Council Agenda 19 March 2025

Meeting will be held at the Queenstown Lakes District Council, 10 Gorge Road, Queenstown 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

19 March 2025 09:00 AM

Agenda Topic

Agenda 1

1. WELCOME

2. APOLOGIES

3. PUBLIC FORUM

Pierre Masrati will speak on behalf of Extinction Rebellion
Bronte Currie will speak on behalf of Protect our Winters, online.

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

6.1 Enviroschools 2024 Work Programme

Kā Paetae o Ōtākou - 2024 Annual Review Summary
Linked Here to Diligent Resource Centre
Linked Here ORC Website

Enviroschools PowerPoint
Linked Here to Dilgent Resource Centre
Linked Here ORC Website

6.2 Port of Otago - Half Year Financial Results

At 1PM Chair Tim Gibson, Chief Executive Kevin Winders and Chief Financial Officer Stephen Connolly will speak.

ORC Half Year Presentation Linked Here in Diligent Resource Centre
Linked here on the ORC Website

7. CONFIRMATION OF MINUTES 5

Confirming the minutes of 19 February 2025 and 26 February 2025 as a true and accurate record.

7.1 2025.02.19 Council Minutes Draft 5

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9.2.4 Balance Sheet February 35

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10.1 Air Quality Management Ambition and Approach 36

The purpose of this report is to seek endorsement of Council's level of ambition for the Air Quality Strategy (the Strategy) and Air Regional Plan (the Plan).
Endorsement of the non-regulatory and regulatory methods to be explored further along with direction on the approach to public engagement.

10.1.1 Attachment 1 Kāi Tahu Values and Outcomes for Otago's Air 54

10.1.2 Attachment 2 - Further Information 56

10.1.3 Attachment 3 Community and Stakeholder Feedback Summary Report 60

10.1.4 Draft Air Zones 92

10.2 Te Awa Otakou Issues and Opportunities Report 127

To present the Te Awa Ōtākou Issues and Opportunities report and seek endorsement of the next steps for improving the harbour's management.

10.2.1 Te Awa Otakou Issues & Opportunities

The PDF of this attachment is available on the ORC Webisite Here
Diligent Resource Centre Link

10.2.2 Te Awa Otakou Recommended Actions 132

10.3 Report on Implications of Changes to the RMA in Relation to Land and Water 137

This paper provides a summary of both the implications and unintended consequences for Otago Regional Council (ORC) of the legislative change preventing the notification of freshwater planning instruments; and the options recommended by staff for addressing these issues.

10.3.1 Implications of the Legislative Change for Managing Rural Diffuse Discharges in Otago 147

10.3.2 Implications of the Legislative Change for Managing Water Permits 157

10.4 Regional Public Transport Plan - Adopting for Consultation 167

To seek Council's approval to consult on the draft Regional Public Transport Plan (2025-2035) (RPTP) and also for Council to appoint a Hearings Panel to hear submissions and deliberate on the draft RPTP.

10.4.1 Regional Public Transport Plan

This attachment is available on the ORC Website
Diligent Resource Centre link here.

10.5 Total Mobility Financial paper 2024/2025 170

To provide some insight into the Total Mobility services for the current financial year and seek direction from Council about the forecasted overspend for the 2024/2025 financial year

10.5.1 2025 Total Mobility Handbook 176

10.5.2 Total Mobility Driver Training 2025 186

10.5.3 Total Mobility Summary Report December 2024 201

10.6 Waitaki Update 202

To update Council on progress on the investigation into managing the Waitaki catchment as a single integrated catchment, and request approval to collaborate with Environment Canterbury (ECan), to undertake a section 35 assessment.

10.6.1 Waitaki Ki Uta Ki Tai Stakeholder List 1 206

10.6.2 Engagement Evaluation Waitaki ki uta ki tai 211

10.7 Flood Recovery Update 2 216

To provide an update on repairs from the October 2024 flood event including financial implications. Also, to seek Council approval to award the contract and authorise payments for the Kaitangata floodbank repair to damage from the 2022 flood.

10.8 Lower Taieri Liaison Group 225

To update the Council regarding the formation of the Lower Taieri Liaison Group, present the confirmed Terms of Reference, and to seek the nomination of a Councillor Representative for the Group.

10.8.1 Lower Taieri Flood Protection Scheme Liaison Group Engagement Report 229

10.8.2 Lower Taieri Liaison Group Flood Protection & Drainage Schemes Terms of Reference 232

10.9 ORC Review of Committee Structure, Terms of Reference, Delegations 236

To consider next steps for reviewing Council's committee structure, terms of reference and delegations.

10.9.1 2022 2025 Committee Terms of Reference and Delegations - Review Version 243

10.10 South Dunedin Future – Risk Assessment and Potential Adaptation Futures 266

10.10.1 SDF Programme Summary 279

10.10.2 South Dunedin Risk Assessment 280

10.10.3 7 Potential Adaptation Futures for South Dunedin 478

10.10.4 South Dunedin Future Workstream 4. Adaptation 499

11. RECOMMENDATIONS ADOPTED AT COMMITTEE MEETINGS 571

11.1 Recommendations of Environmental Implementation Committee 571

11.2 Recommendations of the Public and Active Transport Committee 572

12. NOTICES OF MOTION

No notices of motion had been submitted at the time of publishing.

13. CLOSURE

Otago Regional Council

Council
MINUTES

Minutes of an ordinary meeting of the Otago Regional Council held in the Council Chamber, Level 2 Philip Laing House, 144 Rattray Street, Dunedin, on Wednesday 19 February 2025, commencing at 1:00 PM.

https://www.youtube.com/live/TnRPl6O7uME?si=BgDTB6thKuAtzazS

PRESENT

Cr Gretchen Robertson *(Chair)*
Cr Lloyd McCall
Cr Alexa Forbes
Cr Gary Kelliher
Cr Michael Laws
Cr Kevin Malcolm
Cr Tim Mepham
Cr Andrew Noone
Cr Alan Somerville
Cr Elliot Weir
Cr Kate Wilson

1. WELCOME

Chair Robertson welcomed Councillors, members of the public and staff to the meeting at 1 pm. Staff present included Richard Saunders (Chief Executive), Anita Dawe (GM Regional Planning and Transport), Nick Donnelly (GM Finance), Tom Dyer (GM Manager Science and Resilience), Joanna Gilroy (GM Environmental Delivery), Tami Sargeant (GM People and Corporate), Amanda Vercoe (GM Strategy and Customer, Deputy CE), Kylie Darragh (Governance Support), and Mike Roesler (Manager Corporate Planning).

2. APOLOGIES

There were no apologies for this meeting.

