 2022) (see Figure 5.1).

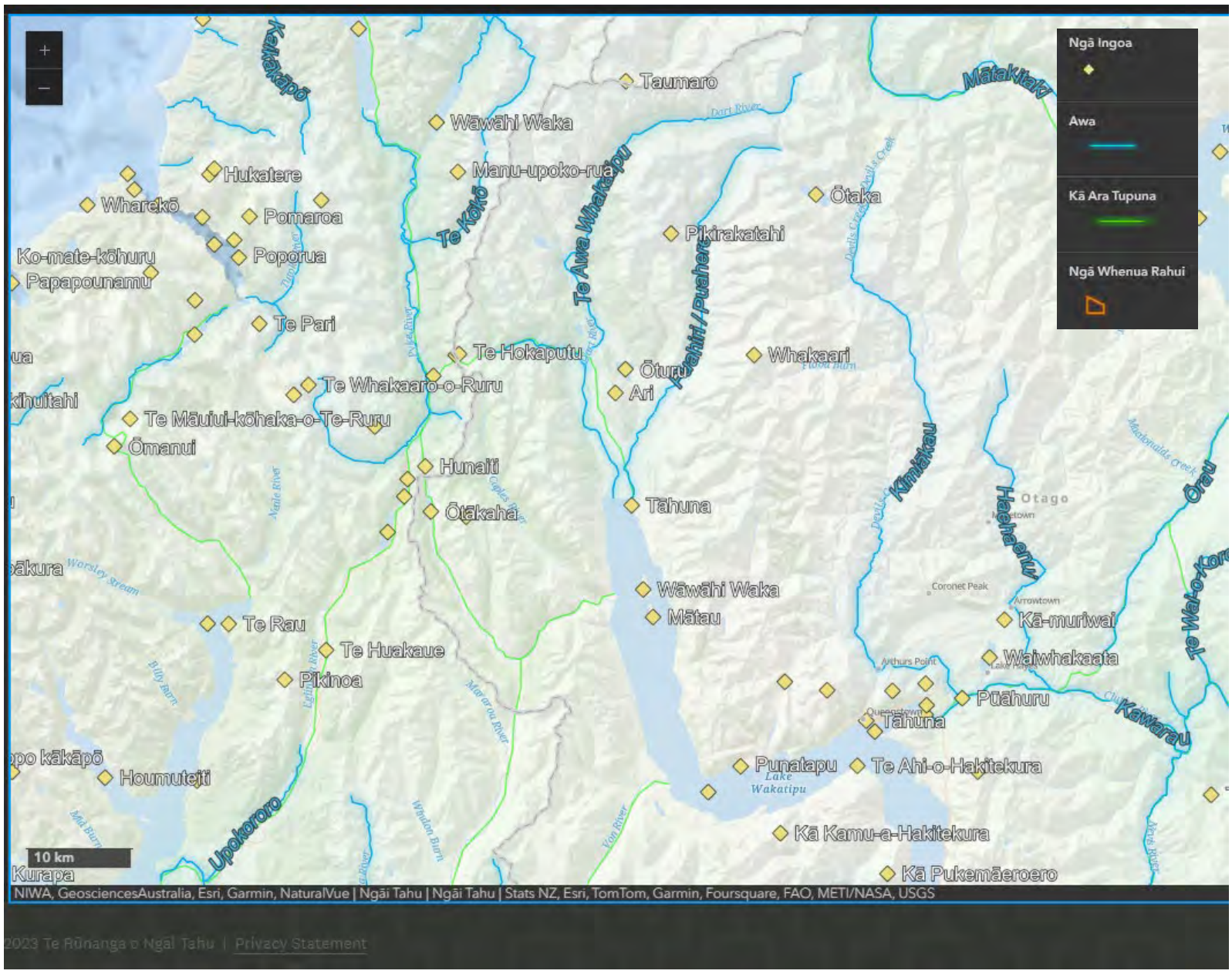


Figure 5.1 Placenames of significance from Kā Huru Manu Ngāi Tahu Atlas (2023)

5.3 Community Profile

The area at the Head of Lake Whakatipu is home to the close-knit townships of Glenorchy and Kinloch, as well as residents living in Paradise, Rees, and Greenstone Valleys, Campbelltown, and Wyuna Preserve. The residential population of the Head of the Lake (Glenorchy SA2) is about 522 people (Stats NZ, 2023).

Influences from European settlement and history are visible in the modern community who live at the Head of the Lake. Since early European settlement in the mid-late 19th century, scheelite mining, gold mining, sawmilling, farming, and tourism have all supported communities at the Head of Lake Whakatipu (see Figure 5.2). Steam ships largely served the community until the construction of the Glenorchy-Queenstown Road in 1962 and was sealed in 1997 (QLDC, 2005 and Glenorchy Community Website, 2018). The wild environment and relative remoteness of the Head of Lake Whakatipu shaped both the economy of the area and the types of people who lived there.

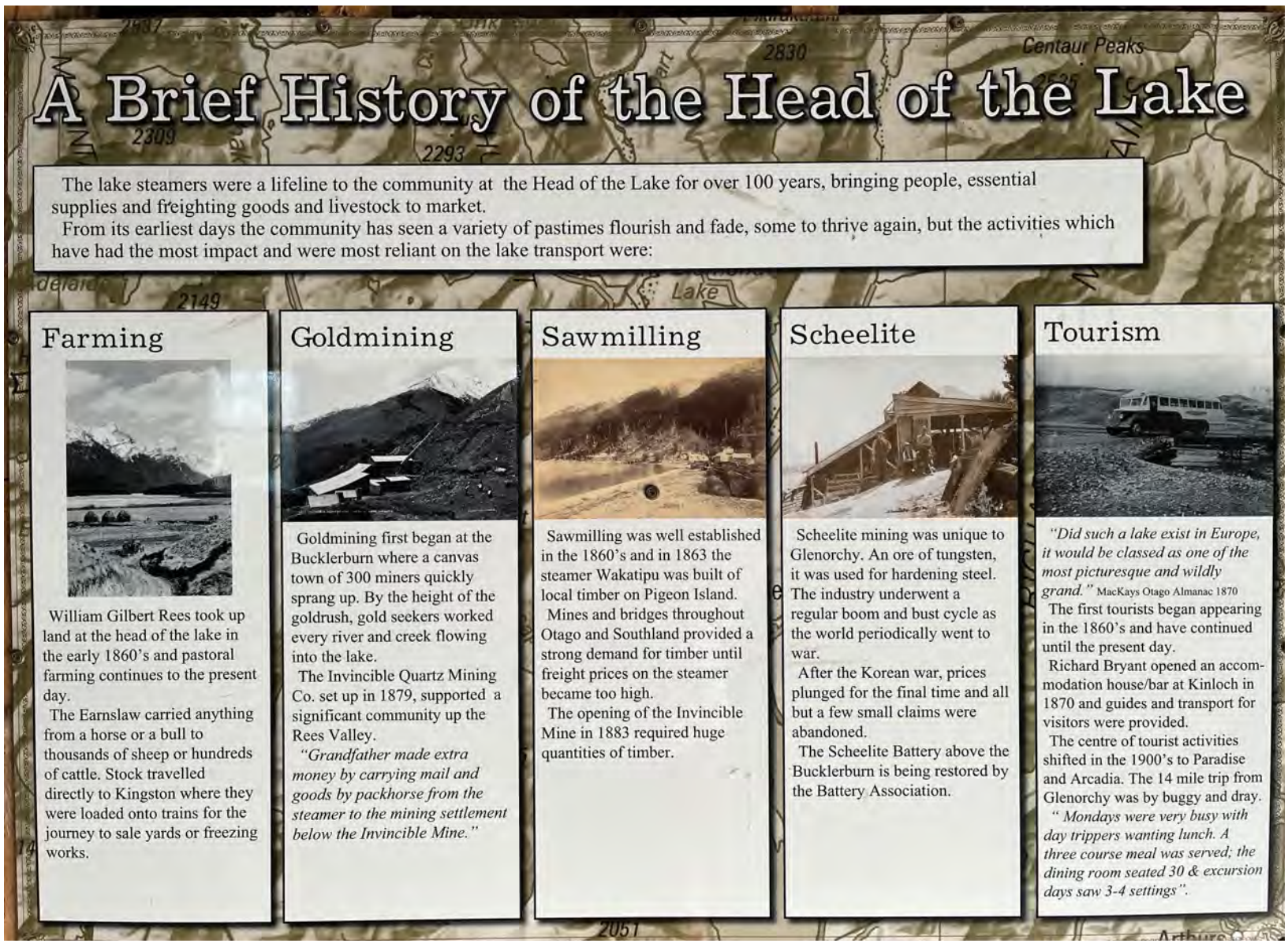


Figure 5.2 Photo of community history poster located in the Glenorchy Wharf Red Shed.

Population data

The project area overlaps with the statistical area 'Glenorchy SA2' (StatsNZ) (see Figure 5.3). This geographic area, defined by Statistics New Zealand, aims to reflect a community that interacts socially and economically. Population and demographic data for the 'Head of the Lake' referred to in this Strategy is reflective of the Glenorchy SA2, unless stated otherwise.

Key demographic data is represented in Figure 5.4 and is based on 2023 Census data. To summarise, the Head of the Lake is predominately a Pākehā settlement, with a reasonable proportion of residents born overseas. While the median age of 41 is higher than the Aotearoa New Zealand median (38), there are relatively fewer older and younger members of the community (Stats NZ, 2023).

The majority of private dwellings are home to permanent residents. However, over a quarter of the dwellings are 'unoccupied' – which includes vacant houses, holiday homes, huts, and cabins (Figure 5.4). A portion of the community are 'temporary residents' such as holiday-home owners or people who live at the Head of the Lake part-time. Anecdotally, there is a relatively stable core part of the community, but there is some turnover of the population due to the nature of work available in the area (seasonal hospitality and tourism work).

Population Growth

There has been rapid growth over time at the Head of the Lake. Between 2006 and 2013 the population grew by 33%, from 272 to 363 people, between 2013 and 2018 it grew by 24% up to 450 people, and between 2018 to 2023 it grew by 16% up to 522 people (Stats NZ, 2023).

Figure 5.3 Outline of the Glenorchy SA2 statistical area (Stats NZ, 2023)

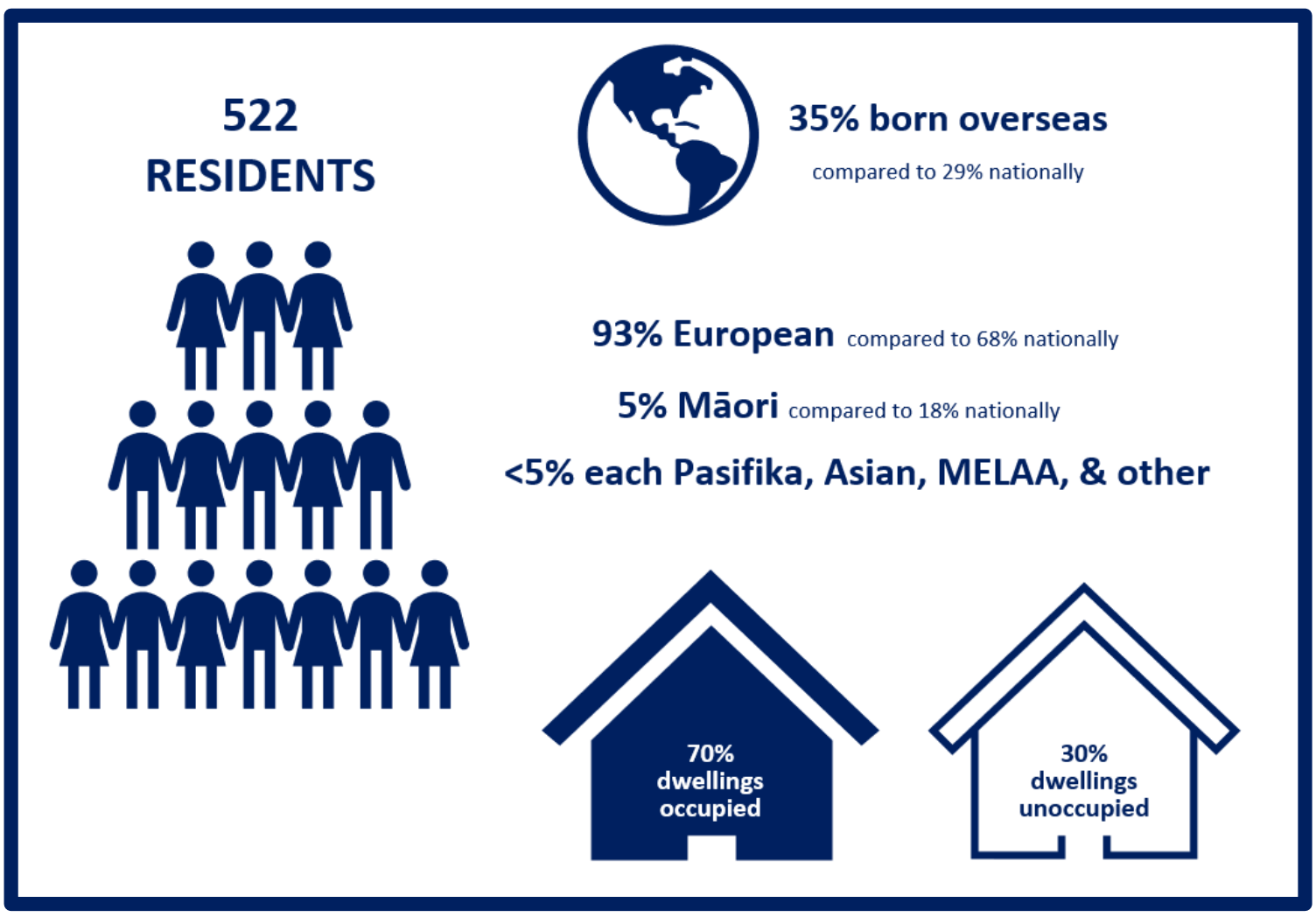


Figure 5.4 Population and demographic data of the Glenorchy SA2 area (Stats NZ, 2023).

The resident population Queenstown Lakes District grew by 38% from 2013 to 2018, and 22% from 2018 to 2023 (StatsNZ, 2023) as the wider district faces growth and development pressures.

From 2023 to 2053, a pattern of residential growth is expected at the Head of the Lake, with an annual estimated increase of approximately 2.5% over the first decade, and then 1.0% over the next two decades, under a medium scenario. By 2053, forecasted growth expects to reach 940 residents (QLDC, 2024). With anticipated growth in the resident population over time, there is the potential for increased development and infrastructure needs.

Health

There is limited physical and mental health data for the Head of the Lake area. About two percent of the Head of the Lake population reported to have one or more activity limitations in the 2023 Census, which is lower than reports for the Otago region (7.4%). Similarly, participants in the QLDC 2023 Quality of Life Survey self-reported relatively high levels of physical health (74%), compared to Queenstown (61%) (Versus Research, 2024).

Glenorchy participants in the QLDC 2023 Quality of Life Survey self-reported relatively high levels of mental health (63%), compared to Queenstown (43%) (Versus Research, 2024).

The availability of primary care at the Head of the Lake is limited. Currently, a Practice Nurse operates a non-funded Registered Nurse-led Health Clinic in Glenorchy fortnightly and provides house visits on request.

Sense of community

Of Glenorchy respondents to QLDC's 2023 Quality of Life Survey, 100% describe their neighborhood as safe, 92% as welcoming, 79% as strong/active, 45% as having a strong sense of belonging, and 33% as having good community participation (Versus Research, 2024). This is supported by community sentiments of the Head of the Lake being a strongly cohesive community.

Community Visioning work completed in 2001 and revised in 2016 sets out a clear set of shared values and aspirations for the future of the Head of the Lake community (Blakely Wallace Associates, 2001 and Shaping Our Future, 2016). Community engagement, as part of the Strategy development, is consistent with these shared values and visions and is elaborated on in Section 9.3.2.

5.4 Economic Profile

Over its history the Head of the Lake has had a changing economy. Today, tourism is the most significant industry to the Head of the Lake, followed by hospitality, film, agriculture, and trade.

In the Head of the Lake, the local Gross Domestic Product (GDP) for 2022 was estimated to be $42.42 million with the tourism industry making up a significant portion of this Head of the Lake GDP (Infometrics, 2023).

The Head of the Lake is a popular tourist destination, hosting activities such as jet boating, tramping (hiking), fishing, hunting, horse trekking, farm tours, 4WD safaris, scenic flights, and Lord of the Rings tours. It also acts as a gateway to Mount Aspiring National Park and some of Aotearoa New Zealand's premier tramping and day-walk attractions, including the Routeburn Track (one of Aotearoa New Zealand's Great Walks), the Rees-Dart Track, and the Greenstone and Caples Tracks.

In 2023, the total number of daily visitors for the Head of the Lake area was estimated to be 339 people on an average day and up to 935 people on peak days (QLDC, 2024). Looking ahead to

2053, with a medium growth scenario, the number of average day visitors is projected to increase to 733 people, and 1919 people on peak days (QLDC, 2024).

The Head of the Lake is also a popular filming location for the film industry. Most production teams are based in Queenstown and travel to and from Glenorchy, while some temporarily basing themselves in Glenorchy.

Hospitality is one of the largest industry employers in the Head of the Lake, with a range of accommodation and food services located across the Head of the Lake area (Healy *et al*., 2024).

Farming in the area is predominately high-country station farming, either in the beef and lamb or wool industries. There are six stations at the Head of the Lake, being a mix of generational family-owned and iwi-owned stations. Most stations have diversified their income in some way, mostly in the hospitality or tourism industries (Healy *et al*., 2024).

Healy *et al*. (2024) reports there is a variety of tradespeople operating or employed within the Head of the Lake or travelling to Queenstown for work. This industry has helped to support recent residential developments in the area (Healy *et al*., 2024).

Employment and income

Healy *et al*. (2024) reports that in 2022 there are estimated to be 349 people employed in the Head of the Lake, with tourism making up 149 of estimated employees. Figure 5.5 shows the industry contribution to employment in 2022 excluding tourism (Healy *et al*., 2024).

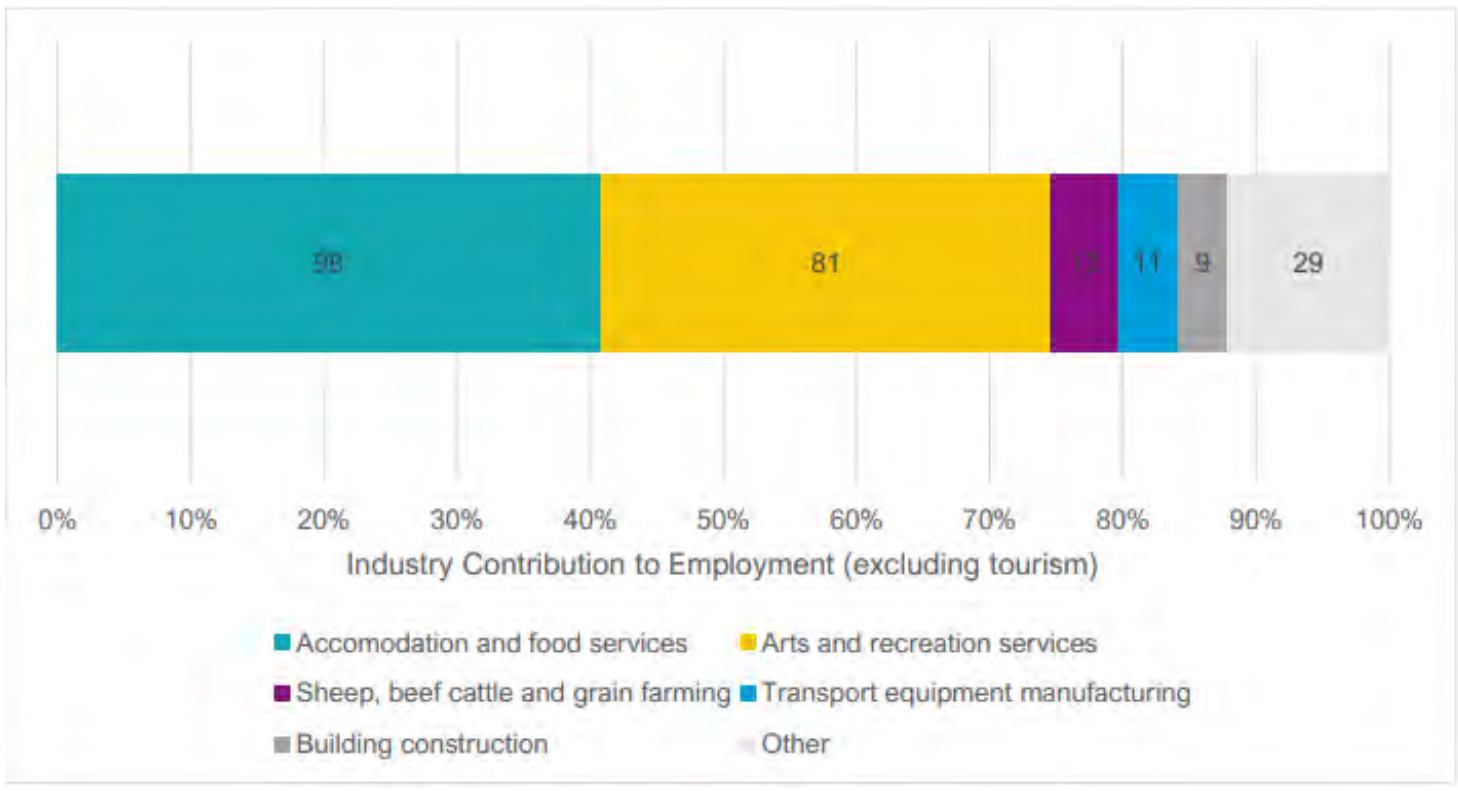


Figure 5.5 Industry contribution to employment in 2022, excluding tourism (from Healy et al 2024, information from Infometrics, 2023]

As of 2023, approximately 64% of the population aged 15 years and older at the Head of the Lake are employed full time, 12% part time, 1.3% are unemployed, and 23% are not in the labour force (Stats NZ, 2023). The largest proportion of workers in the area are categorised as 'Managers', followed by 'Professionals', and 'Technical and trade workers'. The occupation profile of the area is reflected in the large proportion of people that work from home (Healy *et al*., 2024).

As of 2023, the median income at the Head of the Lake was $44,100, which is higher than the median income of Otago ($39,100). However, approximately 33% percent of residents above the

age of 15 earn less than$30,000. About 22% of the resident population aged over 15 earn more than $70,000.

Healy *et al*. (2024) reports that around a third of interviewed residents stated that their property is their main source or supports a portion of their income, including from farming, horticulture, or providing accommodation.

5.5 Geomorphic

The Southern Alps are an exceptionally dynamic geomorphological terrain, with complex landscape evolution and geomorphic processes (Cook *et al*, 2014).

The head of Lake Whakatipu lies east from the main divide of the Southern Alps and is part of a large basin glacially carved out by the Dart glacier during the Pleistocene. Lake Whakatipu formed subsequent to glacial retreat, initially with an outlet at Kingston and a water level of 360 masl (approximately 50 metres higher than present-day lake levels). At about 12,000 years ago, the lake outlet switched to drain into the Kawarau catchment and lake levels progressively lowered in response to incision at the outlet, stabilising at its current levels only within the last 500 years (Sutherland *et al*, 2019). Present-day lake levels have a mean level of approximately 309.95 m.

The Rees and Dart catchments have a very high sediment availability, driven by the very high rates of erosion present throughout the catchment areas. The key factors in erosion rates are the high rates of tectonic uplift (up to 5 mm/year) and orographic precipitation which may exceed 5000 mm annually in higher-elevation locations, an unstable ‘paraglacial’ landscape characterised by over-steepened slopes, retreating glaciers, and abundant active landslides (Brasington, 2024).

The Dart and Rees rivers have been estimated to supply sediment to the lake at an average annual gravel bedload supply rate of 300,000 m^3 (Wild, 2012). Because the volumes of sediment available greatly exceed the capacity of the rivers to transport it downstream, this is considered a ‘transport-limited’ catchment system, with an essentially unlimited sediment availability (Brasington, 2024).

The highly erodible schist bedrock in the Rees and Dart catchments is transported down-valley by the river systems, to be eventually deposited into Lake Whakatipu at the Dart-Rees delta. Sediment deposition infilling the glacially-carved bedrock valley over time has formed the broad Dart and Rees floodplains which join together downvalley of Mount Alfred, where the floodplain is up to 4 km in width.

Floodplain and delta evolution – aggradation and erosion

In response to the very high rates of sediment delivery, the braided channel belts, floodplains, and delta of the Dart and Rees Rivers are undergoing continuous and irreversible geomorphic change over time. The geomorphic changes observed are described below and are expected natural behaviour for this type of river system.

Analysis of riverbed change between repeated LiDAR surveys has shown that there is a persistent, widespread aggradation trend in the active riverbeds of the Dart and Rees rivers (Brasington, 2024). This trend is driven by rates of sediment deposition generally outweighing the rate of sediment removal (scour/erosion) within the active riverbed (the areas of flowing channels and unstable gravels).

Riverbed aggradation is an accumulation of sediment that raises bed levels. It impacts on flooding hazards through reducing the flood capacity of the active river channels, in turn reducing available freeboard to riverbanks and floodbank structures, while also increasing rates of lateral migration of the braided riverbed’s active channels.

In several locations, the Rees River's active channel is super-elevated, or 'perched', higher than the surrounding floodplain, notably in the right-bank area upstream of the Rees bridge and adjacent to the Glenorchy wetland. As aggradation of the active riverbeds continues, an avulsion (breakout) of the river channel into these lower elevation floodplain areas becomes increasingly likely and an inevitable outcome over time.

An avulsion is the process where a river channel switches location, often suddenly, re-routing river flows through a new, steeper flow path. It may result in the complete or partial abandonment of the formerly-active channel. An avulsion event, could be triggered by a major high-flow event, or it could result from the cumulative effects of aggradation reaching a 'tipping point'.

Channel migration and bank erosion is most apparent on the lower Dart River floodplain, where there is a long-term bank erosion trend and where the right bank of the river's active channel has migrated westwards by >500 metres since the 1960's. This bank erosion has locally threatened road access to the Kinloch and Greenstone areas by way of Kinloch Road. Potential bank erosion impacts have been managed to date by localised bank protection works, but as bank erosion continues, this may not be a sustainable long-term future approach (Webby, 2022).

Delta growth

As sediment is progressively deposited into Lake Whakatipu, the shoreline of the Dart-Rees delta is extending lakewards, advancing at an average rate of 2 m to 3 m per year since 1937 (URS, 2007). Historically, the growth rate of the delta has not been uniform but shown a lot of local variation across the floodplain, due to factors such as the location of the main river channels entering the lake. For example, in the 1890s Kinloch wharf had sufficient depth of water to service the paddle steamer S.S. Mountaineer (Figure 5.7); then the bay at Kinloch was rapidly infilled from the early 2000's (Figure 5.6); and now the Kinloch wharf is now unusable due to sedimentation (Figure 5.8).

Delta growth has caused dramatic landscape changes within the Glenorchy area. Much of the delta shoreline has advanced lakeward by 200-250 metres since the earliest European records. Early surveys at Glenorchy show the present-day wetland area was a large lagoon in the 1860-70's (red shoreline in Figure 5.6) which included the first wharf at Glenorchy. The current wharf at Glenorchy is the third constructed over the township's history. The second having been located at Jetty Street at the Rees Delta (Figure 5.6).

Modelling of future delta growth by Wild (2012) indicates that over the next 100-120 years the delta shoreline is expected to advance an average of ~165 metres, with actual advances across the delta shoreline ranging from 40 to 300 metres (Figure 5.6).

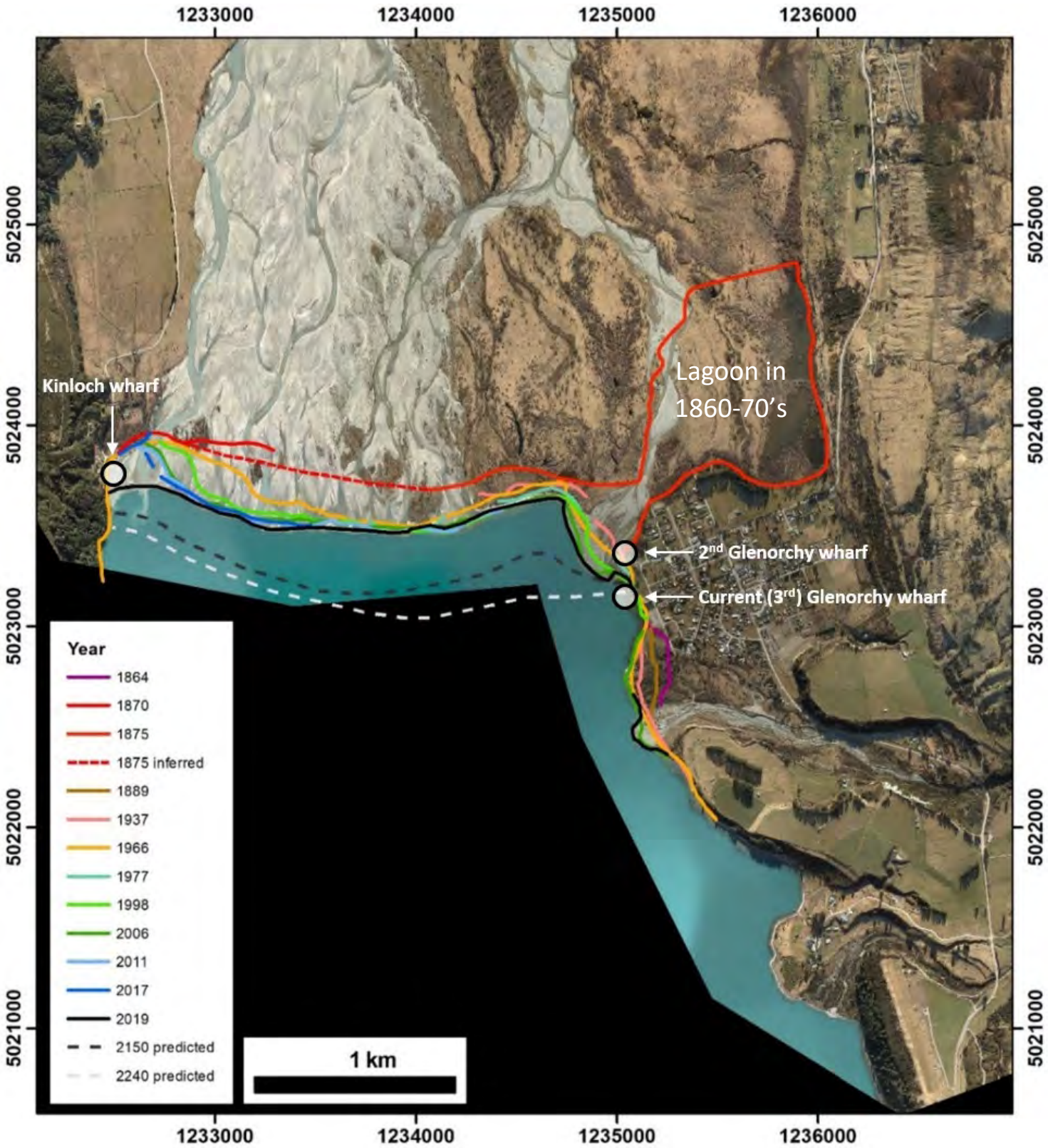


Figure 5.6 Historical and predicted shoreline positions of the Dart-Rees delta, based on compilations of historical maps and photographs by URS (2007) and Wild (2012). Projected delta growth based on modelling by Wild (2012).

Figure 5.7 The S.S. Mountaineer at Kinloch wharf, pictured in the 1890s (Image by Valentine and Sons Ltd, 1892-1893. Hocken collections reference number P2008-073-013).

Figure 5.8 The Kinloch wharf, pictured in October 2019.

Alluvial fans

Alluvial fans are landforms developed by the build up of river or stream sediments over time, typically at the boundary between hillslopes and valleys, for example where a steep gully merges onto a flatter valley floor (Grindley *et al*, 2009).

Many alluvial fan landforms have been developed on the Dart-Rees floodplain by sediments deposited from their tributary streams. For example, the Glacier Burn and Scott Creek (Figure 5.9) alluvial fans on the Dart floodplain, and those formed by Precipice Creek and Ox Burn on the Rees floodplain. At Glenorchy (Buckler Burn), Blanket Bay (Stone Creek) and Greenstone (Greenstone River), alluvial fan-deltas have been formed as sediments are deposited directly into Lake Whakatipu.

Alluvial fans may be subject to a range of natural hazards and geomorphic processes, including inundation by floodwater, debris deposition from debris flow and debris flood events, channel migration, deposition and erosion. Alluvial fan flooding is characterised by a high level of flow-path uncertainty due to the processes of sediment deposition and the lateral displacement of streams during flooding (Grindley *et al*, 2009).

Figure 5.10 shows an example of extensive flooding and sedimentation on the Earnslaw Burn alluvial fan in the January 1994 flooding event, compared to the narrow stream channel present during non-flood conditions.

Figure 5.9 Example of an alluvial fan landform – the Scott Creek alluvial fan formed at the base of the Humboldt Ranges onto the Dart floodplain, showing evidence for recent sediment deposition across multiple sectors of the fan surface (photo dated October 2020).

Figure 5.10 Comparison of the Earnslaw Burn alluvial fan in flood (1994) and non-flood conditions (2021), illustrating the potential for widespread flooding and debris impacts across alluvial fan surfaces.

5.6 Meteorological and Hydrological

Orographically enhanced precipitation is the dominant climatic feature of the alpine regions of the South Island. Orographic precipitation is produced when moist air is lifted and cools as it moves over a mountain range. Due to the prevailing westerly winds, the majority of the precipitation falls on the windward (western) side of the Southern Alps (Figure 5.11). 'Spillover' rainfall occurs on the sheltered (eastern) side of the range when rainfall is blown over from the western side.

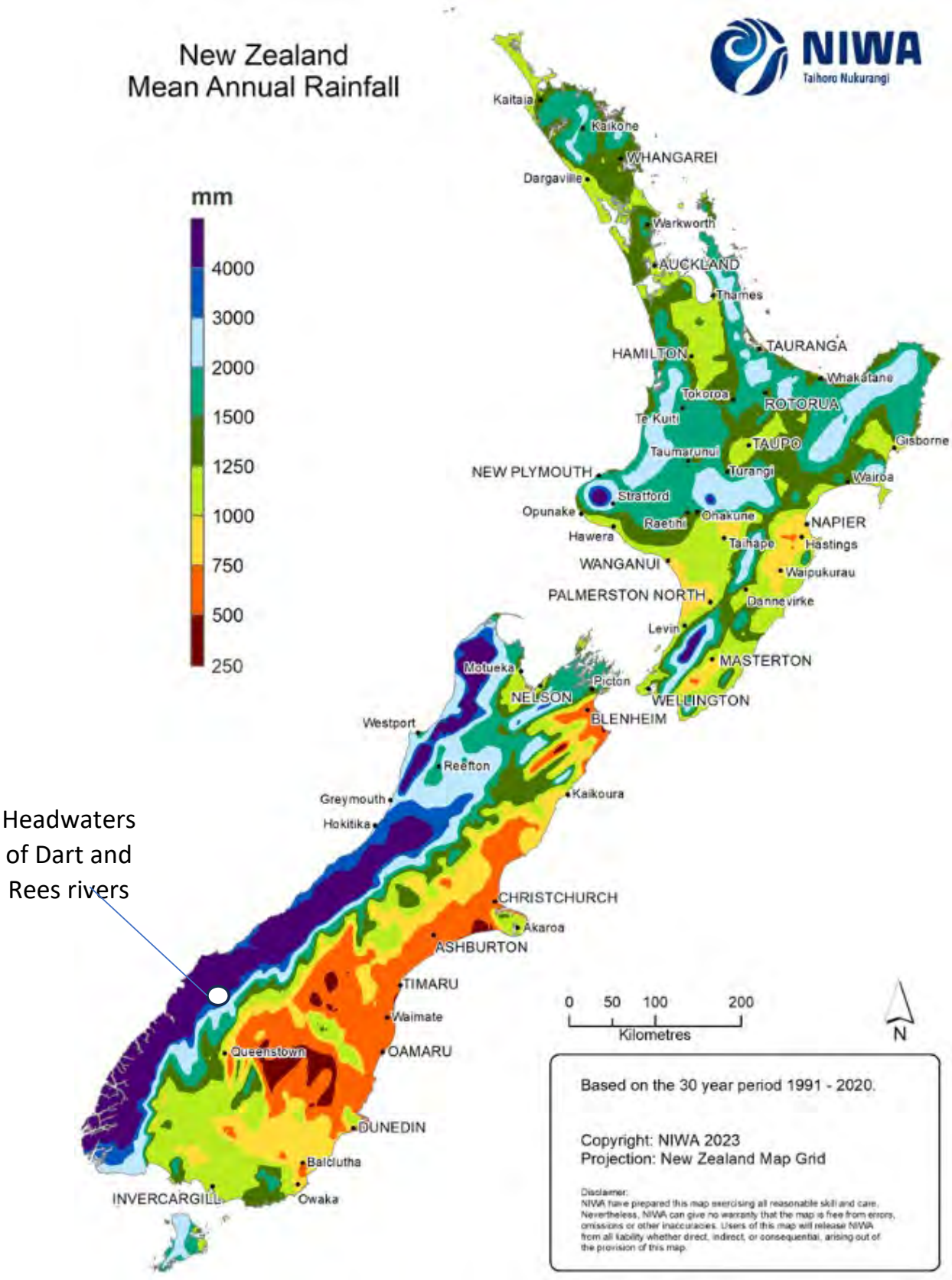


Figure 5.11 Aotearoa New Zealand Mean Annual Rainfall 1991-2020 (NIWA 2023).

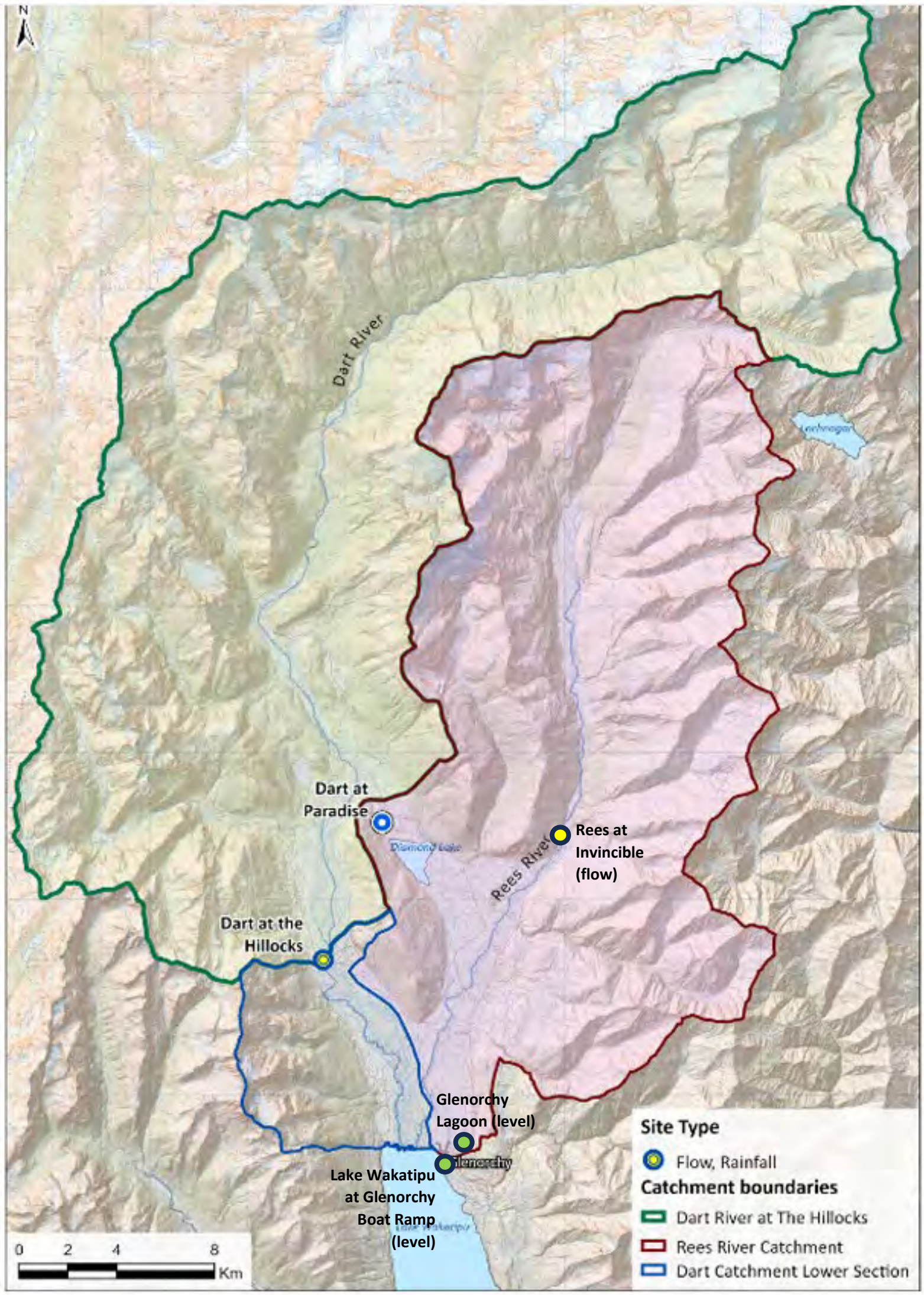


Figure 5.12 Rees and Dart catchments and ORC monitoring sites (Gardner M, 2022)

Dart and Rees Rivers

The two largest river systems are the Rees and Dart Rivers. The Rees (405 km^2) and Dart (632 km^2) catchments (Figure 5.12) make up about one third of the total catchment area of Lake Whakatipu.

The catchments have their headwaters in the high-elevation ranges east of the main divide. Precipitation can exceed 6,000 mm/year (MfE 2017) in the higher-elevation upper portions of the catchments, which regularly receive heavy rainfall as 'spillover'.

ORC currently monitors rainfall in the Head of the Lake area at Paradise (since 2003) and the Hillocks (since 1997). The locations of the stations are shown in Figure 5.12. Summary rainfall statistics for these sites are shown in Table 5-1.

Table 5-1 Summary rainfall statistics for ORC sites.

	Dart at The Hillocks (EM759)	Dart at Paradise (EM619)
Period of record:	Aug 1997 to now	May 2003 to now
Elevation	RL 360 m	RL 1300 m
Mean annual precipitation	1706 mm	2057 mm
Maximum recorded yearly precipitation	2191 mm	2742 mm
Maximum recorded daily precipitation	126.0 mm 21/09/2023	146.5 mm 10/09/2013 and 3/2/2020
Estimated 1% AEP, 24-hour rainfall (NIWA HIRDS)	188 mm (historical) 201 mm (RCP8.5 scenario)	225 mm (historical) 242 mm (RCP8.5 scenario)

Annual Exceedance Probability (AEP) is s the probability of a certain sized event occurring in a single year. If a rainfall has an AEP of 1%, it has a one in 100 likelihood of occurring in any given year.

NIWA's High Intensity Rainfall Design System (HIRDS) tool estimates high intensity rainfall at ungauged locations for a range of return periods, event durations and future time periods. Climate change projections are based on Intergovernmental Panel on Climate Change (IPCC) scenarios called representative concentration pathways (RCPs)

Reduced Level (RL) is a standard term for survey points with reference to a common datum. In this report, the common datum is Dunedin 1958 local vertical datum, unless stated otherwise.

The Dart River has a length of approximately 58 km. Dart River flows have been monitored by ORC since 1997, by a monitoring station located at the Dart River bridge at the Hillocks. The highest river flows documented since that date were in March 2019 and February 2020, both events having peak flows of approximately 1800 cumecs and estimated to be events of around 40-year return period, based on flood frequency analysis by Mohssen (2024). Summary flood frequency statistics for the Dart River at the Hillocks are shown in Table 5-2.

The Rees River has a length of approximately 41 km. Rees River flows have been monitored by ORC since 2021, by a monitoring station located near the confluence with Invincible Creek. The highest river flow documented since that date was 240 cumecs in September 2023. Higher flows of >475 cumecs in the Rees River have also been recorded during research by Williams *et al*. (2015) and an archived 1974 Otago Catchment Board (OCB) gauging card (Wild, 2012).

Summary flood frequency statistics for the Rees River at Invincible have been estimated by Mohssen (2024) using a rainfall-runoff modelling approach (Table 5-2).

Table 5-2 Flood Frequency Statistics for Dart and Rees Rivers, Buckler Burn and Bible Stream (Mohssen 2024).

Location	Catchment area	Frequency Statistics / Design Flows (cumecs)				
		10-year ARI	20-year ARI	50-year ARI	100-year ARI	500-year ARI
Dart at Hillocks station	591 km^2	1559	1694	1849	1952	2153
Rees at Invincible station	230 km^2	620	718	855	962	1223
Buckler Burn (at bridge)	51 km^2	104	121	146	166	217
Bible Stream	0.7 km^2	1.4	1.7	2.0	2.3	3.0

Buckler Burn and Bible Stream

The Buckler Burn is located immediately south of Glenorchy township and has a catchment of 51 km^2 (Figure 5.13). The burn flows westwards from headwaters in the Richardson Ranges and outflows directly into Lake Whakatipu.

Bible Stream is located immediately east of Glenorchy township and has a catchment of 0.7 km^2 (Figure 5.13). The stream flows over Bible Terrace and towards the township through a gully on the northern side of the terrace. A diversion channel at the base of the gully was constructed in early 2000s, and diverts flows around the eastern margin of the township into Glenorchy Lagoon. The diversion floodbank/channel has been described as “poorly formed and not engineered”, likely to be eroded during high flows and offering very little protection during flood events (Woodmansey, 2001; Whyte, 2007).

There has been no measurement of stream flows for either the Buckler Burn or Bible Stream, but summary flood frequency statistics for both catchments have been estimated by Mohssen (2024) using a rainfall-runoff modelling approach (Table 5-2).