3. PUBLIC FORUM

Julian Doorey spoke to Council on behalf of Stormwater Justice for South Dunedin, after some questions Chair Robertson thanked Mr Doorey for attending.

Online, Suze Keith and Rob van der Mark on behalf of Sustainable Tarras spoke to Council, after an opportunity for questions, Chair Robertson thanked both for attending.

4. CONFIRMATION OF AGENDA

The agenda was confirmed as published.

5. DECLARATIONS OF INTERESTS

No changes to Councillor Declarations of Interests were noted.

6. CONFIRMATION OF MINUTES

There was an amendment to matter 9.1 noted.

Resolution: Cr Robertson Moved, Cr Wilson Seconded

That *the minutes of the (public portion of the) Council meeting held on 4 December 2024 be received and confirmed as a true and accurate record.*

MOTION CARRIED

7. ACTIONS (STATUS OF COUNCIL RESOLUTIONS)

Open actions from resolutions of the Committee were reviewed. The Chair noted the letter item to the Minister for the Environment is now completed.

8. CHAIRPERSON'S AND CHIEF EXECUTIVE'S REPORTS

8.1. Chairperson's Report

Chair Robertson noted to council there was an erroneous double up of letters and an additional response letter also published to the ORC website now as a correction.

Resolution: Cr Somerville Moved, Cr McCall Seconded

That the Council:

1. ***Notes*** *this report.*

MOTION CARRIED

8.2. Chief Executive's Report

Richard Saunders, Chief Executive responded to questions on his report.

Resolution: Cr Mepham Moved, Cr Weir Seconded

That the Council:

1. ***Notes** this report.*

MOTION CARRIED

9. MATTERS FOR CONSIDERATION

9.1. Annual Plan 2025/26

[Youtube 40:54] This report formalised a draft position on changes to the financial forecast and work programme contained in the Otago Regional Council Long-Term Plan 2024-34 (LTP). Doing so provided a basis for consultation with the community and final decisions prior to approving the Annual Plan 2025-26 (AP) in June 2025. Nick Donnelly (General Manager Finance) and Mike Roesler (Manager Corporate Planning) were available to respond to questions on the report. There were two additional recommendations from Cr Kelliher and one additional recommendation added from Cr Wilson. All were taken separately.

Resolution: Cr Kelliher Moved, Cr Laws Seconded

1. ***That** the $2 million Environmental fund is deferred by 12 months to allow for an appropriate management and consideration structure to be established.*

FOR:	Cr Kelliher, Cr Laws, Cr Malcolm.
AGAINST:	Cr Forbes, Cr McCall, Cr Mepham, Cr Noone, Cr Somerville, Cr Weir, Cr Wilson, Chair Robertson.
ABSTAINED:	None.

MOTION FAILED

Resolution: Cr Kelliher Moved, Cr Laws Seconded

2. ***That** ORC staff numbers are reduced across the next two years to a base level maintained at 325.*

FOR:	Cr Kelliher, Cr Laws, Cr Malcolm, Cr Noone.
AGAINST:	Cr Forbes, Cr McCall, Cr Mepham, Cr Somerville, Cr Weir, Cr Wilson, Chair Robertson.
ABSTAINED:	None.

MOTION FAILED

Resolution CM25-101: Cr Mepham Moved, Cr Wilson Seconded

That the Council:

1. ***Notes** the consolidated financial forecasts and key underlying expenditure and funding changes to the LTP 2024-2034 as presented in the 'Discussion' section of this report.*

MOTION CARRIED

Cr Kelliher voted against.

Resolution CM25-102: Cr Mepham Moved, Cr Wilson Seconded
That the Council:
2. Agrees *the proposed adjustments to the Long-Term Plan 2024-34 work programme and associated financial forecasts as summarised in the discussion section of this report*.
MOTION CARRIED

Resolution CM25-103: Cr Mepham Moved, Cr Wilson Seconded
That the Council:
3. Agrees *that the proposed changes to the Long-Term Plan 2024-34 do not represent significant or material change*.
MOTION CARRIED

Resolution CM25-104: Cr Mepham Moved, Cr Wilson Seconded
That the Council:
4. Approves *the proposed changes to the Long-Term Plan 2024-34 measures and targets for the purpose of consulting the Annual Plan 2025-26*.
MOTION CARRIED
Cr Kelliher and Cr Laws voted against.

Resolution CM25-105: Cr Mepham Moved, Cr Wilson Seconded
That the Council:
5. Approves *proposed changes to the Otago Regional Council 'Schedule of Fees and Charges' for the purpose of consultation*.
MOTION CARRIED
Cr Kelliher and Cr Laws voted against.

Resolution CM25-106: Cr Mepham Moved, Cr Wilson Seconded
That the Council:
6. Notes *that a Communication Plan and draft consultation content for the Annual Plan 2024-25 process has been considered in Council workshops*.
MOTION CARRIED

Resolution CM25-107: Cr Mepham Moved, Cr Wilson Seconded
That the Council:
7. Directs *Council staff to begin community consultation on the proposed adjustments to the Long-Term Plan 2024-34*.
MOTION CARRIED

Resolution CM25-108: Cr Mepham Moved, Cr Wilson Seconded
That the Council:
8. Directs *Council staff to begin community consultation on the proposed changes to the Otago Regional Council Fees and Charges*.
MOTION CARRIED

It was moved by Cr Robertson and seconded by Cr Malcolm
That *Council adjourn from 2:55 pm to 3:10pm*.
MOTION CARRIED

Resolution CM25-109: Cr Wilson Moved, Cr Noone Seconded
That the Council:
9. Request *a summary of expenditure and FTE and associated work programmes or deliverables for each group within ORC structure for a high level understanding in time for deliberations on 25/26 AP.*
MOTION CARRIED

9.2. Order of Candidate Names on Voting Documents

This report outlined the three options available to order candidate names on voting documents for the 11 October 2025 election and any subsequent byelections that may become necessary. Amanda Vercoe (Manager Strategy and Customer) was available to respond to questions on the report.

Resolution CM25-111: Cr Wilson Moved, Cr Laws Seconded
That the Council:
1. Notes *this report.*
2. Approves *the continued use of random order for candidate names on voting documents and any by-election voting documents for the 2025 triennial election.*
MOTION CARRIED

9.3. Private Share of Public Transport Operating Costs

[YouTube 2:28:58] This paper updates Council on changes to central government requirements for public transport cost recovery, recommends private share targets, and mechanisms for achieving them. Lorraine Cheyne (Manager Transport) Robyn Hyde (Transport Planning Lead) and Anita Dawe (General Manager Regional Planning and Transport) were available to respond to questions. A PowerPoint was provided to recap details on the private share. There were amendments to the recommendations.