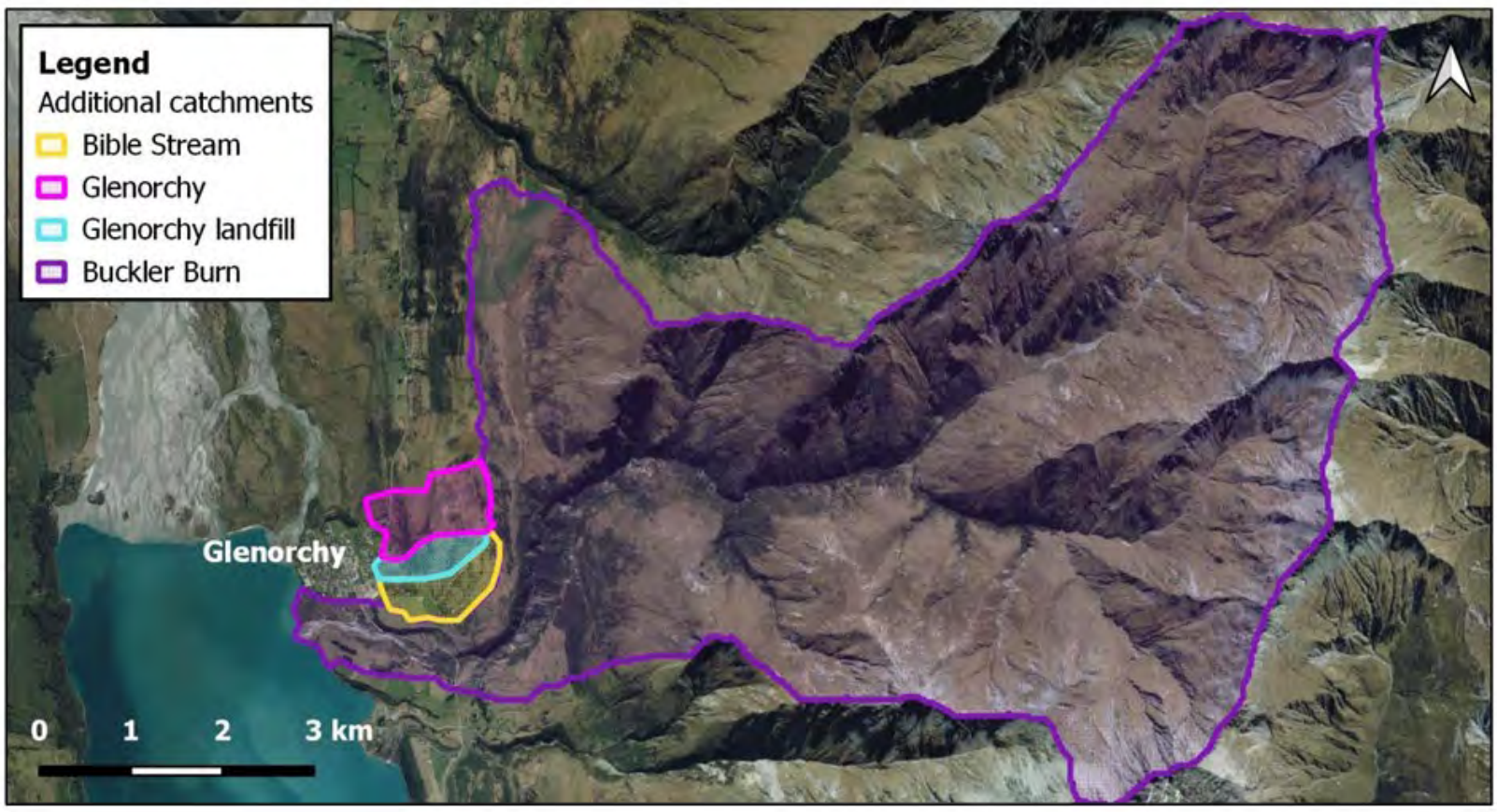


Figure 5.13 Buckler Burn, Bible Stream and local Glenorchy catchments (Beagley R, 2024)

Glenorchy Lagoon

The Glenorchy lagoon (Figure 5.14) is located immediately north of Glenorchy township and has an area of about 16 hectares (0.16 km^2). The lagoon is part of a wider wetland area, 350 ha in area, much of which is administered by the Department of Conservation as a Wildlife Management Reserve. The geomorphic history of the lagoon and wetland area is detailed by Whyte (2007).

The lagoon is fed by local runoff from Bible stream and other small catchments on the slopes immediately east of the wetland. When groundwater levels are high, many small tributary channels feed into the lagoon through the wetland area. There is no direct connection to the Rees River during normal (non-flood) flow conditions, but during high river flows the lagoon is fed by overbank flows spilling eastwards from the Rees River.

The lagoon outflow is a small stream known as Lagoon Creek, which joins with the Rees River on the delta, a short distance upstream from Lake Whakatipu.

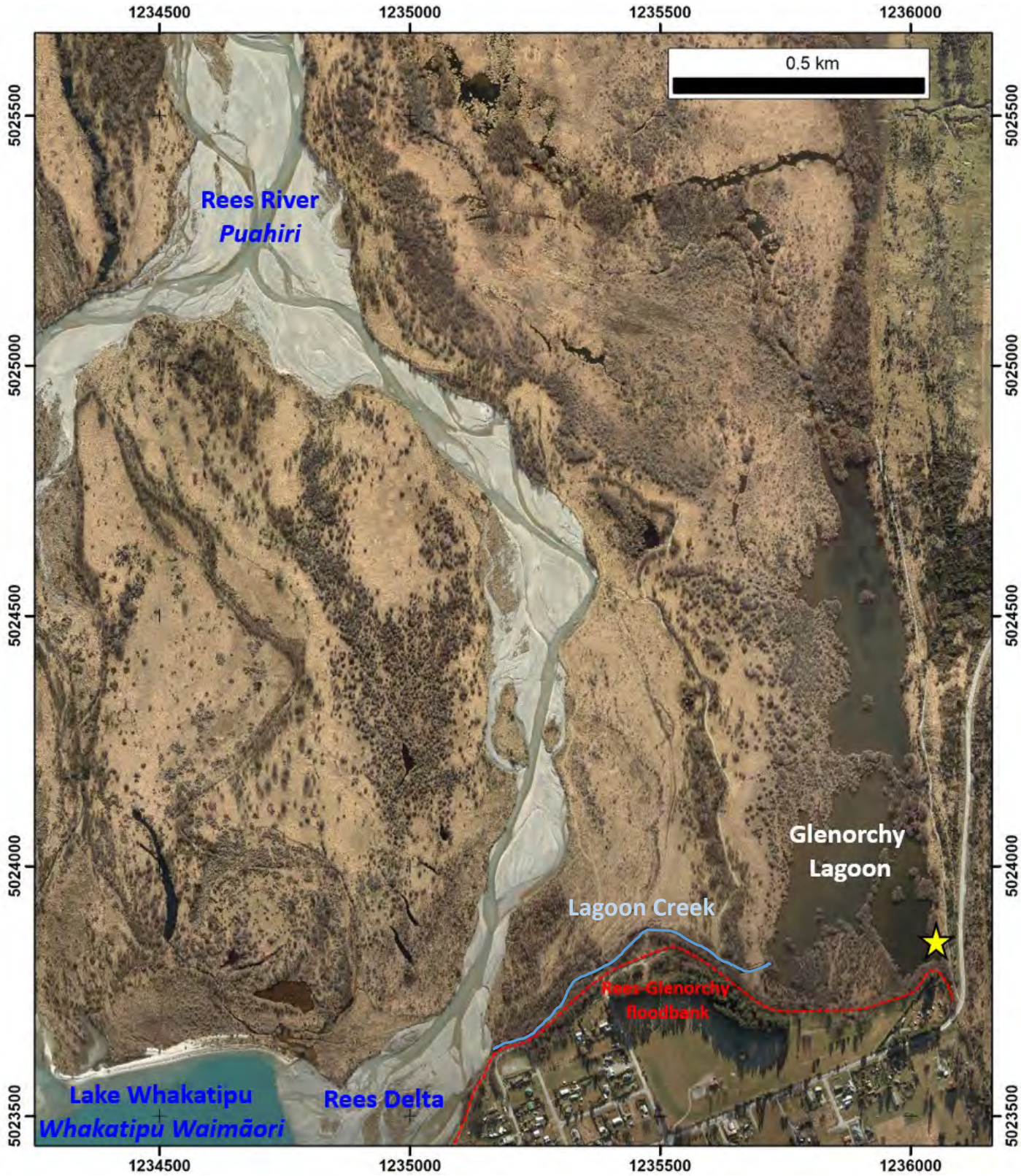


Figure 5.14 Overview map of the lower Rees River and the Glenorchy lagoon/wetland. The locations of the Rees-Glenorchy floodbank (dashed red line) and the ORC water level monitoring station (yellow star) are annotated.

Glenorchy lagoon levels rise in response to rainfall and high Rees River flows, interpreted to be due to the effects of both increased inflows (local runoff, overland flow from Rees) and reduced outflows (backwater effect of high Rees River flows and/or elevated Lake Whakatipu levels on creek outflow). Stream flows in Lagoon Creek may reverse when Rees River flows are high relative to the lagoon water level (e.g. as was observed and reported to ORC in May 2021).

ORC has monitored water levels in the lagoon since October 2020. In that time, the highest recorded level has been 312.49 m in September 2023.

During the February 2020 flooding event, the water level in the lagoon was estimated to have reached 312.7-312.8 m, based on observation of floodwaters overtopping the Rees-Glenorchy floodbank and inspection of silt deposits remaining following floodwater recession.

Lake Whakatipu

Lake Whakatipu has a catchment of 3,067 km^2, fed in the main by the Rees and Dart River catchments, with a combined catchment of 1,037 km^2. The lake outlet, located near Frankton, outflows into the Kawarau River.

The normal water level of Lake Whakatipu is typically at about RL 310 m. Historical records show that the level typically fluctuates between about RL 310 m and RL 312 m. Higher levels result in inundation of parts of Glenorchy and Kinloch, and elsewhere on the lake, cause inundation at Queenstown and Kingston also.

The main cause of high lake levels in Lake Whakatipu is the natural imbalance between the capacity of the lake outlet (Kawarau River) and the magnitude of inflows during heavy rainfall events. Lake Whakatipu outflows may be further impeded by high flows in the Shotover River, due to the perpendicular configuration of the confluence of the Kawarau and Shotover Rivers.

Despite having a large catchment, due to the large surface area Lake Whakatipu rises relatively slowly, even when inflows are high. This characteristic of the lake, in which the lake surface rises slowly and in response to particular weather conditions, means that the development of a high lake level flood event can be reliably monitored and the affected communities generally afforded a lead time, typically of several days, in which to prepare for potential inundation.

High lake levels are often associated with a succession of fronts, where rainfall events occur one after another and without sufficient time for the lake levels to recede, causing cumulative increases in lake level. The lake may remain at high levels for prolonged periods of days to weeks.

During the November 1999 flooding event, the lake reached the highest recorded lake level of RL 312.78 m and remained at levels greater than RL 312 m for around 8 days.

Frequency analysis of Lake Whakatipu levels has been completed by Mohssen (2021), based on a nearly 100-year record of lake levels (continuously monitored since 1962), and daily observations from 1924-1962, plus observations of historical levels in earlier flooding events, such as those occurring in 1878 and 1919 (Table 5-3).

Table 5-3 Frequency Statistics for Lake Whakatipu Water Level (Mohssen, 2021).

Frequency (average recurrence interval, years)	5-year ARI	10-year ARI	20-year ARI	50-year ARI	100-year ARI	150-year ARI
Lake Whakatipu water level (RL, m)	311.13	311.46	311.82	312.38	312.86	313.18

5.7 Built Environment

The built environment in the Head of the Lake area includes existing man-made structures, features and facilities that the community relies on for social and economic well-being.

Settlements – Glenorchy township is the main settlement, and includes critical public infrastructure such as the school, fire station / St Johns and community hall. The greater Head of the Lake area includes the surrounding rural areas of Kinloch, Paradise, Routeburn, Greenstone, Caples, Te Awa Whakatipu / Dart River Valley, and Puahiri/Puahere / Rees River Valley.

Dwellings – At the time of the 2023 Census, there were 261 occupied dwellings, 114 unoccupied dwellings (including residents away and empty dwellings) and 6 under construction (StatsNZ, 2023). More recently areas of residential growth have occurred in Alfred's Terrace; a 60-lot residential development. Some lifestyle blocks have also been developed, particularly around the Glenorchy-Paradise Road area, as well as large homes in private gated communities or estates (largely catering to overseas owners). By 2053, forecasted growth under a medium scenario expects to reach 584 dwellings (QLDC, 2024).

Glenorchy-Queenstown Road – Provides the only road access in and out of Head of the Lake area for residents and visitors. The community relies heavily on the road to access goods, services, employment, education, recreation, and health care outside the area. Over the period 2013-2023 Average Daily Traffic (ADT) ranged from approximately 705 to 5,650 (both lanes) (QLDC, 2023c).

Local roads (such as Glenorchy-Paradise-Kinloch-Routeburn and Rees/Dart bridges) – Provide an important link to people and businesses located in Paradise and the Rees Valley. Provide access to Kinloch, and the Routeburn, Rees-Dart, Lake Sylvan, and Greenstone Caples tracks via the Glenorchy-Routeburn, Kinloch and Routeburn Roads, which are popular tourism and recreation destinations. Over the period 2013-2023, Average Daily Traffic for Glenorchy-Paradise Road ranged from approximately 121 to 1,211 vehicle movements (both lanes) (QLDC, 2023c).

Wharfs – Kinloch and Glenorchy both have wharf structures. Sediment build up has constrained the level of service at Glenorchy Wharf and Kinloch Wharf is unusable (e.g. Figure 5.8).

Power – Aurora Energy is the local electricity distribution company. Aurora Energy is partway through a large, five-year work programme investing over $500 million to upgrade the electricity network in Otago, including Glenorchy network improvements, which are now completed. The Glenorchy generator is in place and can supply past the township. Pioneer Energy Renewables owns the small Oxburn hydro power station (Annual Generation: 2.5 GWh).

Wastewater – Currently households manage and treat their own wastewater at their properties.

Drinking water – Glenorchy has town water supply and two large water reservoirs have recently been installed on Bible Terrace. Rural properties provide their own water supply.

Telecommunications – Service is provided by three telecommunication providers: One NZ, Spark and Lakes Internet. Service reliability is reported to vary across the area. Some residents have access to Starlink, which provides satellite internet access. Approximately 77% of households have access to telecommunications systems (71% have internet and cellphone access, 16% telephone access) (StatsNZ, 2023). Approximately 1.3% have no access to telecommunication systems (StatsNZ, 2023).

Floodbanks – The existing floodbank at the northern margin of Glenorchy township is owned and managed by QLDC and provides flood protection from low-moderate flood events (Damwatch 2022). Privately-owned floodbanks in the Rees River floodplain provide low-level protection for agricultural land and local roads.

5.8 Experience of past natural hazard events

High water levels in Lake Whakatipu can cause flooding issues for the lakeside communities of Glenorchy, Kinloch, Kingston, and the Queenstown CBD (ORC and QLDC, 2006). At Glenorchy, the lakefront reserve and carpark areas begin to be inundated when lake levels reach approximately 311 masl (e.g. December 2019). This has happened 32 times since 1878, and there is a 29% chance the lake will rise above this level each year, and a 97% chance it will happen at least once in any 10-year period (ORC, 2013). The lake starts flooding into residential areas when reaching a level of 311.4 masl. There is a 10% chance that the lake will rise to this level each year, and a 67% chance it will happen at least once in any 10-year period (ORC, 2013).

In November 1999, Lake Whakatipu reached its highest lake level on record at RL 312.8 m (Figure 5.15) (DUN58 vertical datum). The second-highest level recorded was in September 1878 at RL 312.60 m.

At Glenorchy township, past flooding events have occurred due to various sources of flooding, including high flows in the Rees River, Buckler Burn and Bible Stream, and high-water levels in Lake Whakatipu. Some flood events are due to a combination of sources.

A notable recent event was in February 2020, when high Rees River flows caused overtopping of a section of the Rees-Glenorchy floodbank, resulting in flooding of Glenorchy township residential area (Figure 5.16).

Buckler Burn is a very dynamic alluvial fan with high sediment supply. Historical impacts include flooding of properties in southern parts Glenorchy township (late 1970s) and damage to Queenstown-Glenorchy Road (November 1999, Figure 5.17). The present-day alignment of the active channel is along the most southern limit of the fan. The fan surface may build up in the future and, consequently, northwards migration towards the township should be anticipated.

Flooding caused by high flows in the Dart and Rees Rivers can cause widespread inundation of the combined Dart-Rees floodplain area, such as during the January 1994 event (Figure 5.19) and March 2019 event (Figure 5.18). The main impacts of flooding are disruption to road access (e.g. to Kinloch, at the Rees bridge approaches, or at Paradise Road), and damage to infrastructure and land.

In addition to river flooding, major storm events have also caused a range of associated impacts, such as landslide and debris flow activity in January 1994 which also caused disruptions to road access and damage to infrastructure and land (Figure 5.20).

Some community members' experiences of the January 1994, November 1999 and February 2020 flood events are captured in MacKenzie's (2023, p. 97-104) thesis. These stories offer insights into the impacts felt by community members from these events and demonstrate community resilience.

Figure 5.15 November 1999 – significant flooding of Glenorchy township residential area, due to highest water levels on record in Lake Whakatipu.

Figure 5.16 February 2020 – flooding of Glenorchy township residential area, due to high Rees River flows causing overtopping of a section of the Rees-Glenorchy floodbank.

Figure 5.17 November 1999 – Buckler Burn flooding and erosion damages to the Queenstown–Glenorchy Road (photos: Kelly Family).

Figure 5.18 March 2019 – flooding of Dart floodplain, showing inundation of Kinloch Road.

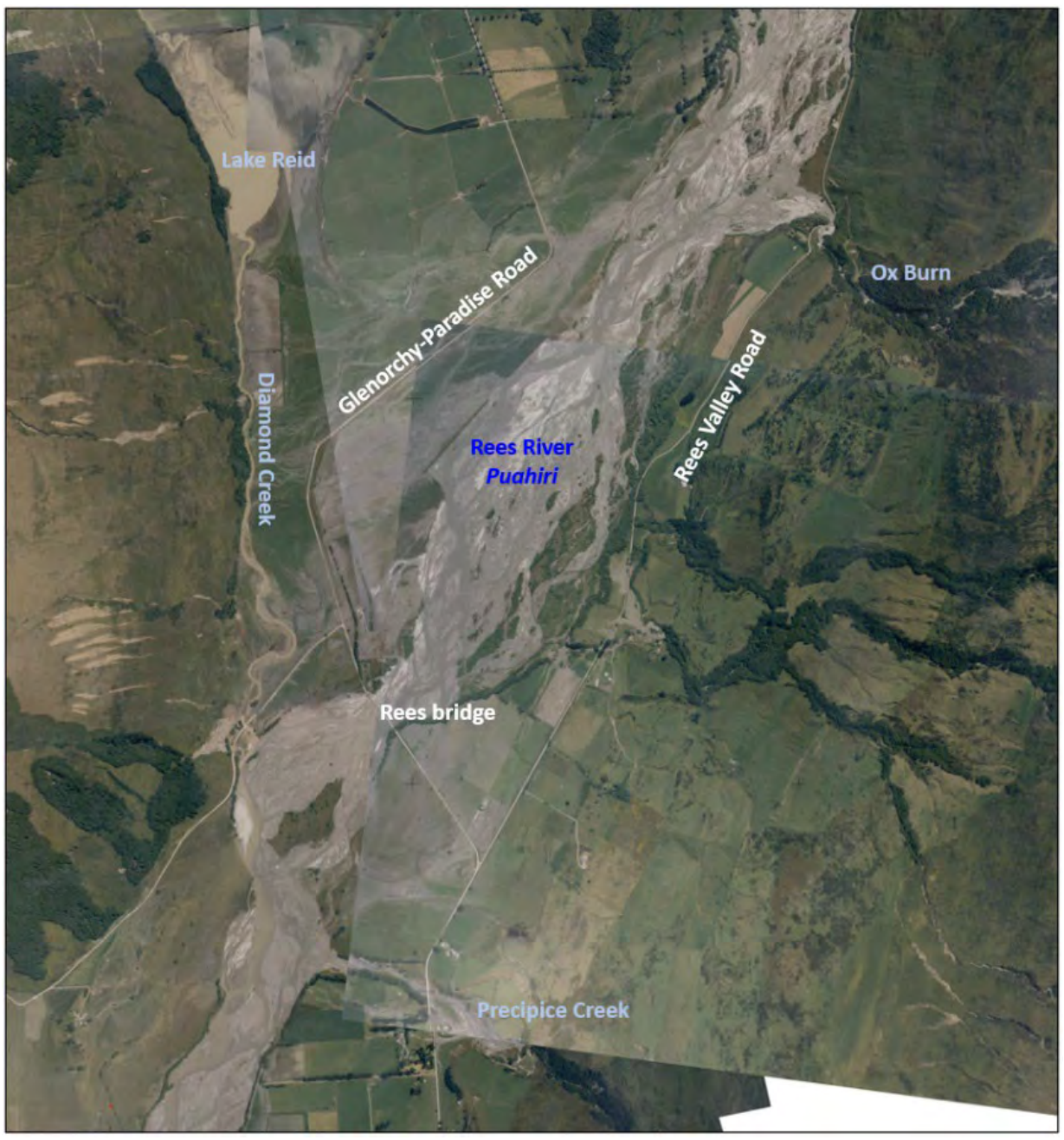


Figure 5.19 January 1994 - disruption to road access and damage to infrastructure and land, caused by flooding of Rees floodplain, and alluvial fan activity at the Precipice Creek and Ox Burn alluvial fans.

Figure 5.20 January 1994 – disruption to road access and damage to infrastructure and land, caused by flooding of Dart floodplain and alluvial fan and debris flow activity. Includes Scott Creek, Stockyard Creek and Kowhai Creek alluvial fans.

6 Drivers for Adaptation

Adaptation at the Head of the Lake is driven by several key factors. This section provides an overview of these drivers and explain how they relate to and motivate the adaptation efforts for the area.

Community interest – experience of past flooding events has heightened community interest in hazard management.

Dynamic landscape – delta growth, shifting river channels, ongoing sediment deposition and erosion will continue to put pressure on sites of cultural significance; and the sustainability of infrastructure and land use.

Complex hazardscape – Since 2019, we have greatly enhanced our understanding of the natural hazards challenges in the area. The complexity and future uncertainties mean that there is no simple solutions.

Future growth – Population numbers at the Head of the Lake and in the district are expected to keep rising (QLDC, 2024). This is expected to increase demand for infrastructure, housing and services. We need to ensure that future growth happens in the right place and that land use activities are appropriate.

Climate change - Projections of climate variables for the Otago region have been developed by NIWA (2019), under a range of future time periods (mid-century and late-century) and emissions scenarios (Representative Concentration Pathways, RCPs). For the head of Lake Whakatipu catchments, these projections show significant increases in both rainfall and river flow variables, where increases in average temperature due to climate change are expected to produce a 20-40% increase in winter rainfall and more intense storms by 2090, with up to a 100% increase in the mean annual flood flow and up to 15 additional heavy rain days (>25 mm).

Estimations of the climate change effects on flood flows for the Rees and Dart Rivers, are for the 1% AEP flood flows to increase in magnitude by approximately 20% by 2090 under a RCP8.5 scenario, and 13% under a RCP6.0 scenario (Mohssen, 2021)[3].

It is inferred that the projected future increases in mean river flows and flood magnitudes from the Lake Whakatipu catchments will cause an increase in mean and in-flood lake levels and, therefore, an increased likelihood of the lake reaching levels where they have an effect on lakeside communities. Detailed analysis to understand or quantify the potential climate change effects on lake levels has not yet been carried out.

[3] If a flood has an AEP of 1%, it has a one in 100 likelihood of occurring in any given year. Climate change projections are based on Intergovernmental Panel on Climate Change (IPCC) scenarios called representative concentration pathways (RCPs).

7 Legislative and Strategic Context

Natural hazards and associated risks in Aotearoa New Zealand are not managed under a single statute. Rather, their effective management relies on the interplay of many statutes and requires those agencies exercising powers and responsibilities to do so in a coherent and coordinated way (Figure 7.1). These statutes include;

- Civil Defence Emergency Management Act 2002 (CDEMA)
- Resource Management Act 1991 (RMA)
- Local Government Act 2002 (LGA)
- Soil Conservation and Rivers Control Act 1941 (SCRCA)
- Local Government Official Information and Meetings Act (section 44A) 1987 (LGOIMA)
- Building Act 2004

7.1 Otago Regional Policy Statements

The Strategy addresses objectives and policies outlined in the ORC's Otago Regional Policy Statement (RPS) 2019, specifically focusing on:

- Objective 4.1: Risk that natural hazards pose to Otago's communities are minimised;
- Objective 4.2: Otago's communities are prepared for and able to adapt to the effects of climate change;

Also relevant are objectives in the proposed Otago RPS 2021, which was notified in March 2024 and subject to appeal[4].

- HAZ-NH-01: Levels of risk to people, communities and property from natural hazards within Otago do not exceed a tolerable level.
- HAZ-NH-02: Otago's people property and communities are prepared for and able to adapt to the effects of natural hazards, including climate change.

Objectives outlined in the RPS 2019 and proposed PRS 2021 are supported by a number of policies to provide guidance for local communities to address challenges posed by natural hazards and climate change.

[4] proposed RPS is subject to appeal, which means the provisions around natural hazards may change through mediation or hearing.

7.2 Queenstown Lakes District Council District Plan (2015)

The Queenstown Lakes District addresses natural hazards in Chapter 28 of the Proposed District Plan (2015) which contains the following natural hazards objectives:

- 28.3.1 A: The risk to people and the built environment posed by natural hazards is managed to a level tolerable to the community.
- 28.3.1 B: Development on land subject to natural hazards only occurs where the risks to the community and the built environment are appropriately managed.
    - …..
    - 28.3.1.5 Recognise that some areas that are already developed are now known to be subject to natural hazard risk and minimise such risk as far as practicable while acknowledging that the community may be prepared to tolerate a level of risk.
    - ….
- 28.3.2: The community's awareness and understanding of the natural hazard risk in the District is continually enhanced.

Chapter 20 of the Proposed District Plan notes that the low-lying areas at Glenorchy, Kinloch and Kingston that are susceptible to flooding are shown as 'Historical Flood Zone' on the Planning Maps, and specifies a minimum floor level for management of lake level flooding risk in those communities. This rule states that;

- "Buildings with a gross floor area greater than 20m^2 shall have a ground floor level not less than RL 312.8 masl (412.8 Otago Datum) at Kinloch, Glenorchy and Kingston." (20.5.20)."

7.3 Learning to Live with Flooding Strategy (2006)

In 2006 Otago Regional Council (ORC) and Queenstown Lakes District Council (QLDC) jointly developed

- Learning to Live with Flooding: A Flood Risk Management Strategy for the communities of Lakes Wakatipu and Wanaka.

The objective of the strategy is to manage the community's exposure to lake flooding risk and equip Wānaka, and the Whakatipu communities of Queenstown, Glenorchy, and Kingston to understand and learn to live with lake flooding. Development of the Learning to Live with Flooding Strategy was a response to the severe 1999 lake flood, which was the highest lake level on record for Lake Whakatipu.

QLDC and ORC outlined an approach to manage the impacts and risks of lake flooding, rather than trying to avoid or limit them through engineered alteration of the physical environment. This approach, to learn to live with lake flooding at a strategic, local, and individual level is a key principle of both councils' strategic, joint approach to lake flooding.

7.4 Other plans and guidance

Climate change and adaptation planning is informed by these plans:

- National Adaptation Plan (2022) [5]
- Otago Regional Council Strategic Climate Action Plan (2024)[6]
- Queenstown Lakes District Council Climate and Biodiversity Plan (2022)[7]
- Te Rūnanga o Ngāi Tahu - Climate Change Strategy[8]

Natural Hazards Commission Toka Tū Ake (formerly EQC) is Aotearoa New Zealand's natural hazards insurance agency, with a primary objective to 'reduce the impact of natural hazards on people, property and the community'. The following research and guidance published by the NHC has informed this Strategy:

- Natural hazard risk tolerance literature review (2023)
- Risk tolerance methodology (2023)

[5] https://environment.govt.nz/publications/aotearoa-new-zealands-first-national-adaptation-plan/

[6] https://www.orc.govt.nz/media/4alnenfa/draft-strategic-climate-action-plan-scap-august-2024.pdf

[7] https://climateaction.qldc.govt.nz/our-plan/

[8] https://ngaitahu.iwi.nz/assets/Documents/Ngai-Tahu-Climate-Change-Strategy.pdf

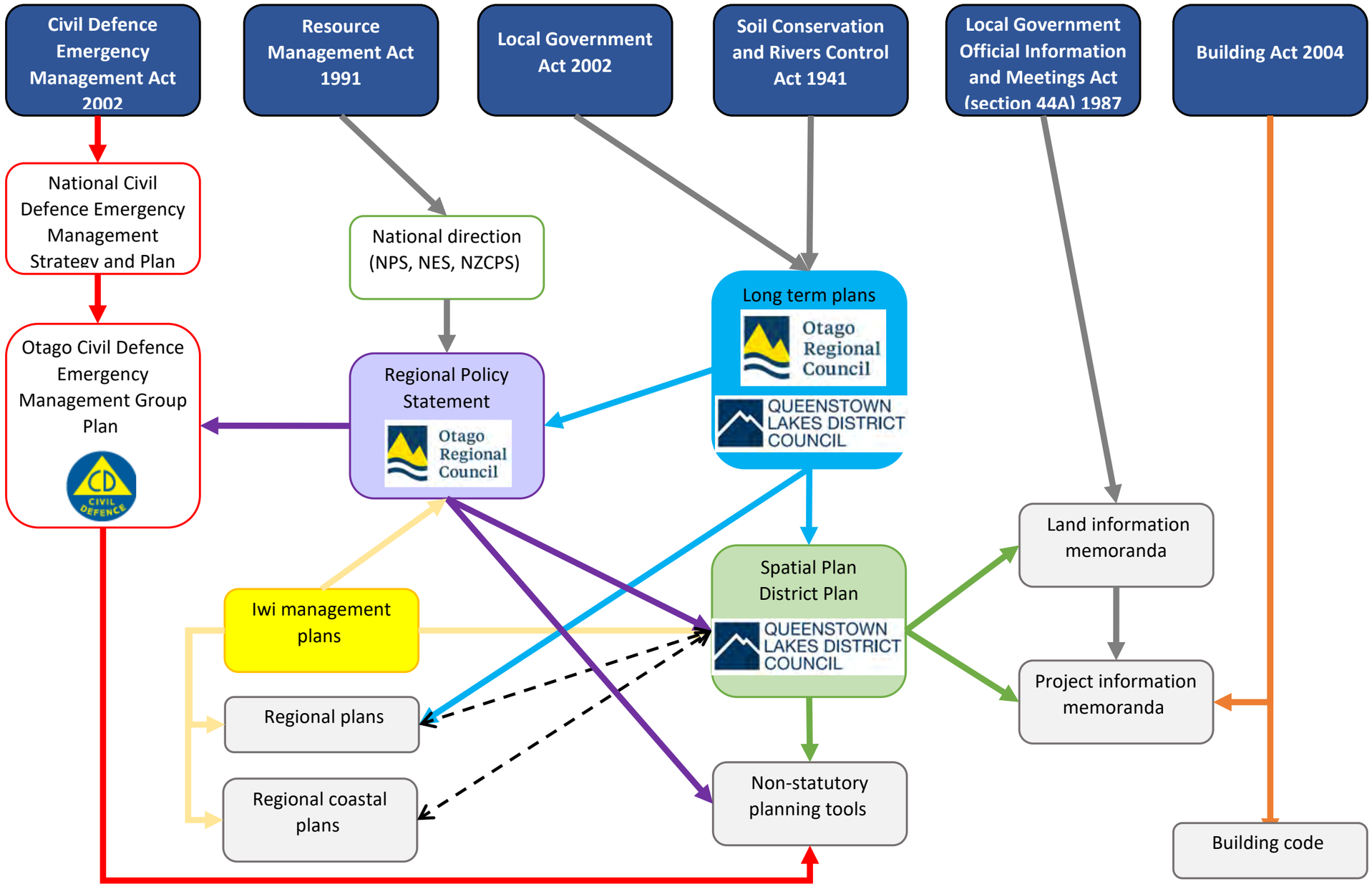


Figure 7.1 Statutes and interactions

8 Strategy Governance

8.1 Partnerships and collaboration

Key partners in the Strategy are Queenstown Lakes District Council, Civil Defence Emergency Management Otago, and the local community. The Strategy has been developed in collaboration with Aukaha and Te Ao Mārama Inc as the mana whenua representatives.

8.2 Roles and Responsibilities for implementing the Strategy

This section outlines the existing roles and responsibilities of partners, community, and other agencies in reducing risks and impacts, and implementing the Strategy. Working collaboratively to manage risks and build resilience.

8.2.1 Otago Regional Council

The ORC's role is to reduce the impact of natural hazards through hazard identification and providing information about the likelihood of an event occurring.

Key responsibilities include:

- Monitoring and maintaining a network of rain and river flow gauges and sharing the data
- Analysing incoming information to provide early warning and awareness of flood events
- River management activities, such as vegetation and gravel management.
- Investigation and decision-making around new flood mitigation measures (including hard or nature-based protection), alongside other parties.
- Conducting planned and reactive monitoring activities to collect up-to-date information on natural hazards, their impacts, and geomorphic changes.
- Updating natural hazard and risk analyses and sharing results with partners and the community.

ORC also has responsibilities as a member of the Otago Civil Defence and Emergency Management Group.

8.2.2 Queenstown Lakes District Council

QLDC is a territorial authority which has responsibility for making decisions about the effects of land use, activities on the surface of rivers and lakes, providing for sufficient development capacity for residential and business growth, noise management, and subdivision. This work is guided through QLDC's strategic framework and investment priorities, and supported through the Queenstown Lakes Operative and Proposed District Plan, Spatial Plan, Climate & Biodiversity Plan, Infrastructure Strategy, and various asset management plans and master plans. Funding and investment decisions for projects, activities, and services for the district are set out in the 10 Year Long Term Plan which is reviewed every 3 years, with an Annual Plan completed in the years between.

At the Head of Lake Whakatipu for example QLDC is responsible for maintaining public roading and three waters assets, the Glenorchy marina and jetty, the Glenorchy flood bank, and ensuring appropriate land use activities through implementation of the District Plan. Natural hazard information for individual properties is provided on the property LIM report.

QLDC is a member of the Otago CDEM Group, which is coordinated by Emergency Management Otago. Emergency Management Otago employs Emergency Management Advisors who are assigned into the district to support emergency planning, deliver training and public education campaigns, lead the development of community response groups and support Council to build its response capability. Council officers support these efforts by volunteering for the Council's Emergency Operations Centre (EOC) and by delivering a broad range of activities that help with community risk reduction and resilience building. These activities include land-use planning, resource and building consenting, resource management engineering, infrastructure planning and operations, climate adaptation planning, and community partnership development.

In the event of a major emergency event, the QLDC Emergency Operations Centre is activated to lead a coordinated, multi-agency response in collaboration with Emergency Services and partner organisations. For major emergency events this may involve a Declaration of a State of Local Emergency which provides access to a range of emergency powers to help coordinate the response and fulfil the objectives outlined in the CDEM Act 2002, National Disaster Resilience Strategy (2019), National CDEM Plan (2015), and Otago CDEM Group Plan.

8.2.3 Head of the Lake communities

The community is responsible primarily for ensuring their own safety; the protection of any dependants and property; reducing their potential for loss; maintaining readiness; and responding appropriately during an event. This requires awareness of both the greater hazards and their specific risk exposure; and adoption of practices and measures to manage this risk (ORC & QLDC, 2006).

8.2.4 Mana whenua

ORC's commitment is to partner with mana whenua and make mātauraka (knowledge, wisdom, and understanding) Kāi Tahi an integral part of our decision-making. Within this Strategy, the roles and responsibilities of mana whenua are represented by two organizations: Aukaha and Te Ao Mārama. In the development of this Strategy ORC have worked with and through Aukaha and Te Ao Mārama (the Papatipu Rūnaka consultancy services, Aukaha, representing Kāi Tahu ki Otago, and Te Ao Mārama Inc, representing Ngāi Tahu ki Murihiku) to ensure the traditions and values of mana whenua and mātauraka Kāi Tahu are embedded in the Strategy and actions.

Some specific responsibilities of Auhaka and Te Ao Mārama for the Strategy:

- Ensure that cultural values and practices of mana whenua are embedded and upheld throughout the Strategy's planning, decision-making processes, as well as implementation phases.
- Provide mana whenua with up-to-date information and knowledge of natural hazard risks at the Head of the Lake Whakatipu.
- Work closely with iwi Māori to foster collective adaptation efforts across the area as well as build trust and relationships.
- Engage with mana whenua to gather input and feedback to ensure their voices are reflected in adaptation strategies and actions within this Strategy.

8.2.5 Civil Defence Emergency Management Otago

The main role of Civil Defence Emergency Management Otago is safeguarding communities across the Head of the Lake area in emergencies.

CDEM Otago has specific responsibilities:

- Take lead on preparedness, response, and recovery from natural hazards events, including development of emergency plans and early warnings.
- Conduct emergency drills and raising awareness of the importance of preparedness for emergency events.
- Coordinate emergency response efforts as well as mobilizing resources and providing logistical support to affected communities at the area.
- Monitor impacts and damages caused by natural disasters as well as developing evacuation and recovery plans.
- Provide essential support to affected communities including foods and medical assistance.
- Implement recovery work for affected communities at Head of the Lake.

8.2.6 Central Government

Central government has roles and responsibilities that contribute to the Strategy:

- Provide legislative and policy frameworks and direction
- Provide information, guidance, and tools to support effective adaptation planning for natural hazards and climate change impacts.
- Publish information on climate change projections and natural hazards impacts.
- Publish funding opportunities and tools to support adaptation.
- Respond to major natural hazards events.

9 Adaptation cycle approach to planning

The approach selected by ORC to develop holistic, longer term natural hazards management plans in line with the Ministry for the Environment **10 Step adaptation cycle**. This adaptation approach is often shown as a circular 10-step decision cycle and can also be simplified as the sequence of five phases shown in Figure 9.1. This process has been promoted by the Ministry for the Environment as a blueprint for community-influenced decision making in areas affected by natural hazards and considering potential future uncertainties (e.g. landscape and climate changes).

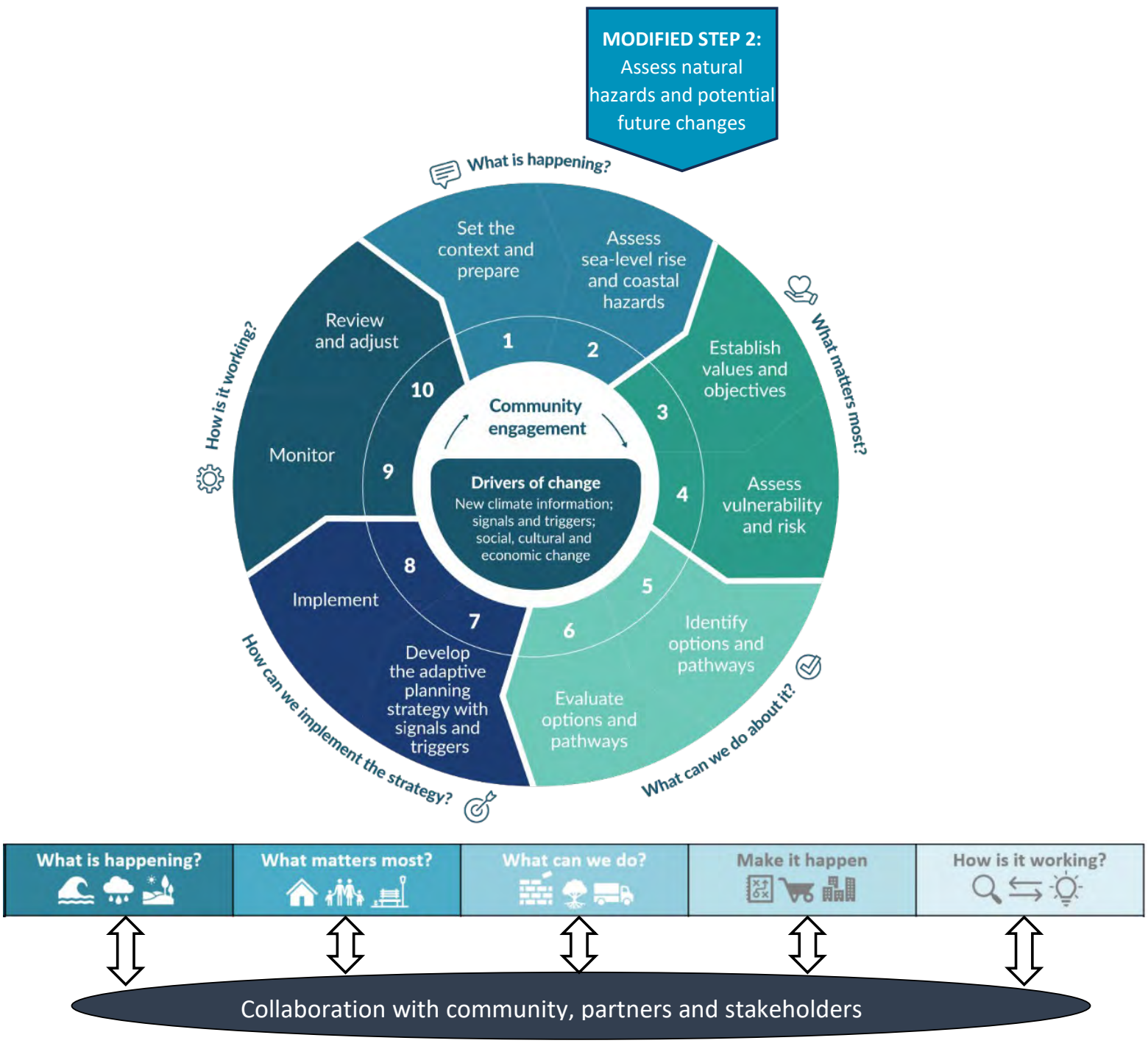


Figure 9.1 The 10-step decision cycle framework (modified from MfE 2024) and a simplified sequence of activities making up the approach.

Adaptation pathways

Within the adaptation cycle is a method known as Dynamic Adaptative Pathways Planning (DAPP) or 'Adaptation Pathways'. A conceptual outline of the adaptation pathways decision-making process in included as Figure 9.2. By using a pathways approach, it becomes clear what suite of adaptation actions can be implemented as change occurs, or a previous adaptation option stops working as it was intended. In situations like the Head of Lake Whakatipu, it is very likely that a series of actions (rather than just a single action) will be needed as the hazards and landscape change. This means that it is important to know how and when to transition between the different responses.

ORC is applying the adaptation pathways approach in a variety of local areas in Otago with complex natural hazard challenges, including Head of Lake Whakatipu, South Dunedin and Clutha Delta. The adaptation pathways approach is also supported by programme partners. Other regions are also applying the approach, including Hawkes Bay, Wellington and Waikato.

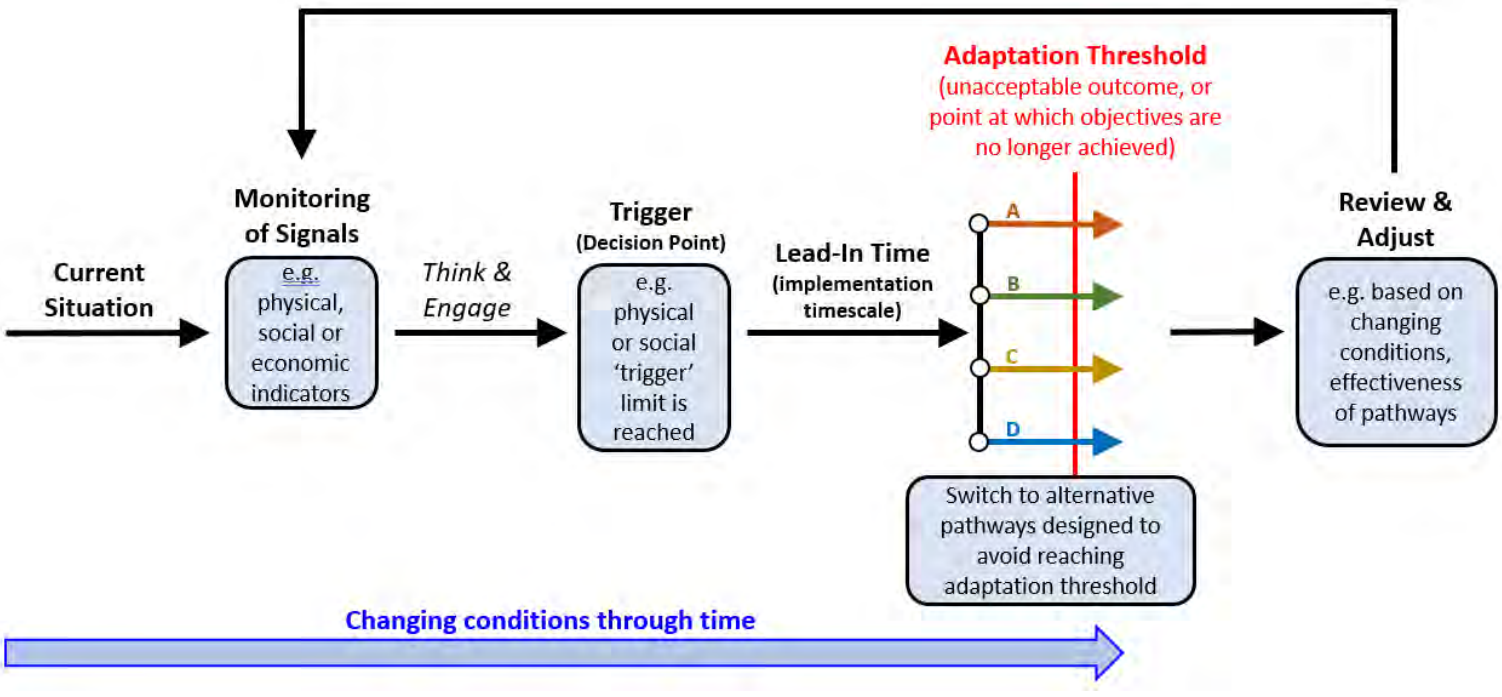


Figure 9.2 Conceptual outline of the adaptation pathways decision-making process.

9.2 Phase 1: What is happening?

The previous sections have set out the context for the Strategy, which is Step 1 of the adaptation cycle approach. Therefore, this section is focused on modified Step 2: *assessing the natural hazards and potential future changes*.

Figure 9.3 "What is happening?" Steps 1 & 2 of the adaptation cycle (modified from MfE 2024).

9.2.1 Natural hazard processes, characteristics, and potential impacts

A thorough understanding of natural hazard processes, characteristics, and their risks is required to ensure a robust basis for decision-making regarding the most appropriate hazard management and adaptation approaches.

To this end, ORC has undertaken more than twenty technical and supporting studies to build the body of knowledge, detailed in Appendix A. These investigations, with detailed modelling and analysis, provide a much better understanding and modelled data of the area's natural hazards challenges. Note that key studies were externally reviewed by independent experts.

It is important to be aware that multiple hazards can also occur at the same time and that one hazard can trigger another in a cascade. Some relevant examples for Head of Lake Whakatipu area:

- Major storms could cause flooding, riverbank erosion, and debris flow.
- Earthquakes could trigger landslides and liquefaction.
- Landslides could increase sediment supply and disrupt access.
- Liquefaction could cause land subsidence, increasing subsequent flood hazard.

9.2.2 Geomorphic processes

Geomorphologic processes in the area are highly dynamic and can be a key influence on natural hazard characteristics. Collection of aerial imagery, LiDAR and on-ground survey information enables comparison with prior surveys, and analysis of change.

For parts of the Glenorchy and Rees River area, archive aerial imagery dates to 1937, so provides an 80+ year record of geomorphic changes in this location. For the Dart River floodplain, archive imagery dates to 1966 so covers a 50+ year period.

LiDAR surveys were collected for the lower Rees and Dart floodplains by ORC in 2011 and 2019. Additional LiDAR surveys were collected by the University of Canterbury for research purposes in 2021 and 2022, with data made available to ORC. The high-resolution topographic information provided by LiDAR survey enables geomorphic change analysis (e.g. Figure 9.5) and provides a detailed topographic base for hydraulic modelling projects (e.g. Gardner, 2022; Beagley and Gardner, 2023; Beagley, 2024).

Geomorphic analysis and assessments for the Dart-Rees floodplain and delta have been completed by Brasington (2021, 2024), and findings from these analyses also included within T+T (2021) and Webby (2023). These studies build on earlier geomorphic assessments by URS (Mabin, 2007) and Wild (2012). These geomorphic assessments have included description of the geomorphic context (drivers, processes and responses), and influences on natural hazards, review of historical changes, and quantification of rates of change. Key outputs from geomorphic analysis are relative elevation modelling, and mapping of geomorphic changes.

Relative elevation models compare the elevation of the valley floor to the adjacent average level of the active river channel (Figure 9.4). This analysis highlights two locations where the floodplain is notably lower in elevation than the adjacent active riverbed and, therefore, vulnerable to a channel breakout event (avulsion):

- the right bank upstream of the bridge (Diamond Creek area)
- left bank downstream of Precipice Creek (Glenorchy wetland area).

Geomorphic change detection (GCD) analysis is used to compare differences over time, between repeat LiDAR topographic surveys (e.g. Figure 9.5). Analysis findings can be used to identify the locations of sedimentation or erosion/scour and to quantify the rates of these processes.

For example, Figure 9.5 illustrates the widespread bank erosion on the right bank of the lower Dart floodplain and the dominant aggradation trend in the lower Rees River. Estimation of net changes provides an indication of the mean rate of aggradation (e.g. ‘cm per decade’ rate), or the net volume changes between repeat surveys (sedimentation minus erosion, in cubic metres per year).

Maintaining an up-to-date understanding of current conditions is of high importance. The acquisition of up-to-date geomorphic datasets enables:

- revision of geomorphic analysis
- identification and proactive response to potential issues
- enables the updating of flood hazard assessments to ensure they provide accurate representation of current conditions (e.g. riverbed levels)

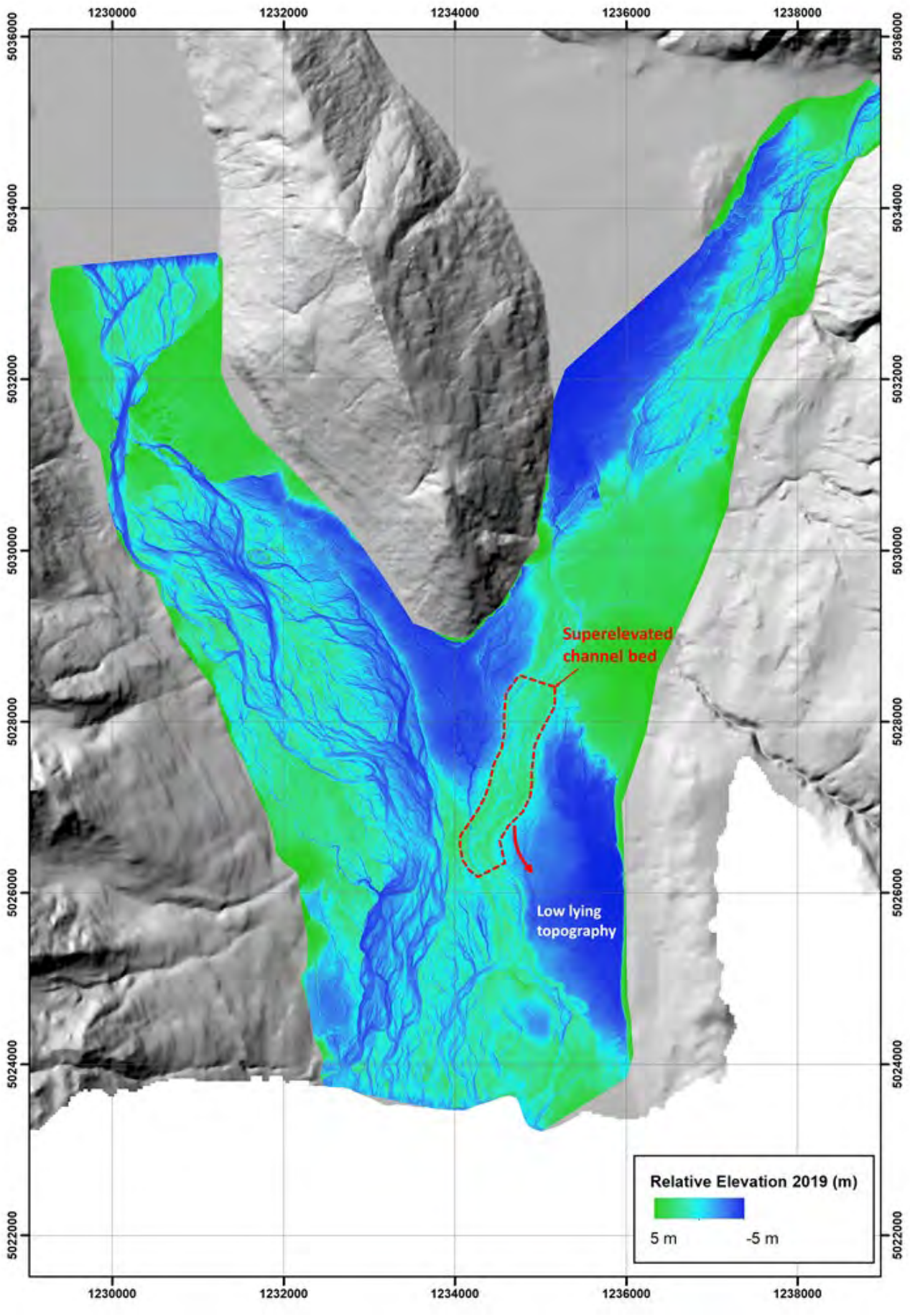


Figure 9.4 Relative elevation model of the Rees-Dart valley floor. This is computed by comparing the valley floor elevations to the adjacent average level of the river bed. The section of super-elevated river bed highlighted is the likely source for a potential channel breakout flood eastwards into the lower-lying topography of the wetland and lagoon area. The analysis is based on a 1 m resolution lidar topographic dataset acquired in 2019 (Analysis by J Brasington).

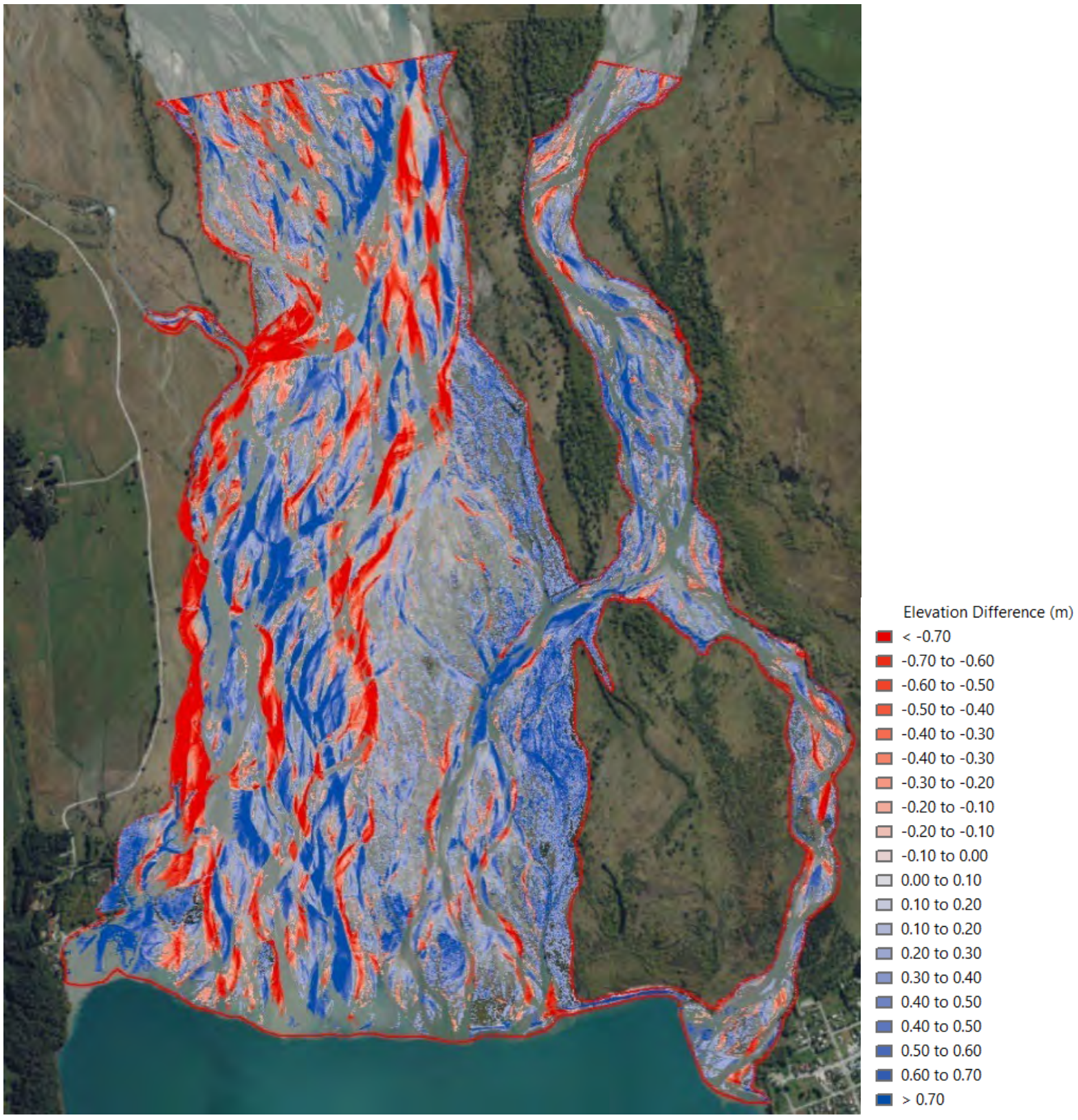


Figure 9.5 Geomorphic change for the lower Dart and Rees rivers (2011-2019). Blue is sedimentation, red is erosion. Showing westwards erosion of the lower Dart floodplain.

9.2.3 Hydrological and flood hazard assessments

Detailed flood hazard analysis has been carried out to understand flood hazard characteristics and the findings were used to inform risk assessment and engineering studies.

Hydraulic modelling and flood hazard analysis has been completed for the Rees and Dart Rivers (Gardner, 2022) and the Buckler Burn (Beagley and Gardner, 2023). In 2024, further hydraulic modelling was undertaken using the previously developed models, to assess a wider range of flooding magnitudes and a combined 'all source' model scenario which included inflows from the Dart and Rees Rivers, Buckler Burn, and Bible Stream (Beagley, 2024).

For the Rees-Dart Rivers, modelled flooding scenarios included combinations of large (up to 100-year ARI) river flows and lake levels, and the effects of climate change on future river flows and flood events. Additional factors modelled include an avulsion of the lower Rees River channel, and a breach of the Rees-Glenorchy floodbank (Gardner, 2022). For the Buckler Burn, modelled

flooding scenarios considered a range of river flows, and the effects of alluvial fan aggradation on fan morphology.

Model outputs from these flood hazard assessments typically include floodwater elevation, depth, velocity, and a classification of flood hazard as a function of floodwater depth and velocity. Findings from the Dart-Rees (2022) and Buckler Burn (2023) flood hazard assessments can be viewed in the ORC Natural Hazards Portal.[9]

Key findings from flood hazard assessments are that;

- In larger-magnitude Dart-Rees flooding scenarios, there is widespread overtopping by floodwaters over the Glenorchy floodbank and floodwater inundation of a large northern portion of the township (e.g. Figure 9.6 and Figure 9.7). It is estimated that the Rees-Glenorchy floodbank structure will not prevent flooding in the township for river flow events of a 20-year ARI (average recurrence interval) or greater.
- In the larger-magnitude Buckler Burn flooding scenarios, there is some floodwater spillover northwards from the stream into the township area (e.g. Figure 9.7). However, modelled floodwater depths in the residential parts of the township are generally relatively shallow (<0.5 metre depth), even in the largest magnitude scenarios modelled.
- Buckler Burn active channel is in close proximity to Queenstown-Glenorchy Road (Figure 9.7) and bank erosion is a threat to access.

These flood hazard assessments represent a significant increase in understanding from the previous flood modelling study at Glenorchy (Whyte and Ohlbock, 2007), which used a 1D modelling approach and was completed prior to the availability of LIDAR-derived topography.

Several supporting studies have been undertaken to inform flood hazard assessments;

- Hydrological analysis by Mohssen (2021, 2024). Flood frequency analysis for Dart River flows and Lake Whakatipu levels, development of rainfall-runoff models for Rees River and Buckler Burn, analysis of climate change impacts on flows.
- Geotechnical assessments by T+T (2021) to inform modelling of floodbank breach scenarios at Glenorchy. These build on earlier floodbank stability assessments completed in response to concerns regarding bank erosion and floodbank stability (Jaquin, 2020, 2021).

Additional hydraulic modelling analysis has also been carried out as part of assessments by;

- Wong *et al* (2023): A study completed for QLDC to inform a structural options assessment for the Rees River bridge structure, to help provide direction and guidance towards a long-term asset management strategy. The findings are summarised in Section 0
- Damwatch Engineering Ltd (2024): Assessments completed to inform review of potential floodplain hazard management approaches. The findings are summarised in Section 0.

[9] http://hazards.orc.govt.nz

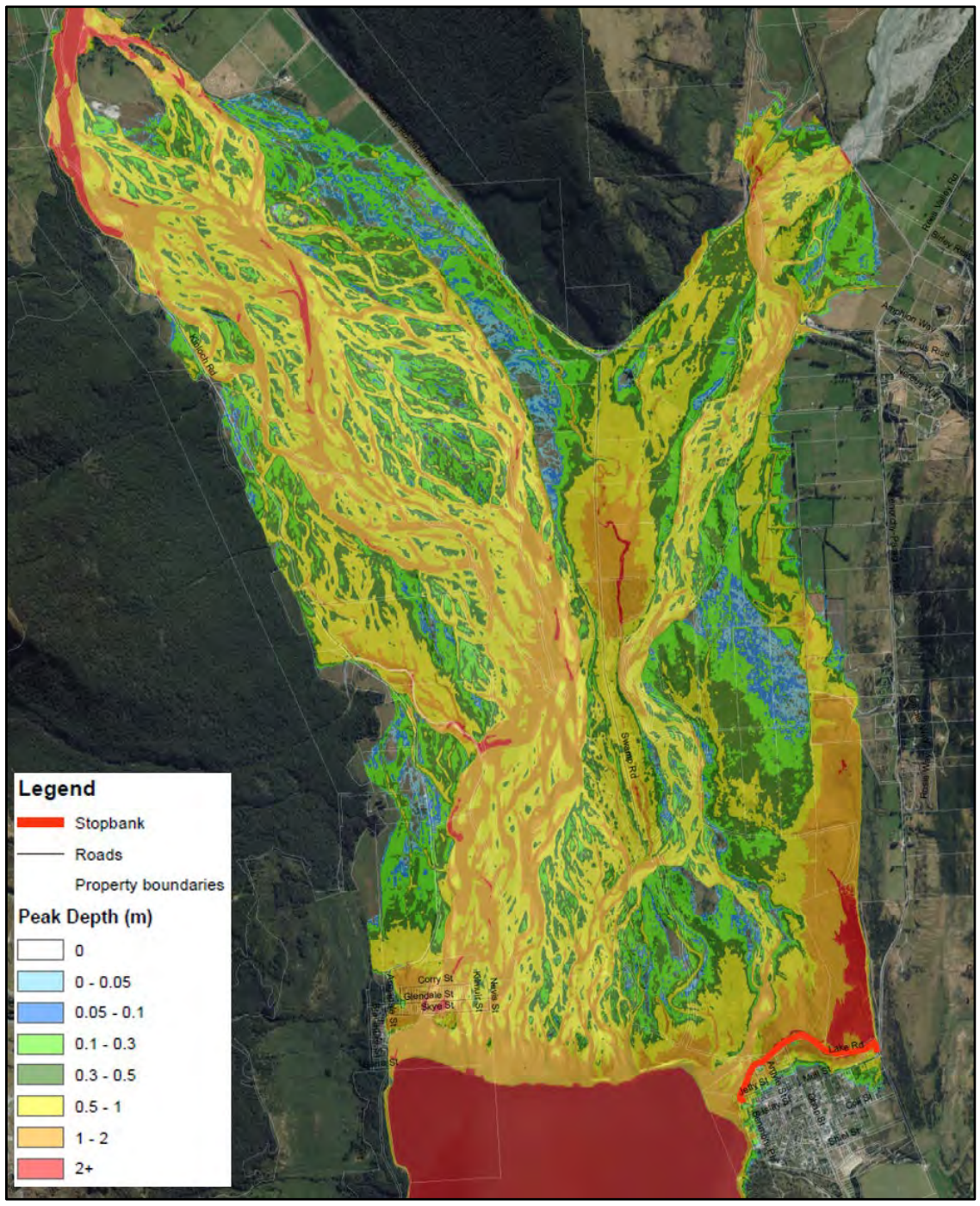


Figure 9.6 Model results for a Dart-Rees flooding scenario with 100-year ARI river flows, and Lake Whakatipu at 10-year ARI levels. Colouring shows peak floodwater depths according to the included legend. Figure 9.7 shows detail of the Glenorchy township area for this scenario.

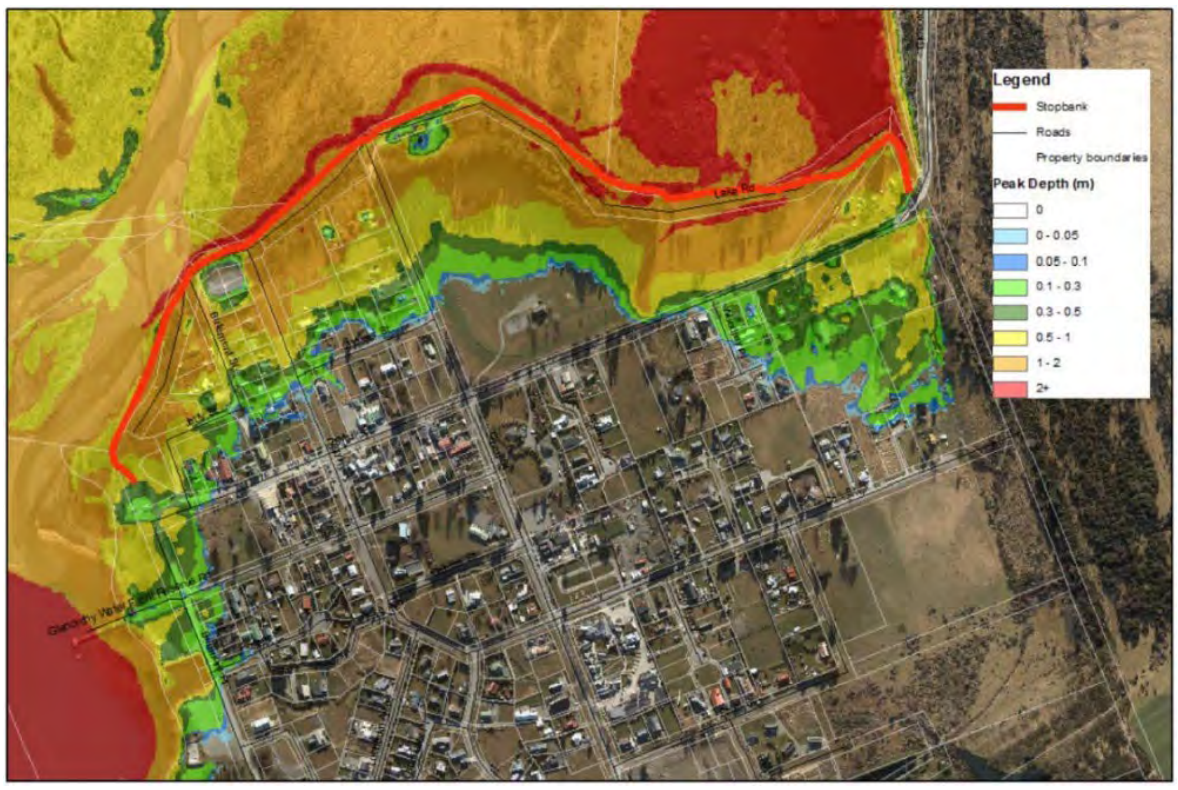


Figure 9.7 Model results for a Glenorchy flooding scenario with 100-year ARI river flows, and Lake Whakatipu at 10-year ARI levels. Colouring shows peak floodwater depths according to the included legend.

Figure 9.8 Model results showing floodwater depths for a Buckler Burn flooding scenario with a 300 m^3/s peak flow. In this scenario minor floodwaters flow into the township area, mainly flowing northwards along Oban Street and around the eastern margin of the township.

9.2.4 Alluvial fan hazards

The focus of alluvial fan hazard assessments for this work programme has been the Buckler Burn alluvial fan, on which Glenorchy township is constructed. In addition to the flood hazard assessments completed for the Buckler Burn alluvial fan by Beagley and Gardner (2023), a preliminary assessment of debris flood and debris flow potential was completed by Fuller and McColl (2021). This assessment considers debris flows unlikely to be a threat to Glenorchy, but identified possible high-energy debris flood deposits in drill core from within the township area.

Debris flow hazard modelling for the Buckler Burn using RAMMS software was reported by Faulkner (2021) and Faulkner and Rogers (2021) but was completed only as a test of sensitivity to factors such as failure locations, debris volumes and release mechanisms.

Other alluvial fans in the Head of the Lake area are mapped by Grindley *et al* (2009) and Barrell *et al* (2009),[10] with some known to be subject to flooding or debris inundation (e.g. Figure 5.19 and Figure 5.20), but these hazards have not been assessed in detail.

In April 2022, a debris flow event occurred at Shepherds Hut Creek, located about 8 km southwards from Glenorchy on the Queenstown-Glenorchy Road. Following the event, an assessment was completed by Shaw (2022) to review the event and comment on the debris flow hazard characteristics and risks.

Between Queenstown and Glenorchy, the road also traverses many other locations exposed to debris flow, flooding or landslide/rockfall hazards, but these hazards have not yet been assessed in detail.

[10] This mapping can be viewed in ORC's Natural Hazards Portal: http://hazards.orc.govt.nz.

9.2.5 Seismic hazard assessments

Seismic Shaking

Seismic shaking hazards were summarised by Menke *et al* (2024) in the Glenorchy and Kinloch Risk analysis. Aotearoa New Zealand is seismically active, with a high frequency of earthquakes. Earthquakes induce strong ground motion (earthquake shaking) in response to rapid release of built-up strain along fault lines. The intensity of shaking depends on the severity of the earthquake, distance from the epicentre, specific ground characteristics and local topography.

Numerous mapped fault systems are present in the wider area and influence seismicity in Kinloch and Glenorchy. Nearby possible active faults include the West Whakatipu Fault located approximately 2 km west of Kinloch and the Moonlight Fault approximately 15 km east of Glenorchy (Barrell, 2019a).

The most notable fault in the area is the Alpine Fault some 55 km to the nearest point from Glenorchy, due to the anticipated magnitude of earthquake and low recurrence interval. earthquake triggering at some point along the 800 km long Alpine Fault over the next 50 years is 75%, with an 80% chance that the earthquake event would exceed magnitude 8 (www.af8.org.nz). The potential AF8 hazards and impacts for Central Otagao include strong shaking triggering snow/ice avalanches, landslides and rockfalls on mountain and hill slopes, making some roads impassable and potentially isolating communities in the area. Central Otago lakes could be affected by landslide-triggered tsunami, making it important for communities to know the 'Long or Strong, Get Gone' messaging. Thousands of tourists may be stranded in the area, unable to get home and will need to be looked after for days due to damage to roads. Some areas may lose power and telecommunication services.

Assessment of shaking hazard for the risk assessment considers a range of probabilistic earthquake scenarios rather than specific fault rupture scenarios.

Menke *et al* (2024) reports that seismic shaking hazard at Kinloch and Glenorchy is expected to pose the greatest risk to buildings and lifelines infrastructure through structural damage, compared to relatively few injuries or deaths. During the 2010/2011 Canterbury earthquakes no deaths were attributed to structural failure of light weight timber frame buildings (being the typical building form within Glenorchy). However, one fatality occurred associated with collapse of a chimney induced by strong ground motion (Canterbury Earthquakes Royal Commission, 2012).

Liquefaction and lateral spreading

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 (Figure 9.9).

Mapping of liquefaction susceptibility (Barrell, 2019b) has been completed for the Otago region, providing an overview at a regional-scale of the hazard susceptibility. The regional-scale liquefaction hazard assessment is a classed as a Level A investigation in accordance with MBIE/MfE (2017) guidance.

For the Glenorchy township area, a more detailed (Level C) investigation was undertaken by T+T (2022). This study included geotechnical field investigations (boreholes and CPT), and geotechnical analysis for a range of seismic scenarios including an Alpine Fault rupture.

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.

The assessment developed a liquefaction vulnerability categorization map for the Glenorchy township study area (Figure 9.10 and Figure 9.11), intended to show broad trends in liquefaction vulnerability. For strong earthquake shaking, significant and widespread liquefaction land damage may occur across all the lower lying areas of Glenorchy in the north and west.

Findings show the potential for lateral spreading damage is highest near the lake edge and decreases with an increasing distance from the lake. The magnitude of potential lateral spreading damage increases with earthquake shaking at larger return periods, and for stronger shaking may be comparable or worse to that observed in parts of the residential red zone in Christchurch, which was typically in the order of 1m to 3m.

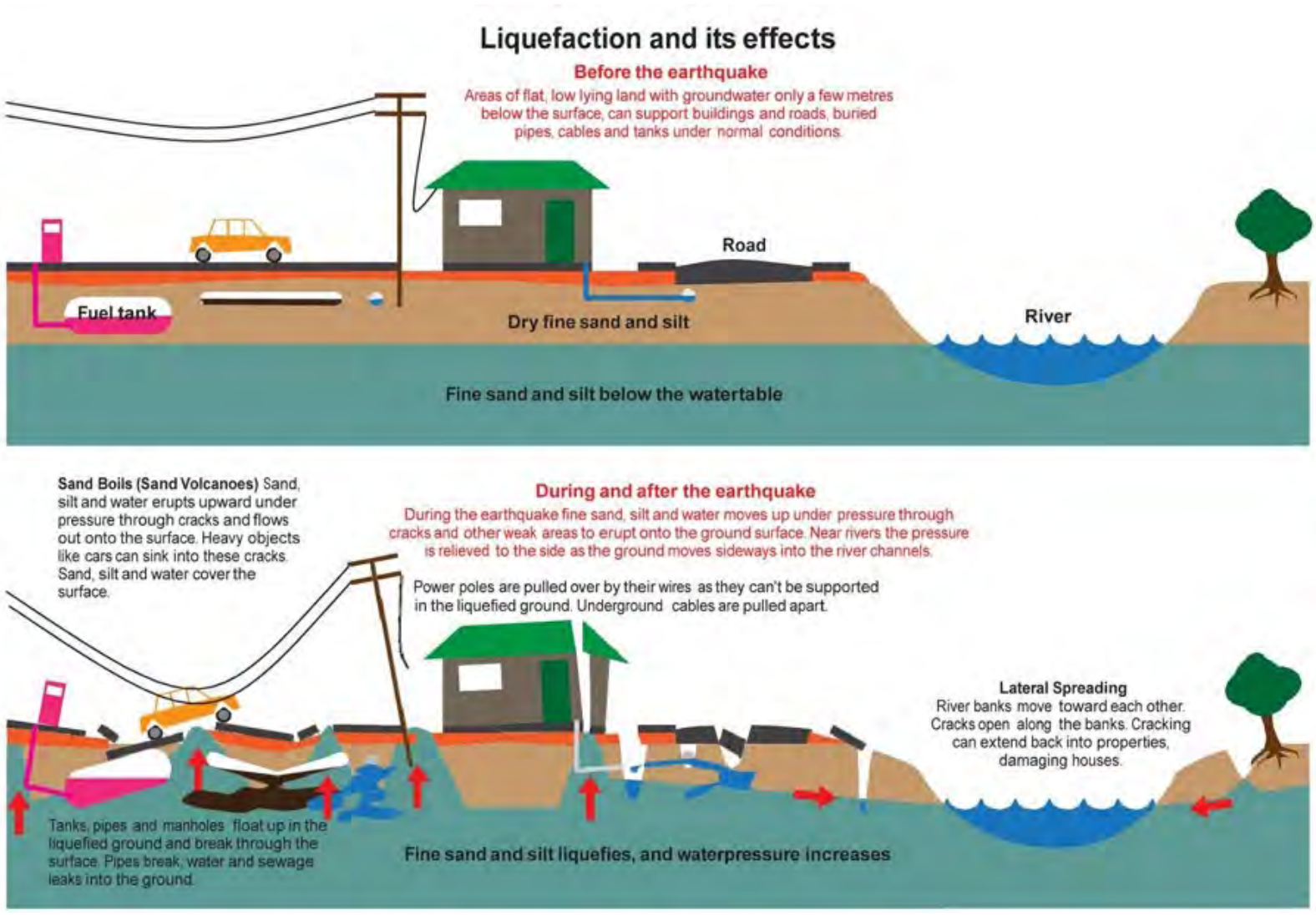


Figure 9.9 An illustration of liquefaction and lateral spreading processes and their effects (IPENZ, 2012).

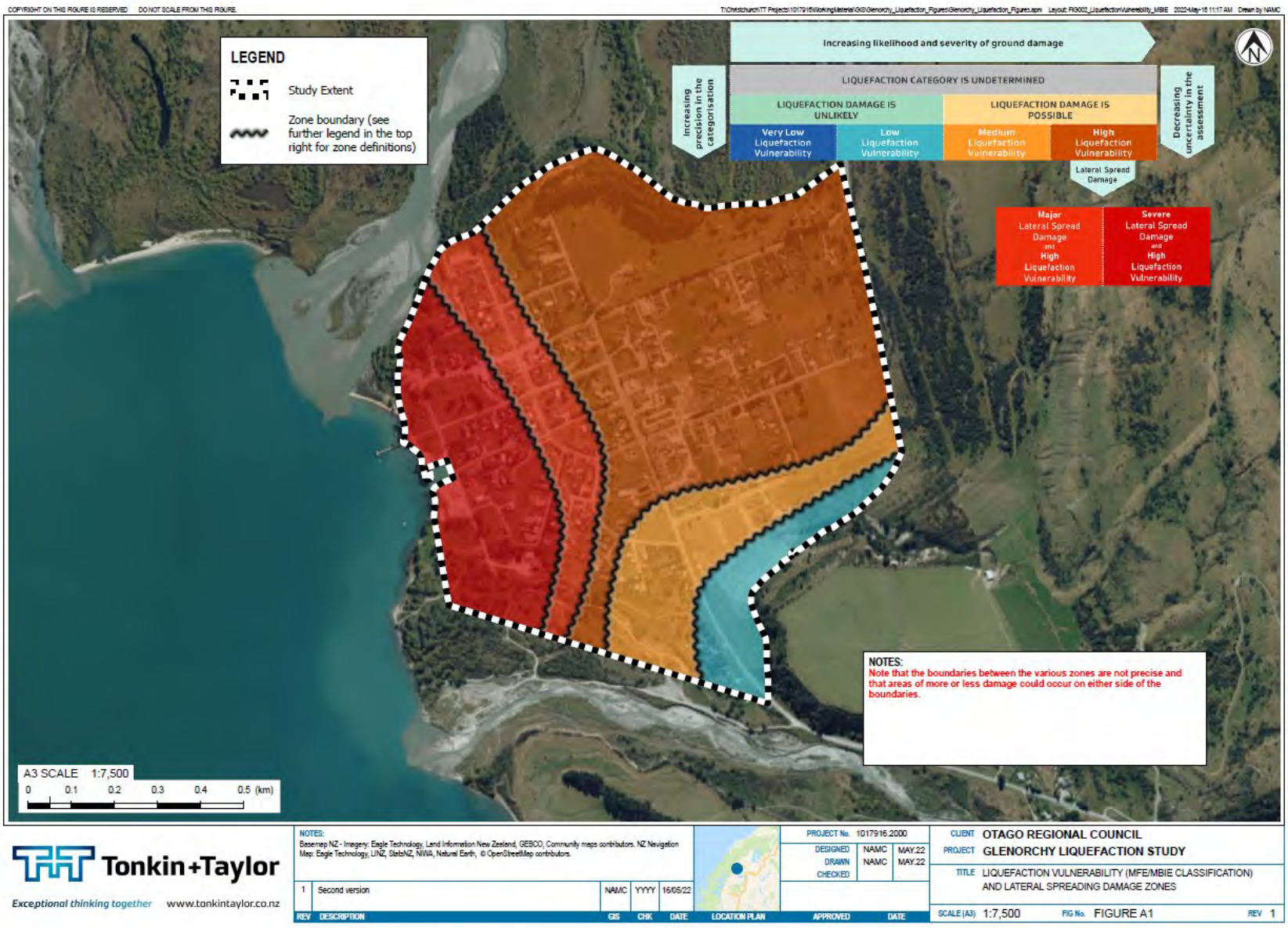


Figure 9.10 Liquefaction vulnerability categorization for Glenorchy township. The boundaries between the hazard categories shown are indicative of the spatial distribution of the liquefaction and lateral spreading vulnerability but are uncertain and not intended as a precise boundary between hazard categories. In reality, areas of damage might well occur on either side of the boundaries illustrated. T+T (2022).

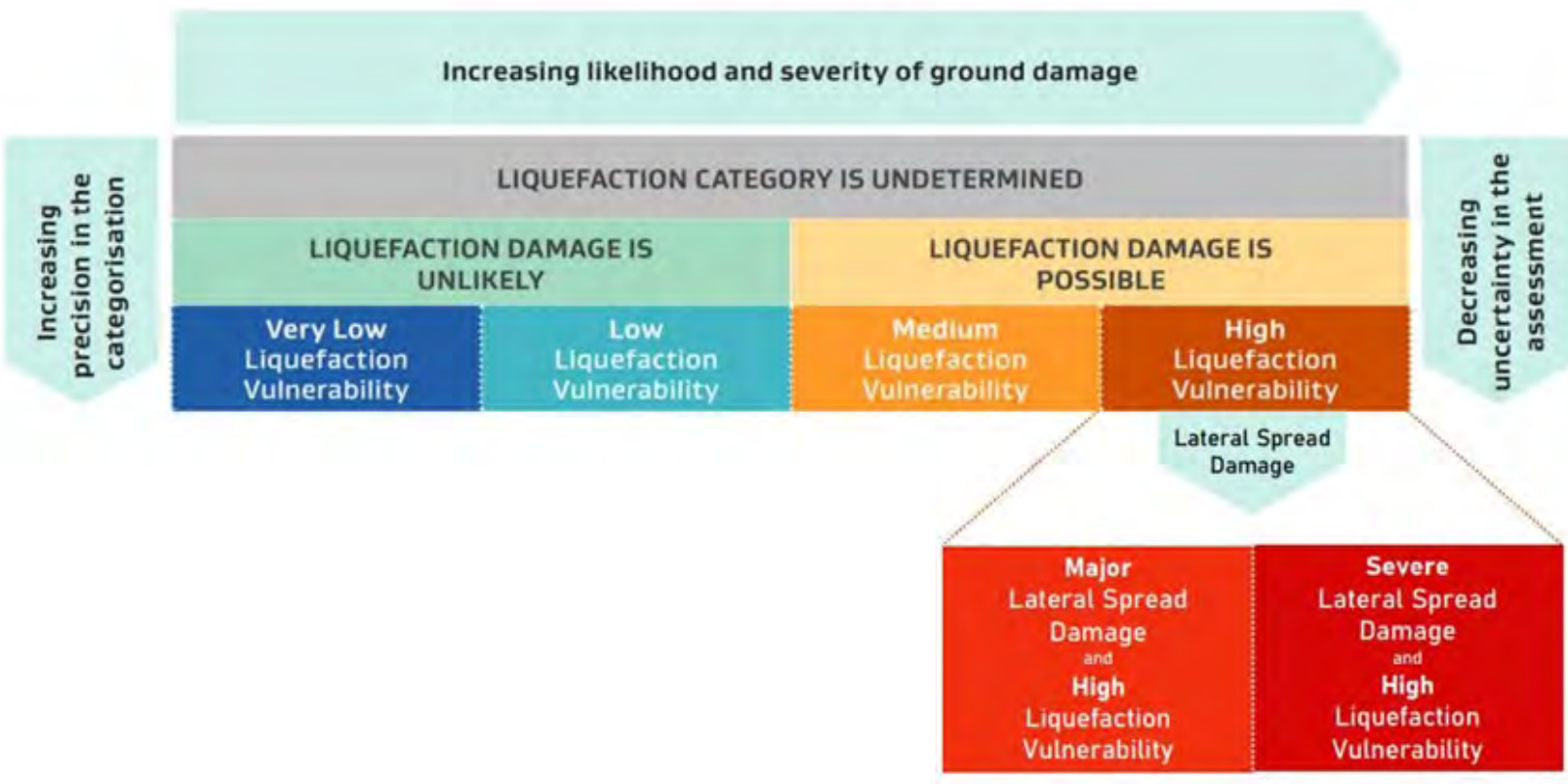


Figure 9.11 Magnified image of the hazard categorisation used for assessment of both liquefaction and lateral spreading hazard. T+T (2022).

9.3 Phase 2: What matters most?

Figure 9.12 "What matters most?" Steps 3 & 4 of the adaptation cycle (modified from MfE 2024).

9.3.1 Collaboration and engagement with community, partners and stakeholders

As highlighted in Figure 9.1, community engagement is central to the adaptation cycle in all steps. The development of the Strategy and ideas for adaptation pathways has involved extensive engagement with communities, experts, mana whenua, and partner agencies. We are immensely grateful for everyone who has contributed to this Strategy. Communications and engagement activities are summarised in Table 9-1 below.

ORC is part of a wider network of people and organisations working to adapt to natural hazards and impacts of climate change at the Head of the Lake. To develop this Strategy, ORC has taken a collaborative approach across and between councils, mana whenua, central government, stakeholders and the local community. These include agencies and organisations such as QLDC, CDEM Otago, Aukaha, Te Ao Mārama, Glenorchy Community Association, Department of Conservation, Enviroschools, as well as consultants and experts.

At an operational level ORC has encouraged partnership and collaboration through:

- Knowledge and information sharing through regular catch up and programme updates.
- Inviting staff to collaborate and input on various programme workstreams, including programme planning, engagement planning, adaptation options assessment.
- Expert advice, input and feedback on hazard investigations and reports.
- Supporting the delivery of technical studies and assessments led by partners.
- Collaborating on the delivery of engagement activities.

Table 9-1 Summary of communications and engagement activities as part of the programme from 2019-2024.

Activity	Date	Summary	Agencies or organisations involved
Presentations to Glenorchy Community Association	2019-2020	Update the Glenorchy Community Association on ORC's completed and planned natural hazards activities.	Otago Regional Council Glenorchy Community Association
Community drop-in session	December 2020	Discuss and provide information on the range of natural hazard events the community is exposed to, and how these events and landscape changes have impacted the community in the past.	Otago Regional Council Queenstown Lakes District Council Tonkin + Taylor Glenorchy Community Association Civil Defense Emergency Management Otago
Public presentation	April 2021	Expert (Prof. James Brasington, University of Canterbury) overview of the river processes and changes of the Dart-Rees floodplain, and their implications for natural hazards.	Otago Regional Council University of Canterbury
Community drop-in session	April 2021	Discuss with the community the natural hazards challenges facing this area in the future, and to initiate discussions about what adaptation to those challenges could look like.	Otago Regional Council Queenstown Lakes District Council Civil Defense Emergency Management Otago University of Canterbury Tonkin + Taylor NIWA
Online presentation	June 2022	Present and update on investigation findings into liquefaction and flood hazards.	Otago Regional Council Tonkin + Taylor Land River Sea Consulting

Activity	Date	Summary	Agencies or organisations involved
Community drop-in session	July 2022	An in-person opportunity to discuss in more detail the investigation findings into liquefaction and flood hazards.	Otago Regional Council Queenstown Lakes District Council Civil Defence Emergency Management Otago Tonkin + Taylor
Community workshop sessions	August 2023	To workshop ideas about community aspirations for the future and have discussions about a long-list of possible adaptation options	Otago Regional Council Queenstown Lakes District Council Civil Defence Emergency Management Otago Glenorchy Parent, Teacher and Friends Association NIWA
Community input into Socio-Economic Impact Assessment	July 2023 – April 2024	Community input into scope of assessment, methodology, data collection phase and draft report.	Glenorchy Community Association Beca
Online survey	September 2023	To get feedback on community values and aspirations for the future, and how we should engage in the future.	Otago Regional Council
Stall at Glenorchy Village Fair	November 2023	To initiate discussions about the natural hazards adaptation programme, community resilience and preparedness.	Otago Regional Council Civil Defence Emergency Management Otago
Adaptation education session at Glenorchy	April-May 2024	To build understanding of landscape changes over time, how people have adapted to these changes in the past and present and what adaptation could look like in the future.	Otago Regional Council Enivroschools
Head of the Lake Youth Art Competition	April-May 2024	To engage children and youth people in the programme and better understand their values.	Otago Regional Council

Activity	Date	Summary	Agencies or organisations involved
Online presentation	May 2024	To present and update on findings of socio-economic impact assessment.	Otago Regional Council Queenstown Lakes District Council Beca
Public (in-person and online) presentation	September 2024	To present and update on findings of risk analysis and assessment of possible Dart-Rees floodplain interventions.	Otago Regional Council Queenstown Lakes District Council Civil Defence Emergency Management Otago NIWA Beca Damwatch Engineering
Community drop-in session	September 2024	An in-person opportunity to discuss in more detail the findings of the risk analysis and assessment of possible Dart-Rees floodplain interventions. Also, to initiate discussions about what adaptation could look like over the short to long term.	Otago Regional Council Queenstown Lakes District Council Civil Defence Emergency Management Otago NIWA Beca Damwatch Engineering
Monthly email newsletter	41 editions since August 2020	To provide progress updates for the work programme and give an indication of upcoming project work.	Otago Regional Council
Media releases and media coverage	Ongoing	To provide updates on key milestones in the programme. Media interest in aspects of the programme.	Otago Regional Council
Communications and advertising channels	Ongoing	Tailored communication and advertising for programme activities (such as Facebook ads and events, Google ads, flyer, letter drop)	Otago Regional Council

Activity	Date	Summary	Agencies or organisations involved
Programme webpage	Ongoing	To provide information about the programme and – site for links and find key materials	Otago Regional Council
Designated programme email address	Ongoing	Easy way for people to contact the team about the programme: headofthelake@orc.govt.nz	Otago Regional Council
Supported two research projects	2021-2023	Masters research project about storytelling and the ORC's community engagement process (MacKenzie, 2023).	University of Otago, Resilience to Nature's Challenges
	2021 - ongoing	Research project about landslide-generated tsunami hazards of the Lake Whakatipu basin.	Massey University, University of Otago, NIWA

Figure 9.13 Community engagement session August 2023

Figure 9.14 Manager Natural Hazards Jean-Luc Payan at the September 2024 community drop-in session

9.3.2 Values and aspirations for the future

The Head of the Lake community has a strong and clear set of shared values and aspirations for the future, as noted in the 'Glenorchy – Head of the Lake 2001 Community Plan' and 'Shaping our Future: Glenorchy Community Visioning Report 2016' (Blakely Wallace Associates, 2001 and Shaping Our Future, 2016). Through engagement people provided many insights into what matters most to them at the Head of the Lake. This has helped to generate a set of shared community values that will provide guidance for decision making at the Head of the Lake now and into the future.

In the 2001 Community Plan, reinforced in the 2016 Visioning process, core resident values included being safe, caring, self-reliant, welcoming, working together, and respecting the environment (Blakely Wallace Associates, 2001). Residents also valued the history of the area, the rural atmosphere, peacefulness, landscapes, and having the wilderness at their doorstep.

The community vision for the area as part of the Shaping our Future (2016) report, is as follows:

- *"A unique, inclusive community that fosters and embraces individuality, diversity and innovation, encourages resilience and promotes community vitality and collaboration. The Glenorchy community has a collective strong voice that advocates for positive change. Glenorchy has the infrastructure to support a thriving boutique local economy in keeping with the rural landscape, actively respects and enhances the natural environment, collectively works towards providing their own resources (self-sufficiency)."*

The 2001 and 2016 values and vision align closely with feedback elicited as part of the engagement process. From all the feedback and engagement, as part of methods outlined in Table 9-1, the following overarching community values emerged:

- **Lifestyle and wellbeing** – people feel safe to do their day-to-day activities. A sustainable, self-sufficient, and resilient community.
- **Environment** – sense of stewardship and connection to nature – mountains, rivers, lake. A place for wildlife and biodiversity to thrive.
- **Belonging** – a feeling of home. A strong sense of community where people support and take care of each other.
- **Recreation** – being able to enjoy recreation and links to the broader environment. A place for residents and visitors to enjoy together.

Additionally, the Head of the Lake Youth Art Competition built upon previous engagement about community values and what matters most to people about Glenorchy. The theme was 'what does the Head of the Lake mean to you?'. Art entries from children and youth emphasised nature, cultural heritage, social connections, and play. These entries are displayed on the front and back cover of the Strategy.

Through the engagement process, we invited people to help develop community outcomes through a workshop exercise and online survey. These outcome statements for the Strategy will inform decision-making and pathways planning discussed in Section 0:

- Outcome #1 – A community that feels safe and supported from the impacts of natural hazards
- Outcome #2 – Residents feel at home, connected to their environment and supported by the experience of community
- Outcome #3 – A beautiful environment and a feeling of connection with nature
- Outcome #4 – Sustainable, functioning ecosystems

- Outcome #5 – The opportunity to make a living
- Outcome #6 – Be resilient and self-determining
- Outcome #7 – Functional, resilient and accessible infrastructure, support services and emergency response
- Outcome #8 – Heritage is safeguarded and accessible
- Outcome #9 – A healthy community that promotes the wellbeing of all

Takau (2021) outlined key values for mana whenua in a Cultural Values Statement to guide planning and decision-making at the Head of the Lake now and into the future.

Ka Uara – Core cultural values:

- **Mana** – mana whenua are leaders, influences and partners.
- **Mauri** – protect and enhance the mauri (life force) of the Head of Lake Whakatipu, now and well into the future.
- **Whakapapa** – The traditional authority of mana whenua at the Head of the Lake is recognised ancestral rights which give mana whenua the mana and kaitiaki responsibilities.

Additional Kāi Tahu values include:

- **Ki Uta ki Tai** – commonly translated to ‘from the Mountains to the Sea’ but means interconnectedness across the whole environment.
- **Kaitiakitak**a – intergenerational and inherited responsibility and stewardship by mana whenua on behalf of future generations.
- **Maanakitaka** – expressing aroha, hospitality, generosity and mutual respect. Processes and decisions that enable positive social outcomes and support wellbeing.
- **Mahika kai** – ability to, and access to, gather or harvest resources. Ensure a healthy functioning ecosystem and sustainable harvesting practices.
- **Wai Māori and Wai Ora** – importance of protecting and enhancing the wellbeing of all bodies as water is a sacred entity in te ao Māori, and is the source of all life.
- **Maumaharataka** – acknowledging and upholding memories of the past and Kāi Tahu pūrakau (stories)
- **Whakawhanaukataka** – relationship and community building, working together for the benefit of the community.