Resolution CM25-112: Cr Laws Moved, Cr Weir Seconded
That the Council:
1. Notes *this report.*
2. Notes *requirements to increase private share of public transport operating costs as set out in the Government Policy Statement for Land Transport 2024.*
3. Notes *the preferred timelines to set private share targets outlined by NZTA to include officer level agreement by 31 January 2025 and Council decision by end of March 2025.*
4. Notes *timeline for the Regional Public Transport Plan 2025.*
MOTION CARRIED

Resolution CM25-113: Cr Laws Moved, Cr Weir Seconded
That the Council:
5. Approve, *for consultation as part of the RPTP, the inclusion of child concessions of 100%.*
Approve, for consultation as part of the RPTP, the increase in an Adult Bee Card fare to $2.50.
MOTION CARRIED

Resolution CM25-114: Cr Laws Moved, Cr Weir Seconded
That the Council:
6. Approves *advising NZTA Waka Kotahi that fare changes, including changes to adult fares or the introduction of fare zones will be consulted on as part of the RPTP, and formal reporting of private share targets and projections will be provided to NZTA by 30 June 2025, after the RPTP process has concluded.*
MOTION CARRIED

Resolution CM25-115: Cr Laws Moved, Cr Weir Seconded
That the Council:
7. Notes *the requirement to increase private share funding of public transport services and the initial private share targets advised by staff to NZTA officials, which are to be confirmed through the RPTP process.*
MOTION CARRIED

Cr Laws left the meeting at 4:10 pm.
Cr Laws returned to the meeting at 4:12 pm.

9.4. Te Korowai Evaluation Report
[YouTube 3:12:53] This report provided Council with a summary of the Evaluation Report from Otago Regional Council's participation in LGNZ's Te Korowai programme. Amanda Vercoe (General Manager Strategy and Customer) and Jasmin Lamorie (Project Lead Business Transformation) were present to respond to questions on the report. There was an amendment to the recommendations.

Resolution CM25-116: Cr Malcolm Moved, Cr McCall Seconded
That the Council:
1. *Notes* *this report.*
2. *Notes* *that progress on implementation of actions to address the priority recommendations will be included in business transformation updates to Council quarterly.*
MOTION CARRIED

Resolution CM25-117: Cr Wilson Moved, Cr Kelliher Seconded
That the Council:
3. Asks *the Chief Executive to present a programme of business transformation to the July Council Meeting that will include options for prioritised areas of improvement listed in Te Korowai Evaluation report*
MOTION CARRIED
Cr Robertson voted against.

Cr Malcolm left the meeting at 4:26 pm.
Cr Malcolm returned to the meeting at 4:28 pm.

9.5 New Fast Track Act Requirements
[3.32.25 YouTube] This report provided Council with an overview of the new Fast-Track Approvals Act 2024, the proposed process for involvement and provided recommendations on delegations to staff under the Act. Alexandra King (Manager Consents) and Jo Gilroy (General Manager Environmental Delivery) were available to respond to questions on the report.

Resolution CM25-118: Cr Forbes Moved, Cr Weir Seconded
That the Council:
1. Notes *this report and the new legislative requirements under the Fast Track Approvals Act 2024.*
MOTION CARRIED

Cr Malcolm left the meeting at 4:26 pm.
Cr Malcolm returned to the meeting at 4:28 pm.

Resolution: Cr Forbes Moved, Cr Weir Seconded
That the Council:
2. Endorses *the proposed process (option 2) for responding to applications under the Fast Track Approvals Act*

FOR:	Cr Forbes, Cr McCall, Cr Somerville, Cr Weir Cr Wilson.
AGAINST:	Cr Kelliher, Cr Laws, Cr Malcolm, Cr Mepham, Cr Noone, Cr Robertson.
ABSTAINED	None.

MOTION FAILED

Resolution CM25-120: Cr Laws Moved, Cr Malcolm Seconded
That the Council:
3. ***Endorses*** *the proposed process (option 1) for responding to applications under the Fast Track Approvals Act.*
MOTION CARRIED

Resolution CM25-121: Cr Laws Moved, Cr Malcolm Seconded
That the Council:
4. ***Nominates*** *Cr Robertson, Cr Noone as the representatives to sit on the Fast Track working group and provide governance input into ORC's fast track responses.*
MOTION CARRIED

Resolution CM25-122: Cr Robertson Moved, Cr Forbes Seconded
5. Approves *new delegations under the Fast Track Approvals Act 2024 as outlined in this report.*
6. Approves *the amendment of the Delegations Manual to reflect changes outlined in this report.*
MOTION CARRIED

Cr Noone left the meeting at 4:57 pm.
Cr Noone returned to the meeting at 5:01pm.

9.6. Port Otago Letter of Expectation
[YouTube 3:51:08] This paper was brought to consider and approve a Letter of Expectation to Port Otago Limited (Port Otago) regarding Otago Regional Council's (Council) expectations for inclusion in Port Otago's Statement of Corporate Intent for the years ended 30 June 2026 to 30 June 2028. Nick Donnelly (General Manager Finance) was available to respond to questions.
Cr Malcolm and Cr Somerville both submitted changes for the grammar and wording for the letter.

Resolution CM25-123: Cr Malcolm Moved, Cr Laws Seconded

That the Council:

1. ***Notes*** *this report and the draft Letter of Expectation 2026-2028*.
2. ***Provides*** *feedback and amendments to the draft Letter of Expectation 2026-2028*.
3. ***Approves*** *the Port Otago Letter of Expectations 2026-2028, subject to any amendments approved in (2) above, and the sending of that letter to Port Otago Limited*.
4. ***Approves*** *the payment of a donation of $350,000 to the Otago Southland Rescue Helicopter Trust to be funded from General Reserves*.

MOTION CARRIED

Resolution: Cr Somerville Moved, Cr Forbes Seconded

That *Council endorses Port Otago's goal of influencing others in the supply chain also to reduce their contributions to climate change and would like these efforts to be reported to Council and the wider community*.

FOR	Cr Forbes, Cr Mepham, Cr Somerville, Cr Weir
AGAINST	Cr Kelliher, Cr Laws, Cr Malcom, Cr McCall, Cr Noone, Cr Robertson.
ABSTAINED	Cr Wilson.

MOTION FAILED

10. RECOMMENDATIONS ADOPTED AT COMMITTEE MEETINGS

10.1. Recommendations of the Audit and Risk Subcommittee

Resolution CM25-124: Cr Wilson Moved, Cr Laws Seconded

That the Council adopts the recommendations of the 5 December 2024 Audit and Risk Subcommittee.

MOTION CARRIED

10.2. Recommendations of the Environmental Science and Policy Committee

Resolution CM25-125: Cr McCall Moved, Cr Weir Seconded

That the Council adopts the recommendations of the 4 December 2024 Environmental Science and Policy Committee.