The Head of the Lake area is immensely significant to mana whenua. To uphold the mana of kā rūnaka, it is crucial that mana whenua have authority over how their manawa (aspirations) for the future are portrayed and represented in this Strategy and in future actions (as outlined in Section 9.4.2.1). Councils need to ensure engagement is open and ongoing with mana whenua as the programme progresses.

9.3.3 Fears and concerns

As the programme has developed, people have also shared some of their fears and concerns about the programme and potential adaptation actions at the Head of the Lake. Concerns and fears include:

- Impact of natural hazard investigations on property values, property owners’ ability to get property insurance, or result in rising insurance premiums. In particular, focusing on

findings before the Strategy has been developed or decisions on adaptation action have been made.

- Media attention about natural hazards and the programme could result in the reluctance of tourists to visit, further reducing the ability of the resident communities to withstand disruption.
- Media attention putting a negative 'spotlight' on Glenorchy based on the area's natural hazard risk profile compared to other areas around the region.
- Some residents have highlighted parts of the community, including youth, parents of young families, and newer residents to the community, who have not been as engaged in the process. Therefore, their voices and perspectives may be under-represented from the development of the Strategy.
- Some residents have highlighted parts of the community, including newer residents to the community, are less informed about natural hazard risks and adaptation, which consequently impacts their ability to respond and be resilient to natural hazard challenges.

This general feedback has informed ORC's approach throughout the programme and to develop this Strategy. It will continue to inform decision-making and actions relating to the Strategy moving forward.

9.3.4 Potential social and economic consequences of natural hazards

In addition to the socio-economic baseline, Healy *et al* (2024) also examined the potential social and economic consequences of three indicative natural hazard scenarios in relation to the status quo (the current community and the natural hazard management measures currently in place).

9.3.4.1 IN WHAT WAYS IS THE COMMUNITY RESILIENT?

Local groups such as Glenorchy Community Response Group and Community Association play a significant role in disaster preparedness and response. These groups, collaborating with CDEM Otago, regularly organise training sessions and awareness activities to enhance community response skills. They provide information to the Emergency Management Advisor and activate a Community Emergency Hub during crises to coordinate local response efforts. Additionally, they fundraise to support community projects, which strengthens resilience and preparedness (Glenorchy Community Response Group, 2022; Healy *et al*, 2024).

Social cohesion is a defining characteristic of the Head of the Lake, where residents frequently unite to achieve common goals and welcome newcomers (Healy *et al*, 2024). This strong sense of support, cooperation is key to resilience to natural hazards. Social cohesion helps foster networks that aid in adaptation and disasters preparations. It also promotes resource sharing, information exchange and collaboration during emergencies.

9.3.4.2 IN WHAT WAYS IS THE COMMUNITY VULNERABLE?

Healy (2024) noted that there are several sectors of the community that are particularly vulnerable to natural hazards. Namely, the high-needs population, elderly, young people and families, tourists/visitors, people with multiple, low-level, low-income jobs, and temporary workers.

The demands of living in the Head of the Lake requires a level of health and mobility. These demands are likely to increase in a natural hazard event, therefore those with a high level of

physical or mental health needs and disability are likely to be vulnerable. There are currently relatively low levels of physical limitations and disability reported in the community (2.4%) (StatsNZ, 2023). However, research participants noted that mental health was as concerns for members of the community.

The Head of the Lake community is a small community and often people “wear many hats”. In a natural hazard event, these people would be susceptible to high levels of fatigue from trying to address both their household and community’s challenges.

The economy of Head of the Lake economy is driven largely by tourism, followed by hospitality and film production. This dependency leaves the community vulnerable to external fluctuations, such as visitor numbers, infrastructure, and natural resources. The impact of reduced visitor numbers causes large financial pressure on both the local economy and people’s livelihoods. Most businesses noted a dependency on roading and telecommunications for operations. Many businesses directly or indirectly depend on Head of the Lakes natural resources (e.g., mountains, lake, rivers, landscapes) for the operation of their businesses.

9.3.5 Glenorchy and Kinloch Natural Hazards Risk Analysis

Assessments were undertaken by Menke *et al* (2024) to better understand and characterise the natural hazards risks at Glenorchy (Tāhuna) and Kinloch.

The purpose of the risk analysis was to;

- Provide the head of Lake Whakatipu community with information on the relative levels of natural hazard risk in the township. This information was specifically requested by the community as feedback during community engagement sessions, and as feedback on behalf of the Glenorchy Community Association.
- To provide a robust evidence base for any future land use decision making, such as if avoidance approaches may be appropriate for higher-risk areas.
- To provide a greater risk understanding for identification and prioritisation of risks to assist adaptation or risk management activities.

The risk analysis made use of all natural hazards assessments previously completed, particularly the more detailed hazard analysis carried out for flooding hazards (Gardner, 2022; Gardner and Beagley, 2023; Beagley, 2024) and for liquefaction hazard at Glenorchy (T+T, 2022).

The analyses considered the risk to life and property from the following natural hazards:

- River flooding from Rees River, Dart River and Buckler Burn.
- Lake Whakatipu flooding
- Seismic shaking.
- Liquefaction and lateral spreading in earthquakes (Glenorchy only).

Risk was initially assessed qualitatively (descriptively), and then quantitatively (providing a numeric risk value) for those hazards warranting further assessment.

A short list of natural hazards potentially impacting Glenorchy and Kinloch was developed and agreed with ORC following a high-level review of hazards and community exposure, as well as suitability of available data to conduct risk analyses.

9.3.5.1 RISK ANALYSIS PROCESS

Qualitative and quantitative risk analyses have been completed for the short-listed natural hazards in accordance with the requirements set out by the proposed Otago Regional Policy

Statement (RPS) - Hearing Panel version (ORC, 2022), which has been notified but is subject to appeal[11]. The proposed RPS presents a framework for the assessment of natural hazards in Otago which considers the interaction between a hazard occurring (likelihood) and the effects on life and the built environment (consequence). The proposed RPS requires three scenarios to be considered for each hazard representing median likelihood, high likelihood, and maximum credible event. The approach uses the following relationship:

Risk = Hazard (likelihood) x Consequence

Risk is assessed for the following elements in accordance with (and using the same terminology as) the proposed RPS (ORC, 2022):

- Qualitative risk:
    1. Health and safety (injuries and death)
    2. Built environment
        - Buildings
        - Lifelines (essential infrastructure services e.g., water, transport, power, telecommunications)
- Quantitative risk:
    1. Life
    2. Property

Qualitative Risk Analysis Process

Qualitative risk analysis uses professional judgement and qualitative observations to evaluate the potential risks of each hazard against a range of prescribed consequence criteria. It is typically used where there is insufficient data for quantitative analysis or as a preliminary screening tool to determine whether quantitative analysis is required.

Qualitative risk is determined using a matrix of likelihood and consequences, as shown in Table 9-2. Each square corresponds to a different combination of likelihood and consequences. Green squares are *Acceptable* risk, yellow are *Tolerable* Risk and red are *Significant* risk.

[11] proposed RPS is subject to appeal, which means the provisions around natural hazards may change through mediation or hearing.

Table 9-2 Qualitative risk matrix from proposed RPS (Table 8).

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain					
Likely					
Possible			example		
Unlikely					
Rare					
Green, Acceptable *Risk*: Yellow, Tolerable *Risk*: Red, Significant *Risk*					

Proposed RPS appendix (APP6) provides further guidance on how to assess likelihood and consequences of the selected natural hazard scenarios. Guidance on consequence includes descriptions of severity of impact (ranging from insignificant to catastrophic) for Health & Safety (deaths and injuries) and Built Environment (Social/Cultural, Buildings, Critical Buildings and Lifelines) and a list of other considerations.

First step is to determine the likelihood of a natural hazard scenario; second step is to determine the consequence; third step is to plot where they intersect in the Qualitative Risk Category matrix. For the example shown, a scenario with 'possible likelihood' and 'moderate consequences' gives a yellow 'Tolerable' risk category.

Quantitative Risk Analysis Process

Quantitative risk analyses allow for greater consideration of uncertainty and provides a numerical expression of risk for each hazard scenario. The output is natural hazard risk presented as an annualised probability.

The quantitative assessment of life risk considers the probability that an individual most at risk is killed in any one year as a result of the hazards occurring. This is termed the Annual Individual Fatality Risk (AIFR).

The quantitative assessment of property risk considers the probability of total property (i.e., building) loss in any one year as a result of the hazards occurring, and is termed the Annual Property Risk (APR). Total property loss occurs when the cost of repair exceeds the value of the property.

Quantitative risk (AIFR and APR) is calculated from the following equation:

Quantitative Risk = **Annual Probability** x **Spatial Probability** x **Temporal Probability** x **Vulnerability**

Where:

- The ***annual probability*** is the risk of the hazard occurring in any one year.
- The ***spatial probability*** relates to impact by the hazard in a specific location occupied by the person most at risk, or occupied by property.
- The temporal probability for
    a) ***life risk*** incorporates the proportion of the time the person most at risk is present and allowing for the possibility that the person may be able to evade the hazard.

b) ***property risk*** is 1.0 (i.e., the house or building is always present).

- The vulnerability for
  a) ***life risk*** is the probability of death of the person most at risk, in the event of an interaction with the hazard.
  b) ***property risk***, it is the vulnerability of the property to the damage, or the expected proportion of property value lost in the event of being impacted by the hazard (typically termed the damage ratio).

The assessment does not consider specific locations of people or buildings, and assumes they could be present anywhere across the study area, to allow for relative comparison of risk levels.

Quantitative risk levels are categorised in accordance with Table 9-3 following quantitative analysis. The defined risk levels apply to both life (AIFR) and property (APR), for existing developments.

Table 9-3 Quantitative risk levels in accordance with the proposed RPS (ORC, 2022).

Risk Category	Risk Value
Acceptable	Less than $1x10^{-5}$
Tolerable	$1x10^{-4}$ to $1x10^{-5}$
Significant	Greater than $1x10^{-4}$

9.3.5.2 RISK ANALYSES RESULTS

A summary showing the risk levels results are shown in Table 9-4. The qualitative analysis was used as a screening tool to identify risks that required further analysis, and these were carried forward to the quantitative analysis.

The qualitative analysis considered:

- All scenarios or scales of hazard,
- Any location within the study area, and
- All built environment sub-categories, where assessed (e.g., lifelines, buildings etc).

Qualitative analysis findings include some *Acceptable* and *Tolerable* risks that do not require further assessment:

- Lake Whakatipu flooding health and safety risk is *Acceptable* for all areas due to the slow speed that lake levels typically rise and the prolonged warning times.
- Seismic shaking health and safety risk is *Acceptable*, as the potential for collapse of the typical timber-framed building in Glenorchy and Kinloch is relatively low and would not necessarily lead to fatality or serious injury. Built environment risk is considered as *Tolerable* due to potential for structural damage of lifeline infrastructure, such as water supply wells. Predicted damage to buildings is considered to result in *Acceptable* levels of risk.
- Liquefaction and lateral spreading health and safety risk for Glenorchy is *Acceptable*, as this hazard generally does not cause death or injury.

Table 9-4 Summary of risk analysis findings (Menke et al, 2024)

Hazard	Qualitative Assessment		Quantitative Assessment	
	Health and Safety Risk	Built Environment Risk	Life Risk (AIFR)	Property Risk (APR)
River flooding – Buckler Burn	☑	☑	Acceptable	Significant
River flooding – Rees/Dart	☑	☑	Acceptable	Significant
River flooding – Joint (multiple sources)	n/a	n/a	Acceptable	Significant
Lake Whakatipu flooding	Acceptable	☑		Significant
Liquefaction and lateral spreading - Glenorchy	Acceptable	☑		Significant
Seismic shaking	Acceptable	Tolerable		

☑ risks carried forward for quantitative analysis

Acceptable and *Tolerable* risks that do not require further analysis

Other qualitative findings:

- Large Buckler Burn flood events are expected to flood Queenstown-Glenorchy Road, cutting off access to Glenorchy and Kinloch.
- Liquefaction is predicted to be widespread for Glenorchy, with lateral spread displacements up to 3m predicted along the shoreline. Such large displacements would lead to the development of both wide and frequent cracking of the ground sub-parallel to the lake edge and lateral stretch across buildings. Such ground displacements would lead to significant structural damage and potential for building collapse. Lifeline risk is also considered *Significant*.

On the basis of the qualitative results, the following **hazards were identified and carried forward to quantitative analysis**, as agreed with ORC:

- Buckler Burn flooding – life risk (AIFR) and property risk (APR)
- Rees/Dart flooding – life risk (AIFR) and property risk (APR)
- Joint flooding scenario – life risk (AIFR) and property risk (APR)
- Lake Whakatipu flooding – property risk (APR)
- Liquefaction and lateral spreading (Glenorchy) – property risk (APR)

Note, the 'joint flood' event is a modelled scenario where Buckler Burn, Dart/Rees Rivers, Bible Stream, and two small Glenorchy catchments flood at the same time. This was assessed during the quantitative analysis only due to the availability of additional flood modelling data.

The impacts of liquefaction in Kinloch were not assessed as there is insufficient data available to inform a risk assessment.

A summary of the quantitative analysis results are shown in Table 9-4 and discussed below. Quantitative risk levels are categorised in accordance with the proposed RPS defined risk levels for existing developments (Table 9-3).

Annual Individual Fatality Risk (AIFR) - River Flooding

Results of the river flooding life risk (AIFR) analysis are shown in Figure 9.14. Each map shows the combined risk, being the sum of risk from all three scenarios assessed for each hazard.

The risk to life (AIFR) from river flooding hazards has been assessed as *Acceptable* for developed areas in Glenorchy and Kinloch. The *Significant* effects of flooding are concentrated on the margins adjacent to the rivers and lake, and outside the developed areas. This lower level of risk is partly a function of the ability of people to evade slow rising floodwaters.

In Glenorchy, the primary river flooding risk come from flooding of the Rees/Dart Rivers. However, Buckler Burn also poses some risks within the township. The areas with the highest life risk (AIFR) are the Glenorchy lagoon, the lakefront (including Jetty Street and Benmore Place), and the Glenorchy golf course. Areas behind the floodbank, near the confluence of the Rees River and the lagoon, show the highest estimated AIFR values but are considered *Acceptable*.

The highest risks in Kinloch are also caused by Rees/Dart flooding. Existing buildings west of the Kinloch Road are in low flood risk areas. Areas east of the Kinloch Road have the highest life risk (AIFR) values but are still considered *Acceptable*.

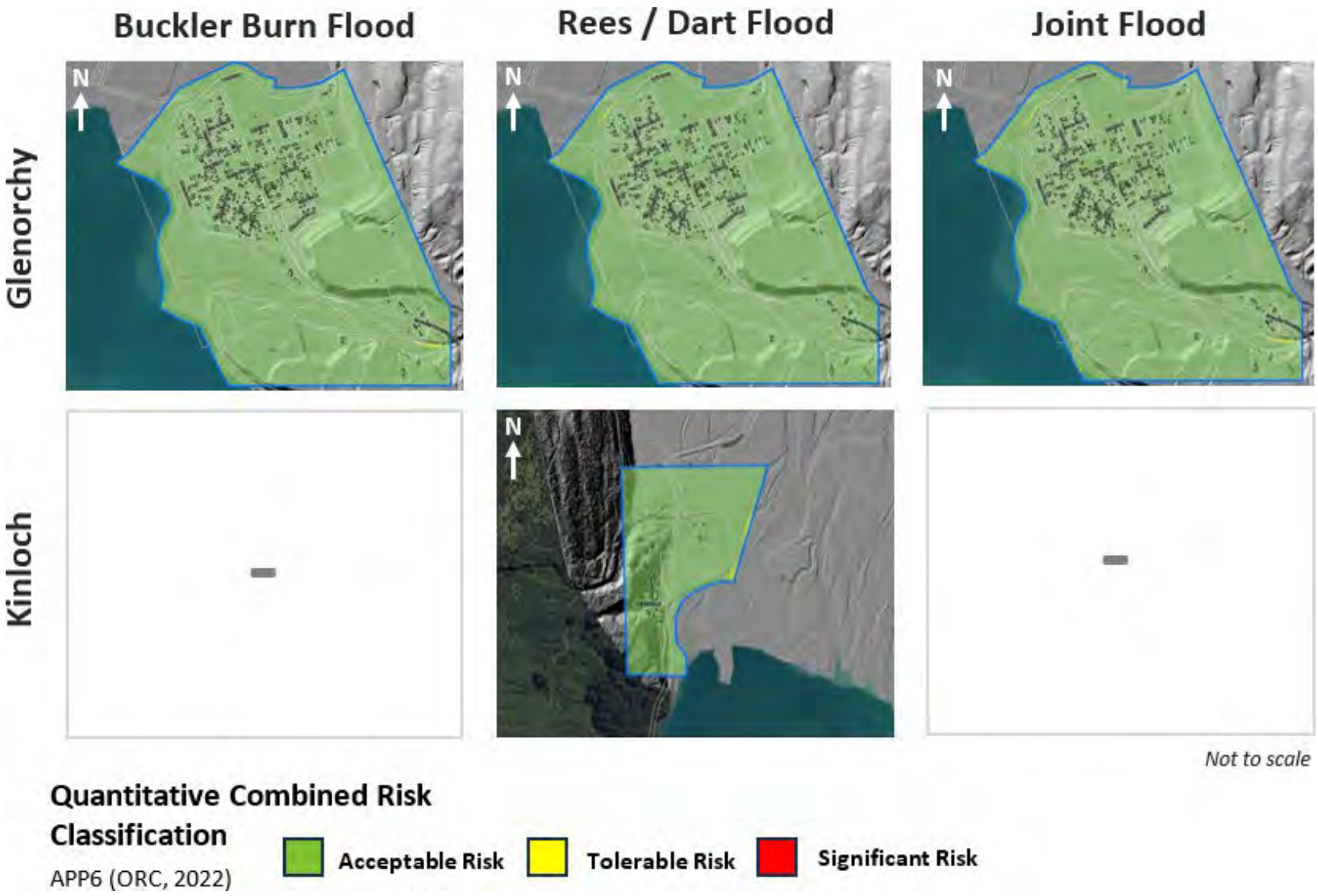


Figure 9.15 River flooding life risk (AIFR) levels

Annual Property Risk (APR) - River Flooding

Results of the combined river flooding annual property risk (APR) analysis are shown in Figure 9.15.

Quantitative property risk levels vary spatially between hazards, with the risk to property being *Significant* along the river and lake margins, and *Acceptable* outside of these areas. A large proportion of the land area that is most prone to flooding and within the *Significant* risk categorisation is used for community recreation and does not house a permanent population (including recreation reserve/parks and the golf course).

A Dart/Rees River flood poses the highest risks to property, having the highest APR values and the greatest extent of potential damage to property. In Glenorchy, this leads to potential damage around the lagoon and the Rees River mouth, with the highest property risk (APR) values on the golf course, in areas of *Significant* risk. In Kinloch a Rees/Dart River flood could potentially damage areas to the east of Kinloch Rd with APR calculated to be *Significant*.

The potential damage caused by the Buckler Burn is limited to a few areas within its modelled overland flow path along the Glenorchy-Queenstown Road and Shield Street. Overall, the Buckler Burn has low property risk (APR values) and a small flood extent within the township area. Consequently, the additional damage caused by flooding from the Glenorchy catchments and the Buckler Burn in a joint flood scenario is minimal. The joint flooding scenario shows higher property risk (APR) values along Coll Street and the Glenorchy Cemetery, resulting in areas of *Significant* risk.

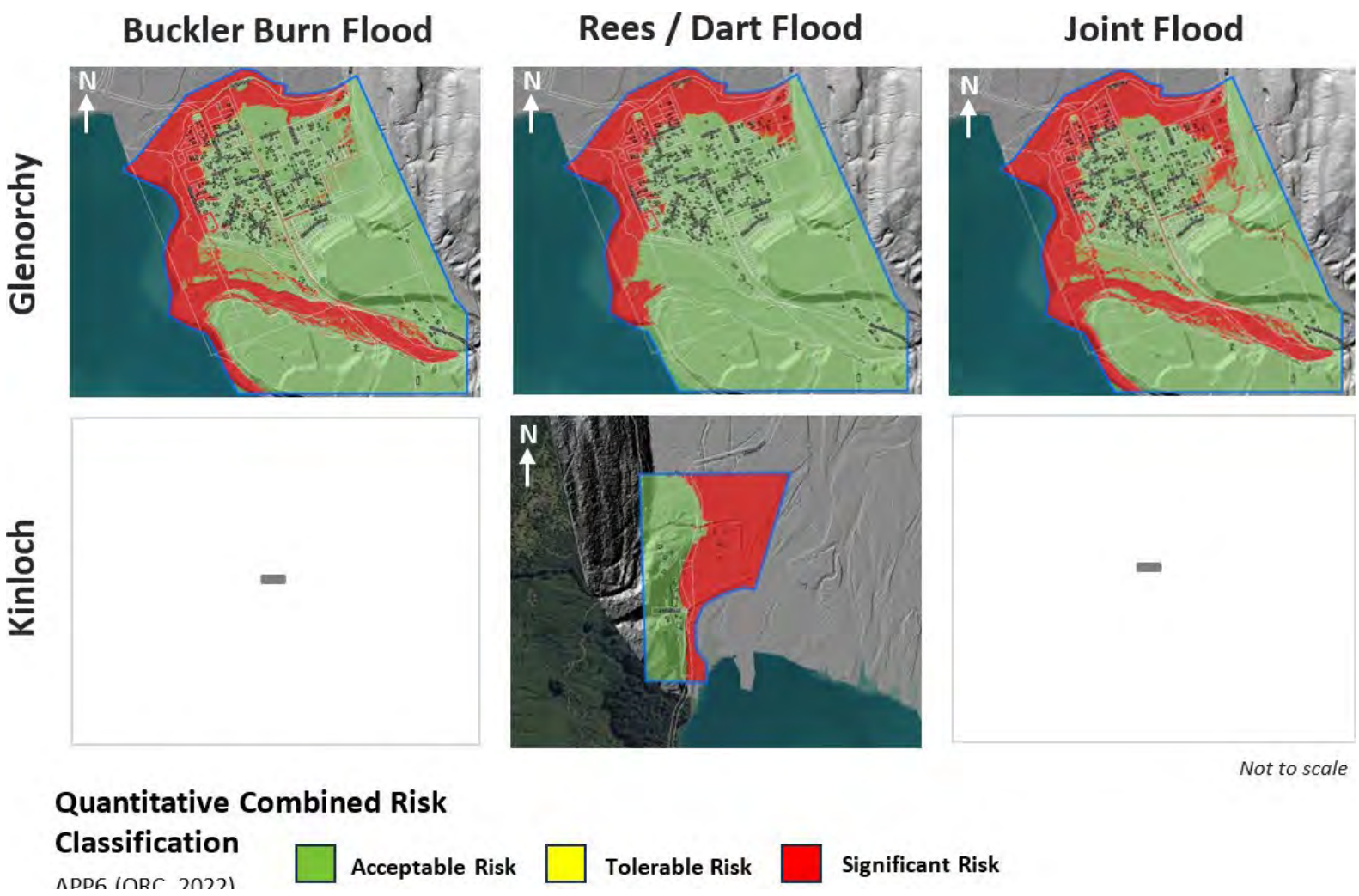


Figure 9.16 River flooding property risk (APR) levels.

Annual Property Risk (APR) - Lake Flooding

Results of the lake flooding property risk (APR) analysis are shown in Figure 9.16. Quantitative property risk levels show areas of *Significant* risk along the lake front at both Glenorchy and Kinloch, and the Rees River margin in Glenorchy.

The level of damage caused by a lake flood follows the topography of Glenorchy and Kinloch. The low-lying areas along the Rees lagoon and the lake are the areas most affected (e.g. Jetty Street and Butement Street). In Kinloch, APR values on Kinloch Road equate to a *Significant* risk.

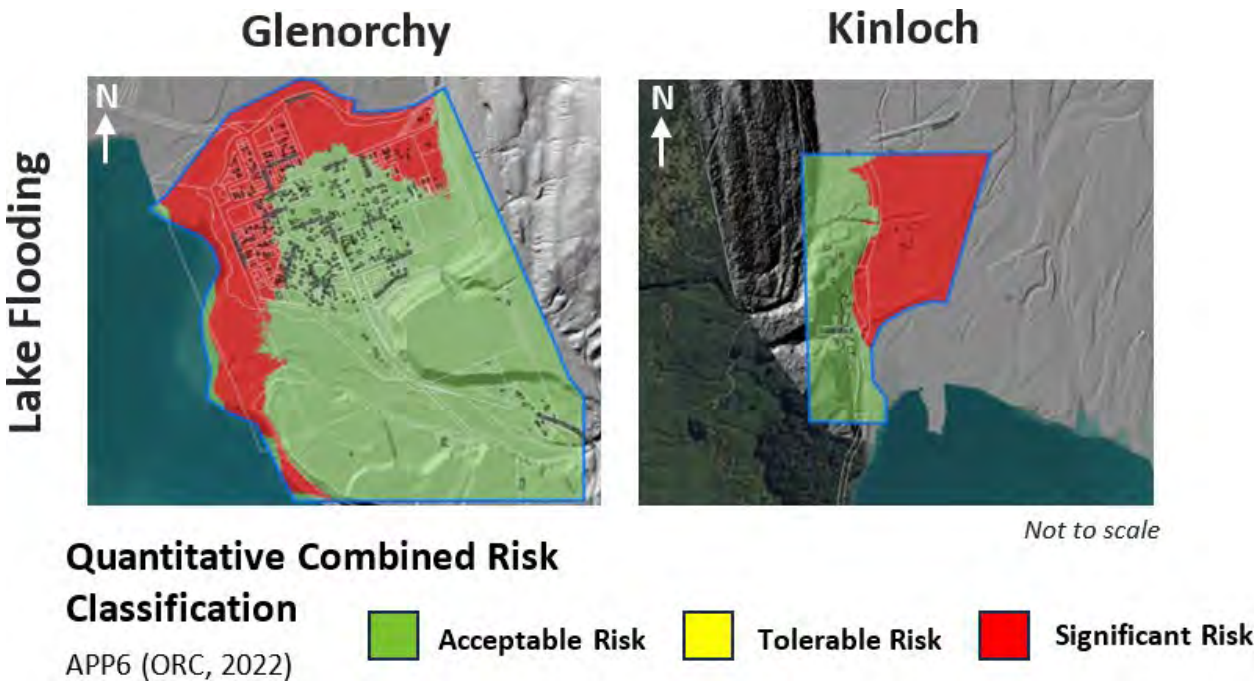


Figure 9.17 Lake flooding property risk (APR) levels.

Annual Property Risk (APR) - Liquefaction and Lateral Spread

Results of the liquefaction and lateral spread property risk (APR) analysis for Glenorchy are shown in Figure 9.17. Quantitative property risk levels from liquefaction and lateral spread are *Significant* for the whole of Glenorchy township.

The hazards that affect the greatest area to the built environment in Glenorchy are liquefaction and lateral spread-inducing land damage affecting property. While damage associated with liquefaction is expected to be substantial, lateral spreading is anticipated to result in the most significant damage focused along the lake margins, due to an approximately 25m high free face (where the land is not physically constrained and extends down to the lake bed).

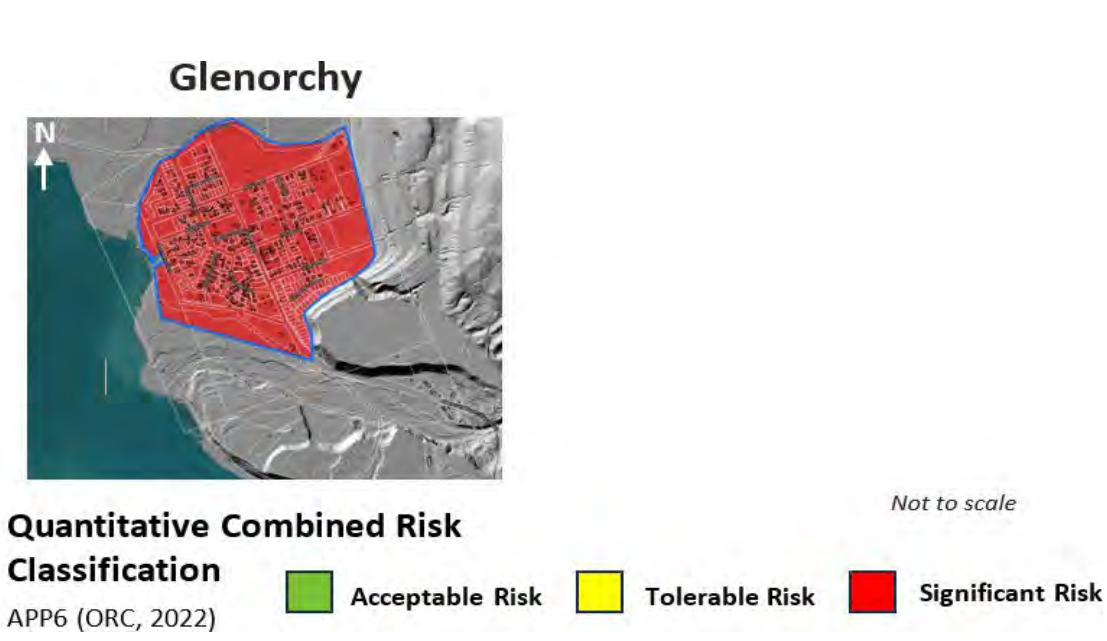


Figure 9.18 Liquefaction and lateral spread property risk (APR) levels

9.3.6 Risk Tolerability

Risk to property (APR) from flooding and liquefaction hazards exceeds the Tolerable threshold listed in the proposed RPS (ORC, 2022) in parts of both Kinloch and Glenorchy. It is noted in the proposed RPS that it is ultimately the responsibility of local authorities (i.e. both ORC and QLDC) to undertake a consultation process with communities, stakeholders and partners regarding risk level thresholds. The Action Plan (Section 10) outlines next steps for ORC and QLDC.

How much risk is tolerable?

Toka Tū Ake Natural Hazards Commission (2023) notes that 'once we understand a risk, we must consider whether we are willing to tolerate the consequences', and offers guidance on assessing tolerance to risk, as shown in Figure 9.18.

T+T (2023) makes the following points about risk tolerability and liquefaction hazard management:

- Before discussing potential options for managing liquefaction hazard, it is useful to ask the question "how much risk is tolerable". This helps to set a benchmark level of performance that the various different options can be compared against.
- When it comes to natural hazards risk management and adaptation planning, there are no fixed rules about exactly how much risk is tolerable. Rather than being a purely technical engineering or legal question, this becomes a balance between costs and benefits, recognising that communities have many other objectives in addition to managing natural hazards. Finding the balance that best suits a particular situation requires a collaborative approach including the community, stakeholders, technical experts and decision-makers. To help with these discussions, Table 9-5 includes various factors that may be relevant when deciding how much liquefaction-related risk is tolerable.
- "Residual risk" is the risk that remains even after all adopted risk management measures are implemented. It is usually not practical or affordable to completely eliminate all risks. One of the goals of risk management is to find the point where the residual risk is reduced to a level which is acceptable, or the point of "diminishing returns" where further investment in risk management measures does not give a worthwhile reduction in the overall level of residual risk.

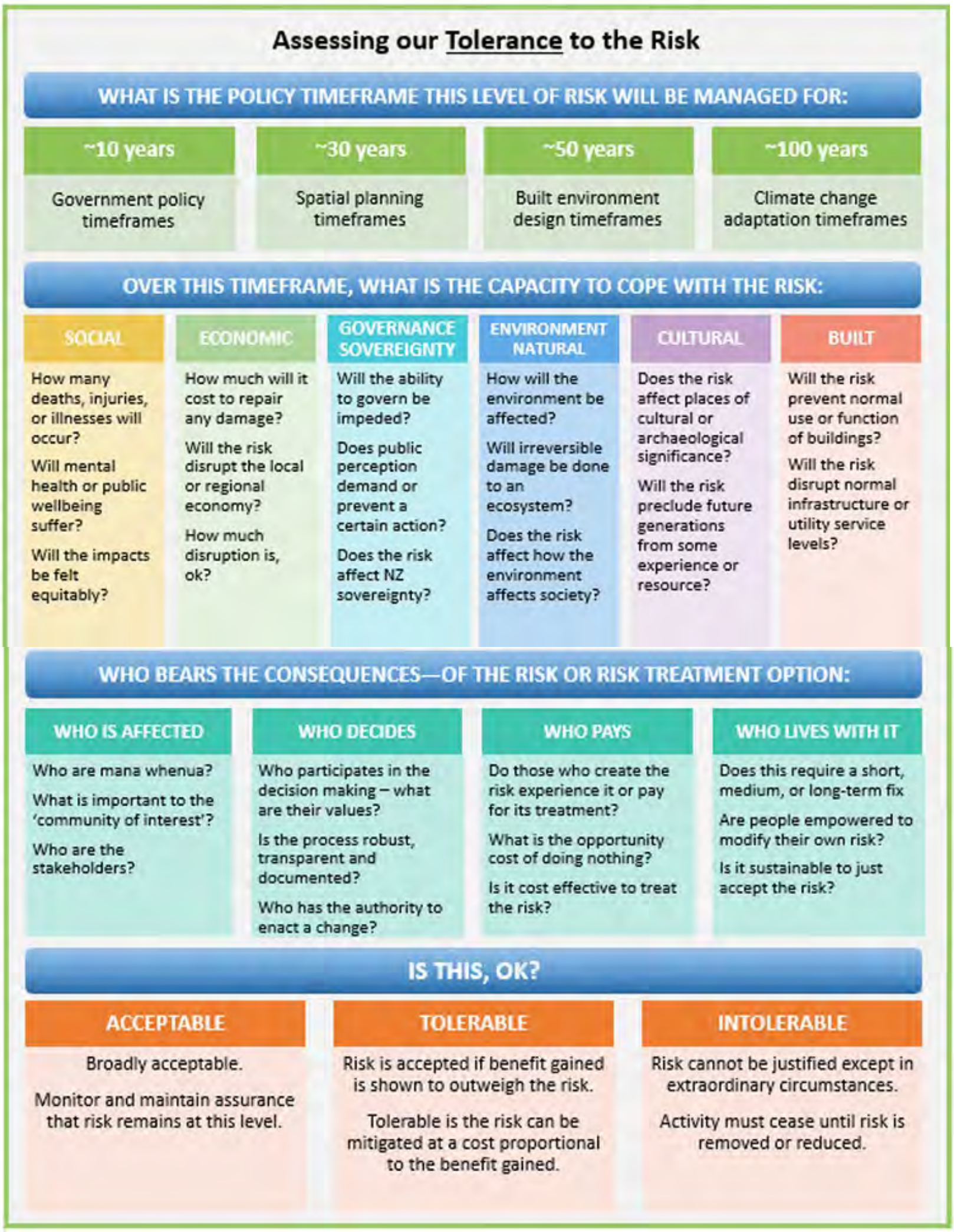


Figure 9.19 Assessment of Risk Tolerance (Toka Tū Ake Natural Hazards Commission, 2023)

Table 9-5 Relevant factors when deciding how much liquefaction-related risk is tolerable (T+T 2023)

Factor	Comments
Life safety during an earthquake	Lateral spreading damage to buildings is the main life safety concern related to liquefaction. While there were no deaths caused by lateral spreading in the 2010 – 2011 Canterbury Earthquakes, this was more a matter of good luck rather than good design – if the shaking had been stronger or longer then building collapse could have occurred.
Habitability in the days and weeks after an earthquake	If buildings are severely damaged, it may not be possible to use them after the earthquake so people would need alternative accommodation. Damage to electricity, water supply, stormwater and sewer networks would also impact on habitability, potentially for many months (or longer) after the earthquake. These issues could be worsened if earthquake damage cuts off the only road in and out of the town.
Long term recovery after an earthquake	While it is the most severe damage which often attracts most attention immediately after an earthquake, a more significant issue for long term recovery can sometimes be the minor and moderate damage (as it can be much more extensive). While it may be possible to continue living with this damage until it is eventually repaired, there can be far-reaching economic, social and environmental consequences.
Other hazards	Some locations may also be exposed to other hazards (e.g. flood) and cascading hazards (e.g. liquefaction settlement leaves building more flood-prone).
Building Act	All building work must comply with the Building Code regardless of whether a building consent is required, and irrespective of whether it is to construct a new building or to repair or alter an existing building. In the case of alterations or repairs it is only the new work that must comply with the current Building Code. If existing parts of the building do not comply, then the main requirement (with some exceptions) is that the alterations or repairs do not result in the building complying with the Building Code to a lesser extent than before. The Building Act requires councils to refuse building consent if the land is likely to be subject to natural hazards, unless adequate steps are taken to protect against the hazard. However, the Act provides a specific list of hazards that this applies to, and it is unclear whether this includes earthquakes and liquefaction. Nonetheless, it is useful to note that the test of whether a hazard is considered "likely" has been defined as a "100 year" event (which has a 40% chance of occurring over the next 50 years).
Building Code minimum requirements	For most "normal" buildings (and other structures) the Building Code mandates minimum acceptable performance for two earthquake scenarios: The Serviceability Limit State (SLS) is assessed for "25 year" earthquake shaking levels (a 90% chance of occurring over the next 50 years). The building should suffer little or no structural damage and remain accessible and safe to occupy. There may be minor damage to building fabric that is readily repairable. The Ultimate Limit State (ULS) is assessed for "500 year" earthquake shaking levels (a 10% chance of occurring over the next 50 years). The building is expected to suffer moderate to significant structural damage (which might not be repairable), but not to collapse.
Resource Management Act (RMA)	The RMA identifies management of significant risks from natural hazards as a matter of national importance, which means it needs to be considered at all levels of planning and decision-making. The RMA also gives councils power to refuse or place conditions on subdivision consents where there is a significant natural hazard risk.

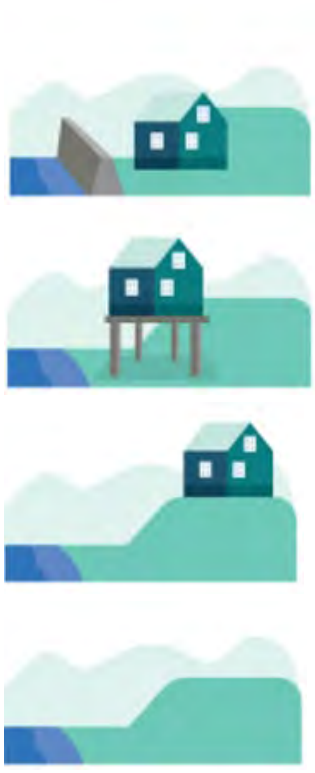
Factor	Comments
Insurance and mortgages	Insurers each make their own decisions about natural disaster risk, often balancing many different factors. The availability and cost of insurance is subject to these decisions. In Aotearoa New Zealand there is an increasing trend of insurers moving toward more "risk-based" pricing where specific attributes (such as location and presence of hazards) are taken into account in both deciding whether to offer cover, and in determining the cost of providing that cover. Following the Christchurch earthquakes, most insurers adopted an approach where new dwellings would be provided insurance cover on the basis that compliance with the Resource Management Act and Building Act/Code largely provided mitigation of the hazards potentially affecting the dwelling. In general, insurers were more concerned with existing dwellings on land that was revealed to be both liquefaction and flood prone, as there was little opportunity to mitigate the hazards for existing buildings. In the past banks have typically provided mortgage lending as long as insurance was in place, however in future banks may also undertake their own independent assessment of natural hazard risk before offering lending.
Chance of an earthquake occurring	The T+T May 2022 liquefaction assessment report concluded that significant damage due to liquefaction and lateral spreading could be expected at a "50 to 100 year" level of earthquake shaking (a 40 – 60% chance of occurring over the next 50 years). The Alpine Fault is particularly relevant, as it passes relatively close to Glenorchy (55km at its nearest point). There is a 75% chance of a large earthquake occurring on the Alpine Fault within the next 50 years. It is likely that a large Alpine Fault earthquake would cause significant liquefaction and lateral spreading damage in Glenorchy, however there is some uncertainty in the severity and extent of damage that could occur.
Type of land use activity	There are many different ways that land can be used, such as for housing, commercial activity, infrastructure, recreation, environmental purposes etc. Because each of these different land uses has different consequences if damaged in an earthquake, they each have different risk profiles. This means that a particular degree of liquefaction-induced damage might be tolerable for some types of land uses but not for others.

9.4 Phase 3: What can we do about it?

The natural hazard challenges at Head of Lake Whakatipu are complex and there is no simple solution. The community has a long history of 'living with the hazards' and adapting along the way, and this approach will continue to be necessary. This section of the Strategy focuses on identification and high-level evaluation of responses (Figure 9.19).

There are a variety of existing and possible future responses that offer potential benefits for adaptation. One framework for understanding some of these responses is: Protect, Accommodate, Retreat, Avoid (PARA) (Figure 9.20).

Figure 9.20 "What can we do about it?" Steps 5 & 6 of the adaptation cycle (modified from MfE 2024).



PROTECT - Refers to engineering works to mitigate the threat of erosion and flooding. Protection options may be "soft" or "hard". Soft measures may include 'enhancing' natural defences through gravel and vegetation management, and stabilisation via planting. Hard measures may include rock armouring, improving existing flood banks, or constructing new flood banks.

ACCOMMODATE - Refers to accommodating ("living with") the hazards and changes. Responses focus on reducing impacts (e.g., retrofitting buildings, raising floor levels) and maintaining natural defences (e.g. wetland function and "room for the river"). Emergency readiness, response and recovery are also a key component.

RETREAT / RELOCATION - Refers to a process of withdrawal from a location when the risk associated with staying becomes intolerable. This could require a change in planning practices and the relocation of public infrastructure and private assets. May provide space for nature to roll back. Retreat can also be a reaction to a hazard event with intolerable outcomes (e.g. red-zoning).

AVOID - Refers to identifying future areas that are suitable to build, and using planning tools to prevent inappropriate, new (or infill) development in a higher hazard zone. Appropriate or adapted development may be possible.

Figure 9.21 The PARA framework; Protect, Accommodate, Retreat, Avoid (MfE, 2023).

At a high level, Phase 3 involved the following steps:

a) Identify a range of possible responses, including crowdsourced ideas from community and local knowledge,

b) Screen out responses that are not technically feasible,

c) Develop a 'long-list' of adaptation responses; including existing and planned responses, and a future toolbox with both standard ways to manage hazards, and innovative ideas,

d) Community engagement on the long-list,

e) High-level socio-economic screening and mana whenua assessment of possible responses,

f) Technical evaluation of some responses (i.e. potential responses for liquefaction management and floodplain management).

9.4.1 Identify a range of possible responses

9.4.1.1 LOCAL KNOWLEDGE AND COMMUNITY INSIGHTS

We have heard many ideas, insights and observations from the community about what we can do to adapt to natural hazard challenges and impacts of a changing climate in the Head of Lake Whakatipu area. Thank you to community members for sharing. Appendix B Table 13-2 collates the ideas and comments on how they were considered further.

Community feedback on possible responses can be grouped in the following general themes:

- Responses that provided more natural solutions such as wetlands, trees and greenspace were liked for their wider benefits to the community.
- Large-scale, engineered responses to manage liquefaction and lateral spreading hazards were not preferred due to their cost, and residual risk.
- Significant interest in emergency readiness and response, including community-led action.
- Combination of responses working together.
- Consideration of cost, who will pay for the response and what impact would it have on the individual property owner and the ratepayer in terms of rates increases.
- Generally, people expressed that people living in the area had a high-level of tolerance to flood risk. But that there were more vulnerable parts of the community with lower risk tolerances, and that the community would still need support in response and recovery to a disaster.
- Retreat was largely considered as a long-term future action, with some opposition to this response as they believe Glenorchy township is worth protection.
- There is a lack of clarity about roles and responsibilities for implementation of any potential managed retreat, and what a proactive or reactive retreat process could look like. People would like further clarity to be able to give more meaningful feedback on this option and how to ensure it is a fair and equitable process for community.

9.4.1.2 LONG LIST OF RESPONSES

After screening, sorting and collating ideas there is a long list of responses (Table 9-6) which includes 13 existing responses, and a future toolbox of 24 responses that might be useful when we face future challenges.

Table 9-6 Long list of responses (October 2024).

CATEGORY	EXISTING OR FUTURE TOOLBOX?	LONG LIST OF RESPONSES (OCTOBER 2024)	TYPE OF RESPONSE	CURRENT AREA OF RESPONSIBILTY	WHAT IS THE MAIN OBJECTIVE OF THE RESPONSE?
Hazard awareness and mitigation	Existing **	Societal, behavioural, and institutional changes (improve over time) when considering natural hazards and changes to the physical environment	Accommodate	Everyone	Support awareness and informed decision-making
	Future Toolbox **	➢ Review and accept residual risk for existing development	Accommodate	ORC, QLDC, community	Informed decision-making
	Existing	Emergency readiness and response (improve over time)	Accommodate	CDEM, ORC, QLDC, community	All hazards emergency response
Road access	Existing	Maintenance, reactive repair and planned works for the Glenorchy-Queenstown Road	Accommodate / protect	QLDC	Maintain resilience of regional road access to flood, erosion and alluvial fan hazards
	Existing	Maintenance, reactive repair and planned works for the Kinloch and Glenorchy-Paradise local road system	Accommodate / protect	QLDC	Maintain resilience of local road access to flood, erosion and alluvial fan hazards
	Future Toolbox	➢ Small scale improvement to existing Kinloch and Glenorchy-Paradise local road system road (as well as maintenance and reactive repair)	Accommodate / protect	QLDC	Reduce impacts of flood, erosion and alluvial fan hazards on local road access
	Future Toolbox	➢ Reduced level of service of existing Kinloch and Glenorchy-Paradise local road system (e.g. some parts 4WD only)	Accommodate	QLDC	Maintain local road access at a lower level of service
	Future Toolbox	➢ Major works to increase resilience of Kinloch and Glenorchy-Paradise local road system (e.g. protect, raise, realign)	Protect	QLDC	Reduce impacts of flood, erosion and alluvial fan hazards on local road access
	Future Toolbox	➢ Reactive re-design Kinloch and Glenorchy-Paradise local road system for changed conditions (e.g. post event)	Protect	QLDC	Post-event replacement to restore local road access
Boat access	Existing	Existing boat access at Kinloch and Glenorchy (limited by existing and ongoing sediment accumulation)	Accommodate	QLDC	Maintain alternative access
	Future Toolbox	➢ Short-term improvements to existing boat access (e.g dredging)	Accommodate	QLDC	Improve alternative access
	Future Toolbox	➢ Upgrade boat access with resilient solution (e.g. relocatable wharfs)	Protect	QLDC	Provide alternative access with higher level of service
	Future Toolbox	➢ Relocate wharfs periodically to maintain future access	Protect	QLDC	Maintain alternative access with higher level of service
Flood mitigation and protection	Existing	Maintain the flood monitoring network (rainfall and water level stations) and flood data history	Accommodate	ORC	Flood hazard readiness and emergency response
	Existing	Flood monitoring, forecasting and warning (improve over time)	Accommodate	ORC	Flood hazard emergency response
	Existing	Existing low level Rees River flood protection by Glenorchy floodbank (maintenance and reactive repair)	Protect	QLDC	Maintain existing Rees River flood protection
	Future Toolbox	➢ Small scale improvements to Glenorchy floodbank to maintain/reduce flood risk	Protect	QLDC	Increase resilience of Rees River flood protection
	Future Toolbox	➢ Major works to increase level of service of Glenorchy floodbank	Protect	QLDC	Reduce impacts of Rees River flood hazard on Glenorchy township
	Future Toolbox	➢ Redesign Rees flood protection for changed conditions (e.g. post event)	Protect	ORC, QLDC	Post-event replacement to restore protection
	Existing	Existing river management (vegetation and gravel)	Accommodate	ORC, QLDC	Maintain resilience to flood, erosion and alluvial fan hazards
	Future Toolbox	➢ River management and nature-based interventions (e.g. targeted planting)	Accommodate	ORC	Reduce impacts of flood, erosion and alluvial fan hazards
	Future Toolbox	➢ Redesign nature-based interventions for changed conditions	Accommodate	ORC	Post-event replacement
	Future Toolbox	➢ Small scale works to reduce Buckler Burn erosion and/or flood risk	Protect	ORC	Reduce impacts of Buckler Burn flood, erosion and alluvial fan hazards
Public asset resilience	Future Toolbox	➢ Improve resilience of critical assets in higher hazard areas (such as floodproofing, floor raising, ground or structure strengthening, retrofit, move elsewhere)	Accommodate	Asset owner	Reduce impacts on critical assets
Community-wide resilience (public and private)	Future Toolbox	➢ Community-wide improvement works for liquefaction hazard (such as ground improvement and strengthening existing buildings).	Accommodate	Not defined	Reduce impacts from seismic hazards on Glenorchy township
Private property resilience	Existing	Household emergency planning	Accommodate	Household	Reduce impacts on existing development
	Existing	Property and business insurance (adjust coverage as needed)	Accommodate	Property/business owner	Support recovery
	Future Toolbox	➢ Improve property and land resilience (such as floodproofing, floor raising, ground or structure strengthening)	Accommodate	Property owner	Reduce impacts on existing development
	Existing	Consider local risk and hazard information when property decisions are required (e.g. buying/selling) are required	Accommodate	Property owner	Informed decision-making

CATEGORY	EXISTING OR FUTURE TOOLBOX?	LONG LIST OF RESPONSES (OCTOBER 2024)	TYPE OF RESPONSE	CURRENT AREA OF RESPONSIBILTY	WHAT IS THE MAIN OBJECTIVE OF THE RESPONSE?
Policy	Existing	Policy - Existing land use zoning, rules and building controls	Accommodate	ORC, QLDC	Reduce impacts on future development
	Future Toolbox **	➢ Policy – Review hazard and risk information and set appropriate requirements for new development	Accommodate	ORC, QLDC	Reduce impacts on future development
	Future Toolbox	➢ Policy - Strengthen land use controls in higher hazard areas to avoid additional exposure	Avoid	ORC, QLDC	Avoid impacts on future development
	Future Toolbox	➢ Policy and services – identify and make available lower hazard land for new building and/or relocation	Avoid	QLDC	Avoid impacts on future development
	Future Toolbox	➢ Recovery plan improvement	Accommodate	CDEM, QLDC, community	Support effective recovery
	Future Toolbox	➢ Proactive relocation plan	Retreat	Not defined	Support effective relocation
	Future Toolbox	➢ Voluntary proactive relocation from higher hazard areas	Retreat	Not defined	Avoid / reduce impacts on existing community (by relocating before an event)
	Future Toolbox	➢ Voluntary reactive post event retreat from higher hazard areas	Retreat	Multi-agency, property owners	Avoid repeat impacts

** Three additional responses have been added to the long list since March 2024 (when it was shared with Aukaha for mana whenua assessment and Beca for Phase 2 socio-economic impact assessment)

9.4.2 Evaluate possible responses and pathways

9.4.2.1 HIGH LEVEL EVALUATION

The Coastal Hazard Guidance (MfE 2024) identifies factors that to consider in evaluating responses, depending on the objectives and level of evaluation effort.

At this early stage it is useful to have a high level evaluation as a basis for further discussion. The following high level evaluation criteria provide a way to compare and contrast the responses in Table 9-7:

- Effectiveness to reduce risk (or achieve main objective)
- Scale of cost
- Complexity to implement
- Timeframe to implement (after decision)
- Impact on social resilience and adaptive capacity

Head of Lake Whakatipu Social & Economic Impact Assessment - Phase 2: *Social & Economic Impact Assessment of Existing and Future Potential Natural Hazard Adaptation Responses* was used to inform the evaluation. Healy *et al* (2024) notes that the existing adaptation responses in the Head of the Lake are likely to have a large, positive impact on social resilience and adaptive capacity. This is because they address multiple vulnerabilities (e.g., resilience of access, household readiness) and hazards (e.g., flooding, earthquakes).

- Phase 1 (Healy *et al,* 2024) identified the importance of access to the wider community, both in terms of access to/from Queenstown, and around and within the community. Existing responses to maintain and repair the Glenorchy-Queenstown Road, local road system, and boat access are therefore likely to have a large positive impact on the resilience and adaptive capacity of the community. Access to recreation, education, employment, goods, services, and consumers of goods and services (i.e., to support local businesses), supports the social and economic wellbeing of the community. A resilient connection between Queenstown and the Head of the Lake may also increase the resilience and adaptive capacity of the Otago Region, by enabling economic activity in the Head of the Lake to recover quickly following a natural hazard event.
- The impact of road and boat access on resilience and adaptive capacity is further enhanced by existing responses to reduce exposure to natural hazards, such as flood monitoring and protection and building controls in high hazard areas, as well as measures to improve the resilience of critical public building assets (e.g., community facilities). Household-level responses such as property insurance and household emergency planning also contribute to overall resilience and adaptive capacity, as households that are prepared are likely to reduce strain on community resources during and after an event.
- Whilst the existing responses are likely to have a large, positive impact on social resilience and adaptive capacity, a high level of risk still remains, and certain groups have been identified as more vulnerable than others.

Healy *et al* (2024) assessed the future responses for potential impact on social resilience and adaptive capacity (Table 9-7).

Table 9-7 High level evaluation of responses (October 2024).

Category	Existing or Future Toolbox?	Long list of responses (October 2024)	What is the main objective of the response?	Scale of effectiveness	Scale of cost	Scale of complexity	Timeframe to implement (after decision)	Impact on social resilience and adaptive capacity
Hazard awareness and mitigation	Existing **	Societal, behavioural, and institutional changes (improve over time) when considering natural hazards and changes to the physical environment	Support awareness and informed decision-making	★	$	medium		
	Future Toolbox **	➢ Review and accept residual risk for existing development	Informed decision-making	★	$	low	1 year	
	Existing	Emergency readiness and response (improve over time)	All hazards emergency response	★	$	low		
Road access	Existing	Maintenance, reactive repair and planned works for the Glenorchy-Queenstown Road	Maintain resilience of regional road access to flood, erosion and alluvial fan hazards	★★★	$ $	low		
	Existing	Maintenance, reactive repair and planned works for the Kinloch and Glenorchy-Paradise local road system	Maintain resilience of local road access to flood, erosion and alluvial fan hazards	★	$ $	low		
	Future Toolbox	➢ Small scale improvement to existing Kinloch and Glenorchy-Paradise local road system road (as well as maintenance and reactive repair)	Reduce impacts of flood, erosion and alluvial fan hazards on local road access	★	$ $ $	low	3+ year	Minor improvement
	Future Toolbox	➢ Reduced level of service of existing Kinloch and Glenorchy-Paradise local road system (e.g. some parts 4WD only)	Reduce cost by maintaining local road access at a lower level of service	★	$	low	1 year	Moderate negative
	Future Toolbox	➢ Major works to increase resilience of Kinloch and Glenorchy-Paradise local road system (e.g. protect, raise, realign)	Reduce impacts of flood, erosion and alluvial fan hazards on local road access	★★	$ $ $	medium	5+ year	Major improvement
	Future Toolbox	➢ Reactive re-design Kinloch and Glenorchy-Paradise local road system for changed conditions (e.g. post event)	Post-event replacement to restore local road access	★★	$ $ $ $	medium	5+ years	Moderate improvement
Boat access	Existing	Existing boat access at Kinloch and Glenorchy (limited by existing and ongoing sediment accumulation)	Maintain alternative access	★	$	low		
	Future Toolbox	➢ Short-term improvements to existing boat access (e.g dredging)	Improve alternative access	★	$ $	medium	3+ year	Minor improvement
	Future Toolbox	➢ Upgrade boat access with resilient solution (e.g. relocatable wharfs)	Provide alternative access with higher level of service	★★★	$ $	medium	5+ years	Moderate improvement
	Future Toolbox	➢ Relocate wharfs periodically to maintain future access	Maintain alternative access with higher level of service	★★★	$ $	medium	5+ years	Minor improvement
Flood mitigation and protection	Existing	Maintain the flood monitoring network (rainfall and water level stations) and flood data history	Flood hazard readiness and emergency response	★	$ $	low		
	Existing	Flood monitoring, forecasting and warning (improve over time)	Flood hazard emergency response	★	$ $	low		
	Existing	Existing low level Rees River flood protection by Glenorchy floodbank (maintenance and reactive repair)	Maintain existing Rees River flood protection	★	$	low		
	Future Toolbox	➢ Small scale improvements to Glenorchy floodbank to maintain/reduce flood risk	Increase resilience of Rees River flood protection	★	$	low	3+ years	Minor improvement
	Future Toolbox	➢ Major works to increase level of service of Glenorchy floodbank	Reduce impacts of Rees River flood hazard on Glenorchy township	★★	$ $ $	medium	5+ years	Moderate improvement
	Future Toolbox	➢ Redesign Rees flood protection for changed conditions (e.g. post event)	Post-event replacement to restore protection	★★	$ $ $	medium	5+ years	Minor improvement
	Existing	Existing river management (vegetation and gravel)	Maintain resilience to flood, erosion and alluvial fan hazards	★	$	low		
	Future Toolbox	➢ River management and nature-based interventions (e.g. targeted planting)	Reduce impacts of flood, erosion and alluvial fan hazards	★	$	low	3+ years	Minor improvement
	Future Toolbox	➢ Redesign nature-based interventions for changed conditions	Post-event replacement	★	$ $	low	3+ years	Minor improvement
	Future Toolbox	➢ Small scale works to reduce Buckler Burn erosion and/or flood risk	Reduce impacts of Buckler Burn flood, erosion and alluvial fan hazards	★★	$	low	3+ years	Minor improvement
Public asset resilience	Future Toolbox	➢ Improve resilience of critical assets in higher hazard areas (such as floodproofing, floor raising, ground or structure strengthening, retrofit, move elsewhere)	Reduce impacts on critical assets	★★	$	low to medium	3+ years	Moderate improvement
Community-wide resilience (public and private)	Future Toolbox	➢ Community-wide improvement works for liquefaction hazard (such as ground improvement and strengthening existing buildings).	Reduce impacts from seismic hazards on Glenorchy township	★★	$ $ $ **to** $ $ $ $	high	10+ years	Minor improvement
Private property resilience	Existing	Household emergency planning	Reduce impacts on existing development	★	$	low		
	Existing	Property and business insurance (adjust coverage as needed)	Support recovery	★	$	low		
	Future Toolbox	➢ Improve property and land resilience (such as floodproofing, floor raising, ground or structure strengthening)	Reduce impacts on existing development	★	$	low to medium	3+ years	Moderate improvement
	Existing	Consider local risk and hazard information when property decisions are required (e.g. buying/selling) are required	Informed decision-making	★	$	low		

Category	Existing or Future Toolbox?	Long list of responses (October 2024)	What is the main objective of the response?	Scale of effectiveness	Scale of cost	Scale of complexity	Timeframe to implement (after decision)	Impact on social resilience and adaptive capacity
Policy	Existing	Policy - Existing land use zoning, rules and building controls	Reduce impacts on future development	★	$	low		
	Future Toolbox **	➢ Policy – Review hazard and risk information and set appropriate requirements for new development	Reduce impacts on future development	★	$	low	3+ years	Minor improvement
	Future Toolbox	➢ Policy – Strengthen land use controls in higher hazard areas to avoid additional exposure	Avoid impacts on future development	★★	$	medium	5+ years	Minor improvement
	Future Toolbox	➢ Policy and services – identify and make available lower hazard land for new building and/or relocation	Avoid impacts on future development	★★	$ $	medium	5+ years	Minor improvement
	Future Toolbox	➢ Recovery plan improvement	Support effective recovery	★	$ $	medium	3+ years	Minor improvement
	Future Toolbox	➢ Proactive relocation plan	Support effective relocation	★	$ $	medium	3+ years	Minor improvement
	Future Toolbox	➢ Voluntary proactive relocation from higher hazard areas	Avoid / reduce impacts on existing community (by relocating before an event)	★★★	$ $ $	high	10+ years	Moderate improvement
	Future Toolbox	➢ Voluntary reactive post event retreat from higher hazard areas	Avoid repeat impacts	★★★	$ $ $ $	high	3+ years	Minor improvement

Notes:

** Three additional responses have been added to the long list since March 2024 (when it was shared with Aukaha for mana whenua assessment and Beca for Phase 2 socio-economic impact assessment)

Scale of effectiveness – more stars indicates greater effectiveness at reducing risk (or achieving the main objective)

Scale of cost (10-year CAPEX & OPEX) – scale is non-linear: '$' less than one million, '$$' millions, '$$$' tens of millions, '$$$$ 'more than fifty million, typically based on high level relative estimates (Healy *et al* 2024).

9.4.2.2 HEAD OF LAKE WHAKATIPU WAIMĀORI MANA WHENUA ASSESSMENT

Aukaha carried out a Mana Whenua assessment of an early draft long list[12] of 34 possible responses for Head of Lake Whakatipu Waimāori adaptation (Aukaha 2024).

Sites of Cultural Significance

The approximate area within scope for the ORC project includes a number of wāhi tupuna, wāhi tapu and wāhi taoka, including:

- over 20 archaeological sites (Pā, terraces, ovens, middens, pits, tauraka waka, cave shelters, artefacts),
- two Ara Tūpuna (Tarahaka-Whakatipu, Greenstone River),
- two statutory acknowledgement areas (Whakatipu-wai-māori, Pikirakatahi),
- the wāhi and awa labelled on Figure 5.1.

Analysis of responses

The 34 hazard responses considered by ORC were grouped into the categories shown to the right of Figure 9.21. The relevant mana whenua guiding principles identified by Aukaha are shown on the left.

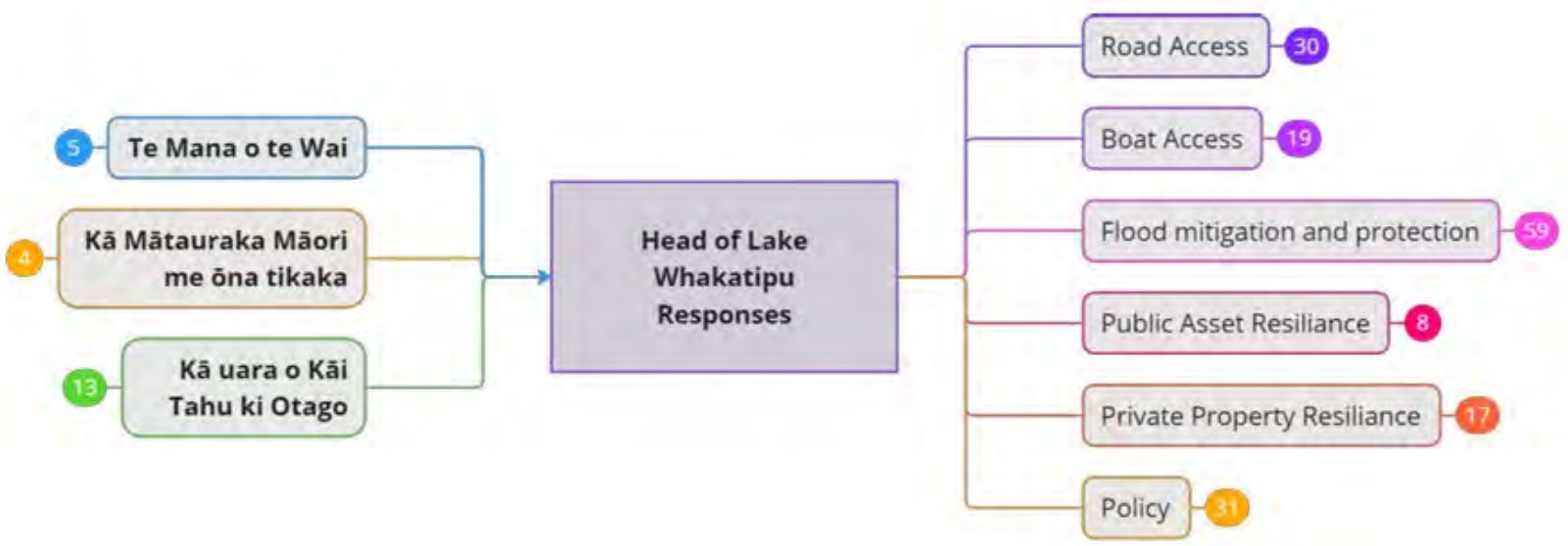


Figure 9.22 Mana whenua principles (left) and ORC adaptation response categories (right) related to the project.[13]

Each response was scored based on its alignment to the mana whenua values, policies, and objectives from the KTKO NRMP 2005, mātauraka Māori and associated tikaka, and with the principles laid out in Te Mana o Te Wai. The scoring favoured responses which allowed for mana whenua to maintain rakatirataka and kaitiakitaka, and which abided by the tribal pepeha: mō tātou, ā, mō kā uri a muri ake nei. Scoring factored in the implications of each response on Wāhi Tūpuna, Wāhi Taoka, and Ara Tawhito, including accessibility and preservation of these culturally significant sites. Comments and provisos were made about each individual response, and these

[12] The current long-list includes 3 additional responses that were not on the early list

[13] The numbered balloons in Figure 9.21 represent how many pieces of information are associated with each of the broader categories. These include all responses, response scores, supporting details, and justifications for scoring.

were then considered holistically to give an overall score between -3 and +3. The scoring scale is detailed below, with respect to the mana whenua guiding principles.

-3: Strongly misaligned w/	-2: Moderately misaligned w/	-1: Somewhat misaligned w/	0: Unrelated to	+1: Somewhat aligned w/	+2: Moderately aligned w/	+3: Strongly aligned w/

After analysing all the responses, the following themes were observed across them. The number shown in brackets after each theme indicates that it relates to a specific policy, objective or issue in the KTKO NRMP 2005. These numbers are further referenced below in Table 9-8.

A response which **scored poorly** tended to:

- Consider habitat factors narrowly (1.5-)
- Favour structures which are located close to mahika kai or areas of dynamic river/ coastal processes (3.1-)
- Favour structures to be built right next to river or coastal margins (3.2-)
- Rely on structures and system designs that are no longer fit for purpose (3.5-)
- Promote channel straightening and subsequent flow changes (3.6-)
- Promote short term solutions that lack an intergenerational view

A response which **scored well** tended to:

- Consider habitat needs holistically (1.5+)
- Provide greater kaitiakitaka opportunities for mana whenua to be involved in the management of wai māori through cultural health monitoring (1.6+)
- Harness the cleansing/ purifying processes of the whenua to remove contaminants (2.1+)
- Promote the use of natural processes for stormwater management (2.2+)
- Locate structures away from culturally sensitive areas (3.1+)
- Design for a changing environment (especially due to climate change) (3.5+)
- Promote water quality in the Otago Catchment that are healthy enough to support Kāi Tahu ki Otago customs (4.2+)
- Reduce the contaminants being discharged directly or indirectly to water (4.4+)
- Be consistent with a long term view of upholding the environment for following generations (mō tātou, ā, mō kā uri ā muri ake nei)
- Promote natural river flows and movements

Table 9-8 shows scoring and comments for a response from each different category to demonstrate the analysis conducted. Those examples also show a range of scores. The entirety of the scoring is included in Table 9-9.

Commentary

Discussion with Rūnaka representatives reinforced the extent of significant sites in the area, and how vulnerable these sites are to flooding and other natural hazard risks. It was acknowledged:

1. how sensitive the area is and the difficulty in establishing pragmatic controls and structures.
2. the difficulties in planning for a fast-changing mountain environment.
3. that ancillary infrastructure would need to be implemented to compliment significant infrastructure changes made.

The intention of the cultural scoring by Aukaha was to prioritise cultural links to the roto, awa, wāhi tapu, wāhi taoka, and ara tūpuna. The cultural lens on these would have to be represented through the scoring.

Some responses scored poorly despite providing safeguards for the local community. These responses tended to favour changes which were either not aligned with enhancing the mana of the natural environment, or not providing safeguards for the sites of cultural significance.

Table 9-8 Detailed scorings and analysis of one response from each category (demonstrating the analysis conducted).

Category	Response	Score	Provisos, comments, references to guiding principles
Road Access	A2 Small scale improvement, maintenance & reactive repair to existing Kinloch & Glenorchy-Paradise local road system	-1	'Mō tātou, ā, mō kā uri a muri ake nei'. Acknowledging the pepeha above, this response involves reactive repair work to keep an asset in place that is likely to suffer more flooding inundation over time. It scores higher than A1 as has specific resilience measures in mind, but still accepts the continuing risk of gradual and abrupt river changes. This response does not fully acknowledge the changes that the river is tending toward, and aims to maintain a level of service that prioritises human interests over the natural flow of the river
Boat Access	B2 Improve existing boat access temporarily (e.g. dredge sediment periodically)	-3	Dredging causes continual upheaval and homogenisation of the sediment profile, invertebrate populations will be affected and there will be flow on effects on larger organisms, this pathway does not prioritise the health of the environment over human usages. Refer to (1.5-), (3.5-)
Flood Mitigation and Protection	F9 River management and nature-based interventions (i.e. targeted planting)	+3	With the requirement that re-vegetation with locally sourced indigenous plants for all disturbed areas. Re-vegetation should be monitored by an assessment of the vegetative cover at one growing season after establishment and again at three seasons from establishment. Refer to (1.5+), (1.6+), (2.1+), (2.2+), (3.5+), (4.2+)
Public Asset Resilience	PA1 Community-wide improvement works for liquefaction hazard (i.e. ground improvement, strengthening existing buildings)	-2	Highly complex and requires extensive works in and around the buildings. ORC has stated: - this will only be partially effective and not reduce the liquefaction hazard category below 'medium', - the remaining risk is still high. Successful implementation would help reduce impacts of flooding and liquefication events, but the response is still favouring maintaining the built environment over the direction of the natural environment. Not well aligned with the tribal pepeha written above in A2.
Private Property Resilience	H3 Improve property resilience (such as floodproofing, floor raising, ground or structure strengthening)	-1 / +1	On one hand, it would allow damage and clean-up cost from a flood / storm / weather event to be minimised. Conversely, the climatic impacts are unpredictable and the effectiveness of these (bespoke) solutions would vary by property. Some properties are in locations that will not be viable in the long-term, in which case, these resilience measures will only buy time, not mitigate the risk. It needs to be weighed up whether the resources are best spent here or diverted elsewhere. Refer to the tribal pepeha written above in A2.
Policy	P2 Policy- Strong land use controls in higher hazard areas to avoid additional exposure (e.g. Plan change to restrict activities)	+2	This response is still constrained by existing policy and governance frameworks, but having specific controls in place to restrict activities in higher hazard areas helps to minimise risk exposure to both people and environment. This policy change puts higher priority on appropriate land use than existing policy, and favours the natural form of the environment. Refer to (3.5+)

Table 9-9 Condensed scoring of each response.

Hazard Category	Code	Individual Response Desciption	Score
Road access (Kinloch - Glenorchy - Paradise roads)	A1	Continue maintenance, planned works, and reactive repair	-2
	A2	Implement Small scale improvements	-1
	A3	Implement Major protection / raising / realignment works	+1
	A4	Reduce the level of service (i.e. 4WD only)	-3
	A5	Implement reactive (post event) redesign	-2
Road Access (Queenstown - Glenorchy road)	R1	Continue maintenance, planned works, and reactive repair	+1
Boat access	B1	Maintain existing boat access	-2
	B2	Implement periodic improvement (i.e. via dredging)	-3
	B3	Upgrade with resilient solution (i.e. relocatable wharves)	+2
	B4	Periodically relocate wharves	+1
Flooding mitigation and protection	F1	Implement flood network stations	+3
	F2	Integrate flood monitoring, forecasting & warning stations	+3
	F3	Develop emergency readiness and response	+3
	F4	Continue existing maintenance and reactive repair of Rees River	-1
	F5	Implement small scale protective works to reduce Rees River flood risk	-1
	F6	Implement major protective works to reduce Rees River flood risk	-2
	F7	Implement reactive (post event) flood protection for Rees River	+3
	F8	Continue existing river management through vegetation and gravel	-1 / +1
	F9	Implement nature-based river management interventions	+3
	F10	Implement reactive (post event) nature-based interventions	+3
	F11	Implement small scale works to reduce Buckler Burn erosion / flood risk	-2 / +2
Public Asset Resiliance	PA1	Improve resilience of critical public building assets in high hazard areas	-1 / +1
	PA2	Implement community wide improvement works for liquefaction hazard	-1
Private Property Resiliance	H1	Implement household emergency planning	+2
	H2	Adjustment property insurance cover	0 / +1
	H3	Improve property resilience	-1 / +1
	H4	Provide info. to assist house sales / purchases based on individual risk tolerance	-1 / 0
Policy	P1	Continue with existing land use zoning and building controls	-1
	P2	Implement strong land use controls in higher hazard areas	+2
	P3	Make lower hazard land available for relocation and / or new builds	+1
	P4	Develop and implement a proactive relocation plan	+3
	P5	Promote proactive voluntary relocation from higher hazard areas	+3
	P6	Develop a recovery plan	+1
	P7	Promote reactive (post-event) voluntary relocation from higher hazard areas	+1 / +2

9.5 Phase 4: How can we implement the Strategy?

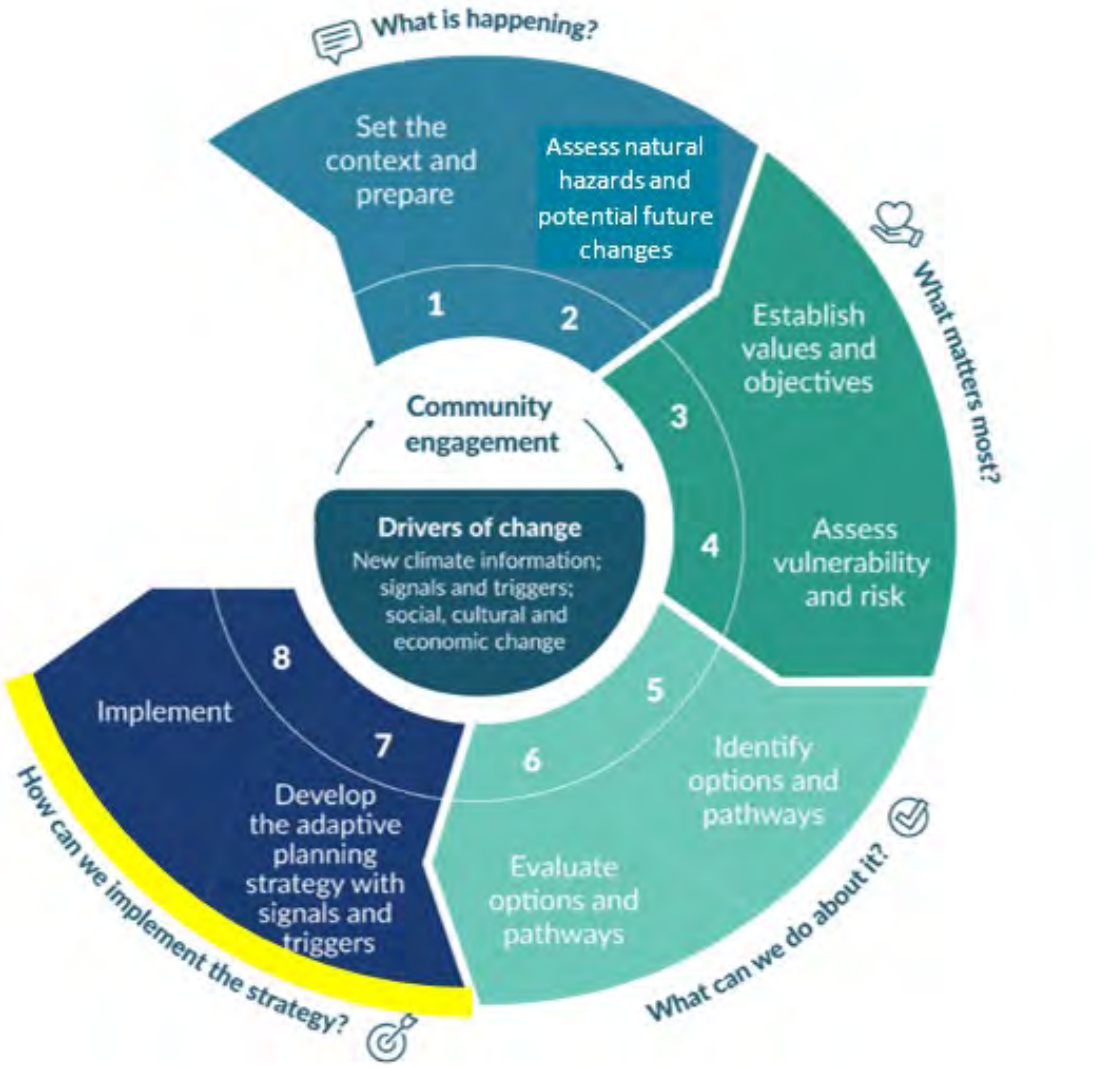


Figure 9.23 "How can we implement the Strategy?" Steps 7 & 8 of the adaptation cycle (modified from MfE 2024).

9.5.1 Adaptation pathways with signals and triggers

An adaptation threshold is 'what people do not want to happen' (an unacceptable condition). Based on what we have heard from the community and partners through this programme, the following adaptation thresholds are unacceptable conditions:

- Extended disruption to road access from Queenstown
- Frequent or severe damaging or disruptive events
- Loss of amenity and cultural values
- Lengthy displacement of people following extreme events
- Withdrawal of maintenance, decline in levels of service and increasing cost of repairs
- Unaffordable or high-excess insurance premiums or withdrawal of insurance and bank finance

An advanced "signal" is something we can monitor that helps to avoid an adaptation threshold being reached and being unprepared. Signals help us get ready to move to new pathways with enough time for decision-making and implementation. They give us a heads up and flag the need for collective effort on social, behavioural and institutional changes to support adaptation. However, surprise situations can still occur and so signals are not a guarantee that an adaptation threshold will be avoided.

There are huge numbers of different signals that could be monitored to track change at Head of the Lake area, across the domains of natural, built, social and economic. Guided by our goal of weaving adaptation into our everyday work, and our principle of cost-effectiveness, we have selected relevant and measurable signals that are aligned with current business-as-usual activities for Strategy partners:

- **SIGNAL #1. Growth in costs to maintain and repair assets**
- **SIGNAL #2. Lower level of service** (e.g. due to delta growth, river bed aggradation, channel movement)
- **SIGNAL #3. Frequency, number or impacts of flooding events reaching nuisance level** (this signal includes residential areas, roads and agricultural land)
- **SIGNAL #4. Movement of active river channel towards high value areas and assets**
- **SIGNAL #5. Negative impacts on community wellbeing** (e.g. concern and anxiety, increased demand for protection or for doing things differently)
- **SIGNAL #6. Insurance affordability or coverage** – this is outside the control of Strategy partners. Regional or national trends could be tracked by discussions and engagement with local government and insurance sector, and local trends with community members and Councillors.

"Triggers" denote decision points when a review and decisions are made as to whether to change responses or pathways. Triggers that occur ahead of an adaptation threshold are the most useful for forward planning.

- **TRIGGER #1. Decision-making cycles (3-year, 10-year, 30-year)** – this is the usual timing to consider partner agencies priorities, level of investment and business cases for changes. These timelines are suitable for staying ahead of gradual changes at Head of the Lake. Up-to-date analysis and reporting of the signals are important to feed into and inform the decision-makers. Public consultation is also required by agencies.
- **TRIGGER #2. Opportunities** – is about keeping adaptation goals in front of mind, looking out for opportunities to take action and make progress. Some example: funding opportunities; opportunities for integration with other projects; and opportunities to influence other decision-makers.
- **TRIGGER #3. Significant natural hazard event with unacceptable outcomes –** an integrated, multi-agency approach will be required for effective recovery. A one-off plan would be developed to support integrated decision-making.

9.5.2 Implementation Framework

The responsible agencies for the current natural hazard responses already in place are shown in Figure 9.23. The current responses are implemented through well-established planning processes, such as Long Term Plans, QLDC District Plan and Otago CDEM Group Plan. Many of the possible future responses are also standard ways of managing natural hazards. The plans have a regular update cycles and this is when decisions on continuing and future investment are made by the agencies.

Some possible future responses are out-of-the-ordinary. Implementation of uncommon responses would require one-off, specialised planning, funding and governance arrangements.

If there is severe damage as a result of a natural hazard event, then it is likely that a tailored recovery plan would be put in place.

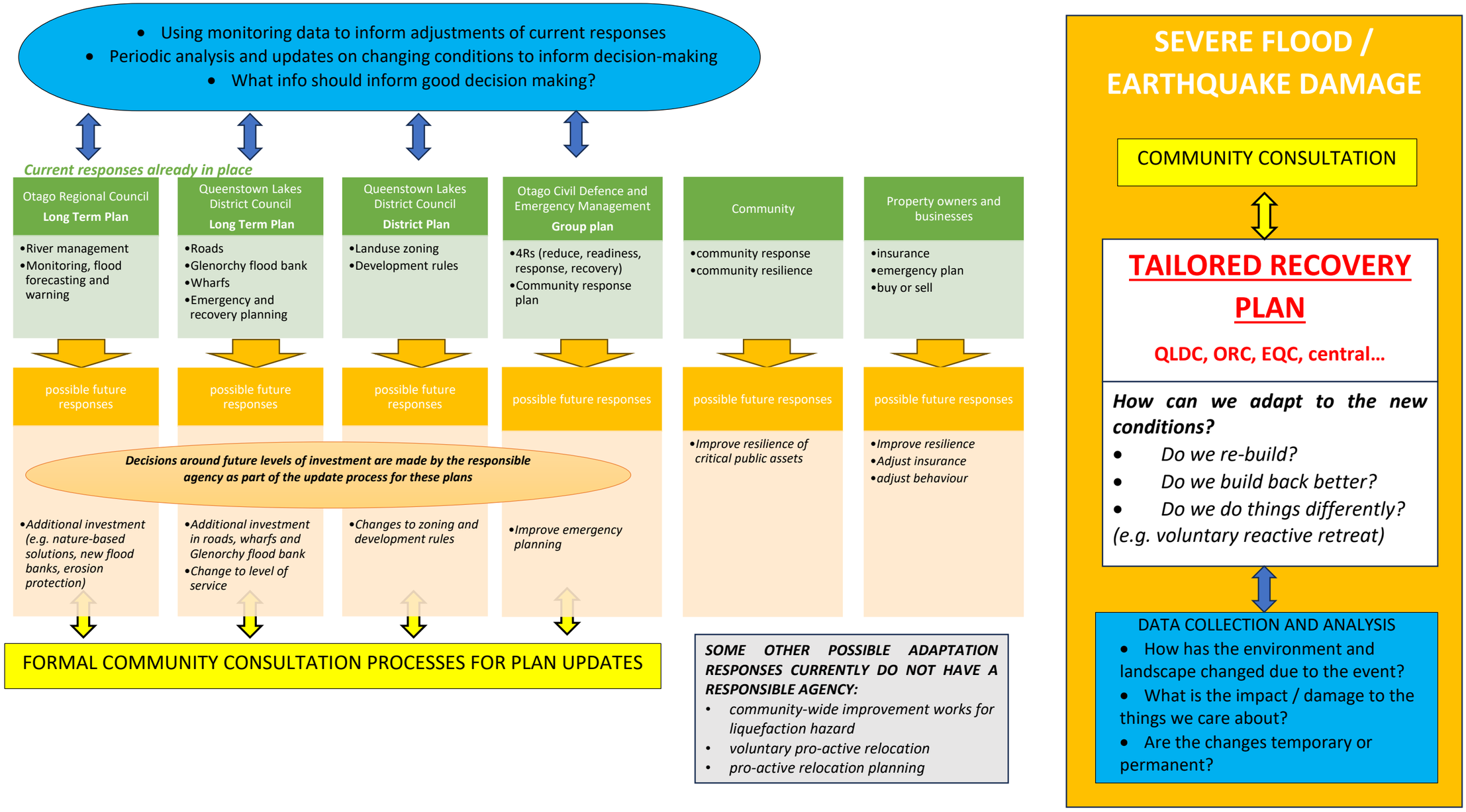


Figure 9.24 Current framework for implementation

9.6 Phase 5: How is it working: A review framework

Figure 9.25 "How is it working?" Steps 9 & 10 of the adaptation cycle (modified from MfE 2024).

Strategy partners already collect and track most of the information we would need to monitor how the Strategy is working, as part of our existing business practices. The following types of information can be used to track changes of social, economic, institutional and environmental conditions:

- Wellbeing surveys
- Community consultations
- Physical monitoring (e.g., hydrological data, aerial imagery, LiDAR topography, and cross-section surveys)
- Reporting on costs associated with services and activities
- Emergency and disaster damage/needs assessments
- Reporting on local disruptions, such as road closures
- Channels for the community to share observations and concerns regarding adaptive capacities, vulnerabilities, and awareness
- Updates and analyses of international and national trends on hazards adaptation and resilience

- Updates on central government direction or legislation related to natural hazards decision-making and climate change adaptation
- Reports on cultural values and aspirations of mana whenua embodied within this Strategy
- Community submissions and feedback on ORC and QLDC planning and decision-making processes
- Open dialogue on potential changes, risks, or opportunities
- Updates on insurance policies for property owners

We will track the progress of the Strategy by monitoring the implementation of the actions listed in the Action Plan (Section 10).

Every six years, ORC will conduct a comprehensive review to ensure the Strategy is updated appropriately in light of new information gathered from monitoring activities, or earlier if there is an urgent need.

10 Action Plan

This is the first iteration of the Action Plan, which shows what Strategy partners are doing and plan to do over current planning timeframes, to progress towards our Strategy goals.

Despite the resilience and adaptation work we already do at the Head of the Lake, we may need to do more and do some things differently to adapt to future changes.

We will update this action plan every 6 years, or more often if required, to reflect our progress and adjust. Between updates, we will track progress on actions and report back to the community via established communications channels (such as the newsletter and website).

Actions are organised by themes:

- Governance and collaboration
- Advice, information and education
- Addressing impacts and risks of hazards
- Emergency Management
- Information gathering and monitoring
- Policy and planning processes

Governance and collaboration

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Underway or planned	Otago Regional Council (ORC) and Queenstown Lakes District Council (QLDC) collaborate to develop a governance framework or memorandum of understanding (MoU) for addressing adaptation issues at the Head of the Lake and/or across the district, including the implementation of adaptation actions to improve resilience.	1	Otago Regional Council (Natural Hazards) Queenstown Lakes District Council	
Underway or planned	ORC to partner with mana whenua to ensure mana whenua values and aspirations and mātauraka Kāi Tahu is embedded into decision-making and implementation of the Strategy, following the lead of Aukaha and Te Ao Mārama.	All goals	Otago Regional Council (Natural Hazards) Aukaha and Te Ao Mārama Inc	
Underway or planned	Work together with QLDC, Civil Defence Emergency Management Otago (CDEM), mana whenua and local community to ensure co-ordinated and consistent approach to implementation of actions aligning with this Strategy.	All goals	Otago Regional Council (Natural Hazards) Queenstown Lakes District Council Civil Defence Emergency Management Otago Aukaha and Te Ao Mārama Inc Glenorchy Community Association	
Underway or planned	Work together to mainstream adaptation across ORC work programmes and ensure our work aligns with this Strategy and towards achieving each goal.	All goals	Otago Regional Council (Natural Hazards, Environmental Implementation, Engineering, Integrated Catchment Management)	Ongoing

Information gathering and monitoring					
	Status	**Action**	**Goal this contributes towards**	**Agency responsible**	**Timeframe**
	Existing	ORC to Investigate hazards and risks as part of usual business	1, 2	Otago Regional Council (Natural Hazards)	Ongoing
	New	<u>Geomorphic change monitoring and assessment</u> Maintain an awareness of locations and scale of geomorphic changes (e.g. active river channel position, bed levels and rates of change) which may have direct impacts, or exacerbate natural hazard characteristics. • Collect LiDAR, aerial imagery - spatial extent to include at least Dart, Rees and Buckler (at least extent of 2019 survey). • Cross section survey and/or bathymetric LiDAR • Undertake geomorphic change detection analysis. This information will; • Enable proactive response to issues • enable the updating of flood hazard assessments to ensure they provide representation of current conditions (e.g. bed levels).	2	Otago Regional Council (Natural Hazards) with external support	Periodic (at least every 5 years) or when new LiDAR is available

Information gathering and monitoring

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Existing	<u>Data collection to document major flooding (or other hazard) events</u> Improve the recording and understanding of hazard event characteristics (e.g. floodwater extents, depths and flow pathways), and the impacts of those events. The types of data collected will depend on the hazard and the impact and may include the following: • Post-event LiDAR • During-event or immediately post-event aerial imagery • During-event or post-event observations (on-ground inspections and/or drone imagery) • Develop an online data portal to enable collation of crowdsourced natural hazard event observations (e.g. photographs) • On-ground post-event survey (debris survey) • Assessments/observations of damages/impacts (infrastructure, or residential) • Geotechnical assessments • Post-earthquake assessments (landsliding, liquefaction, subsidence …) This information will; • Assist with hazard/risk assessments by providing ground-truthed observations of hazard events. • be valuable for calibration/validation of future hazard modelling, helping to ensure models represent reality.	2, 3	Otago Regional Council (Natural Hazards) with external support	After hazard events

Information gathering and monitoring

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	<u>Monitoring and analysis of signals/triggers/thresholds</u> SIGNALS – give us a heads up about changes • Growth in costs to maintain and repair assets • Lower level of service (e.g. due to delta growth, river bed aggradation, channel movement) • Frequency, number or impacts of flooding events reaching nuisance level (this signal includes residential areas, roads and agricultural land) • Movement of active river channel towards high value areas and assets • Negative impacts on community wellbeing (e.g. concern and anxiety, increased demand for protection or for doing things differently) • Insurance affordability or coverage TRIGGERS – points where review and decisions are made • Decision-making cycles (3-year, 10-year, 30-year) • Opportunities • Significant natural hazard event with unacceptable outcomes THRESHOLDS – unacceptable conditions we are trying to avoid • Extended disruption to road access from Queenstown • Frequent or severe damaging or disruptive events • Loss of amenity and cultural values • Lengthy displacement of people following extreme events • Withdrawal of maintenance, decline in levels of service and increasing cost of repairs • Unaffordable or high-excess insurance premiums or withdrawal of insurance and bank finance	2	Otago Regional Council (Natural Hazards) with input from Queenstown Lakes District Council and external support	Periodic (at least every 5 years)

Information gathering and monitoring

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	Communication and reporting of physical environment monitoring • Data collection and analysis findings will be communicated to key project partners and stakeholders. • A brief environmental monitoring update report will be prepared every 3 years summarising any notable natural hazards event/impacts (e.g. peak flows/lake levels observed) within that time period, and any post-event data collection or analysis completed. • One-off standalone event reports may be prepared for any natural hazards events which causes significant impact – summarising event causes, characteristics, effects/impacts, and ORC responses. • Reports will be distributed to key contacts, through existing communication channels (e.g. ORC e-newsletter and project website), and appended to any councillor update reports.	2	Otago Regional Council (Natural Hazards)	3 yearly updates One-off reporting for significant events

Emergency Management

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
New	Develop a long-term recovery plan for a potential major hazard event, including ways to minimise maladaptation post-event and ensure recovery considers long-term adaptation opportunities.	1, 3, 5	Otago Regional Council (Natural Hazards) Civil Defense Emergency Management Otago Queenstown Lakes District Council	Ongoing

Emergency Management

	Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	Existing	Operate a network of near real-time rainfall and water level stations across the region to support flood forecasting and emergency response with a 24/7 duty roster to support forecasting duties and any necessary response.	2, 3	Otago Regional Council (Natural Hazards, Engineering, Environmental Monitoring) Civil Defense Emergency Management Otago	Ongoing
	Existing	Monitor and ensure ORC's network of environmental monitoring stations remains fit for purpose; providing information for flood response, for documentation of flood events, and for public awareness of river flow, lake and lagoon levels). • Review of performance of the flood forecasting systems (lake level and lagoon level forecasting) • Review of hydrological monitoring network (any opportunities for improvement?) • New/temporary monitoring in some circumstances (e.g. landslide dam formation) This action is intended to ensure the monitoring network and forecasting systems provides the most suitable coverage.	1, 2	Otago Regional Council (Natural Hazards, Environmental Monitoring)	Periodic reviews One-off temporary monitoring
	Existing	Capability development and awareness raising • Undertake public/internal education to develop knowledge and raise awareness of risks and natural hazards to communities and Community Response Group's members. • Share lessons learned from emergency response with communities • Introduced and organised training sessions for Community Response Group members of how to use Community Emergency Hub Guide.	1, 2, 3	Civil Defense Emergency Management Otago	As needed Annually

Emergency Management

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Existing	Engagement with communities and stakeholders • Communicate prior to forecast weather events to have a common understanding around Lake and Lagoon levels, river flows and potential outcomes of the forecast weather • Communicate with communities about changes in risk and readiness • Work with Community Response Group to coordinate emergency support before, during and after an emergency • Organised consultations with communities on emergency proposed plans and guidelines. • Convene meetings with communities and stakeholders to decide a scale of an emergency event.	1, 2, 3	Civil Defense Emergency Management Otago Community Response Group	As needed Annually
Existing	Risk communication and early warnings • Provide right and trusted information about natural disasters to communities so that they can prepare effectively to emergency events.	3	Civil Defense Emergency Management Otago Queenstown Lakes District Council	Frequently Per event

Emergency Management

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Existing	Provide community resilience equipment • Provide communications equipment to not only communicate locally but also communicate to the Emergency Operations Centre in Queenstown if BAU communications systems have failed. • Provided equipment for communities to better prepare for emergency events: ✓ 4000W Petrol Inverter Generator ✓ Petrol Container ✓ Extension cords ✓ Multi boxes ✓ Rechargeable LED light 20Watt Work-lights ✓ Tripod LED light 60Watt Work-lights ✓ Handheld torches and spare batteries	3	Queenstown Lakes District Council Civil Defense Emergency Management Otago	As needed One-off
Existing	Develop and share emergency guides and plans and update annually • Glenorchy Community Resilience Guide (draft in progress) • Glenorchy Community Response Plan (draft in progress) • Developed Glenorchy Flood Guide • Developed Community Emergency Hub Guide • Developed Community Emergency Preparedness Brochure	3	Civil Defense Emergency Management Otago Community Response Group	Update annually

Emergency Management

	Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	Existing	Training and exercises for Community Response Group and Emergency Hub implementation • Provided trainings to help Community Response Group set up Emergency hubs, operating radios and community response planning. • Exercise the implementation of the Community Emergency Hub to gain an understanding of expectations of the community, emergency services and local government as well as clarify any ambiguity or operational expectations that may present during an actual emergency.	3	Civil Defense Emergency Management Otago Community Response Group	One-off As needed

Advice, information and education

	Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	Underway or planned	Ensure the ORC Natural Hazards Portal includes up-to-date information on natural hazards and the impacts of climate change, to provide the community with a single location for information.	2, 3	Otago Regional Council (Natural Hazards)	
	Underway or planned	Maintain ORC Head of Lake Whakatipu adaptation webpages with relevant and up-to-date information, including latest reports, Council updates and key programme milestones.	2	Otago Regional Council (Natural Hazards and Communications)	Ongoing
	Underway or planned	Provide newsletter updates about programme milestones and or progress towards actions to inform community members, and be accountable to the Strategy.	2	Otago Regional Council (Natural Hazards and Communications)	As needed
	New	ORC to attend Glenorchy Community Association (GCA) meetings as and when required, at least annually, to provide updates about programme	2, 3	Otago Regional Council (Natural Hazards)	Annually or as needed

Advice, information and education

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	milestones and progress towards actions and act as a check-in with the community.			
Underway or planned	Ensure that ORC's messaging about natural hazards adaptation and adaptation workstreams is communicated in a way that is understood by a wide audience.	2	Otago Regional Council (Natural Hazards and Communications)	Ongoing
Underway or planned	Monitor the headofthelake@orc.govt.nz inbox for public enquiries and information relating to the programme. Consider other methods and tools for capturing community feedback.	2	Otago Regional Council (Natural Hazards)	Ongoing

Policy and planning processes

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Underway	Consider natural hazard property information for resource and building consents.	4	Queenstown Lakes District Council	Ongoing (BAU)
Underway or planned	ORC and QLDC to collaborate to ensure common adaptation priorities, information and actions identified in this Strategy inform and input into the next ORC and QLDC Long-Term Plan, Spatial Plan, District Plan and other relevant policies and plans.	1, 2	Otago Regional Council Queenstown Lakes District Council	Every LTP cycle
	Natural hazard information included on LIM reports	1, 2	Queenstown Lakes District Council	
New	ORC and QLDC to collaborate on path forward for assessing risk tolerance with the community (once the proposed RPS is operative)	1, 2, 3, 4	Otago Regional Council Queenstown Lakes District Council	once the proposed RPS is operative

Addressing impacts of natural hazards and climate change				
Status	**Action**	**Goal this contributes towards**	**Agency responsible**	**Timeframe**
Underway	Routine maintenance of transport network, including QLDC roading assets, Glenorchy jetty and marina.	1, 4	Queenstown Lakes District Council	Ongoing/BAU
Underway	Glenorchy Area Bridge Resilience (24-34 LTP): Non-routine work required to protect the serviceability of the Glenorchy, Paradise, Rees River bridge assets following damage, and to minimise threat of road closure due to natural phenomena.	1, 4	Queenstown Lakes District Council	As required, budgeted biennially
Underway	Raising Kinloch Road (24-34 LTP) Raising Kinloch Road in conjunction with two-yearly gravel extraction under the Rees River bridge.	1, 4	Queenstown Lakes District Council	As required, budgeted biennially
New	Develop Operational River Management Plans, including the Dart and Rees floodplains. • Operational Management Plans that outline the activities undertaken for river management. • These plans will be developed in 2025.	1, 4	Otago Regional Council (Engineering and Natural Hazards)	2025 Reviewed every 2 years
New	Develop a gravel management plan for the Buckler Burn • ORC, Engineering held consent of Buckler gravel management plan. • This plan will be developed in 2025.	1, 4	Otago Regional Council (Engineering and Natural Hazards)	2025 Reviewed every 2 years
Underway	Annual vegetation management, rock armouring and gravel management • Ongoing river management activities (such as regular vegetation control in Lagoon Creek/Lagoon area)	3, 4, 5	Otago Regional Council (Engineering)	Ongoing/Annually
Existing	Maintenance of Rees River floodbanks • Maintain (not renew or increase) the existing banks – (Rees River floodbanks are not owned by ORC)	1, 4	Otago Regional Council (Engineering and Natural Hazards)	Every 1 year

Addressing impacts of natural hazards and climate change				
Status	**Action**	**Goal this contributes towards**	**Agency responsible**	**Timeframe**
New	Floodplain and rivers • Create/trial NBS groynes	1, 4, 5	Otago Regional Council (Engineering and Natural Hazards)	Every 2 years
New	Glenorchy Adaptation Pathways (30 Yr Infrastructure strategy) Work on Social Infrastructure required to address selected adaptation pathways, as budgeted in the QLDC 30 year Infrastructure Strategy.	1, 3, 4	Queenstown Lakes District Council	2034-2054
New	Provide information and support property owners to undertake property-level interventions to improve their resilience to natural hazards risks.	3, 4	Otago Regional Council (Natural Hazards)	
New	Head of the Lake Adaptation (24-34 LTP) Strategy to inform responses to identified hazards, providing scoped and costed solutions for input to the next LTP (27-37) and other key planning documents	1, 2, 4	Queenstown Lakes District Council	2034-2054

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12 Glossary of Terms

Key Term	Definition
Adaptation	Adaptation in this Strategy is defined as a proactive response to anticipate and adjust to ongoing and future environmental changes. It is an ongoing process that involves identifying, assessing and managing risk while continually evaluating the effectiveness of actions and making necessary adjustments. This proactive, long-term approach enables planning and response in situations where the future is uncertain including variability in the rate, timeframe and magnitude of change.
Adaptation options / responses	The wide range of strategies and measures that are available and appropriate for addressing adaptation. They can take the form of structural, institutional, ecological or behavioural actions.
Adaptive capacity	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences.
Aggradation	Net accumulation of sediment in the stream channel or land surface.
Alluvial fan	An alluvial fan is a triangle-shaped deposit of gravel, sand and even smaller pieces of sediment, such as silt. This sediment is called alluvium.
Annual Exceedance Probability	Annual Exceedance Probability (AEP) is the probability of a certain sized flood occurring in a single year. For example, a 0.5% AEP flood has a 0.5 per cent, or 1 in 200 chance of occurring in any year. Large, infrequent floods have a low AEP and smaller, more frequent floods have a higher AEP. 200-year ARI and 0.5% AEP are different ways to describe the same event.
Average Recurrence Interval	The Average Recurrence Interval (ARI) is the average time between floods of a certain size. Large, infrequent floods have higher ARIs than smaller, more frequent floods. For example, a 200 year ARI flood will occur on average once every 200 years. A 50 year ARI flood will occur on average once every 50 years and be a smaller flood than a 200 year ARI. While a 200 year ARI flood may happen once every 200 years on average, every year there is still a 1-in-200 chance that a flood of this size might occur. 200-year ARI and 0.5% AEP are different ways to describe the same event.
Avulsion	An avulsion is the process where a river channel switches location, often suddenly, and may result in the complete or partial abandonment of the formerly active channel.
Capacity building	The practice of supporting an individual, community, society or organisation to respond to change by enhancing their strengths and attributes and improving the resources available to them.