MOTION CARRIED

10.3. Recommendations of the Regional Leadership Committee

Resolution CM25-126: Cr Weir Moved, Cr McCall Seconded

That the Council adopts the recommendations of the 21 November 2024 Regional Leadership Committee.

MOTION CARRIED

Resolution: Cr Robertson Moved, Cr Malcolm Seconded:

It was moved to adjourn the public excluded portion of the meeting until the conclusion of the Finance Committee on 20 February 2025.

MOTION CARRIED

13. CLOSURE

There was no further business and Chairperson Robertson declared the meeting adjourned at 5:12 pm.

_____ _____

Chairperson Date

Council reconvened on 20 February at 10:10 am.

It was moved by Cr Wilson, seconded by Cr Forbes

That the public be excluded from the following items under LGOIMA 48(1)(a):

1. Confidential Minutes of Council 4 December 2025

3.1 Business Case for Queenstown Depot for Electric Buses

MOTION CARRIED

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. Confidential Minutes of Council 4 December 2024	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.

3.1 Business Case for Queenstown Depot for Electric Buses	To protect information where the making available of the information—would be likely unreasonably to prejudice the commercial position of the person who supplied or who is the subject of the information – Section 7(2)(b)(ii) 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.

Otago Regional Council

Council
MINUTES

Minutes of an ordinary meeting of the Otago Regional Council held in the Council Chamber, Level 2 Philip Laing House, 144 Rattray Street, Dunedin on Wednesday 26 February 2025, commencing at 11:15 am.
https://www.youtube.com/live/DkzvIMDUTaI?si=zT-kdxcP8kv10td-

PRESENT
Cr Gretchen Robertson *(Chair)*
Cr Alexa Forbes
Cr Gary Kelliher
Cr Michael Laws
Cr Kevin Malcolm
Cr Lloyd McCall
Cr Tim Mepham
Cr Andrew Noone
Cr Alan Somerville
Cr Elliot Weir
Cr Kate Wilson

1. WELCOME

Chair Robertson welcomed Councillors, members of the public and staff to the meeting at 11:15AM. Staff present included Richard Saunders (Chief Executive), Anita Dawe (GM Regional Planning and Transport), Nick Donnelly (GM Finance), Tom Dyer (GM Manager Science and Resilience), Joanna Gilroy (GM Environmental Delivery), Tami Sargeant (GM People and Corporate), Amanda Vercoe (GM Strategy and Customer, Deputy CE), Kylie Darragh and Cara Jordan (Governance Support Officers) also present and welcomed by the Chair was Mayor Glyn Lewers of QLDC and Dylan Rushbrook from CODC, online.

2. APOLOGIES

The apologies for Cr Michael Laws were noted.

3. PUBLIC FORUM

No requests to address the Committee under Public Forum were received.

4. CONFIRMATION OF AGENDA

The agenda was confirmed as published.

5. DECLARATIONS OF INTERESTS

No changes to Councillor Declarations of Interests were noted.

6. MATTERS FOR CONSIDERATION

6.1. Regional Deal Package

[12:55 YouTube] This paper was brought to consider the regional deals package jointly prepared by Queenstown Lakes District Council, Central Otago District Council and Otago Regional Council. A video provided to council from Mayor Alley was played first. Mayor Lewers spoke to Council on behalf of Queenstown District Lakes Council for five minutes with an opportunity for Councillors to ask questions. Anita Dawe (GM Regional Planning and Transport) and Richard Saunders (Chief Executive) were available to respond to questions. There was an amendment to number 2 of the recommendations.

Resolution CM25-128: Cr Robertson Moved, Cr Mepham Seconded

That the Council:

1. **Notes** this report.
2. **Notes** that Central Otago District Council and Queenstown Lakes District Council are separately considering the regional deals proposal.
3. **Approves** the regional deals proposal for submission to Central Government.
4. **Notes** that if the regional deals light touch proposal is approved by Central Government, additional work will be required, including to establish governance arrangements.
5. **Notes** that there is no budget available to support this work, which is currently being funded from existing budgets.
6. **Delegates** to the Chief Executive authority to make minor editorial changes to the Regional Deals proposal prior to it being lodged.

MOTION CARRIED

9. CLOSURE

There was no further business and Chairperson Robertson declared the meeting closed at 12:26 pm.

_____ _____

Chairperson Date

Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
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
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

Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
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
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
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 of Public Transport targeted rates and report back in time for the 25/26 annual plan.	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.	6-12-2024
Finance Committee LTP Deliberations -	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	General Manager Regional Planning and Transport		27-06-2025

Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
29&30 May 2024			one forecast budgets the feasibility of incorporating an Oamaru-Dunedin service within the 'Oamaru year two and three public transport trial.			
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		1-06-2025
Council Meeting - 20 November 2024	GOV2471 LWRP Next Steps	In Progress	CM24-213 Directs staff to report back to Council by March 2025 with advice on solutions for any issues identified that have resulted from the delay to notification of the draft Land and Water Regional Plan.	Chief Executive, Executive Assistant - Corporate Services		28-02-2025
Council Meeting - 4 December 2024	OPS2440 Flood Recovery Update	Assigned	CM24-205 (8) Requests that staff provide an update on the October 2024 flood repairs and the financial implications to the March 2025 Council meeting.	Executive Assistant, Operations, General Manager Science and Resilience		25-03-2025
Council Meeting - 19 February 2025	GOV2513 Te Korowai Evaluation Report	Assigned	Resolution CM25-117 Asks the Chief Executive to present a programme of business transformation to the July Council Meeting that will include options for prioritised areas of improvement listed in Te Korowai Evaluation report	Chief Executive, Executive Assistant - Corporate Services		9-07-2025

9.1. Chairperson's Report

Prepared for: Council

Author: Gretchen Robertson, Chairperson

Date: 19 March 2025

SUMMARY

[1] The following report outlines some national-level engagement and collaborative work in which I have been involved. I would also like to acknowledge the many other roles and portfolios our Councillors hold, and the significant contributions you make both within and beyond our communities and region.

[2] Throughout the reporting period, we have maintained an active presence at regional events, including our participation in A&P Shows across Otago. I extend my sincere thanks to our local constituency councillors, wider councillor representatives, and our dedicated staff for their efforts in engaging with and supporting our communities at these events and beyond.

[3] This Council meeting, held in Queenstown within the QLDC district, comes at a time when this part of Otago—alongside the Central Otago District—is at the focus of a new Regional Deal proposal. This initiative underscores the importance of collaboration in shaping Otago's future. By working together, we are not merely responding to challenges and opportunities but actively crafting a path forward that ensures our region's growth and vitality. The future is not without challenges and actively discussing and addressing these as partners will be important.

[4] As we head into a local body election year, it's timely to reflect on the role of local representation. Our recent presentation to the Local Government Commission as part of the representation review highlighted the diverse challenges we face in serving an expansive region. With the distinct dynamics between Otago's rapidly growing inland centres and the well-established coastal community of Dunedin, and our role in covering many other geographic areas and communities, our Councillors are tasked with supporting diverse issues and huge areas. Your ongoing efforts outside of formal council meetings—whether through meeting individuals, addressing correspondence, or attending community meetings—are often unseen but are critical to serving communities in a meaningful way.

[5] Additionally, I wish to recognise the significant contributions made by private landowners and community volunteers, whose environmental guardianship and hard work are critical to Otago's future. There are numerous commendable examples of work in biodiversity, water quality, pest and weed management, land management, and community-building – work critical to diverse, resilient and sustainable business models for Otago. The ORC is currently assisting the community in developing an Upper Lakes Catchment Action Plan, which aims to capture community values, aspirations, and clear actions for outcomes. I would like to acknowledge the progress being made leveraging seasoned, resourceful and results driven community leadership and partnership.

[6] As we consider what it means to add genuine value to our communities, I wanted to reflect on the power of democratically elected representatives who care deeply about

their local areas. Your commitment is the cornerstone of fostering collective good and achieving shared visions efficiently and effectively.

MEETINGS ATTENDED

Meetings attended during the period:

21 February: NZ Police Award Ceremony, Dunedin Public Art Gallery

[7] The ceremony included the Southern District Commander Awards for members of the public who assisted with the Countdown Central Event along with long service awards for members of the police. I was invited in my capacity as CDEM Joint Committee Chair and our collaborative work (e.g. Inner City Safety Oversight Group). Police Commissioner Richard Chambers and Assistant Commissioner Michael Johnson attended. Cr Alexa Forbes was also in attendance.

27 February: LGNZ All of Local Government Meeting, Wellington

Attendance: Cr Tim Mepham, Cr Kevin Malcolm, Amanda Vercoe and myself.

[8] Local Government Minister Simon Watts outlined his priorities for local government and emphasised strengthening the partnership between local and central government. He thanked elected members for our work. He reiterated the Government's priority of driving economic growth and ensuring NZ is open for business. He took a part in crafting 'Local Water Done Well' and 'Regional Deals' in opposition. He is an advocate for the opportunities regional deals offer: 10-year certainty on what and how projects will be done alongside increased productivity, growth and jobs through a collaborative model. He expressed a commitment to working collaboratively with local councils to ensure policies are effective at the community level, focusing on balancing the needs of ratepayers. He signalled reduced 'legislative burden' for Councils and a focus on clear performance standards.

[9] The wider meeting also featured an announcement on development levies for housing growth (relevant to City/District Councils) by Minister Chris Bishop and Under-Secretary Simon Court, which has been covered in the media.
https://www.beehive.govt.nz/release/going-housing-growth-new-and-improved-infrastructure-funding-and-financing-tools
This initiative is part of Pillar 2 of the reform, with Pillar 3 yet to be announced.

[10] Simon Court (ACT MP, Parliamentary Under-Secretary to the Minister of Infrastructure and the Minister Responsible for RM Reform) spoke broadly about upcoming RM reform (which is yet to be announced). He mentioned a live issue on whether the current RMA should be 'panel-beaten' or whether a new system will be put forward. He spoke of concepts for future legislation consideration, including the following. Less focus on ironing out the issues up front at consent application time - which he thought was 'limiting designers' ability to innovate and doesn't help us shift to a growth economy'. Strong enforcement mechanisms for higher risk activities with tough enough penalties to disincentivise the issues occurring. Local communities remaining in control through a democratically agreed Plan. Community-level input should be focussed at a planning stage not at a consent stage. A place for offsetting and compensation. A stricter 'effects-based' system that enables simple consenting of activities that 'have no effects'. Limit who gets a say on private land. He noted this would 'liberalise resource management to

increase innovation and economic growth' making Councils 'less burdened and free to get on with their work'.

[11] Mike Wakefield, Partner, Simpson Grierson, spoke about the reform package and spoke about strengthening the partnership of Local and Central Government. He reflected on Councils being portrayed as doing unnecessary work and government focus on reducing burdensome processes, improving clarity and identifying new and improved funding tools with the sole focus of economic growth. He thought some reforms will not deliver reduction in burden. His final thoughts were on Regional Deals as an opportunity for collaboration between Local and Central Government. However a package needs to come together on growth funding. There is real pressure back on ratepayers to sustain growth. He believed regional deals would need tangible investment in infrastructure if the areas that are successful are indeed nationally significant.

[12] Other sessions included discussions on improving council accountability and transparency, insights from the Office of the Auditor-General, and perspectives from media representatives on building trust with communities. A panel discussion provided viewpoints from various sectors on council performance, and a case study showcased the benefits of partnerships between councils and the private sector.

[13] The day concluded with reflections from Clinton Jury, CE of Local Government South Australia, on South Australia's experience in avoiding rates capping through increased financial transparency and stronger relationships with the government. Attendees engaged in discussions on practical ways to demonstrate value and measure council performance, drawing from both international insights and local experiences.

28 February: Regional Sector Meeting

Wastewater Standards

[14] Allan Prangnell (CE, Tatumata Arowai) spoke about the recently released wastewater standards. These are found here:
https://korero.taumataarowai.govt.nz/regulatory/wastewater-standards/

Consultation on these closes 24 April.

[15] Mr Prangnell noted that, like national environmental standards, these proposed standards would override any inconsistent current plan provisions. There will be no ability to be more stringent via a consent. There will be an ability for local councils to determine how their communities' wish to address wastewater issues though and opt in to being more stringent.

[16] There would still be some requirement for current consenting processes. All bypasses of plants would need to be consented, with no emergency provisions. High risk overflows would need to be telemetered and reported to community. The new standards also won't apply to 'pristine' or very low dilution receiving environments (these will still rely on a current consenting regime).

[17] If a current consent is about to lapse there will be a 2-year automatic extension to enter into the new standards setting.

[18] While cumulative effects are not provided for, Mr Prangnell noted it would be a preference not to have a 'piecemeal approach to consenting within catchments' as communities need to consider what is appropriate as a whole.

[19] Examples of acceptable proposed limits for E.coli discharges from plants to receiving environments are lakes: 6500cfu/100ml and high dilution rivers: 32,500cfu/100ml.

[20] Local Government Act requirements to consult will still apply for Territorial Authorities when they choose how to treat their wastewater and best serve the needs of their communities (above these standards) i.e. choose the level of treatment they want above the standard.

[21] Regional sector members asked some questions about cumulative effects and also the different approach for industrial/trade waste and wastewater. Also in meeting community expectations for clean water and expectations of other sectors compared with the wastewater standards.