Key Term	Definition
Climate change	A change in the state of the climate that can be identified (eg, by using statistical tests) by changes or trends in the mean and/or the variability of its properties, and that persists for an extended period, typically decades to centuries. Includes natural internal climate processes and external climate forcings such as variations in solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. The United Nations Framework Convention on Climate Change (UNFCCC) definition of climate change specifically links it to direct or indirect human causes, as: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.
Co-benefit	A positive effect that a policy or measure aimed at one objective has on another objective, thereby increasing the total benefit to society or the environment.
Cumecs	The unit of volumetric rate of flow, equal to one cubic metre per second.
Delta	Deltas are landforms at the mouths of rivers. They are formed when rivers drop their sediment upon entering another body of water.
Disaster	A serious disruption of the functioning of a community or a society, at any scale, that occurs because hazardous events interact with conditions of exposure, vulnerability and capacity, leading to human, material, economic and/or environmental losses and impacts.
Disaster risk management	Processes for designing, implementing and evaluating strategies, policies and measures to improve understanding of current and future disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, prevention and protection, response and recovery practices. The aim is to increase human security, wellbeing, quality of life and sustainable development.
Dynamic adaptive pathways planning	A framework that supports climate adaptation decision-making by developing a series of actions over time (pathways). It is based on the idea of making decisions as conditions change, before severe damage occurs, and as existing policies and decisions prove no longer fit for purpose.
Flood	An event where the normal boundaries of a stream or other water body overflow, or water builds up over areas that are not normally underwater. Floods can be caused by unusually heavy rain – for example, during storms. Floods include river (fluvial) floods, flash floods, urban floods, rain (pluvial) floods, stormwater floods, coastal floods and glacial lake outburst floods.
Free face	Regarding liquefaction hazard, a free face occurs where the land is not physically constrained, such as riverbanks and the front face of deltas. Part of the free face may be underwater.
Freeboard	An allowance in engineering design to account for uncertainties and other effects above an estimated floodwater level.

Key Term	Definition
Geomorphic/geomorphology	Geomorphology is the study of landforms and the processes that shape them.
Hazard	The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.
Hapū	Within each iwi (tribes) are many hapū (clans or descent groups), each of which is made up of one or more whānau (extended families).
Impact	The consequences of realised risks on natural and human systemsy. They are generally effects on human lives, livelihoods, health and wellbeing; ecosystems and species; economic, social and cultural assets; services (including ecosystem services); and infrastructure. They can be harmful or beneficial. Also known as consequences or outcomes.
Iwi	Generations ago, waka sailed by Māori ancestors set out from East Polynesia and landed in New Zealand. From these founding peoples came the iwi (tribes) that form the structure of Māori society. Within each iwi are many hapū (clans or descent groups), each of which is made up of one or more whānau (extended families). The bond that holds them together is one of kinship, both with a founding ancestor and with the many members of their iwi, hapū and whānau today.
Lateral spreading	Lateral spread is defined as the horizontal movement of ground towards the free-face or downslope as a result of the liquefaction of shallow underlying soil deposits. Liquefaction primarily occurs as a result of earthquake shaking of loose sands and soils. Free faces include river channels and fan deltas.
Liquefaction	Liquefaction causes wet, sandy, and silty soils to behave more like a liquid than a solid during strong earthquake shaking. To liquefy, soil must be loose, sandy or silty, and wet (below the water table). Clay and gravel tend not to liquefy.
Maladaptation	Actions that are unsustainable and may lead to increased risk of adverse climate-related outcomes, including increased greenhouse gas emissions, increased vulnerability to climate change and reduced welfare, now or in the future. Maladaptation is usually an unintended consequence. Some actions may be effective in some ways but maladaptive in others.
Mana whenua	Mana whenua are Māori who hold traditional customary authority and are representatives of Treaty partners within an area and whose traditions and histories are as determined by whakapapa, resource use, and ahikāroa (the long burning fires of occupation). In Otago, Kāi Tahu are mana whenua.
Mātuaraka Māori	Kāi Tahu knowledge
Nature-based solutions	Solutions that are inspired and supported by nature and are cost effective, and at the same time provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features (eg, vegetation and water features) and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. For example, using vegetation (eg, street trees or green roofs) or water elements (eg,

Key Term	Definition
	rivers or water treatment facilities) can help reduce heat in urban areas or support stormwater and flood management.
Natural hazard	Natural hazards are defined as environmental phenomena that have the potential to impact societies and the human environment.
Pathways	NIWA describes pathways thinking as follows: Pathways thinking is a planning approach that allows for the uncertainty and change by encouraging us to imagine many different futures. It does this by focussing on planning and that there will be many ways to find our way through the challenges of our future climate. It takes into account what is important to individuals, whānau and communities. It helps us to consider the many different options in front of us; how long these might be effective for and when we might need to change tack. Pathways thinking supports decision-making and investments in stages. It encourages people to identify triggers (for example a flood), and to make decisions in advance about what to do if that trigger occurs. Using pathways thinking allows us to develop strategies for expected climate impacts, while not compromising or shutting-off other options. This flexible approach recognises that conditions can change and means we avoid being locked in to any one course. Pathways thinking is an approach that is in the Ministry for the Environment's coastal hazards guidance and is being used by councils and others around Aotearoa as they plan how to adapt to a changing climate.
Delta growth	Delta growth (progradation) is defined as the forward extension of shoreline systems due to the deposition of sediment
Qualitative risk	Qualitative risk analysis is a subjective approach that is based on descriptive measures. It uses words to describe the magnitude of potential consequences, and the likelihood that the event will occur. An example of this is a risk matrix, which can be colour-coded to make it easier to understand the level of associated risk
Quantitative risk	A quantitative risk analysis is focused on numerical values of the risks present, based on quantifiable data
Reduced level	Reduced Level (RL) is a standard term for survey points with reference to a common datum. In this report, the common datum is Dunedin 1958 local vertical datum, unless stated otherwise.
Resilience	Resilience has a broad range of definitions. In our context, it is the capacity and ability to withstand and/or recover quickly from difficult conditions. It also includes planning for unexpected events and supporting the wellbeing of our communities in adverse times.
Risk management	The process of making plans, actions, strategies or policies to reduce the likelihood and/or scale of potential adverse consequences, based on assessed or perceived risks.
Rūnaka	A Māori tribal council, assembly, board or administrative group

Key Term	Definition
Te ao Māori	The Māori world
Te Tiriti o Waitangi	The Treaty of Waitangi
Tolerable risk	A risk that society is willing to live with so as to secure certain benefits. Kept under review and may be further reduced as and when possible.
True left bank/true right bank	The sides of the river when facing downstream, meaning the direction the river is flowing.
Uncertainty	A state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may occur for many reasons. For example, the data may be imprecise, definitions of concepts or terminology may be ambiguous, understanding of critical processes may be incomplete, or projections of human behaviour may be in doubt.
Vulnerability	The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.
whānau	Within each iwi are many hapū (clans or descent groups), each of which is made up of one or more whānau (extended families).

List of acronyms and abbreviations

Acronym	Full name
ARI	Annual Recurrence Interval
AEP	Annual Exceedance Probability
GIS	Geographic Information System
ORC	Otago Regional Council
QLDC	Queenstown Lake District Council
CDEM	Civil Defence Emergency Management Otago
LTP	Long Term Plan
LiDAR	Light Detection and Ranging
RL	Reduced Level
RPS	Regional Policy Statement

13 Appendices

Appendix A – Programme Deliverables

Table 13-1 Deliverables completed for Head of Lake Whakatipu natural hazards adaptation work programme (October 2024)

Programme Deliverables	Details
3 flooding hazards assessments	• Gardner M, 2022. Dart/Rees Rivers flood hazard modelling. Prepared by Land River Sea Consulting Ltd. • Gardner M and Beagley R, 2023. Buckler Burn flood hazard modelling. Prepared by Land River Sea Consulting Ltd • Beagley R, 2024. Glenorchy flood modelling – flood hazard scenarios. Prepared by Land River Sea Consulting Ltd
1 liquefaction hazard assessment	• Tonkin + Taylor Ltd (T+T), 2022. Glenorchy Liquefaction Vulnerability Assessment.
9 supporting studies (e.g. hydrology, geotechnical, geomorphic)	• Brasington J, 2024. Geomorphic Character and Dynamics of the Rees-Dart Fluvial Systems. Prepared by the Waterways Centre University of Canterbury for Otago Regional Council. • Fuller I and McColl S, 2021. Key notes and observations from preliminary assessment of debris flood and flow hazard potential at Glenorchy, Otago, Prepared by Massey University. • Jaquin P, 2020. Glenorchy Floodbank Rees River. Prepared by WSP. • Jaquin P, 2020. Glenorchy Rees Floodbank - Floodbank Assessment. Prepared by WSP • Mohssen M, 2021. Analysis of Flood Hazards for Glenorchy. • Mohssen M, 2024. Glenorchy Catchments Hydrology and Design Flows. Prepared by HydroScience • Morris T and Ashfield D, 2021. Rees-Glenorchy floodbank structure failure modes assessment. Prepared by Tonkin + Taylor Ltd • Shaw M, 2022. Shepherds Hut Creek debris flow hazard report. Prepared by WSP • Tonkin + Taylor Ltd, 2021. Head of Lake Wakatipu Natural Hazards Assessment.
1 social and economic impact assessment (two phases)	• Healy J, Stringer K and Goodall, 2024. Socio-economic Impact Assessment - Head of Lake Whakatipu Adaptation Strategy - Phase 1. Prepared by Beca Ltd • Healy J, Stringer K and Goodall, 2024. Socio-economic Impact Assessment - Head of Lake Whakatipu Adaptation Strategy - Phase 2. Prepared by Beca Ltd
1 natural hazards risk assessment	• Menke R, Hoetjes, and Punt A, 2024. Glenorchy and Kinloch Natural Hazards Risk Analysis Report. Prepared by Beca Ltd
5 natural hazards mitigation studies	• Menéndez Arán D and Shrestha J, 2024. Assessment of Floodplain Intervention Options – Dart River. Prepared by Damwatch Engineering Ltd. • Veale B and Shrestha J, 2024. Assessment of Floodplain Intervention Options – Lower Rees River & Glenorchy. Prepared by Damwatch Engineering Ltd • Veale B, Shrestha J and Webby G, 2024. Assessment of Floodplain Intervention Options – Upper Rees River. Prepared by Damwatch Engineering Ltd • Tonkin + Taylor Ltd (T+T), 2023. Engineering Approaches for Managing Liquefaction-Related Risk. Prepared by Tonkin + Taylor Ltd • Webby G, 2022. Dart-Rees Floodplain Adaptation - Report on 23-24 February 2022 Workshop.
1 cultural values statement	• Takau Y, 2024. Cultural Values Statement, prepared by Aukaha.

Programme Deliverables	Details
1 mana whenua assessment	• Aukaha, 2024. Head of Lake Whakatipu Waimāori Mana Whenua assessment
10 Otago Regional Council Safety & Resilience Committee papers or workshops	• 2021 - May • 2022 - June • 2023 - May, August, November • 2024 – February, May, August (workshop & paper), November
2 Queenstown Lakes District Council workshop or briefings for councillors	• May 2021 (jointly with ORC) • September 2024
15 community engagement activities	• 2019-2020 – Updates at Glenorchy Community Association meetings • December 2020 – Community drop-in session • April 2021 – Public presentation • April 2021 – Community drop-in session • June 2022 – Online presentation • July 2022 – Community drop-in session • August 2023 – Community workshops • July 2023 – April 2024 – Community involvement in SEIA (from scope to review stages) • September 2023 – Online survey • November 2023 – Stall at Glenorchy Village Fair • April-May 2024 – Two adaptation classroom sessions at Glenorchy School • April-May 2024 – Head of the Lake Youth Art Competition • May 2024 – Online presentation • September 2024 - Public presentation (in-person and livestreamed) • September 2024 – Community drop-in session
41 editions of a community newsletter	• Commencing in August 2020 and ongoing
Programme webpage	• Webpage on ORC website from December 2020, regularly updated
3 environmental monitoring stations installed	• Glenorchy lagoon (water level) • Rees River at Invincible (flow) • Lake Wakatipu at Glenorchy marina (water level)
1 flood forecast model developed and tested	• Mohssen M, 2023a. Flood Forecasting for Glenorchy Township. Prepared by HydroScience for Otago Regional Council. • Mohssen M, 2023b. Analysis of Glenorchy Lagoon Levels for Event September 2023 and its FFM Model's Performance. Prepared by HydroScience
2 research projects supported	• MacKenzie J, 2023. Telling Stories: Community engagement in a complex and dynamic natural hazards adaptation context at the Head of Lake Whakatipu. Masters Thesis, University of Otago. • Coursey S, PhD research project, in progress. Massey University, NIWA, University of Otago.

Most reports are available online: https://www.orc.govt.nz/get-involved/projects-in-your-area/head-of-lake-whakatipu/ or can be provided on request

Appendix B – Supporting information about existing responses and future toolbox

This appendix provides details and supporting information about responses in three sections:

a) Local knowledge and community insights

b) What responses are already in place?

- Social, behavioural, and institutional changes
- Current plans and policy that guide land use and development
- Investment in assets, services, and activities
- Emergency management - reduction, readiness, response and recovery
- Responses by property owners

c) Future toolbox

- Review and adjust existing responses
- Investigation of possible engineering and floodplain responses
- Land use planning and governance measures
- Retreat / Relocation

LOCAL KNOWLEDGE AND COMMUNITY INSIGHTS

We have heard many ideas, insights and observations from the community about what we can do to adapt to natural hazard challenges and impacts of a changing climate in the Head of Lake Whakatipu area. Thank you to community members for sharing. Table 13-2 collates the ideas and comments on how they were considered further.

Table 13-2 General community ideas or insights and how they were considered further.

Type of response	General community ideas or insights	How was it considered?	Is it part of the Strategy?
Protect	Minor repair to Glenorchy floodbank after the February 2020 flood event.	QLDC completed September 2020.	n/a
Protect	Maintenance of existing Glenorchy floodbank.	QLDC maintains the floodbank as asset owner	Yes, existing response in Section **Error! Reference source not found.**
Protect	Raise existing Glenorchy floodbank	Considered as a possible future response.	Yes, discussed in Section **Error! Reference source not found.**
Protect	New long floodwall alongside the true left bank of the Rees River.	Investigated but found unfeasible (Webby 2022).	Not taken forward.
Protect	Lake flooding protection, including a lake floodbank	Unfeasible	Not taken forward.
Protect	Floodable infrastructure and dedicated areas for water storage during flood events (wetland, canals or channels, greenspaces)	Existing Glenorchy wetland and lagoon fulfils this role	Yes, retain its function, see Action Plan
Protect	Floodbank, rock revetment or vegetation to prevent erosion of Kinloch Road	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Accommodate	Clearance of thick willow growth alongside Lagoon Creek which drains the Glenorchy Lagoon to the Rees River in response to February 2020 flood event.	Completed by ORC in August 2020 in collaboration with DOC.	n/a
Accommodate	Short-term improvements to drainage of Rees River into Lake Whakatipu during high river flows in response to February 2020 flood event.	Short-term, local realignment of the Rees River channel to assist drainage completed in August 2020.	n/a

Type of response	General community ideas or insights	How was it considered?	Is it part of the Strategy?
Accommodate	Install additional lake level recorders and river flow models near Glenorchy, in the Glenorchy Lagoon and at the Rees River.	Lake Whakatipu at Glenorchy marina (water level) site established January 2021. Glenorchy Lagoon (water level) site established October 2020. Rees River at Invincible (river flow) site established December 2021.	Yes, existing response in Section **Error! Reference source not found.**
Accommodate	Behavioural and societal changes to help people prepare, respond, cope and recover from natural hazard events.	Ongoing work in collaboration with CDEM Otago to increase community resilience and understandings of natural hazards.	See action plan.
Accommodate	Create a flood response plan	CDEM Otago has developed and is developing number of emergency guides and plans, which are updated annually.	See action plan.
Accommodate	Install sensors, monitoring recorders or warning system at the Buckler Burn to warn about heavy rainfall or rapidly rising river levels.	ORC reviews its monitoring network regularly and will consider the case for Buckler Burn monitoring	See action plan.
Accommodate	Property level improvements and interventions to existing houses (such as raising floor levels, waterproofing)	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Accommodate	Raise land levels in town and low-lying farmland	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Accommodate	Raise and/or realign Kinloch Road	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.** See Action Plan for current commitment

Type of response	General community ideas or insights	How was it considered?	Is it part of the Strategy?
Accommodate	Alternative transport access to Kinloch and DOC tracks	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Accommodate	Boat access to Glenorchy and Kinloch	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Accommodate	Planting and willow clearing in Rees floodplain	Considered as part of Upper Lakes Catchment Action Plan (in development)	See action plan.
Accommodate	Extract gravel from the Rees River under the Rees Bridge.	QLDC currently extracts gravel periodically	Yes, discussed in Section **Error! Reference source not found.**
Accommodate	Gravel extraction in Dart-Rees Delta to re-direct Rees flows through the split or create a secondary channel for high flows.	Not feasible for flood flows	n/a
Retreat	Managed relocation from high-risk areas in the long-term	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Retreat	Reactive retreat after a disaster	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Retreat	Council(s) should proactively purchase land for the purposes of future relocation of properties.	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Retreat	Relocate critical assets in high-risk areas (i.e. fire station)	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Avoid	No new development/redevelopment or change of land use that will exacerbate risk	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Avoid	More restrictive building development standards in high-risk areas	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**

Type of response	General community ideas or insights	How was it considered?	Is it part of the Strategy?
Avoid	Use planning and zoning mechanisms to define and 'protect' areas of low-risk land for future relocation processes.	Considered as a possible future response	Yes, discussed in Section **Error! Reference source not found.**
Other	We want to understand our risk in comparison to others	Refer to Risk Assessment for Glenorchy and Kinloch	Yes Discussed in Section 9.3.5
Other	We want the social and economic worth of our community to be considered in decision-making	Refer to Socio-economic Impact Assessment Phase 1	Yes iscussed in Section 5.4

WHAT RESPONSES ARE ALREADY IN PLACE?

The long-list in Table 9-6 identifies 13 responses that are already in place and contributing to hazard management at Head of Lake Whakatipu. Further discussion of details and implementation is provided below.

EXISTING SOCIAL, BEHAVIOURAL, AND INSTITUTIONAL CHANGES

There are several ways ORC, partners, community and stakeholders are improving awareness of natural hazard risks and impacts of climate change. This Strategy recognises that knowledge sharing is a two-way process, and so it is essential to have open and transparent dialogue between councils and communities. These efforts aim to improve individual, community and organisational awareness and build their adaptive capacity to natural hazard risks and future changes. Existing and ongoing actions in this category, include:

- Making all information (including technical reports, Council update reports) publicly available on the Head of Lake Whakatipu webpage[14].
- Making technical reports more accessible for a public audience, by providing 'plain-language' summaries.
- Updating the Otago Natural Hazards Portal[15] with the latest natural hazard mapping information.
- Coordinating public talks and recorded presentations on findings of key hazards studies.
- Attending community events to allow opportunities for people to talk with ORC staff and for two-way knowledge sharing and learning.
- Hosting engagement events to provide opportunities for people to talk with ORC staff and consultant experts for two-way knowledge sharing and learning.
- Providing responses to natural hazard enquiries from members of the public.
- Providing QLDC with hazard information, for QLDC to update Land Information Memorandums (LIM).
- Capturing local knowledge, observations and experiences through engagement and feedback from community members.

EXISITNG PLANS AND POLICY THAT GUIDE LAND USE AND DEVELOPMENT

2021 Queenstown Lakes District Spatial Plan (the Spatial Plan) – was developed in partnership with the Queenstown Lakes District Council (QLDC), central Government, Aukaha, and Te Ao Mārama inc. (Kāi Tahu). It is noted that the Otago Regional Council have since joined the Grow Well Whaiora Partnership and are jointly responsible for implementing the Spatial Plan. The Spatial Plan sets out a vision and framework for how and where the district will grow out to 2050. It is focused on ensuring that future growth happens in the right place and is supported by the right infrastructure. It does this by:

- Aligns decision making and investment across local, regional and central government.

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[14] https://www.orc.govt.nz/get-involved/projects-in-your-area/head-of-lake-whakatipu/investigations-reports-and-presentations/

[15] https://maps.orc.govt.nz/portal/apps/MapSeries/index.html?appid=b24672e379394bb79a32c9977460d4c2

- Identifies existing and future urban areas and infrastructure needs.
- Identifies priority areas for investment and action; and other strategically significant priorities.
- Identifies areas to protect and enhance; and areas subject to natural hazards.

QLDC District Plan (QLDC) – guides land use and development in the district. It contains objectives, policies and rules for resource management activities. It sets out what activities can be done as of right, what activities need resource consent for, and how certain activities may be carried out. It covers things like residential development; noise; location and height of buildings; activities on the surfaces of rivers and lakes; and protection of indigenous vegetation.

The District Plan defines rules for permitted activities. Chapter 28 of the Proposed District Plan provides a policy framework to address natural hazards throughout the District. Currently, low-lying areas at Glenorchy and Kinloch that are susceptible to flooding from high lake levels are shown as 'Historical Flood Zone' on the Planning Maps, with corresponding rules relating to building levels: *"buildings with a gross floor area greater than 20m^2 shall have a ground floor level not less than RL 312.8 masl (412.8 Otago Datum) at Kinloch, Glenorchy and Kingston"*.

EXISTING INVESTMENT IN ASSETS, SERVICES, AND ACTIVITIES

Long-term plans (LTP) are Ten Year Plans, adopted by councils every three years. They are the blueprint for investment in the region's (ORC) and district's (QLDC) infrastructure, services and activities over the next ten years. LTPs also include 10-year Financial Strategies and 30-year Infrastructure Strategies. The current long-term plans that are relevant to this Strategy are:

- QLDC 2024-2034 Long Term Plan
- ORC 2024-2034 Long Term Plan

The Action Plan (Section 10) outlines existing and planned actions for the following assets, infrastructure and activities relevant to the Strategy:

- Road network (including Rees and Dart Bridges) (QLDC)
- Glenorchy floodbank (QLDC)
- Kinloch and Glenorchy wharfs (QLDC)
- River management (ORC)
- Integrated catchment management (ORC)
- Monitoring, forecasting and warning (ORC)

QLDC undertakes asset and infrastructure management activities, such as inspection, operational repair and maintenance, as well as planning and decision-making regarding improvements and renewals. QLDC's Asset and Activity Management Plans (https://www.qldc.govt.nz/your-council/council-documents/asset-management-plans/), such as Land Transport Asset Management Plan 2021-2031, provide additional details.

In response to the February 2020 flood event, erosion mitigation actions were carried out for Glenorchy floodbank.

ORC undertakes river and floodplain management activities, such as vegetation and gravel management, as well as associated planning and decision-making.

EXISTING EMERGENCY MANAGEMENT - REDUCTION, READINESS, RESPONSE AND RECOVERY

In alignment of the four principles of the National Disaster Resilience Strategy (2019) and the National Civil Defence Emergency Management Plan (2015): *reduction, readiness, response and recovery*, Otago CDEM has implemented various actions over recent years to enhance the capacity of communities at the Head of the Lake to manage and recover from emergencies. These principles are presented in the Otago Civil Defence Emergency Management Group 10-year Plan (2018-2028)[16]. Specific actions of Otago CDEM at Head of the Lake are detailed in Action Plan (Section 10).

To reduce risks from natural hazards, Otago CDEM is collaborating with ORC teams, including the Natural Hazards team, as well as communities and stakeholders, to identify and analyse risks to life and property, lifelines and critical infrastructure. This is being achieved through a combination of technical studies, workshops and consultations in the area. Otago CDEM is also developing a Catastrophic Event Plan: Alpine Fault (CATPLAN) to assist emergency managers and responding agencies prepare for this complex emergency scenario (Otago CDEM, 2024). This plan is in the consultation phase with stakeholders and is expected to be ratified by Otago CDEM Chief Executive's Group and Joint Committee in March 2025.

To get ready for emergencies, Otago CDEM is collaborating with communities, Community Response Group members and QLDC to develop emergency guidelines and plans. Recent initiatives have been completed, including the Glenorchy Community Response Plan (CDEM and Community Response Group, 2022) and the Community Emergency Preparedness Brochure (CDEM and QLDC, no date). Otago CDEM has also conducted workshops and training sessions to build capacity and improve the emergency preparedness and response skills of communities and community groups.

To respond to emergencies, Otago CDEM has developed evacuation plans to facilitate the safe relocation of people across the Head of the Lake area, including designated evacuation centres in Glenorchy and Kinloch. In the September 2023 weather event, the lagoon reached a high-water level (312.49m) and came close to overtopping the floodbank crest into the township area. A precautionary evacuation of flood-prone properties was undertaken. Although no flooding occurred on that occasion, the event and response provided a test of CDEM planning.

For emergency recovery, Otago CDEM has guided the Community Response Group in incorporating this objective into the Glenorchy Community Response Plan. The recovery plan emphasizes coordinated efforts to support community recovery after an emergency. It also outlines immediate, medium and long-term outcomes that the community aims to achieve following such events.

Environmental monitoring

Timely and relevant flood warning and emergency response can be considered a primary means of increasing the preparedness of the community and thus reducing the economic and social impact of a flood event.

ORC's current environmental monitoring stations in the head of Lake Whakatipu area are shown in Figure 13.1.

[16] https://www.otagocdem.govt.nz/media/1388/emergency-manangement-otago-group-plan-adopted-june-2019.pdf

All ORC monitoring data is publicly available in near real-time through ORC's online data portal,[17] allowing the community to proactively monitor river/lagoon/lake levels and take action if required. The monitoring data is also invaluable to the ORC flood response team, and to inform hydrological analysis for hazards assessment and development of flood forecasting models.

In response to the February 2020 flooding event, three new environmental monitoring stations were installed in the Glenorchy and Rees River area, designed to provide improved monitoring coverage and understanding of hydrological responses to major weather events.

- Rees River at Invincible (river flow), site established December 2021.
- Glenorchy Lagoon (water level), site established October 2020.
- Lake Whakatipu at Glenorchy marina (water level), site established January 2021.

Following installation of the new Rees River and Glenorchy Lagoon sites, further work was also carried out to increase the resilience of the recorders, such as building redundancy into the station's sensor and communications systems.

Early-warning alarm levels are set for Lake Whakatipu and Glenorchy Lagoon sites to provide near real-time notification to the ORC's flood response team when water level thresholds are exceeded. This supports timely advice to CDEM Otago and complements flood forecasting tools.

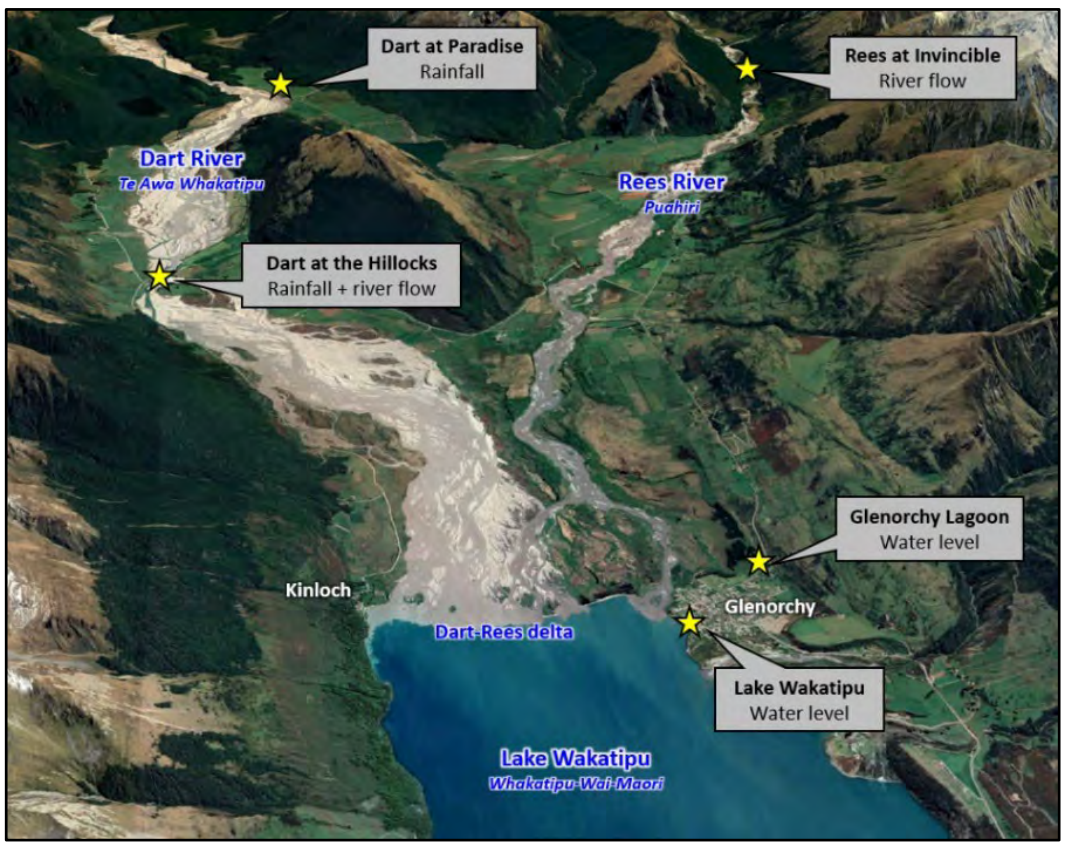


Figure 13.1 ORC environmental monitoring stations in the head of Lake Whakatipu area.

Flood warning systems

ORC has a key role in the flood monitoring and warning process to:

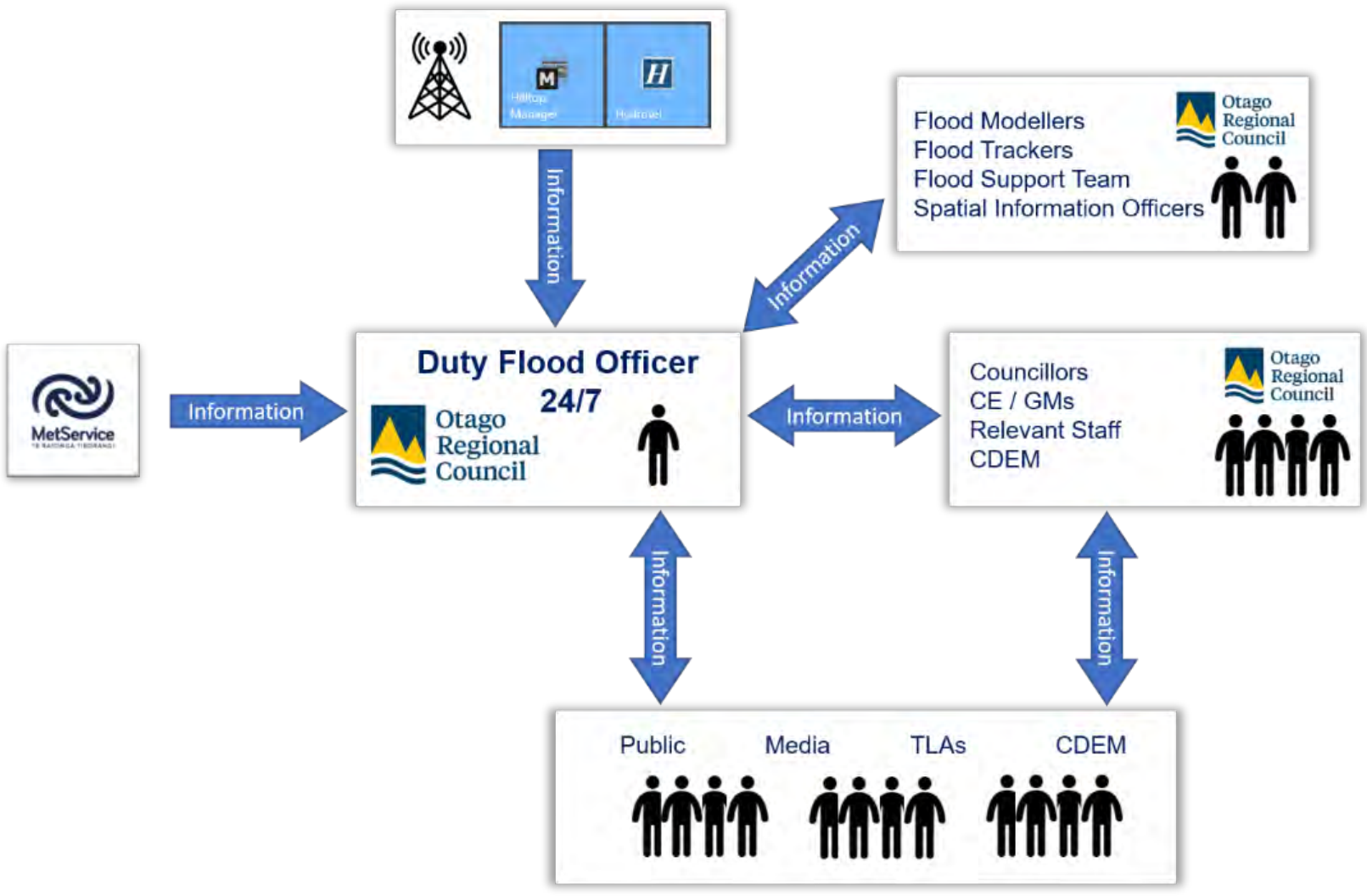
- Maintain an operational flood monitoring telemetry network and telemetry base computer.
- Provide near real-time environmental monitoring data.

[17] https://envdata.orc.govt.nz/AQWebPortal/Data

- Carry out flood forecasting where possible to give greater warning time.
- Provide information on a flood event to territorial authorities, CDEM, community, Councillors, and media.
- Answer public enquiries before, during and after a flood event.
- Carry out flood measurements/observations during a flood event.
- Carry out operational works during a flood event.

ORC maintains a 24/7 on-call flood duty team. The role of this team is to liaise with MetService regarding weather forecast information, to monitor and forecast river flows and lake levels, and to provide information to other agencies (e.g. CDEM, QLDC).

For the head of Lake Whakatipu area, the team makes use of weather forecast, environmental monitoring information, and forecasting tools which enable estimation of likely water levels for Lake Whakatipu and the Glenorchy Lagoon. ORC provides this information to CDEM Otago and QLDC, who provide the communications link to the community.



Glenorchy Lagoon flood forecasting model –

The model is used to forecast possible water levels at Glenorchy Lagoon when significant rainfall totals are forecast for the Rees catchment. The model can provide up to about three days early warning and estimates the final lagoon level for a rainfall event.

This is a relatively new model and still in a testing phase. Consequently, it requires application in a wider range of future rainfall and flood events to better evaluate model performance and accuracy. The model will be evaluated and revised following large flood events and when a longer period of monitoring data is available. For example, the model was evaluated and revised

following the September 2023 high-flow event where observed lagoon levels significantly exceeded those used in the model development (Mohssen, 2023b).

Lake Whakatipu flood forecasting model – estimates high lake levels for Lake Whakatipu based on forecast or recorded rainfall totals and recorded river flows.

EXISTING RESPONSES BY PROPERTY OWNERS

Property and business owners make decisions about appropriate levels of insurance coverage for their own situation.

Property owners are free to buy and sell based on their own risk tolerance, and make decisions about investment in property-level resilience to reduce potential damages (e.g. retrofit, floor raising, flood proofing).

Household readiness contributes to effective emergency management.

FUTURE TOOLBOX

The long-list in Table 9-6 includes possible responses that make up the future toolbox. Possible responses in the future toolbox are not commitments, as they do not have business cases or future funding identified at this stage. Some possible responses fall outside the current roles and responsibilities of partner agencies. There should be no expectation that the strategy partners will or will not undertake any particular mitigation works.

FUTURE TOOLBOX - REVIEW AND ADJUST EXISTING RESPONSES

Reviewing the suitability of existing responses is part of planning processes and happens periodically. Reviews consider factors such as; performance, costs and benefits, changes to risks and conditions, opportunities, and sustainability of current responses.

One way to think about the possible future pathways for existing responses:

- **Is it sustainable to keep doing the same?**
- **Are there things we can do better?**
- **Is it time to consider doing things differently?**

Over time we might choose to improve, adjust or expand our current approaches – these are the "do better" responses in our future toolbox (from Table 9-6):

1. Small scale improvement to existing Kinloch and Glenorchy-Paradise local road system road (as well as maintenance and reactive repair)
2. Major works to increase resilience of Kinloch and Glenorchy-Paradise local road system (e.g. protect, raise, realign)
3. Short-term improvements to existing boat access (e.g. dredging)
4. Small scale improvements to Glenorchy floodbank to maintain/reduce flood risk
5. Major works to increase level of service of Glenorchy floodbank
6. River management and nature-based interventions (e.g. targeted planting)
7. Small scale works to reduce Buckler Burn erosion and/or flood risk
8. Improve property and land resilience (such as floodproofing, floor raising, ground or structure strengthening)
9. Improve resilience of critical assets in higher hazard areas (such as floodproofing, floor raising, ground or structure strengthening, retrofit)
10. Policy – Review hazard and risk information and set minimum requirements for new development
11. Recovery plan improvement

In the future we might reach a point where our current approaches are unsustainable or unsuitable for changed conditions and we will need to consider "doing things differently" (from Table 9-6):

12. Reduced level of service of existing Kinloch and Glenorchy-Paradise local road system (e.g. some parts 4WD only)

13. Reactive re-design Kinloch and Glenorchy-Paradise local road system for changed conditions (e.g. post event)
14. Upgrade boat access with resilient solution (e.g. relocatable wharfs)
15. Relocate wharfs periodically to maintain future access
16. Redesign Rees flood protection for changed conditions (e.g. post event)
17. Redesign nature-based interventions for changed conditions
18. Policy - Strengthen land use controls in higher hazard areas to avoid additional exposure
19. Policy and services – make lower hazard land available for new building and/or relocation
20. Proactive relocation plan
21. Voluntary proactive relocation from higher hazard areas
22. Voluntary reactive post event retreat from higher hazard areas

FUTURE TOOLBOX - INVESTIGATION OF POSSIBLE ENGINEERING AND FLOODPLAIN RESPONSES

This section describes investigation reports completed as part of the Strategy work programme, in order to help ORC, QLDC, and the local community understand potential engineering responses or interventions for managing the liquefaction and flooding hazards identified in Glenorchy and in the Dart-Rees floodplain area.

The reports do not give recommendations for which hazard management interventions may be feasible or should be investigated further, but for each intervention considered, aims to outline the challenges and constraints as a starting point to inform continued discussions.

Rees Bridge Options Assessment

The floodplain assessment by Webby (2023) identified potential risks to the Rees River Bridge from continued bed aggradation and the potential for the Rees River to avulse upstream of the bridge.

QLDC engaged WSP to undertake a structural options assessment to help provide direction and guidance towards a long-term asset management strategy for the Rees Bridge structure. The study scope included: existing bridge structure; current levels of service; hydraulic assessment (including scour); morphological issues and options; structural options; and preliminary planning assessment.

Key findings (Wong, 2023):

- There is no simple solution to the sediment transport issue, and it is expected to continue to aggrade and potentially worsen under certain future scenarios (such as a major earthquake effecting the catchment).
- Due to predicted and observed outflanking of the bridge, there is also potential for the approaches to be damaged or washed away. However, this is preferable to a bridge pier being damaged. The approaches (and hence the bridge) should not be raised in the absence of lengthening the total span as this would potentially increase the risk and extent of scour at the bridge itself by forcing more flow through the bridge.
- It is evident that the aggradation risk at the Rees River Bridge is reliant on wider geomorphological behaviours and the hydraulic characteristics of the wider floodplain. While structural options such as raising the existing bridge and early bridge replacement were considered, the feasibility of both options remain subject to further assessment and

not considered to be of priority. The bridge raising option is also likely to be cost prohibitive and unlikely to be favoured particularly given the potential closure that would be required given that alternative crossings are not available. A full bridge replacement also carries a significant cost and is unlikely to be favoured given the considerable remaining life (~40 years) of the structure.

Wong (2023) recommends ongoing monitoring and data collection, and the following measures to manage the aggradation risk and help inform longer term plans for the Rees Bridge:

- In the short term, managing ongoing aggradation through continued gravel extraction measures appear most appropriate to minimise the rate of gravel build up.
- In the short to medium term, narrowing the channel (e.g. groynes) in the location of the bridge to increase flood velocity and sediment transport should be considered. This would be expected to provide a short-term benefit in the range of 5 – 10 year.
- In the longer term, collaborate between ORC and QLDC on a river management plan for the Rees River is recommended.

How does this link with responses in our future toolbox (Table 9-6)?