Transport - Hon Chris Bishop

[22] Hon Chris Bishop attended in his capacity as Minister of Transport. He opened the floor to questions. Key issues discussed included: Min of Education buses and Private:Public share in bus funding.

4 March: Mana to Mana

[23] Agenda items included update on land and water planning, ORC committee terms of reference and delegations, local government elections, current LTP partnership activities.

4 March: Local Government Representation Review Hearing – Local Government Commission

[24] I presented our proposal to the Local Government Commission's panel and answered questions. Richard Saunders, Amanda Vercoe and expert Stephen Hill joined me. 2 appeals were received from QLDC and DCC. The appellants also presented.

[25] ORC's proposal is to reduce Dunedin constituency councillor representation from 6 to 5, and add an additional Councillor to the Dunstan constituency (ie move from 3 to 4) whilst retaining boundaries and representation numbers for Moeraki and Molyneaux constituencies.

[26] The appeals were on creating a separate Upper Lakes (Wanaka, Queenstown, Cromwell) constituency, and on retaining 6 councillors in Dunedin and extending the boundary to take in Mosgiel/Taieri and Strath/Taieri Community Board areas.

[27] We will await a decision regarding the future format of ORC electoral boundaries and representation once the panel has deliberated.

5 March: NEMA Emergency Management System Improvement Programme and Emergency Management Bill Hui, Online.

[28] Online meeting of CDEM Joint Committee Chairs and Hon Mark Mitchell (Minister for Emergency Management and Recovery).

[29] Min Mitchell acknowledged the good work of Councils in quick and proficient response to multiple recent emergencies. He noted that the Emergency Management Bill will incorporate learnings and recommendations from submissions on the previous discharged bill). Government plan to release a discussion document seeking public feedback on legislative reform options in the first half of 2025.

[30] The Emergency Management System Improvement Programme (EMSIP) is the programme to implement change in the emergency management system after the Government Inquiry into the Response to the North Island Severe Weather Events. EMSIP is led by the National Emergency Management Agency (NEMA).

[31] The Government response to the Report of the Government Inquiry outlined the direction of travel for a five-year work programme to strengthen the emergency management system.

- Government's response Strengthening Disaster Resilience and Emergency Management.

[32] The five focus areas are:

- Give effect to the whole-of-society approach to emergency management.
- Support and enable local government to deliver a consistent minimum standard of emergency management across New Zealand.
- Professionalise and build the capability and capacity of the emergency management workforce.
- Enable the different parts of the system to work better together.
- Drive a strategic focus on implementation and investment to ensure delivery.

[33] NEMA is currently preparing a roadmap for the work programme for Cabinet to consider.

11 March: Seafood NZ Meeting

Anita Dawe, Andrea Howard, myself and Seafood NZ Chair Greg Gent, CEO Lisa Futschek, GM Comms and Marketing Fiona McMillan attended.

[34] This was an introductory meeting organised by Seafood NZ. We spoke about the development of the Coastal Plan for Otago, Harbour Plan and key issues faced by the Seafood Industry.

9.2. Chief Executive's Report

Prepared for: Council

Activity: Governance Report

Author: Richard Saunders, Chief Executive

Date: 19 March 2025

PURPOSE

[1] This report provides Council with an overview of Otago Regional Council's key projects, financial performance and progress against our levels of service.

EXECUTIVE SUMMARY

[2] The Annual Plan project has continued to progress well. At the February Council meeting Council approved a draft annual plan for consultation with the community.

[3] At the end of February there are seven non-financial level of service measures being reported as at risk and five measures being reported as off track.

[4] At the end of February 2025 ORC is reporting a surplus of $12.113m against a budgeted surplus of $3.861m, a positive variance of $8.252m. The organisation is currently forecasting a surplus of $1.255m at year end which is $1.672m ahead of budget.

RECOMMENDATION

That the Council:

a) ***Notes*** *this report.*

DISCUSSION

<u>Annual Plan 2025/26</u>

[5] Council have approved a draft annual plan for the purpose of consultation. The draft position proposes an average rates rise of 7.8% in year two compared to an average of 13.8% which was approved in the long term plan.

[6] Overall spending in the draft annual plan had reduced $6m from the approved LTP position. The required rates take to fund the draft plan has reduced by $3.87m for the approved LTP.

[7] The proposed $3.87m reduction includes $1.2m in transport rates, $1m in freshwater implementation and integrated catchment management resourcing, an approximate $500k reduction through general efficiency savings and a reduction in inflation.

[8] Consultation on the annual plan commenced on 17 March 2025.

Non-financial Levels of Service

[9] Attachments 1 and 2 show the results for the non-financial levels of service contained in the LTP. At the end of January there are seven measures being reported as at risk and five measures being reported as off track. 41 measures remain on-track for delivery in accordance with the targets set.

[10] The off-track measures relate to PT punctuality, Land and Water, and Regional Planning. A new off-track measure is the development of new projects for degraded water bodies. As a decision has been made by Council to reallocate this funding in the 24/25 year this measure will no longer be completed.

[11] There are a range of at-risk measures. A change from last month relates to our pool of trained staff available to work in the Emergency Coordination Centre during an emergency. This continues to be a focus for the organisation. We are currently able to staff the emergency coordination centre in an emergency however fall short of optimal numbers to sustain a centre over a long period in an intense event.

[12] A number of transport targets cannot be measured until Q4 so are not assessed in the preceding months.

Financial Performance

[13] The statement of comprehensive revenue and expenditure (SCRE) is included as attachment 3 and the statement of financial position is included as attachment 4.

[14] At the end of January 2025 ORC is reporting a surplus of $12.113m against a budgeted surplus of $3.861m, a positive variance of $8.252m. Revenue is $2.115m ahead of budget and expenditure is $626k below budget. The organisation is currently forecasting an operating surplus of $1.255m at year end which is $1.672m ahead of budget.

[15] The gain on sale for Birch / Kitchener which was included in the 23/24 budget but realised this year, accounts for $4.550m of the surplus. Additionally $1.2m and $309k of surplus are allocated to the Dunedin and Queenstown transport deficits respectively. This results in an underlying surplus of $3.702m at the end of February.

[16] At this stage of the financial year there are no risks to raise with Council. Expenditure is being carefully managed and full financial reporting including forecasting will continue to be provided to the Finance Committee. This will include a breakdown of reserve surpluses and deficits.

[17] The statement of financial position demonstrates that ORC is continuing to maintain a strong balance sheet that enables us to meet our financial obligations as they fall due.

Business Improvement and Efficiency Review

[18] The executive leadership team (ELT) have reviewed a programme of business improvements including the recommendations from the efficiency review. While many

are underway and a number have been completed as part of business as usual work, further resources are required to address some of the more significant improvement opportunities.

[19] ELT are allocating resources to those actions that will deliver the most value in terms of quality and efficiency. A full report on the status of each action including anticipated timeframes for delivery will be included in the May report.

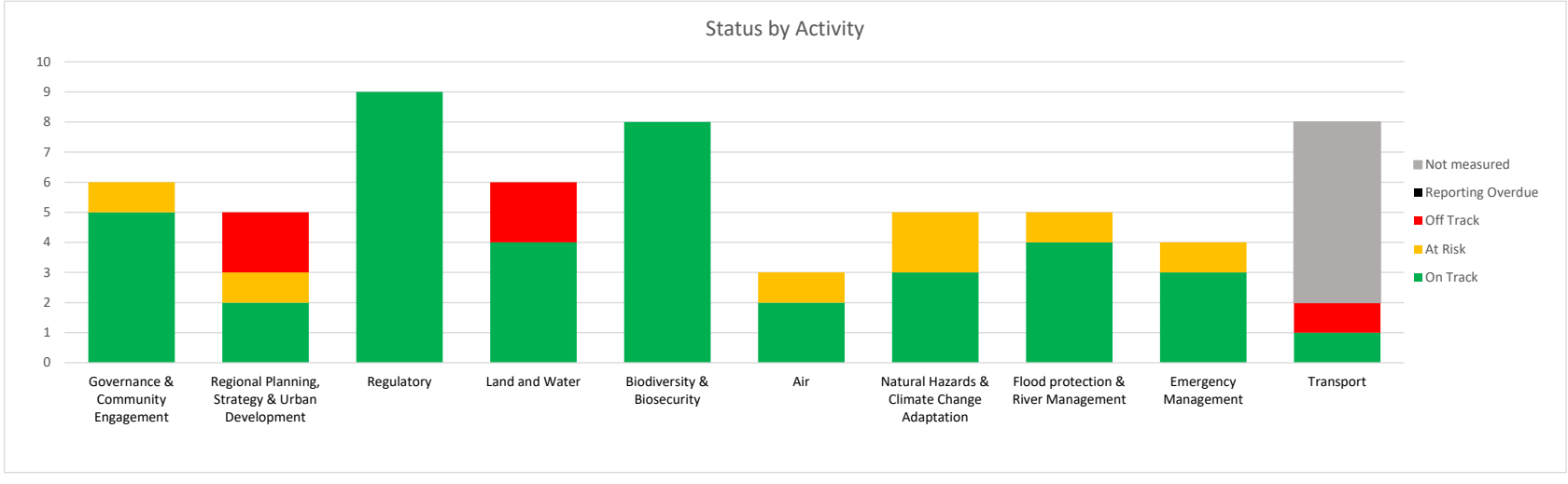
OPTIONS

[20] As this is a report for noting there are no options to consider.

ATTACHMENTS

1. February performance reporting - exceptions [**9.2.1** - 2 pages]
2. February performance reporting - summary [**9.2.2** - 3 pages]
3. SCRE Februrary 2025 [**9.2.3** - 1 page]
4. Balance Sheet February 2025 [**9.2.4** - 1 page]