- Small scale improvement to existing Kinloch and Glenorchy-Paradise local road system road (as well as maintenance and reactive repair)
- Major works to increase resilience of Kinloch and Glenorchy-Paradise local road system (e.g. protect, raise, realign)

Floodplain hazards management

There are three areas of interest on the Dart-Rees floodplain where flooding or erosion may impact the community or infrastructure in the head of Lake Whakatipu area. These areas are shown in Figure 13.2:

- The lower Rees floodplain and Glenorchy township.
- The Dart floodplain and Kinloch access.
- The upper Rees floodplain and the Rees bridge

An assessment by Webby (2023) was undertaken to identify and review, at a high-level, the potential engineering or river management responses available for management of flooding and floodplain hazards. This included consideration of suggestions by community members. For each area of interest, the report also outlined information gaps identified, and gives recommendations for monitoring and additional analysis to address those gaps.

The Webby (2023) report was followed by more detailed technical feasibility studies (Veale and Shrestha, 2024; Menéndez Arán and Shrestha, 2024; Veale, Shrestha and Webby, 2024) to further explore potential responses. The scope and objectives of the most recent 2024 assessments were to:

- Assess the viability of potential options that mitigate existing flood hazards
- Provide an evidence base to rule out various floodplain management options
- Test viable options for their alignment with a Nature-based Solutions (NbS) approach to floodplain management
- Viable options were taken forward to a concept level design stage (i.e. drawings and costings)

The following items were out of scope: backwater flooding hazard to Glenorchy from high water levels in Lake Whakatipu; options to raise and/or lengthen the existing Rees River Bridge; options to raise or re-route the existing Kinloch Road; and any options previously discounted in 2022 floodplain adaption workshop.

Raising the existing Rees-Glenorchy floodbank structure **–** was found to be potentially viable as a response for lower Rees floodplain and Glenorchy township flood hazard. Raising the existing floodbank crest levels by approximately 0.75 to 1.1 m could increase the level of service for Rees flooding to 1 in 100 AEP flood (including climate change and freeboard), potentially reducing the flood hazard extent and depth in the township (Figure 13.3). The concept level design, key benefits, costs and residual risks for the raising option are shown in Figure 13.4.

How does this align with responses in our future toolbox (Table 9-6)?

- Major works to increase level of service of Glenorchy floodbank

Rockfill and vegetated buffers protections for Kinloch Road erosion hazards – The scale of the flood hazard is very challenging to defend against with conventional engineering solutions (e.g. floodbanks) and so the focus was on mitigation of existing flood hazards and providing room-for-the-river.

The intervention options carried forward were a combination of rockfill and vegetated buffer protections (prioritised to allow staged implementation) (Figure 13.5). These interventions were focused on:

a) Mitigating river-bank migration
b) Preventing damage to Kinloch Road
c) Reducing rate of farmland loss between the road and the riverbank to provide protection for the road

How does this align with responses in our future toolbox (Table 9-6)?

- River management and nature-based interventions (e.g. targeted planting)
- Major works to increase resilience of Kinloch and Glenorchy-Paradise local road system (e.g. protect, raise, realign)

Managed floodway on north (right bank) approach to the Rees bridge **–** Under flood conditions, there is insufficient conveyance capacity through the bridge waterway. The river naturally wants to break-out on the true left and right bank floodplains (but primarily on the right bank floodplain). There existing floodbank system on the right bank is outflanked and overtopped in large flood events.

The Rees River Bridge was constructed in c.1950. A floodbank system on the right bank (privately owned) was constructed in c.1980. The floodbank system diverts right bank floodplain flows and increases the flood discharge passing through the Rees River Bridge waterway. In conjunction with channel bed aggradation, this has lowered the level of service of the bridge.

The scale of the flood hazards is very challenging to defend against with conventional engineering solutions (e.g. floodbanks) and so the focus was on the following:

- 1. Providing a managed floodway on the left and/or right bank approaches to the bridge.
  - Guide floodplain flows in defined areas past the bridge

- Reduce flood discharge through the Rees River Bridge waterway.

- 2. Alignment with NbS strategies that provide “room for the river”
  - Floodplain widening and embankment removal or retreat, rather than construction of new floodbanks

A right bank floodway was found to be potentially viable and carried forward for costing, with and without road raising.

- Option A - Develop Right Bank Floodway & Raise Roads – indicative cost range $6,050,000 to $8,470,000
- Option B - Develop Right Bank Floodway, No Road Raising – indicative cost range $470,000 to $660,000

How does this align with responses in our future toolbox (Table 9-6)?

- Major works to increase resilience of Kinloch and Glenorchy-Paradise local road system (e.g. protect, raise, realign)

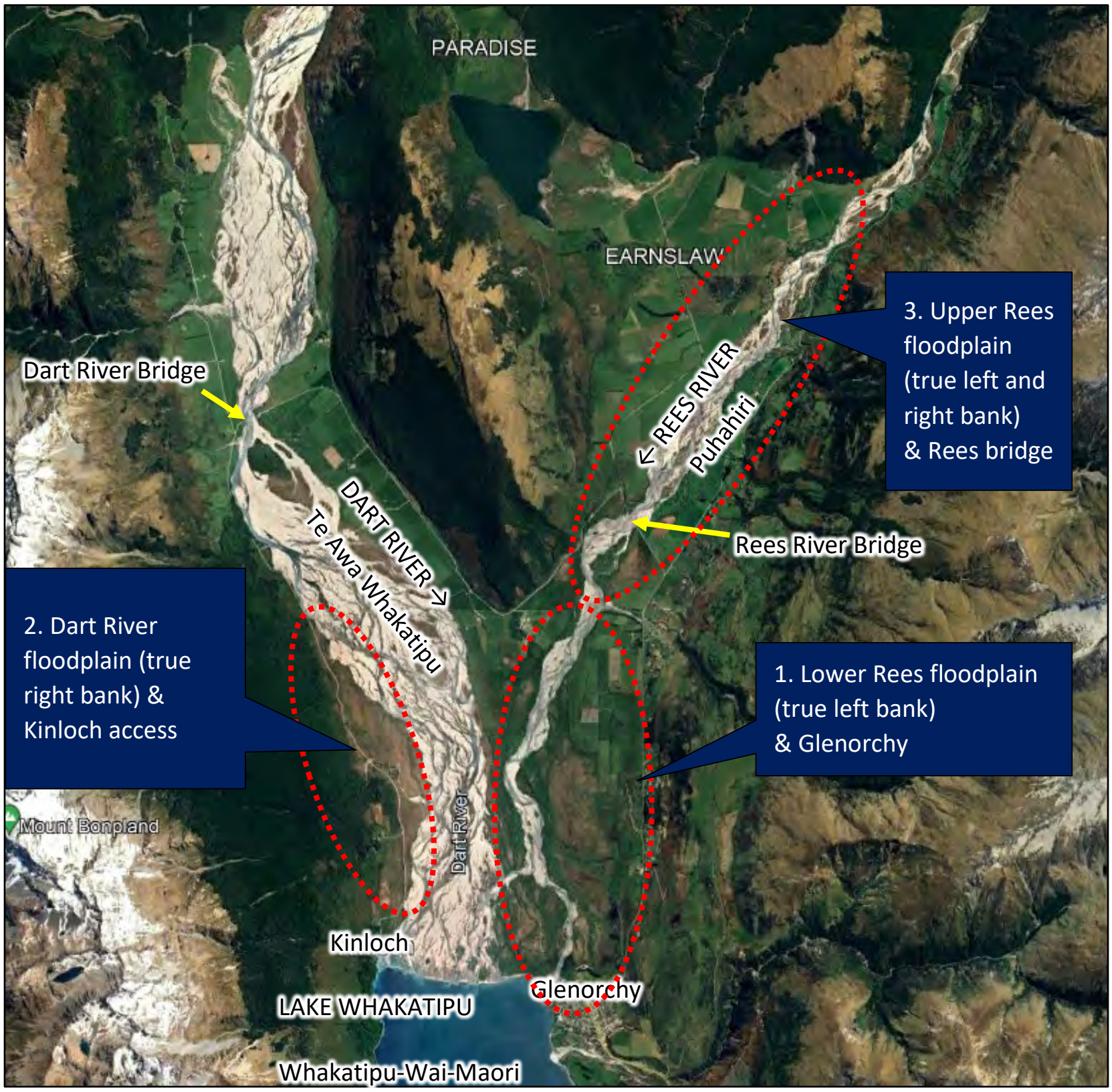
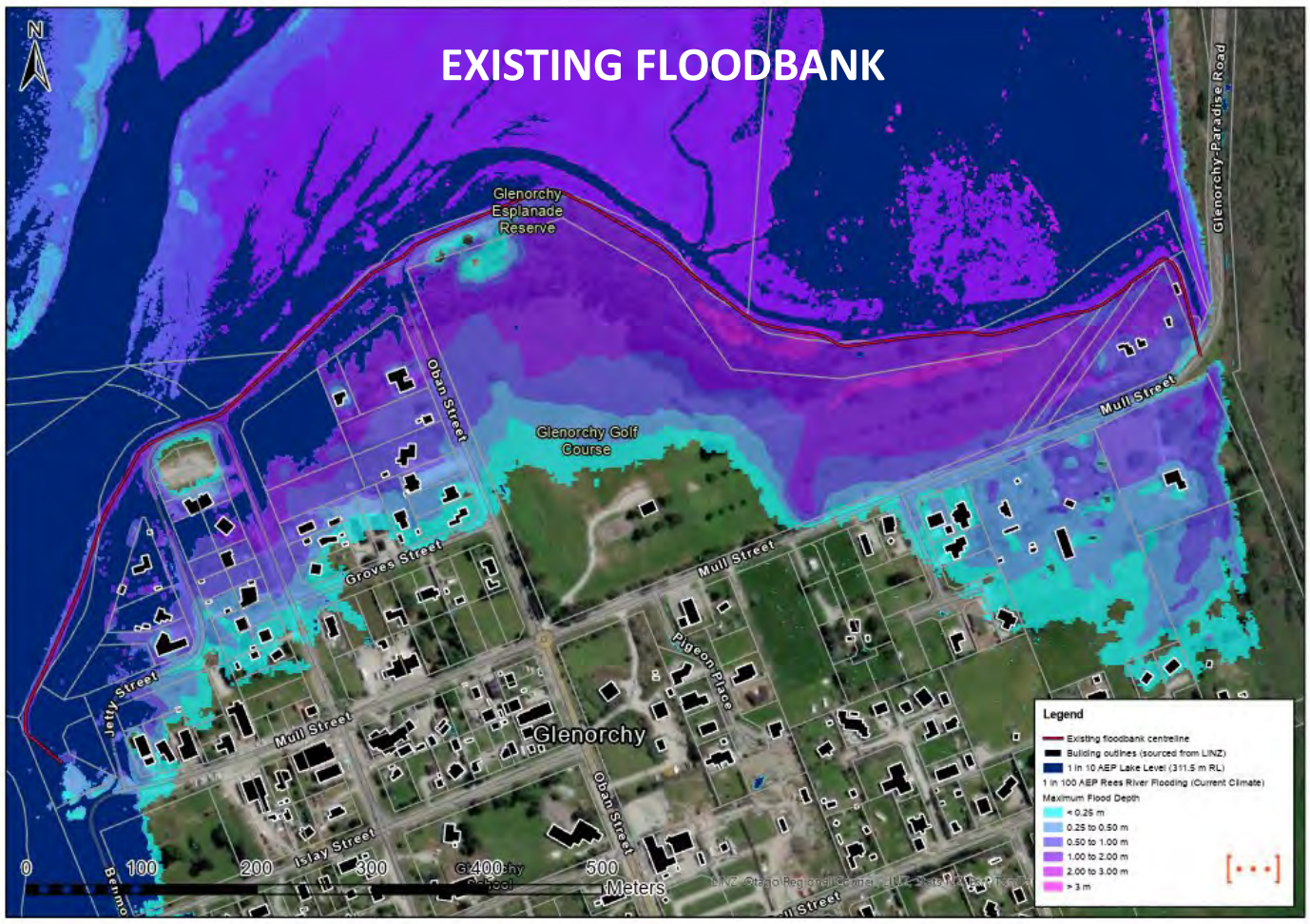
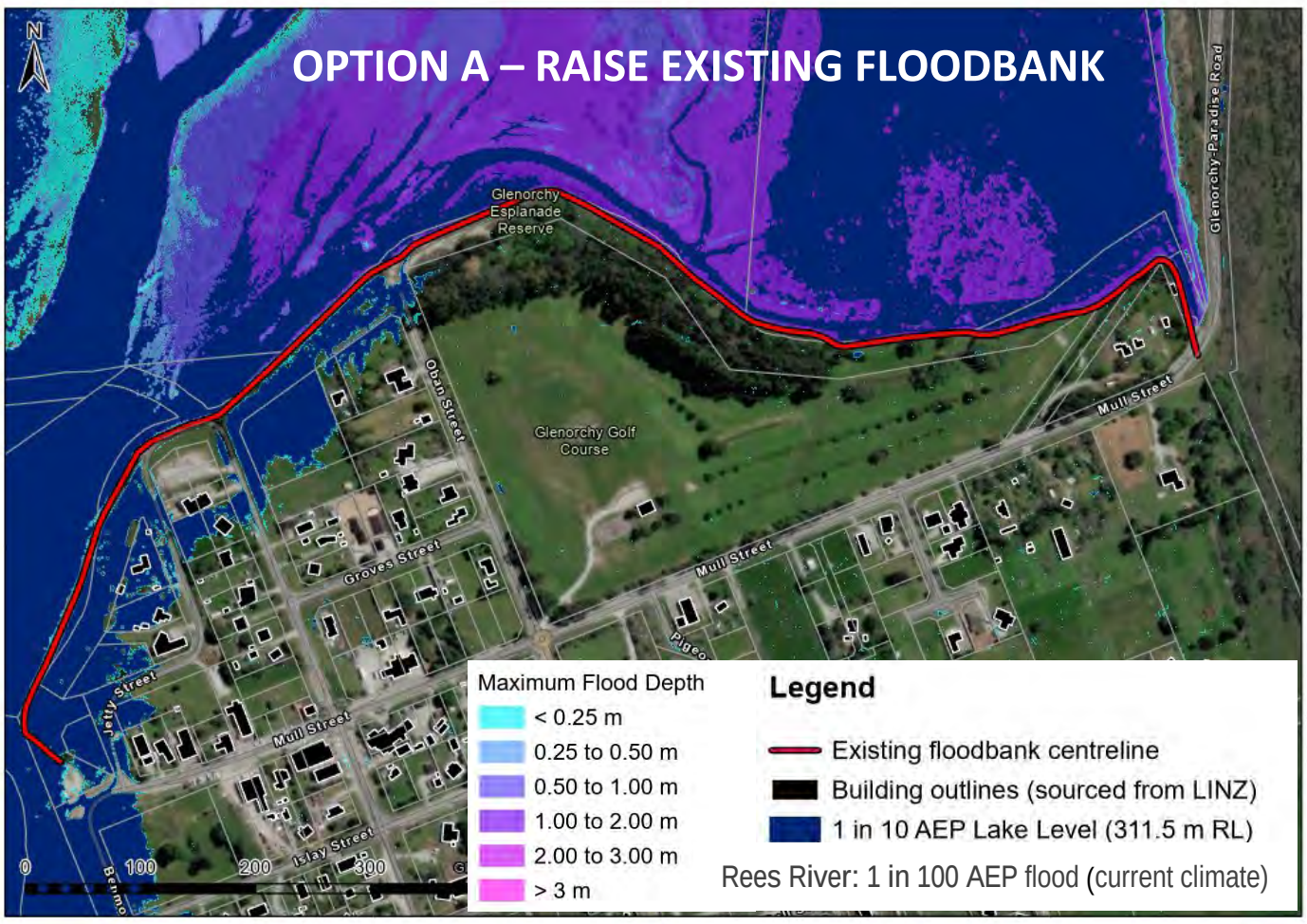


Figure 13.2 Three areas of interest on the Dart-Rees floodplain (modified from Veale presentation 2024

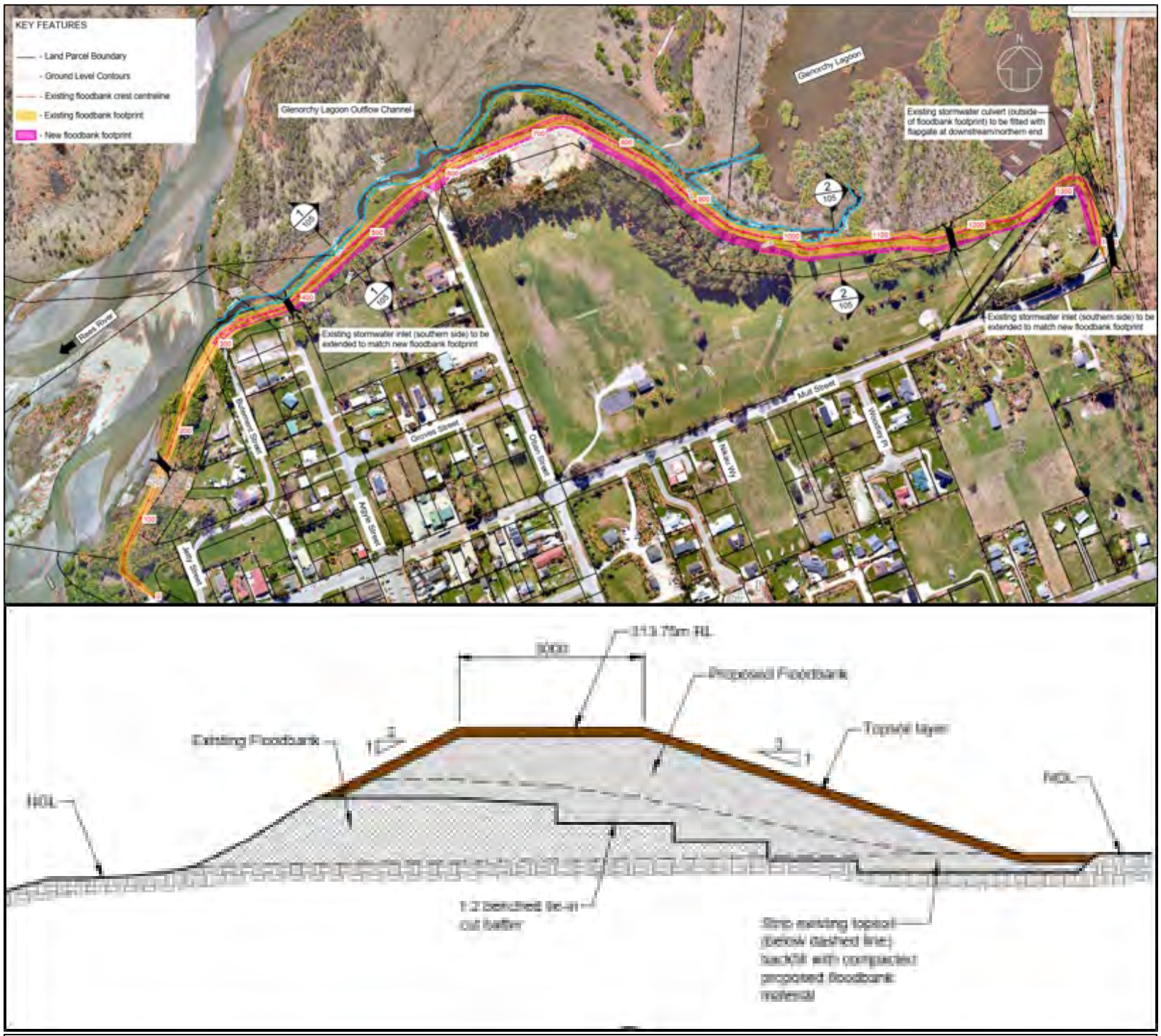


Flood depth information sourced from:
2022 Land Sea River report "Dart / Rees Rivers Flood Hazard Modelling"



Flood depth information sourced from: Current 2024 Damwatch assessment

Figure 13.3 Comparing 1 in 100 AEP Rees flood extent and depth with existing floodbank (top) and Option A: Raise Existing Floodbank (bottom) (Veale, 2024).



Key Benefits of Raising Existing Floodbank:

- ➢ Increase level of service of existing floodbank from 1 in 20 AEP (current climate) to 1 in 100 AEP (including climate change effects)
- ➢ Reduction in number of properties directly impacted from river flooding.

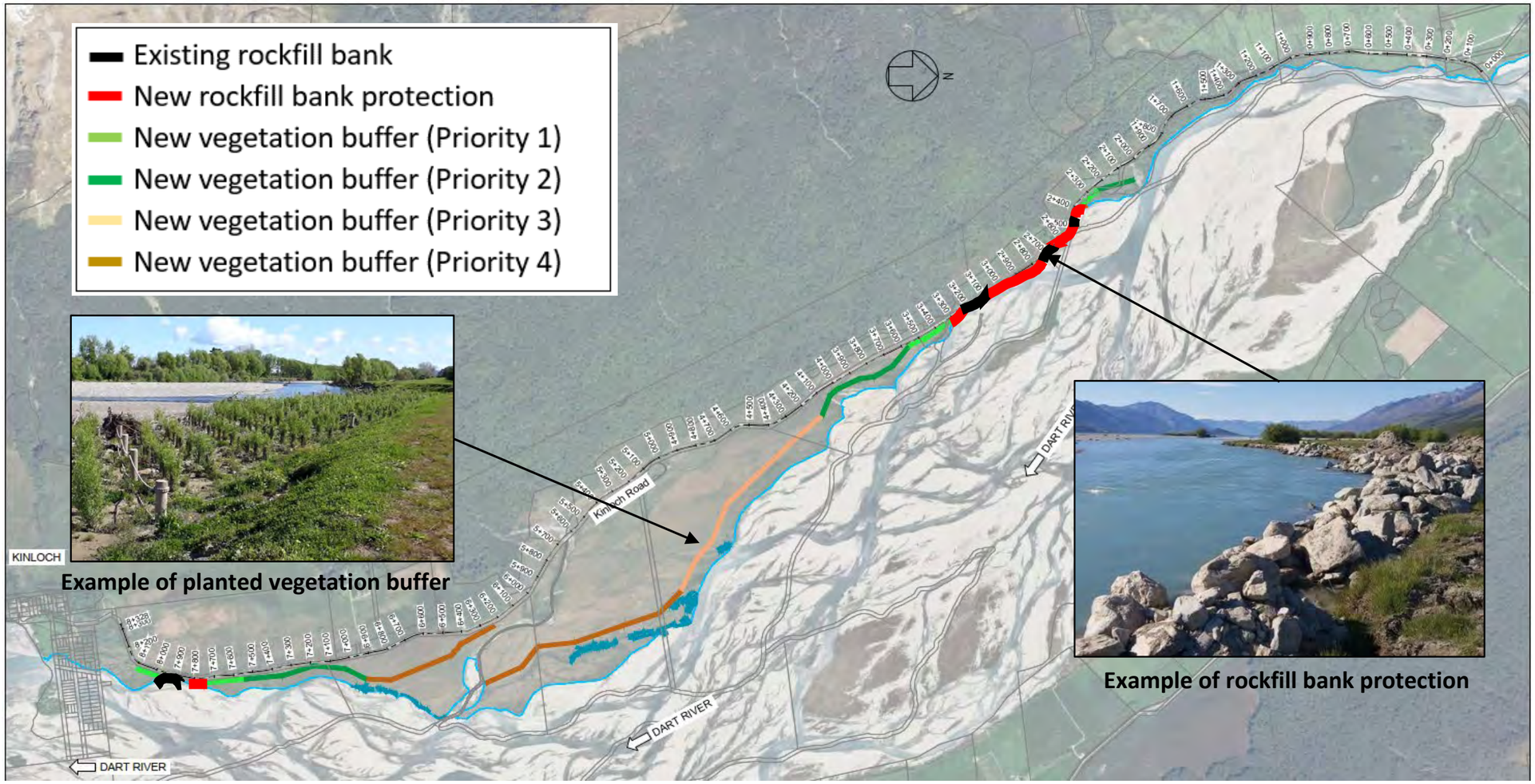
Indicative cost range: $1.6M to $2.3M

- ✓ Includes design, consenting and construction costs
- × Excludes any required land purchase costs

Residual risks:

- × No defence against lake level flooding (floodbank outflanked)
- × No defence against over-design floods (floodbank overtopped/breached)
- × Potential erosion of existing floodbank by Rees River flood events

Figure 13.4 C Conceptual design for raising existing Glenorchy floodbank (Veale, 2024).



Indicative Cost Range for Dart River Bank Erosion Protection Measures - includes design, consenting and construction costs (excludes any land purchase costs)				
New Rockfill $2,360,000 to $3,300,000	**Vegetation Buffer (Priority 1)** $162,000 to $230,000	**Vegetation Buffer (Priority 2)** $260,000 to $360,000	**Vegetation Buffer (Priority 3)** $230,000 to $320,000	**Vegetation Buffer (Priority 4)** $300,000 to $420,000
Residual risks: No defence against road inundation				

Figure 13.5 Combination of rockfill and vegetated buffer protections (prioritised to allow staged implementation) (Veale, 2024)

Liquefaction hazard management

A report by Tonkin + Taylor (2023) identifies a range of engineering mitigation techniques that could be considered for the management of liquefaction and lateral spreading hazard at Glenorchy township. Mitigation techniques, detailed in Appendix B, focus on reducing damage to land; buildings; and infrastructure; and span from very robust options through to a "do nothing" option:

- deep and shallow ground improvement; and geogrid-reinforced crushed gravel rafts are techniques that can reduce damage to land.
- new TC3-type and TC2-type foundation options; and proactive retrofit strengthening of existing buildings are techniques that can reduce damage to buildings.
- new infrastructure should incorporate resilient detailing to better accommodate displacement; and targeted upgrades of critical weak links can improve overall resilience of existing infrastructure.

The report then shows how these techniques could be applied across the township, provides a preliminary high-level assessment of how effective these mitigation works could be in reducing damage, and an indicative relative cost comparison.

The report notes that the more robust end of the range might be impractical or unaffordable, while the less robust end of the range might not satisfy Building Code or insurability requirements. However, for completeness, the report includes these options to provide context for discussion about the range of potential improvements that could be considered.

At the more robust end of the range, the mitigation options incorporate a strip of deep ground improvement constructed on public land running along the edge of the lake. This ground improvement would need to be in the order of 15 – 20m deep, 30 – 40m wide, and approximately 1.5km in length (information provided by Mike Jacka, T+T). Based on the indicative relative cost estimates presented in the February 2023 T+T report, T+T advise that the construction cost for this edge-treatment work alone would likely be many tens of millions of dollars.

In addition to this, many of the mitigation options include ground improvement across the wider township (under both public and private buildings and infrastructure), and there would also be additional coordination and enabling works costs associated with such a large programme of community-wide works. T+T advise that this could bring the overall cost into the hundreds of millions of dollars.

Aside from cost, these engineered interventions considered also have other significant challenges associated with their implementation and effectiveness;

- These interventions do not provide a complete reduction in the natural hazard impacts. It is estimated that 25-30% of buildings and infrastructure in the lateral spreading hazard areas would suffer severe liquefaction damage in a large earthquake, even if comprehensive mitigation works were undertaken.
- These interventions involve the undertaking of large-scale engineering works and would likely be highly disruptive to the local community.
- Some of the area vulnerable to liquefaction and lateral spreading damage is also exposed to other types of natural hazard, such as flooding hazards from Lake Whakatipu, the Rees River or Buckler Burn. Consideration of any potential hazard management interventions for liquefaction and lateral spreading should be part of an integrated response considering the full natural hazard risk profile, not just the seismic-induced hazards.

How does this align with responses in our future toolbox (Table 9-6)?

- Improve property and land resilience (such as floodproofing, floor raising, ground or structure strengthening)
- Community-wide improvement works for liquefaction hazard (such as ground improvement and strengthening existing buildings)
- Review and accept residual risk for existing development
- Policy – Review hazard and risk information and set mininmum requirements for new development

Table 13-3 Liquefaction mitigation techniques for reducing damage to land (T+T, 2023)

Works	Description of mitigation techniques for reducing damage to land
15 – 20m deep by 30 – 40m wide perimeter treatment ground improvement alongside lake	A long vibrating probe is used to compact the ground and inject gravel to form columns about 1m in diameter, in a grid pattern at about 2m spacings. This strip of very deep improvement along the lake edge acts like an “underground dam” of solid ground which helps to hold back the liquefied ground and reduce lateral spreading ground displacements. Perimeter treatment can help reduce the lateral spreading hazard for areas further inland (but the inland ground could still experience settlement damage if the underlying ground liquefies).
12m deep ground improvement, all land	Ground compaction and gravel columns as above, covering all land in an area (e.g. under buildings, roads and the land in between). Only 12m deep so there is still potential for the ground deeper than this to liquefy. This means that liquefaction settlement and lateral spreading could still occur, but the magnitude of displacement should be less.
12m deep ground improvement, land under buildings & infrastructure only	Ground compaction and gravel columns as above, but only covering land under buildings & infrastructure (no improvement of land in between). This will form individual “islands” of ground improvement which can help to reduce settlement and lateral spreading (but less effective at controlling lateral spreading that the options above).
12m deep ground improvement, land around buildings & infrastructure where accessible	This ground improvement approach could be considered where there are existing buildings & infrastructure, to avoid the need relocate them to improve underneath. The main benefit of this is reducing lateral spreading by improving a block of surrounding ground. Significant ground settlement could still occur due to liquefaction of the unimproved ground beneath.
4m deep ground improvement, land under buildings & infrastructure only	There are various shallow ground improvement methods which could be used to compact the upper 4m of the soil profile, including gravel columns (as above), dynamic compaction (a crane drops a weight on the ground) and impact compaction (a square roller or hammer hits the ground). This will have little effect on lateral spreading displacements, but can help reduce the severity of differential ground settlement due to liquefaction and ejected soil. Therefore this option is more applicable in areas further inland where less lateral spreading is expected, or in conjunction with perimeter treatment to reduce lateral spreading displacements.

Works	Description of mitigation techniques for reducing damage to land
1.2m deep geogrid-reinforced crushed gravel raft, under buildings & infrastructure only	This method provides a stiff platform of well compacted and reinforced gravel beneath buildings & infrastructure. The main benefit of this is to help reduce the severity of differential ground settlement due to liquefaction and ejected soil. The geogrid can help reduce the magnitude of lateral ground stretching to some degree (encouraging cracks to instead form on either side), but is less effective than deep ground improvement for controlling lateral spread. Therefore this option is more applicable further inland where less lateral spread is expected, or in conjunction with perimeter treatment which reduces lateral spreading.
No improvement	Ground remains in its current state within an area. However, in some mitigation scenarios ground improvement in a neighbouring area may help to provide some reduction in lateral spreading ground displacement, so we have made allowance for this in our damage estimates where appropriate.

NOTE: The details quoted in this table (such as depth and extent of treatment) are intended to be indicative only, to provide a general picture of the relative scale of the various options. Actual details would need to be determined as part of the design process, to meet agreed target performance requirements.

Table 13-4 Liquefaction mitigation techniques for reducing damage to buildings (T+T, 2023)

Works	Description of mitigation techniques for reducing damage to buildings
New TC3 surface structure foundations	The MBIE Canterbury rebuild guidance provides five concepts for raised platform foundations designed to accommodate significant ground settlement and lateral spreading while limiting deformation of the overlying structure. Settlement and damage is still expected to occur, but the aim is for this to be readily repairable. Existing buildings would need to be temporarily lifted, and possibly relocated, for the new foundation to be constructed underneath. This foundation type also has the added benefit of raising floor levels higher above flood levels.
New TC2 waffle slab foundation or enhanced lightweight platform on timber piles	The MBIE Canterbury rebuild guidance provides numerous TC2-type foundation options, however the most commonly adopted are waffle slab foundations (for concrete slabs) and enhanced lightweight platforms (for timber floors). Existing buildings would need to be temporarily lifted, and possibly relocated, for the new foundation to be constructed underneath. Enhanced lightweight platforms also have the added benefit of raising floor levels higher above flood levels.
Retrofit to strengthen existing foundations and buildings	While the primary focus of the MBIE Canterbury rebuild guidance is on robust design of new buildings and repair of damaged buildings, some of the same concepts could be applied for proactive retrofit strengthening of existing buildings. This would avoid the need to lift/relocate existing buildings, but might not provide the same performance as a new TC2 or TC3 foundation.

Works	Description of mitigation techniques for reducing damage to buildings
	For timber floor foundations this could include subfloor sheet bracing, bolt-spliced bearers, and enhanced connections between piles and bearers. Retrofit strengthening may be more difficult for concrete slab foundations, but could include internal and perimeter tie beams and edge stiffening. There may also be opportunities to enhance the superstructure, such as sheet claddings/linings, lightweight roof/cladding, stiffening walls, and enhanced connections between walls and roof framing.
No improvement	Foundation and building remain in their current state.
NOTE: The foundation concepts in this table are for simple lightweight timber-frame buildings (such as typical houses, or small commercial buildings of similar construction). It might be possible to apply similar concepts to other types of building, but this would need specific engineering assessment. For all buildings, actual details would need to be determined as part design, to meet Building Code performance requirements for building consent.	

Table 13-5 Liquefaction mitigation techniques for reducing damage to infrastructure (T+T, 2023)

Works	Description of mitigation techniques for reducing damage to infrastructure
New infrastructure with resilient detailing	New infrastructure should incorporate resilient detailing to better accommodate displacement. This includes avoiding higher hazard areas, providing redundancy within a system, adopting appropriate technology (e.g. pressure sewer), careful selection of pipe/cable materials, robust/flexible connections, utilising details that resist uplift, and granular/cemented trench backfill.
Retrofit to strengthen existing infrastructure	For existing infrastructure, opportunities to enhance the entire network can be more limited (short of complete replacement). However, detailed assessment of the system may identify critical “weak links” where targeted upgrades can improve the overall resilience of the wider network.
No improvement	Infrastructure remains in its current state.

FUTURE TOOLBOX - LAND USE PLANNING AND GOVERNANCE MEASURES

The Coastal Hazard Guidance (MfE 2024) identifies planning responses to avoid (or reduce where appropriate) greater exposure to coastal hazards and risk. These responses could also be considered for other natural hazards:

- Down-zoning can prevent intensification or exclude areas from further development or redevelopment (Policy 25, NZCPS, DOC, 2010).
- Create rules to discourage or limit specified activities in identified hazard areas, using the full range of Resource Management Act 1991 activity classifications, including prohibited activities. When used in association with hazard lines, zoning or overlays, this can ensure that development occurs only in accordance with a consenting process and subject to conditions, or it may prohibit further development entirely. For example, ‘restricted’ or ‘full discretionary’ activity status is an opportunity for a consent authority to set controls

through conditions on building location or design in specified zones or certain sites, or to decline consent. 'Prohibited' activity status means that no consent can be sought for specified activities in the identified locations. The district plan must specify the discretions and prohibitions.

- Land filling and raising floor levels are temporary adaptation measures and can be prohibited in specified locations to avoid further development that will create legacy effects.
- Other methods and techniques that can be used in statutory planning to manage natural hazards and risk include:
  - designation of protection or buffer areas, which may be used to provide for infrastructure
  - no subdivision areas
  - temporary development or land-use consents
  - covenants, easements and consent notices
  - specifying types of construction and building design and use (e.g., relocatable buildings)
  - land information memoranda (LIM) or project information memoranda (PIM)
  - bonds
  - land purchase
  - special rating areas for funding capital and maintenance of protection, applied under the Local Government Act 2002, could be used to fund capital or maintenance of protection. The areas to which a special rate is applied, and the rate itself, need to be justified on the basis of benefit obtained from the council activity
  - grants and information support

FUTURE TOOLBOX - RETREAT / RELOCATION

Retreat (or relocation) is the process of moving away from high-risk areas. There are no current opportunities for voluntary buy-outs or funding for land acquisition in Head of the Lake area. However, these responses remain in the future pathways in case of future need. Responsibilities for retreat are not defined in this first iteration of the Strategy, due to a lack of legislative clarity.

Reactive retreat describes retreat from affected (or unsafe) land after a natural hazard event has occurred. Aotearoa New Zealand examples tend to be one-off programmes coming out of disaster recovery:

- Land acquisition in Christchurch residential red zone – in response to the 2010/2011 earthquakes and liquefaction events
- Future of Severely Affected Locations (FOSAL) buy-out programme – in response to 2023 North Island floods and Cyclone Gabrielle.

Managed relocation describes a planned relocation of people, buildings and infrastructure out of harms way before damage is suffered.

- Recent review of current law and policy by Environmental Defense Society (EDS, 2022-2024) has identified that the current legislative tools in Aotearoa New Zealand are not fit for the purpose of managed relocation. EDS highlighted various concerns, such as: a lack of clear rules around development in areas subject to risk; gaps in responsibilities; lack of a legal framework linking adaptation plans to funding; and problems with acquisition of affected land under current law.

Back page placeholder for kid's art competition prizewinners

(design in progress)

FEEDBACK DOCUMENT

Draft Head of Lake Whakatipu Natural Hazards Adaptation Strategy

Summary and Survey Questions

COVER ARTWORK: CONNIE ANDERSON

Purpose

Otago Regional Council (ORC) has led the development of a Draft Natural Hazards Adaptation Strategy for the Head of Lake Whakatipu area (the Strategy). The detailed Draft Strategy report is comprehensive and brings together technical, social and strategic information that has been gathered over the last 5 years.

Not everyone has time or interest to delve into a large report, so we also have this plain language Summary that introduces the main ideas.

If you want to explore the detailed Draft Strategy content, you can download a copy from the ORC website at **[insert link here].**

We need your feedback

The feedback period runs from **05 December 2024 to 11:59pm 23 February 2025**.

Your input will be considered by ORC and help us improve the Strategy to make it practical and effective. The revised Strategy is expected to be released in Quarter 2 of 2025.

This document includes:

- **A Summary** of the Draft Strategy.
- **Survey Questions** to collect your feedback. You may respond to as many or as few questions as you like, and we encourage you to explain your answers wherever possible.

Ways to submit feedback

You can submit feedback in three ways:

- **Online**: Use the ORC website **[link here]** to complete the survey.
- **Written Feedback**: Send written feedback by email or mail.

Email address: headofthelake@orc.govt.nz

Mail hard copy to:

Natural Hazards Department,

Otago Regional Council,

70 Stafford Street, Private Bag 1954,

Dunedin 9054.

Summary

Head of Lake Whakatipu

The Head of Lake Whakatipu (Whakatipu-wai-Māori) area is home to about 450 people (Stats NZ, 2018), living in the close-knit townships of Glenorchy and Kinloch as well as in rural areas such as Paradise, Rees and Greenstone Valleys, Campbelltown and Wyuna Preserve. The area is located at the northern end (‘head’) of Lake Whakatipu and is the focus of this Strategy. Figure 1 shows the location of the area.

The area holds deep significance for mana whenua, with its ancestral mountains, rivers and lakes forming a network of taoka (treasure). These natural features, along with pounamu (green stone) and tawhito (traditional travel routes) connected settlements, sustaining generations. The area's ikoa wāhi (place names) weave together the stories and histories of Kāi Tahu, grounding their identity, heritage, spiritual connection to and authority in the land. These all make the area significant to the mana whenua.

A defining geographical feature of the Head of Lake Whakatipu area is the broad braided river systems and floodplains of the Dart and Rees Rivers, which form a combined delta at the lake, lying between the Humboldt and Richardson mountains to the west and east, respectively. A braided river system is characterized by multiple interweaving channels that flow around gravel or sand islands.

The Head of the Lake has a dynamic landscape with the Dart and Rees Rivers having a nearly unlimited sediment supply, moving active channels and building up sediment, and growing the delta into Lake Whakatipu. High rainfall in the mountains feeds these rivers and often causes flooding that impacts local roads and important infrastructure as well as the community’s life and activities.

The area is exposed to seismic hazards including shaking, liquefaction and lateral spreading, partly due to its proximity to the Alpine Fault.

With a dynamic and seismically active environment, the head of Lake Whakatipu area is exposed to a complex range of natural hazards, mainly flooding, landslide and earthquake-related hazards. These natural hazards can be relatively frequent and can be very disruptive. Climate and landscape changes could make some of these natural hazards worse. Natural hazards and associated risks are discussed in the detailed Draft Strategy Report, available on the ORC website at **[insert the link].**

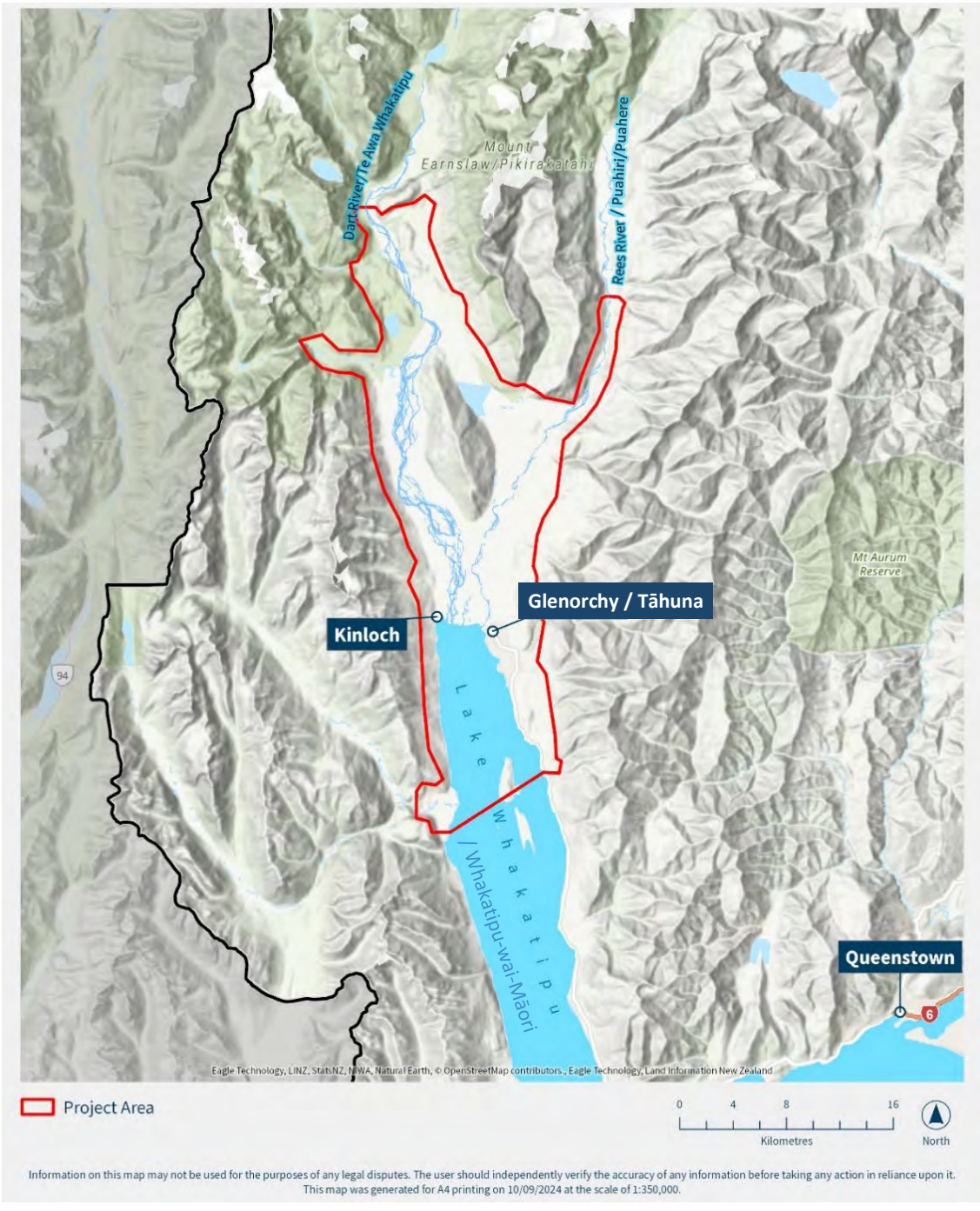


Figure 1. The Head of Lake Whakatipu (Whakatipu-wai-Māori) map, showing the location of the area included in the Natural Hazards Adaptation Strategy (outlined in red).

What matters most to the community?

The community through community engagement sessions has shared the things they care about most, which greatly helped us in developing the Strategy and identifying adaptation response options. The key points identified by the community include:

- **Values:** The community highlighted their most important values, including safety, self-reliance, preserving the natural environment and protecting essential infrastructure, fostering economic resilience and self-sufficiency, maintaining and enhancing recreational spaces, respecting unique rural atmosphere and the area's history.
- **Resilience:** The Head of the Lake has a strong community, whereby people come together and "chips in" in difficult times. Key strengths of the community include strong engagement in adaptation planning efforts, emergency preparations and response, active local groups, and social cohesion (a strong sense of support and cooperation among community members).
- **Vulnerability:** There exist factors and conditions which may impede the adaptation efforts of the community to natural hazards including a small population, limited healthcare services and emergency personnel, older population, high-need with many residents in low-wage jobs and large numbers of tourists.
- **Concerns:** The community's key fears and concerns include impacts of the adaptation programme and potential adaptation actions at the Head of the Lake, rising insurance costs and availability for properties, potential damage to brand, and inadequate preparations for natural hazards and adaptation actions due to a lack of sufficient information.

Why adaptation is needed?

Adaptation in its simplest form means making changes, adjustments to reduce the risks and impacts from natural hazards events like floods, helping communities stay safe and resilient.

The complex natural hazards in the head of Lake Whakatipu pose risks to the community's life and their social and economic activities as well as critical infrastructure of the area.

With a changing landscape and climate, these challenges are expected to intensify. While there are no simple solutions, taking adaptation actions now will lay the groundwork for stronger, more resilient communities in the head of Lake Whakatipu now and in the future.

What is this Strategy?

The Head of Lake Whakatipu Natural Hazards Adaptation Strategy (draft) establishes a long-term vision, goals, actions plans and ways of working to manage and adapt to natural hazards in the Head of Lake Whakatipu area.

The Strategy is developed to support the communities in the Head of Lake Whakatipu area address challenges posed by natural hazards.

It is a non-statutory plan. It does not have any decision-making power or create any obligations. It is intended to lay a good foundation, provide a common direction to support decision-making and effective adaptation in the area.

The Strategy takes a long-term view and encompasses all types of natural hazards. It is focused on adapting to natural hazards only, as it aligns with the capacities of the Strategy's partner agencies: Otago Regional Council, Queenstown-Lakes District Council (QLDC) and Civil Defence Emergency Management Otago.

Simply put, this Strategy is intended to be a reference document designed to guide and support the Head of the Lake's community, mana whenua, ORC and other agencies in preparing for and responding effectively to natural hazards impacts, both now and in the future.

How was the Strategy developed?

ORC has taken a collaborative approach and have worked closely with the community, mana whenua representatives and partners (Queenstown-Lakes District Council and Civil Defence Emergency Management Otago) throughout the process of the development of this Strategy.

We have carried out a series of activities to support the development of the Strategy, including community engagement sessions and technical studies.

The community at the Head of the Lake has been actively engaged over the past five years, participating in meetings, workshops and studies and provided significant feedback. The contribution of the community is a very valuable outcome and plays a crucial role in shaping this Strategy.

Vision of the Strategy

The proposed vision of the Strategy is a resilient and sustainable Head of Lake Whakatipu, where proactive natural hazard and climate adaptation enhance community wellbeing and safety and contribute to a flourishing environment.

Goals and objectives of the Strategy

The Strategy proposes five goals, to help achieve the vision. They are:

Goal 1: Adaptation is woven into our everyday work

- Make plans and recommendations that align with council strategies, policies and processes, and integrate with business-as-usual workstreams.
- Work in partnership with mana whenua, coordinate and collaborate with other agencies and communities with a common purpose to incorporate adaptation into what we do.
- Build connections across and between agencies and work together effectively across work programmes.
- Encourage and amplify existing good practice and initiatives.

Goal 2: Lay a robust foundation for decision-making

- Point us in the same direction, with a common understanding to build from.
- Continue to build understandings of natural hazard risks, uncertainties, and opportunities of now and the future, that come with natural hazards and climate change.
- Increase awareness around current and future natural hazards risks and impacts of climate change, as well as effective adaptation responses.
- Build capacity around adaptation and support communities and decision-makers to take advantage of opportunities.
- Incorporate mātauraka Kāi Tahu into the decision-making framework

Goal 3: Healthy and resilient communities

- Lead and support others to actively manage and reduce risk to natural hazard and impacts of climate change.
- Support and enable community-led action and behavioural change.
- Promote community safety by managing and reducing risk from natural hazards and impacts of climate change.
- Strengthen communities, businesses, and organisations so that they are well-prepared for natural hazard events and are better able to cope and recover.
- Support and strengthen Kāi Tahu connections to and cultural values associated with the area.

Goal 4: Resilient built places, infrastructure and systems

- Lead the way and support others to increase the resilience of infrastructure, resources and systems.
- Encourage responsible management of resources and infrastructure that prioritises resilience, sustainability and avoids maladaptation.
- Provide information for individuals, businesses and agencies to consider natural hazard risks and the impacts of climate change as part of planning and development processes.
- Combine local traditional knowledge and modern knowledge, technology into planning and development of local infrastructure.

Goal 5: A flourishing environment

- Support and enable nature-based solutions and principles to adapt to natural hazard risks and climate change and deliver other socio-economic and environmental benefits.
- Integrate adaptation across Council work programmes to deliver natural hazards, biodiversity and wider environmental outcomes.

Existing and possible future responses

The natural hazard challenges at Head of Lake Whakatipu are complex and there is no simple solution. The Strategy has identified a range of existing and possible future responses that offer potential benefits for adaptation. The identification process has involved the following steps:

a) Identify a range of possible responses, including crowdsourced ideas from community and local knowledge,

b) Screen out responses that are not technically feasible,

c) Develop a 'long-list' of adaptation responses; including existing and planned responses, and a future toolbox with both standard ways to manage hazards, and innovative ideas,

d) Community engagement on the long-list, get feedback on and add new ideas from community,

e) High-level socio-economic screening and mana whenua assessment of possible responses,

f) Technical evaluation of some responses (i.e. potential responses for liquefaction management and floodplain management).

The identified responses are summarised in Table 1 below.

The future possible responses (Future Toolbox) are not commitments, as they do not have business cases or future funding identified at this stage. Some future possible responses fall outside the currently established roles and responsibilities of partner agencies.

These potential future responses will be considered if we find that current approaches become unsustainable or unsuitable under changing conditions. This will help us improve our adaptation efforts for the area.

Table 1: Existing and possible future responses

CATEGORY	EXISTING OR FUTURE TOOLBOX?	LONG LIST OF RESPONSES (OCTOBER 2024)	TYPE OF RESPONSE	CURRENT AREA OF RESPONSIBILTY	WHAT IS THE MAIN OBJECTIVE OF THE RESPONSE?
Hazard awareness and mitigation	Existing **	Societal, behavioural, and institutional changes (improve over time) when considering natural hazards and changes to the physical environment	Accommodate	Everyone	Support awareness and informed decision-making
	Future Toolbox **	➢ Review and accept residual risk for existing development	Accommodate	ORC, QLDC, community	Informed decision-making
	Existing	Emergency readiness and response (improve over time)	Accommodate	CDEM, ORC, QLDC, community	All hazards emergency response
Road access	Existing	Maintenance, reactive repair and planned works for the Glenorchy-Queenstown Road	Accommodate / protect	QLDC	Maintain resilience of regional road access to flood, erosion and alluvial fan hazards
	Existing	Maintenance, reactive repair and planned works for the Kinloch and Glenorchy-Paradise local road system	Accommodate / protect	QLDC	Maintain resilience of local road access to flood, erosion and alluvial fan hazards
	Future Toolbox	➢ Small scale improvement to existing Kinloch and Glenorchy-Paradise local road system road (as well as maintenance and reactive repair)	Accommodate / protect	QLDC	Reduce impacts of flood, erosion and alluvial fan hazards on local road access
	Future Toolbox	➢ Reduced level of service of existing Kinloch and Glenorchy-Paradise local road system (e.g. some parts 4WD only)	Accommodate	QLDC	Maintain local road access at a lower level of service

CATEGORY	EXISTING OR FUTURE TOOLBOX?	LONG LIST OF RESPONSES (OCTOBER 2024)	TYPE OF RESPONSE	CURRENT AREA OF RESPONSIBILTY	WHAT IS THE MAIN OBJECTIVE OF THE RESPONSE?
	Future Toolbox	➢ Major works to increase resilience of Kinloch and Glenorchy-Paradise local road system (e.g. protect, raise, realign)	Protect	QLDC	Reduce impacts of flood, erosion and alluvial fan hazards on local road access
	Future Toolbox	➢ Reactive re-design Kinloch and Glenorchy-Paradise local road system for changed conditions (e.g. post event)	Protect	QLDC	Post-event replacement to restore local road access
Boat access	Existing	Existing boat access at Kinloch and Glenorchy (limited by existing and ongoing sediment accumulation)	Accommodate	QLDC	Maintain alternative access
	Future Toolbox	➢ Short-term improvements to existing boat access (e.g dredging)	Accommodate	QLDC	Improve alternative access
	Future Toolbox	➢ Upgrade boat access with resilient solution (e.g. relocatable wharfs)	Protect	QLDC	Provide alternative access with higher level of service
	Future Toolbox	➢ Relocate wharfs periodically to maintain future access	Protect	QLDC	Maintain alternative access with higher level of service
Flood mitigation and protection	Existing	Maintain the flood monitoring network (rainfall and water level stations) and flood data history	Accommodate	ORC	Flood hazard readiness and emergency response
	Existing	Flood monitoring, forecasting and warning (improve over time)	Accommodate	ORC	Flood hazard emergency response
	Existing	Existing low level Rees River flood protection by Glenorchy floodbank (maintenance and reactive repair)	Protect	QLDC	Maintain existing Rees River flood protection

CATEGORY	EXISTING OR FUTURE TOOLBOX?	LONG LIST OF RESPONSES (OCTOBER 2024)	TYPE OF RESPONSE	CURRENT AREA OF RESPONSIBILTY	WHAT IS THE MAIN OBJECTIVE OF THE RESPONSE?
	Future Toolbox	➢ Small scale improvements to Glenorchy floodbank to maintain/reduce flood risk	Protect	QLDC	Increase resilience of Rees River flood protection
	Future Toolbox	➢ Major works to increase level of service of Glenorchy floodbank	Protect	QLDC	Reduce impacts of Rees River flood hazard on Glenorchy township
	Future Toolbox	➢ Redesign Rees flood protection for changed conditions (e.g. post event)	Protect	ORC, QLDC	Post-event replacement to restore protection
	Existing	Existing river management (vegetation and gravel)	Accommodate	ORC, QLDC	Maintain resilience to flood, erosion and alluvial fan hazards
	Future Toolbox	➢ River management and nature-based interventions (e.g. targeted planting)	Accommodate	ORC	Reduce impacts of flood, erosion and alluvial fan hazards
	Future Toolbox	➢ Redesign nature-based interventions for changed conditions	Accommodate	ORC	Post-event replacement
	Future Toolbox	➢ Small scale works to reduce Buckler Burn erosion and/or flood risk	Protect	ORC	Reduce impacts of Buckler Burn flood, erosion and alluvial fan hazards
Public asset resilience	Future Toolbox	➢ Improve resilience of critical assets in higher hazard areas (such as floodproofing, floor raising, ground or structure strengthening, retrofit, move elsewhere)	Accommodate	Asset owner	Reduce impacts on critical assets

CATEGORY	EXISTING OR FUTURE TOOLBOX?	LONG LIST OF RESPONSES (OCTOBER 2024)	TYPE OF RESPONSE	CURRENT AREA OF RESPONSIBILTY	WHAT IS THE MAIN OBJECTIVE OF THE RESPONSE?
Community-wide resilience (public and private)	Future Toolbox	➢ Community-wide improvement works for liquefaction hazard (such as ground improvement and strengthening existing buildings).	Accommodate	Not defined	Reduce impacts from seismic hazards on Glenorchy township
Private property resilience	Existing	Household emergency planning	Accommodate	Household	Reduce impacts on existing development
	Existing	Property and business insurance (adjust coverage as needed)	Accommodate	Property/business owner	Support recovery
	Future Toolbox	➢ Improve property and land resilience (such as floodproofing, floor raising, ground or structure strengthening)	Accommodate	Property owner	Reduce impacts on existing development
	Existing	Consider local risk and hazard information when property decisions are required (e.g. buying/selling) are required	Accommodate	Property owner	Informed decision-making
Policy	Existing	Policy - Existing land use zoning, rules and building controls	Accommodate	ORC, QLDC	Reduce impacts on future development
	Future Toolbox NEW**	➢ Policy – Review hazard and risk information and set appropriate requirements for new development	Accommodate	ORC, QLDC	Reduce impacts on future development
	Future Toolbox	➢ Policy - Strengthen land use controls in higher hazard areas to avoid additional exposure	Avoid	ORC, QLDC	Avoid impacts on future development

CATEGORY	EXISTING OR FUTURE TOOLBOX?	LONG LIST OF RESPONSES (OCTOBER 2024)	TYPE OF RESPONSE	CURRENT AREA OF RESPONSIBILTY	WHAT IS THE MAIN OBJECTIVE OF THE RESPONSE?
	Future Toolbox	➢ Policy and services – identify and make available lower hazard land for new building and/or relocation	Avoid	QLDC	Avoid impacts on future development
	Future Toolbox	➢ Recovery plan improvement	Accommodate	CDEM, QLDC, community	Support effective recovery
	Future Toolbox	➢ Proactive relocation plan	Retreat	Not defined	Support effective relocation
	Future Toolbox	➢ Voluntary proactive relocation from higher hazard areas	Retreat	Not defined	Avoid / reduce impacts on existing community (by relocating before an event)
	Future Toolbox	➢ Voluntary reactive post event retreat from higher hazard areas	Retreat	Multi-agency, property owners	Avoid repeat impacts

** Three additional responses have been added to the long list since March 2024

How will the Strategy be implemented?

It is proposed that the Strategy is implemented by the community and partner agencies through well-established planning processes, such as Long-Term Plans, QLDC District Plan and Otago CDEM Group Plan. The plans have a regular update cycle and this is when decisions on continuing and future investment are made by the partner agencies.

The following are key activities the Strategy's partners responsible for within this Strategy:

- **ORC** implements activities to reduce the impact of natural hazards, including, but not limited to (1) monitoring and maintaining a network of rain and river flow gauges and sharing the data, (2) analysing incipient information to provide early warning, and (3) river management activities.

- **QLDC** makes decisions about the effects of land use, activities on the surface of rivers and lakes, providing for sufficient development capacity for residential and business growth and subdivision. It also conducts activities, including but not limited to (1) maintaining public roading and three waters assets, the Glenorchy marina and jetty, the Glenorchy flood bank, (2) working closely with ORC and CDEM Otago, emergency services to prepare for and respond to natural hazards events.

- **CDEM Otago** implements activities to safeguarding communities across the area in emergencies, including but not limited to (1) taking lead on preparedness, response and recovery from natural hazards events, including development of emergency plans and early warnings, and (2) conducting emergency drills and raising awareness of the importance of preparedness for emergency events.

- **The Head of the Lake Whakatipu community** is responsible primarily for ensuring their own safety, the protection of any dependents and property, reducing their potential for loss, maintaining readiness, and responding appropriately during an event.

It is proposed that ORC and the Strategy's partners will continue working on activities to monitor how effectively the Strategy will be implemented. It is proposed to monitor changes in social, economic and environmental conditions by using different methods, such as wellbeing surveys, physical monitoring and community feedback.

We will also monitor the progress of this Strategy by tracking the actions listed in the Action Plan.

The Strategy will be reviewed thoroughly every six years to make any needed updates.

Action Plan

To manage the natural hazards as well as reducing the risk and impacts from those hazards to the area of the Head of the Lake, ORC and the Strategy partners over the past years have undertaken or planned to take several activities/actions. The following are key activities:

- Building community awareness and adaptive capacity regarding natural hazard risks and climate change.
- Integrating natural hazards management approaches into local policies such as QLDC's Spatial Plan and District Plan.
- Allocating budget within Long-Term Plans to manage local infrastructure like Rees and Dart Bridges, Glenorchy floodbank as well as activities of river and floodplain management and flood monitoring and warnings.
- Implementing the four principles in emergency management: Reduction, readiness, response and recovery.
- Preparing emergency management personnel.
- Developing community emergency management documents
- Setting up Civil Defence Emergency Management Centres and Community Emergency Hubs.
- Land use planning.

These activities are detailed in the Action Plan part of the Strategy.

The Action plan focuses on planning time horizons to align with Councils' 10-year Long-Term Plans and 30-year infrastructure strategies. Where appropriate, longer time horizons are considered for natural hazards impacts and climate change information.

Actions are based on currently defined roles and responsibilities and aligned with current legislation, systems, processes and policies. Table 2 below presents all current activities and commitments of ORC and Strategy's partners.

Table 2: Action plans and activities of the Strategy

Governance and collaboration				
Status	**Action**	**Goal this contributes towards**	**Agency responsible**	**Timeframe**
Underway or planned	Otago Regional Council (ORC) and Queenstown Lakes District Council (QLDC) collaborate to develop a governance framework or memorandum of understanding (MoU) for addressing adaptation issues at the Head of the Lake and/or across the district, including the implementation of adaptation actions to improve resilience.	1	Otago Regional Council (Natural Hazards) Queenstown Lakes District Council	
Underway or planned	ORC to partner with mana whenua to ensure mana whenua values and aspirations and mātauraka Kāi Tahu is embedded into decision-making and implementation of the Strategy, following the lead of Aukaha and Te Ao Mārama.	All goals	Otago Regional Council (Natural Hazards) Aukaha and Te Ao Mārama Inc	
Underway or planned	Work together with QLDC, Civil Defence Emergency Management Otago (CDEM), mana whenua and local community to ensure co-ordinated and consistent approach to implementation of actions aligning with this Strategy.	All goals	Otago Regional Council (Natural Hazards) Queenstown Lakes District Council Civil Defence Emergency Management Otago Aukaha and Te Ao Mārama Inc Glenorchy Community Association	
Underway or planned	Work together to mainstream adaptation across ORC work programmes and ensure our work aligns with this Strategy and towards achieving each goal.	All goals	Otago Regional Council (Natural Hazards, Environmental Implementation, Engineering, Integrated Catchment Management)	Ongoing

Information gathering and monitoring

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Existing	ORC to Investigate hazards and risks as part of usual business	1, 2	Otago Regional Council (Natural Hazards)	Ongoing
New	<u>Geomorphic change monitoring and assessment</u> Maintain an awareness of locations and scale of geomorphic changes (e.g. active river channel position, bed levels and rates of change) which may have direct impacts, or exacerbate natural hazard characteristics. • Collect LiDAR, aerial imagery - spatial extent to include at least Dart, Rees and Buckler (at least extent of 2019 survey). • Cross section survey and/or bathymetric LiDAR • Undertake geomorphic change detection analysis. This information will; • Enable proactive response to issues • enable the updating of flood hazard assessments to ensure they provide representation of current conditions (e.g. bed levels).	2	Otago Regional Council (Natural Hazards) with external support	Periodic (at least every 5 years) or when new LiDAR is available
Existing	<u>Data collection to document major flooding (or other hazard) events</u> Improve the recording and understanding of hazard event characteristics (e.g. floodwater extents, depths and flow pathways), and the impacts of those events. The types of data collected will depend on the hazard and the impact and may include the following: • Post-event LiDAR • During-event or immediately post-event aerial imagery • During-event or post-event observations (on-ground inspections and/or drone imagery) • Develop an online data portal to enable collation of crowdsourced natural hazard event observations (e.g. photographs) • On-ground post-event survey (debris survey)	2, 3	Otago Regional Council (Natural Hazards) with external support	After hazard events

Information gathering and monitoring

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	• Assessments/observations of damages/impacts (infrastructure, or residential) • Geotechnical assessments • Post-earthquake assessments (landsliding, liquefaction, subsidence …) This information will; • Assist with hazard/risk assessments by providing ground-truthed observations of hazard events. • be valuable for calibration/validation of future hazard modelling, helping to ensure models represent reality.			
	<u>Monitoring and analysis of signals/triggers/thresholds</u> SIGNALS – give us a heads up about changes • Growth in costs to maintain and repair assets • Lower level of service (e.g. due to delta growth, river bed aggradation, channel movement) • Frequency, number or impacts of flooding events reaching nuisance level (this signal includes residential areas, roads and agricultural land) • Movement of active river channel towards high value areas and assets • Negative impacts on community wellbeing (e.g. concern and anxiety, increased demand for protection or for doing things differently) • Insurance affordability or coverage TRIGGERS – points where review and decisions are made • Decision-making cycles (3-year, 10-year, 30-year) • Opportunities • Significant natural hazard event with unacceptable outcomes THRESHOLDS – unacceptable conditions we are trying to avoid • Extended disruption to road access from Queenstown • Frequent or severe damaging or disruptive events • Loss of amenity and cultural values	2	Otago Regional Council (Natural Hazards) with input from Queenstown Lakes District Council and external support	Periodic (at least every 5 years)

Information gathering and monitoring				
Status	**Action**	**Goal this contributes towards**	**Agency responsible**	**Timeframe**
	• Lengthy displacement of people following extreme events • Withdrawal of maintenance, decline in levels of service and increasing cost of repairs • Unaffordable or high-excess insurance premiums or withdrawal of insurance and bank finance			
	Communication and reporting of physical environment monitoring • Data collection and analysis findings will be communicated to key project partners and stakeholders. • A brief environmental monitoring update report will be prepared every 3 years summarising any notable natural hazards event/impacts (e.g. peak flows/lake levels observed) within that time period, and any post-event data collection or analysis completed. • One-off standalone event reports may be prepared for any natural hazards events which causes significant impact – summarising event causes, characteristics, effects/impacts, and ORC responses. • Reports will be distributed to key contacts, through existing communication channels (e.g. ORC e-newsletter and project website), and appended to any councillor update reports.	2	Otago Regional Council (Natural Hazards)	3 yearly updates One-off reporting for significant events

Emergency Management

	Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	New	Develop a long-term recovery plan for a potential major hazard event, including ways to minimise maladaptation post-event and ensure recovery considers long-term adaptation opportunities.	1, 3, 5	Otago Regional Council (Natural Hazards) Civil Defense Emergency Management Otago Queenstown Lakes District Council	Ongoing
	Existing	Operate a network of near real-time rainfall and water level stations across the region to support flood forecasting and emergency response with a 24/7 duty roster to support forecasting duties and any necessary response.	2, 3	Otago Regional Council (Natural Hazards, Engineering, Environmental Monitoring) Civil Defense Emergency Management Otago	Ongoing
	Existing	Monitor and ensure ORC's network of environmental monitoring stations remains fit for purpose; providing information for flood response, for documentation of flood events, and for public awareness of river flow, lake and lagoon levels). • Review of performance of the flood forecasting systems (lake level and lagoon level forecasting) • Review of hydrological monitoring network (any opportunities for improvement?) • New/temporary monitoring in some circumstances (e.g. landslide dam formation) This action is intended to ensure the monitoring network and forecasting systems provides the most suitable coverage.	1, 2	Otago Regional Council (Natural Hazards, Environmental Monitoring)	Periodic reviews One-off temporary monitoring
	Existing	Capability development and awareness raising • Undertake public/internal education to develop knowledge and raise awareness of risks and natural hazards to communities and Community Response Group's members. • Share lessons learned from emergency response with communities	1, 2, 3	Civil Defense Emergency Management Otago	As needed Annually

Emergency Management				
Status	**Action**	**Goal this contributes towards**	**Agency responsible**	**Timeframe**
	• Introduced and organised training sessions for Community Response Group members of how to use Community Emergency Hub Guide.			
Existing	Engagement with communities and stakeholders • Communicate prior to forecast weather events to have a common understanding around Lake and Lagoon levels, river flows and potential outcomes of the forecast weather • Communicate with communities about changes in risk and readiness • Work with Community Response Group to coordinate emergency support before, during and after an emergency • Organised consultations with communities on emergency proposed plans and guidelines. • Convene meetings with communities and stakeholders to decide a scale of an emergency event.	1, 2, 3	Civil Defense Emergency Management Otago Community Response Group	As needed Annually
Existing	Risk communication and early warnings • Provide right and trusted information about natural disasters to communities so that they can prepare effectively to emergency events.	3	Civil Defense Emergency Management Otago Queenstown Lakes District Council	Frequently Per event
Existing	Provide community resilience equipment • Provide communications equipment to not only communicate locally but also communicate to the Emergency Operations Centre in Queenstown if BAU communications systems have failed. • Provided equipment for communities to better prepare for emergency events: ✓ 4000W Petrol Inverter Generator ✓ Petrol Container ✓ Extension cords ✓ Multi boxes ✓ Rechargeable LED light 20Watt Work-lights ✓ Tripod LED light 60Watt Work-lights ✓ Handheld torches and spare batteries	3	Queenstown Lakes District Council Civil Defense Emergency Management Otago	As needed One-off

Emergency Management

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Existing	Develop and share emergency guides and plans and update annually • Glenorchy Community Resilience Guide (draft in progress) • Glenorchy Community Response Plan (draft in progress) • Developed Glenorchy Flood Guide • Developed Community Emergency Hub Guide • Developed Community Emergency Preparedness Brochure	3	Civil Defense Emergency Management Otago Community Response Group	Update annually
Existing	Training and exercises for Community Response Group and Emergency Hub implementation • Provided trainings to help Community Response Group set up Emergency hubs, operating radios and community response planning. • Exercise the implementation of the Community Emergency Hub to gain an understanding of expectations of the community, emergency services and local government as well as clarify any ambiguity or operational expectations that may present during an actual emergency.	3	Civil Defense Emergency Management Otago Community Response Group	One-off As needed

Advice, information and education

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Underway or planned	Ensure the ORC Natural Hazards Portal includes up-to-date information on natural hazards and the impacts of climate change, to provide the community with a single location for information.	2, 3	Otago Regional Council (Natural Hazards)	
Underway or planned	Maintain ORC Head of Lake Whakatipu adaptation webpages with relevant and up-to-date information, including latest reports, Council updates and key programme milestones.	2	Otago Regional Council (Natural Hazards and Communications)	Ongoing
Underway or planned	Provide newsletter updates about programme milestones and or progress towards actions to inform community members, and be accountable to the Strategy.	2	Otago Regional Council (Natural Hazards and Communications)	As needed
New	ORC to attend Glenorchy Community Association (GCA) meetings as and when required, at least annually, to provide updates about programme milestones and progress towards actions and act as a check-in with the community.	2, 3	Otago Regional Council (Natural Hazards)	Annually or as needed
Underway or planned	Ensure that ORC's messaging about natural hazards adaptation and adaptation workstreams is communicated in a way that is understood by a wide audience.	2	Otago Regional Council (Natural Hazards and Communications)	Ongoing
Underway or planned	Monitor the headofthelake@orc.govt.nz inbox for public enquiries and information relating to the programme. Consider other methods and tools for capturing community feedback.	2	Otago Regional Council (Natural Hazards)	Ongoing

Policy and planning processes

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Underway	Consider natural hazard property information for resource and building consents.	4	Queenstown Lakes District Council	Ongoing (BAU)
Underway or planned	ORC and QLDC to collaborate to ensure common adaptation priorities, information and actions identified in this Strategy inform and input into the next ORC and QLDC Long-Term Plan, Spatial Plan, District Plan and other relevant policies and plans.	1, 2	Otago Regional Council Queenstown Lakes District Council	Every LTP cycle
	Natural hazard information included on LIM reports	1, 2	Queenstown Lakes District Council	
New	ORC and QLDC to collaborate on path forward for assessing risk tolerance with the community (once the proposed RPS is operative)	1, 2, 3, 4	Otago Regional Council Queenstown Lakes District Council	once the proposed RPS is operative

Addressing impacts of natural hazards and climate change

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
Underway	Routine maintenance of transport network, including QLDC roading assets, Glenorchy jetty and marina.	1, 4	Queenstown Lakes District Council	Ongoing/BAU
Underway	Glenorchy Area Bridge Resilience (24-34 LTP): Non-routine work required to protect the serviceability of the Glenorchy, Paradise, Rees River bridge assets following damage, and to minimise threat of road closure due to natural phenomena.	1, 4	Queenstown Lakes District Council	As required, budgeted biennially
Underway	Raising Kinloch Road (24-34 LTP) Raising Kinloch Road in conjunction with two-yearly gravel extraction under the Rees River bridge.	1, 4	Queenstown Lakes District Council	As required, budgeted biennially
New	Develop Operational River Management Plans, including the Dart and Rees floodplains.	1, 4	Otago Regional Council (Engineering and Natural Hazards)	2025

Addressing impacts of natural hazards and climate change

Status	Action	Goal this contributes towards	Agency responsible	Timeframe
	• Operational Management Plans that outline the activities undertaken for river management. • These plans will be developed in 2025.			Reviewed every 2 years
New	Develop a gravel management plan for the Buckler Burn • ORC, Engineering held consent of Buckler gravel management plan. • This plan will be developed in 2025.	1, 4	Otago Regional Council (Engineering and Natural Hazards)	2025 Reviewed every 2 years
Underway	Annual vegetation management, rock armouring and gravel management • Ongoing river management activities (such as regular vegetation control in Lagoon Creek/Lagoon area)	3, 4, 5	Otago Regional Council (Engineering)	Ongoing/Annually
Existing	Maintenance of Rees River floodbanks • Maintain (not renew or increase) the existing banks – (Rees River floodbanks are not owned by ORC)	1, 4	Otago Regional Council (Engineering and Natural Hazards)	Every 1 year
New	Floodplain and rivers • Create/trial NBS groynes	1, 4, 5	Otago Regional Council (Engineering and Natural Hazards)	Every 2 years
New	Glenorchy Adaptation Pathways (30 Yr Infrastructure strategy) Work on Social Infrastructure required to address selected adaptation pathways, as budgeted in the QLDC 30 year Infrastructure Strategy.	1, 3, 4	Queenstown Lakes District Council	2034-2054
New	Provide information and support property owners to undertake property-level interventions to improve their resilience to natural hazards risks.	3, 4	Otago Regional Council (Natural Hazards)	
New	Head of the Lake Adaptation (24-34 LTP) Strategy to inform responses to identified hazards, providing scoped and costed solutions for input to the next LTP (27-37) and other key planning documents	1, 2, 4	Queenstown Lakes District Council	2034-2054

Additional information

Several resources related to the Strategy are available on the ORC and QLDC websites. You can access these resources through the links below for more information:

- Head of Lake Whakatipu Programme: https://www.orc.govt.nz/get-involved/projects-in-your-area/head-of-lake-whakatipu/
- Technical reports of this Strategy: https://www.orc.govt.nz/get-involved/projects-in-your-area/head-of-lake-whakatipu/investigations-reports-and-presentations/
- QLDC's Long Term Plans: https://www.qldc.govt.nz/your-council/council-documents/long-term-plan-ltp/.

If you want to stay in touch, subscribe our Community Newsletter:

- https://www.orc.govt.nz/get-involved/projects-in-your-area/head-of-lake-whakatipu/holw-community-get-in-touch-be-involved/

If you have any feedback or enquires about the Strategy or the supporting information, send it to our email or mail addresses:

- Email: headofthelake@orc.govt.nz
- Mail: Natural Hazards Department
  Otago Regional Council
  70 Stafford Street, Private Bag 1954
  Dunedin 9054.

SURVEY QUESTIONS

Vision

The Strategy puts forward a vision for a resilient and sustainable Head of the Lake Whakatipu.

Question 1: Does this vision align with your vision for adapting to natural hazards and climate change in the Head of Lake Whakatipu area?

- Yes
- Somewhat
- Not sure
- No

Question 2: How does your personal vision differ? (250 words max)

Goals

The goals of the Strategy reflect the type of work that ORC and partners can do to support Head of the Lake communities adapt to natural hazards and climate change.

Question 3: Which of these adaptation goals do you think ORC and partners should be working harder to address? (Select all that apply and explain your answers)

- Integrating natural hazard adaptation into everyday decisions
- Collaborating with mana whenua and partners
- Supporting healthy and resilient communities
- Building resilient infrastructure
- Protecting and enhancing the environment

Future Toolbox

Given the ideas and inputs from the community and partners, we developed a future toolbox of potential responses for consideration.

Question 4: What the potential responses in the Future Toolbox are most important to you and your household? (you can choose up to three options and explain why).

Action Plan

The Strategy details the action plans and activities ORC and partners are taking or planning to take to support the Head of Lake Whakatipu's communities adapt to natural hazard risks and climate change impacts.

Question 5: Do you think we are doing enough to support this adaptation at the Head of the Lake?

- Yes
- Yes, but more could be done
- Not sure
- No

Question 6: What additional actions do you think ORC and partners should consider to help Head of the Lake communities adapt to natural hazards and climate change? (250 words max)

Additional feedback

Question 6: Let us know if there is anything else you would like to tell us about the Draft Strategy.

Demographic information

Question 7: What is your connection to the Head of Lake Whakatipu? (Select all that apply)

- Glenorchy resident
- Glenorchy ratepayer
- Community organisation
- Farming
- Tourism operator
- Business owner
- Holiday homeowner
- Recreational visitor
- Other

Question 8: Which age group do you belong to?

- 65 or over
- 30-64
- 15-29
- Under 15
- Prefer not to say

Question 9: Where do you mainly live in relation to the Head of Lake Whakatipu?

- Glenorchy Township
- Rees Valley
- Dart Valley
- Campbelltown
- Wyuna Preserve

- Queenstown
- Elsewhere in Otago
- Outside Otago
- North Island
- Overseas

Question 10: Please enter your email address if you would like to receive updates about this Strategy in our monthly newsletter.

9.6. Council Calendar for 2025

Prepared for:	Council
Report No.	GOV2479
Activity:	Governance Report
Author:	Amanda Vercoe, General Manager Strategy and Customer
Endorsed by:	Richard Saunders, Chief Executive
Date:	4 December 2024

PURPOSE

[1] To adopt a governance meeting schedule for the Otago Regional Council for 2025.

EXECUTIVE SUMMARY

[2] The proposed schedule for meetings in 2025 provides for monthly Council meetings and quarterly Finance, Environmental Implementation, Public and Active Transport, Regional Leadership, Safety and Resilience, Audit and Risk and Environmental Science and Policy committee meetings.

[3] Two regional meetings have been proposed, in Queenstown and Oamaru. This means that each regional centre will have been visited twice over the triennium.

[4] Due to local body elections in October, no committees are scheduled past this month, and the Council meetings scheduled are to be confirmed.

[5] Changes or additional meetings or workshops may be required, which will be notified to elected members and appointed members as soon as possible as they arise.

[6] Still to be scheduled are Annual Plan hearings and deliberations and Mana to Mana meetings.

RECOMMENDATION

That the Council:

1. ***Receives*** *this report and the draft attached meeting schedule.*
2. ***Adopts*** *the meeting schedule, with or without changes.*

BACKGROUND

[7] Under Schedule 7, Clause 19 (a) a local authority may adopt a forward schedule of meetings, and notification of that constitutes as notification to members under the Act of the meetings. The schedule can be amended following adoption.

[8] ORC's regional meetings this triennium have included:

a. November 2022 – Cromwell
b. April 2023 – Balclutha
c. October 2023 - Wānaka
d. February 2024 – Oamaru
e. May 2024 – Queenstown (LTP Hearings)
f. July 2024 – Cromwell
g. October 2024 – Balclutha

[9] Holding meetings in Queenstown and Oamaru will mean that each Territorial Authority region has been visited twice.

DISCUSSION

[10] Nil.

OPTIONS

[11] Council can choose to adopt the schedule, with or without amendments.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[12] Council and committee meetings enable decision making to support the strategic framework and development of policies and plans.

Financial Considerations

[13] Regular meetings are budgeted for.

Significance and Engagement

[14] Nil.

Legislative and Risk Considerations

[15] Meetings must be publicly notified in advance under Part 7, Section 46 of the Local Government Official Information and Meetings Act 1987, and Schedule 7, Clause 19 of the Local Government Act 2002.

Climate Change Considerations

[16] Nil.

Communications Considerations

[17] The adopted Council calendar will be published on the website.

NEXT STEPS

[18] Outlook calendar invitations will be sent to councillors and appointed members for the agreed meeting dates and will be published on the Council's website and the local newspaper as per statutory obligations.

ATTACHMENTS

1. Council calendar 2025 DRAFT (1) [**9.6.1** - 2 pages]

Proposed 2025 ORC Council Calendar

	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25
Tuesday				1			1					
Wednesday	1			2			2			School hols 1		
Thursday	2			3	1		3			2		
Friday	3			4	2		4	1		3		
Saturday	4	1	1	5	3		5	2		4	1	
Sunday	5	2	2	6	4	1	6	3		5	2	
Monday	6	3	3	7	5	Kings Bday2	7	4	1	6	3	1
Tuesday	7	4	4	8	6	3	8	5	2	7	4	2
Wednesday	8	5	Cttees 5	9	7	Cttees 4	9	6	Cttees 3	8	5	Council 3
Thursday	9	Waitangi 6	Cttees 6	10	8	Cttees 5	10	7	Cttees 4	9	6	Workshops 4
Friday	10	7	7	11	9	6	11	8	5	10	7	5
Saturday	11	8	8	12	10	7	12	9	6	Elections 11	8	6
Sunday	12	9	9	13	11	8	13	10	7	12	9	7
Monday	13	10	10	14	12	9	14	11	8	13	10	8
Tuesday	14	11	11	15	13	10	15	12	9	14	11	9
Wednesday	15	12	12	16	14	11	LGNZ Conf16	13	10	15	12	10
Thursday	16	13	13	17	15	12	17	14	11	16	13	11
Friday	17	14	14	Easter 18	16	13	18	15	12	17	14	12
Saturday	18	15	15	19	17	14	19	16	13	18	15	13
Sunday	19	16	16	20	18	15	20	17	14	19	16	14
Monday	20	17	17	Easter 21	19	16	21	18	15	20	17	15
Tuesday	21	18	18	Easter 22	20	17	22	19	16	21	18	16
Wednesday	22	Council 19	Council (Qtown) 19	23	Council 21	18	Council (Oamaru) 23	20	Council 17	Inaugural Council 22	Council 19	17
Thursday	23	Cttees 20	Site visits 20	24	Cttees 22	19	Site visits 24	21	Workshops 18	23	Workshops 20	18
Friday	24	21	21	ANZAC 25	23	Matariki 20	25	22	19	24	21	19
Saturday	25	22	22	26	24	21	26	23	20	25	22	20
Sunday	26	23	23	27	25	22	27	24	21	26	23	21
Monday	27	24	Otago Annivers	28	26	23	28	25	22	Labour 27	24	22
Tuesday	28	25	25	29	27	24	29	26	23	28	25	23
Wednesday	29	26	26	30	28	Council 25	30	Council 27	24	29	26	24
Thursday	30	27	27		29	Cttees 26	31	Cttees 28	25	30	27	25
Fri	31	28	28		30	27		29	26	31	28	26
Saturday			29		31	28		30	27		29	27
Sunday			30			29		31	28		30	28
Monday			31			school hols 30			29			29
Tuesday									30			30
												31

PROPOSED OTAGO REGIONAL COUNCIL SCHEDULE OF MEETINGS 2025

2025	Council (Monthly)	Workshop Days / Site Visits	Regional Leadership Committee (Quarterly)	Finance Committee (Quarterly)	Environmental Science and Policy Committee (Quarterly)	Public and Active Transport Committee (Quarterly)	Environmental Implementation Committee (Quarterly)	Safety and Resilience Committee (Quarterly)	Audit and Risk Committee (Quarterly)
JANUARY - NO MEETINGS SCHEDULED									
19/20 February	19 Feb (pm)	19 Feb (am)		20 Feb (am)	20 Feb (pm)				
5/6 March						5 March (am)	5 March (pm)	6 March (am)	6 March (pm)
19/20 March	19 March (Queenstown)	20 March - site visits	19 March (am)						
Late April / Early May				*Annual Plan Hearings*					
21/22 May	21 May (pm)	21 May (am)		22 May (am)	22 May (pm)				
4/5 June						5 June (am)	5 June (pm)	6 June (am)	6 June (pm)
25/26 June	25 June (10-5pm)	26 June (pm)	26 June (am)						
23/24 July	23 July (Oamaru)	24 July - site visits							
27/28 August	27 August (pm)	27 August (am)		28 August (am)	28 August (pm)				
3/4 September						3 September (am)	3 September (pm)	4 September (am)	4 September (pm)
25/26 September	25 September (10-5pm)	26 September (pm)	26 September (am)						
22 Oct TBC	Inaugural Meeting (TBC)								
19/20 November TBC	19 November (pm)								
3/4 December TBC	3 December (pm)								
TOTAL MTGS	10	TBC	3	3	3	3	3	3	3

9.7. Delegation to Chief Executive in relation to an appeal to the Dunedin City District Plan

Prepared for:	Council
Report No.	GOV2478
Activity:	Community - Response to External Proposals
Author:	Anita Dawe, General Manager, Regional Planning and Transport; Tom Dyer, General Manager, Science and Resilience
Endorsed by:	Richard Saunders, Chief Executive
Date:	4 December 2024

PURPOSE

[1] To provide delegation to the Chief Executive to enable the uplift of conditions associated with rezoning of land in the Dunedin City Second Generation District Plan.

EXECUTIVE SUMMARY

[2] ORC, as an interested party, supported rezoning of land in Mosgiel from rural, to residential, subject to conditions in relation to management of stormwater, and discharges to the Owhiro Stream being satisfied. The land is currently Residential Transition Zone (RTZ) and can become residential land once all conditions are addressed.

[3] There is now a request to progress the uplift of the RTZ zone over part of the subject land, and ORC has been working with the owner to enable that to happen.

[4] Currently however, while delegation exists to participate in Environment Court mediation, there is no existing delegation to allow *the* Chief Executive Officer authority to enter into an agreement under Rule 12.3.4.b.ii.2 of the Dunedin City Second Generation District Plan (2GP) between the Otago Regional Council and any landowner applying under Rule 12.3.4 of 2GP for the release of land in the South East Mosgiel Residential Transitional Overlay Zone.

RECOMMENDATION

That the Council:

a) ***Delegates*** *to the Chief Executive Officer authority to enter into an agreement under Rule 12.3.4.b.ii.2 of the Dunedin City Second Generation District Plan (2GP) between the Otago Regional Council and any landowner applying under Rule 12.3.4 of 2GP for the release of land in the South East Mosgiel Residential Transitional Overlay Zone (as shown in Figure 15.8.21A of 2GP) containing the terms and conditions on which the Otago Regional Council will accept the discharge of stormwater, directly or indirectly, from that landowner's land to the Owhiro Stream or to any work, system or facility owned or operated by the Otago Regional Council.*

BACKGROUND

[5] In 2018, ORC joined an appeal to the Dunedin City Second Generation District Plan(2GP) that sought rezoning of land in Mosgiel from rural, to residential, via a Residential Transition Zone (RTZ). The site is bounded by Hagart – Alexander Road, Gladstone Road North and Wingatui Road.

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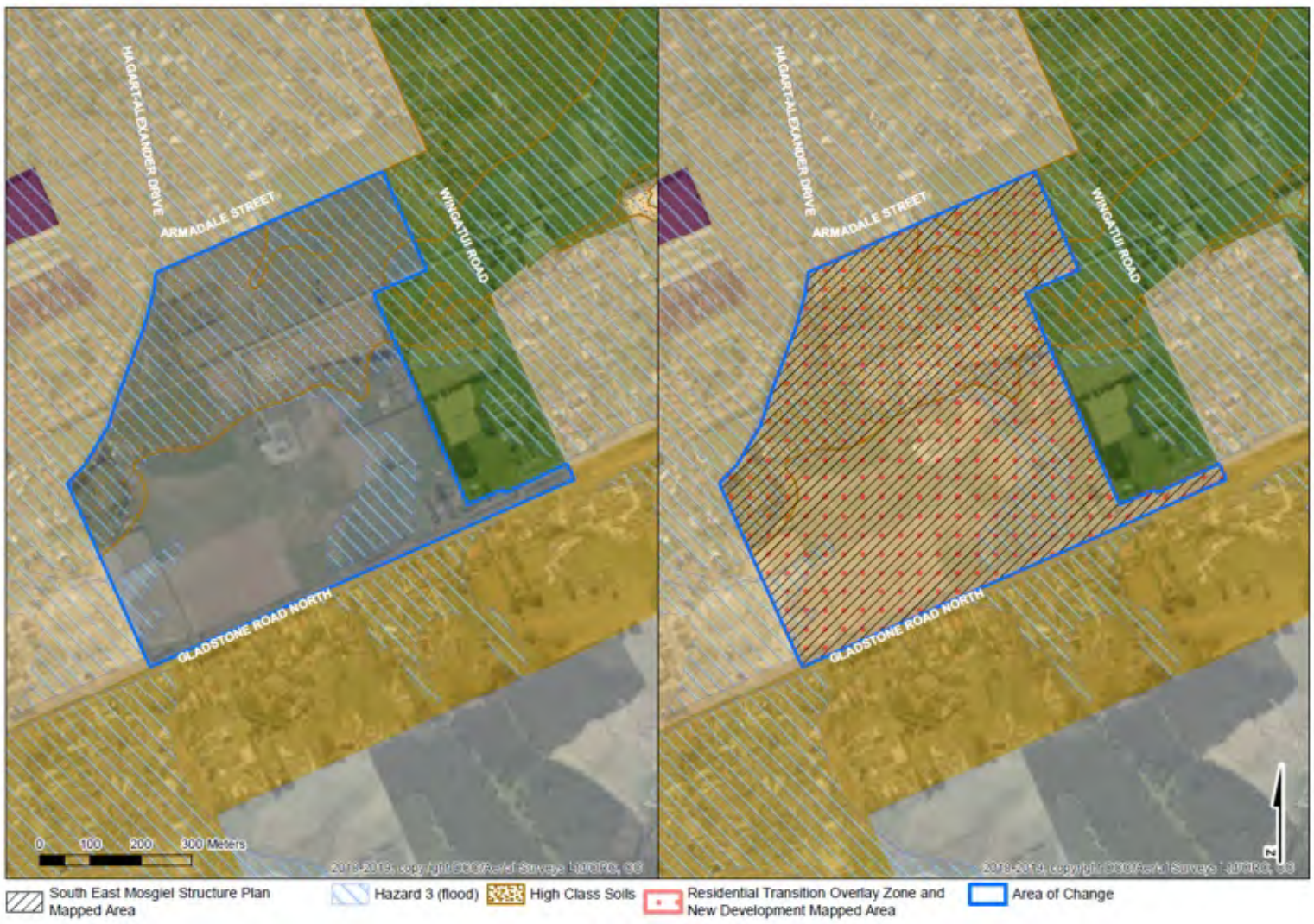
[6] Mediation on the appeal was successful, to move the land from rural, to residential, via a transition zone. The transition zone, called Residential Transition Zone (RTZ) is a planning tool that signals that the land will become residential upon satisfaction of conditions relating to servicing.

[7] ORC's interests related to the integrated management of stormwater across the site, in order to appropriately enable discharge to the Owhiro Stream. The site, and zonings, are shown in the diagram below.



[8] Part of the site has been transferred to a new owner, who is seeking a partial release of the RTZ to enable development. ORC staff have been working through the requirements for stormwater management with the new owner to enable partial uplift.

DISCUSSION

[9] There has been good progress with ORC technical staff working with the owners' representatives on satisfying the conditions relating to integrated stormwater management and management of discharges to the Owhiro Stream, however at the date of writing this report, ORC staff are not yet in a position to recommend to Council that the technical requirements are satisfied to enable the partial release.

[10] We consider that the outstanding technical and operational aspects should be able to be satisfied in the coming weeks, and as such, request a delegation to the Chief Executive to enable the uplift of the RTZ, for this partial release, and for the balance of the land, when the time comes.

OPTIONS

[11] Staff recommend that an appropriate delegation be provided to the Chief Executive to enable the uplift of the RTZ over the land subject to the agreement. This would ensure that the rezoning can be progressed in a timely manner. It is important to note that ORC has agreed to the rezoning and the agreement relates to technical and operational requirements, as opposed to a policy direction consideration.

[12] The alternative option would be for Council not to authorise the delegation. This would require additional Council consideration once the technical and operational requirements were satisfied. This is not the recommended approach.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[13] This paper is not directly influenced by the strategic framework, however the rezoning of land with appropriate servicing requirements aligns with the *Resilience, Climate* and *Communities* strategic directions.

Financial Considerations

[14] There are no particular costs associated with this paper. Staff time from engineering, hazards, and policy have been involved in the appeal, along with legal support, since 2018. These costs are met by existing budgets.

Significance and Engagement Considerations

[15] This paper and process does not trigger the requirements of *He mahi Rau Rika*.

Legislative and Risk Considerations

[16] The rezoning of the land is consistent with the objectives of the Regional Policy Statement, and the proposed Regional Policy Statement, and relevant higher order documents.

Climate Change Considerations

[17] Part of the requirements to be satisfied include ensuring capacity to manage severe weather events, and ensure resilience from climate change events.

Communications Considerations

[18] There are no relevant communications considerations.

NEXT STEPS

[19] Staff will continue to work with the landowners, and the DCC, to progress partial uplift of the RTZ.

ATTACHMENTS

Nil

That the public be excluded from the following items under LGOIMA 48(1)(a):

1.1 Confidential Minutes of Council 25 September 2024
3.1 CS2441 Port Otago Resolution In lieu of Annual Shareholders Meeting
3.2 CS2451 ORC Office Accommodation in Queenstown and Wānaka: Changes

The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter, and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are as follows:

General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under section 48(1) for the passing of this resolution
1.1 Confidential Minutes of Council 25 September 2024	To maintain legal professional privilege – Section 7(2)(g)	Section 48(1)(a); Subject to subsection (3), a local authority may by resolution exclude the public from the whole or any part of the proceedings of any meeting only on 1 or more of the following grounds: (a)that the public conduct of the whole or the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding would exist.
3.1 Port Otago Resolution In Lieu Of Annual Shareholders Meeting	To protect the privacy of natural persons, including that of deceased natural persons – Section 7(2)(a) To enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities – Section 7(2)(h)	Section 48(1)(a); Subject to subsection (3), a local authority may by resolution exclude the public from the whole or any part of the proceedings of any meeting only on 1 or more of the following grounds: (a)that the public conduct of the whole or the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding would exist.

3.2 ORC Office Accommodation in Queenstown and Wānaka: Changes	To enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities – Section 7(2)(h)	Section 48(1)(a); Subject to subsection (3), a local authority may by resolution exclude the public from the whole or any part of the proceedings of any meeting only on 1 or more of the following grounds: (a)that the public conduct of the whole or the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding would exist.

This resolution is made in reliance on section 48(1)(a) of the Local Government Official Information and Meetings Act 1987 and the particular interest or interests protected by section 6 or section 7 of that Act or section 6 or section 7 or section 9 of the Official Information Act 1982, as the case may require, which would be prejudiced by the holding of the whole or the relevant part of the proceedings of the meeting in public.