FEBRUARY PERFORMANCE REPORTING - EXCEPTIONS

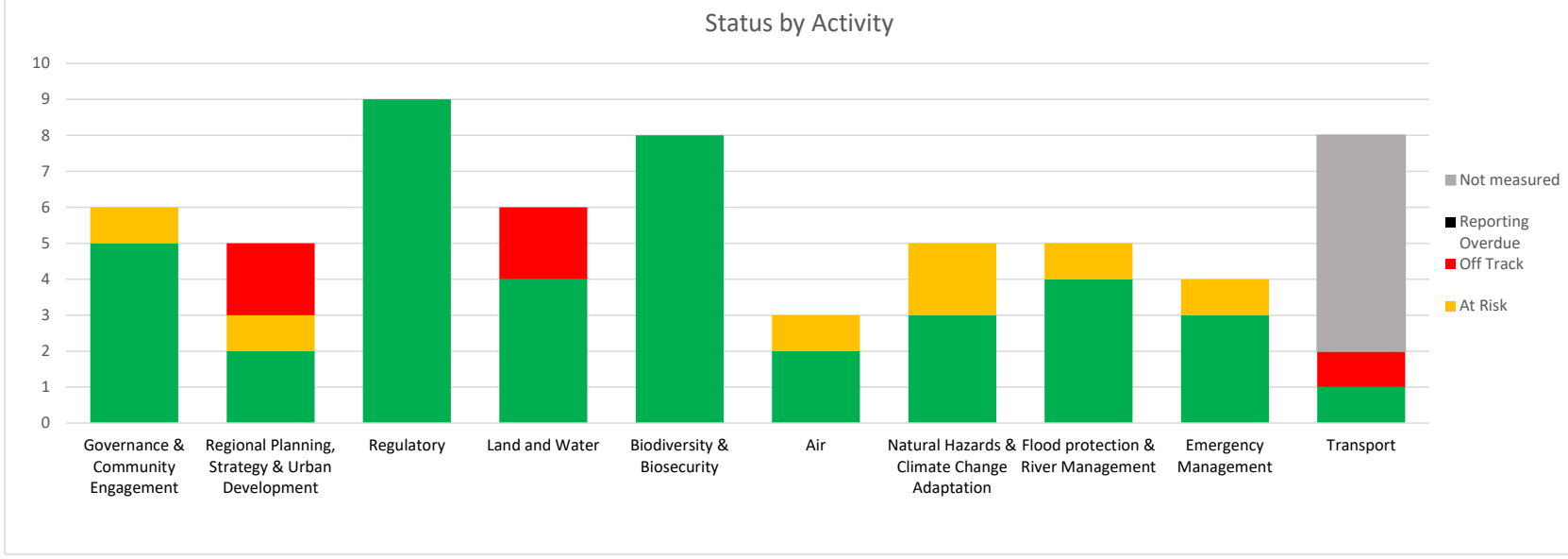


Service Measure and Target	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	COMMENT
REGIONAL LEADERSHIP									
Governance & Community Engagement									
Percentage of official information requests responded to within 20 working days of being logged - Target: 100%									As there are three late responses out of 201. This equates to 98.5% compliance
Regional Planning, Strategy & Urban Development									
Support integrated and well managed urban growth across Otago - Target: Joint Queenstown future development strategy completed by 30 June 2025									As the Housing and Business development capacity assessments (HBCA) for the joint ORC QLDC FDS (Spatial Plan Gen 2.0) is delayed until mid 2025. It is uncertain when the FDS will be notified to the public, heard by a Panel and completed.
Support integrated and well managed urban growth across Otago - Target: Consultation on maps of highly productive land completed by 31 December 2024									Public consultation will be completed during 2025 as we are still waiting on direction from central government.
Develop a Regional Air Quality Strategy and implement ORC actions. Target: Draft Regional Air Quality Strategy is made available for public consultation along with the revised Air Plan by 30 June 2025.									A draft strategy will be presented to the ESP Committee in June, but it is unlikely to be released for public consultation until August so that it can be released at the same time as the proposed Air Plan.
ENVIRONMENT									
Land and Water	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	COMMENT
Complete the Land and Water Regional Plan (LWRP) - Target: Freshwater hearing panel nominations and required documents submitted to Chief Freshwater Commissioner by 30 June 2025.									The pLWRP and the section 32 report were ready for notification decision by end of October 2024, but this decision has been deferred due to legislative change.
Site specific projects are developed for selected degraded waterbodies - Target: New projects and associated milestones are developed and reported to Council									Council decision in November 2024 to reallocate this funding to others projects of work.
Air	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	COMMENT
Complete review of the Regional Plan Air - Target: Council approves Regional Plan Air for notification by 30 June 2025									The draft Plan and section 32 report will be ready for notification by August 2025, which is two months later than the LOSM in the LTP.
CLIMATE CHANGE AND RESILIENCE									
Natural Hazards & Climate Change Adaptation	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	COMMENT
Implement prioritised natural hazard risks adaptation works - Target: The first Head of Lake Whakatipu natural hazards adaptation strategy completed by 31 December 2024; Actions developed, implemented and reviewed, as per Head of Lake Whakatipu natural hazard adaptation strategy.									A revised schedule to deliver the first iteration of the strategy will be in early 2025 so we won't make it to the 31 December 2024 target. This is to allow sufficient time for community/public feedback on the draft Strategy, and incorporation of this feedback into the final version of the Strategy document.
Implement prioritised natural hazard risks adaptation works - Target: Support the South Dunedin Future Programme - South Dunedin Future natural hazards adaptation plan progresses as per annual work plan									Delays in annual work programme but this delay will not affect the expected final delivery date for the programme (2026). It is planned to present two milestone reports (risk assessment and adaptation options) at ORC and DCC council meeting in March
Flood protection & River Management	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	COMMENT
Respond within defined timelines for reported issues and to flood events in a timely manner - Target: Reported issues that have been investigated and appropriate action determined and communicated to affected landholders within 20 working days.									3 enquiries in October fell short of the KPI of 100% responses within 20 working days, the status has been changed to off-target for the rest of the financial year
Emergency Management	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	COMMENT
Provide a regional coordination facility (ECC) capable of coordinating a region-wide emergency - Target: Adequate staff (as defined in the Group Training and Capability Strategy) are trained and capable to coordinate a region wide response									Work continues on growing the existing pool of trained staff and is largely dependent on attracting further ORC staff to be available for training.
TRANSPORT									
Transport	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	COMMENT

Percentage of scheduled services on-time (punctuality – to five minutes) - Target: 95%		Services are heavily affected in both Dunedin and Queenstown by extensive roadworks, road closures and heavy congestion.
Overall passenger satisfaction with Dunedin Public Transport system at annual survey - Target: Maintain or increase 3 yr rolling average >=90%		The next survey will take place in Q4 2025.
Annual public transport boardings in Queenstown - Target: Increase		The next survey will take place in Q4 2025.
Annual public transport boardings in Dunedin - Target: increase		The next survey will take place in Q4 2025.
Overall passenger satisfaction with Whakatipu Public Transport system at annual survey - Target: Maintain or increase 3yr rolling average >=90%		Surveys are completed in Q4 - Targets are expected to be achieved.
Percentage of users who are satisfied with the provision of timetable and services information - Target: Maintain or increase 3 yr rolling average >=90%		Surveys are completed in Q4 - Targets are expected to be achieved.
Percentage of users who are satisfied with the overall service of the Total Mobility scheme- Target: Maintain or increase 3 yr rolling average >=90%		Surveys are done in Q4. We expect to achieve the target.

On Track | At Risk | Off Track | Reporting Overdue

FEBRUARY PERFORMANCE REPORTING - SUMMARY



Service Measure and Target	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB
REGIONAL LEADERSHIP								
Governance & Community Engagement								
Percentage of official information requests responded to within 20 working days of being logged - Target: 100%								
Deliver our Long-Term Plan, annual reviews of the LTP, and reporting of performance against plan as per the statutory requirements - Target: Annual Plan adopted by council prior to 30 June 2025								
Percentage of council agendas are publicly available two working days or more before a meeting - Target: 100%								
Biannual survey is conducted to understand and improve community awareness, perceptions and expectations of ORC - Target: Report against the action plan to Council by March 2025.								
Customers express high levels of satisfaction with customer service provision - Target: Develop Customer Policy to determine satisfaction levels								
Increase opportunities for engagement with diverse groups across Otago to lift awareness and understanding of the work of the regional council and seek feedback on performance Target: Create and implement engagement plan and establish engagement data								
Regional Planning, Strategy & Urban Development	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
Support integrated and well managed urban growth across Otago - Target: Joint Queenstown future development strategy completed by 30 June 2025								
Support integrated and well managed urban growth across Otago - Target: Consultation on maps of highly productive land completed by 31 December 2024								
Develop a regional biodiversity strategy and implement ORC actions. Target: Draft regional biodiversity strategy is made available for public consultation by 30 June 2025								
Develop a Regional Air Quality Strategy and implement ORC actions. Target: Draft Regional Air Quality Strategy is made available for public consultation along with the revised Air Plan by 30 June 2025.								
Develop a Regional Climate Change Strategy and implement ORC actions -Target: ORC actions from the Regional Climate Change Strategy are implemented, and the effectiveness of the strategy is monitored and reported to Council annually.								
Regulatory	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
Maintain 24-hour/7 day a week response for environmental incidents - Target: Pollution hotline staff available/on call 24/7								
Maintain 20 appropriately trained responders for maritime oil pollution incidents -Target: 20 responders attend 3 exercises per year								
Percentage of resource consent applications processed in accordance with Resource Management Act 1991 legislative timeframes - Target: ≥98%								
Percentage of performance monitoring returns completed each year, as per the Compliance Audit and Performance Monitoring Schedule targets - Target: ≥90%								
Percentage of significant non-compliance identified where action is taken in accordance with Compliance Policy - Target: 100%								
Percentage of programmed inspections/audits completed each year, as per the Compliance Audit and Performance Monitoring Schedule targets - Target: ≥90%								
Maintain compliance with Port and Harbour Marine Safety Code - Target: External review is completed and deemed to be code consistent.								
The safety campaign for recreational 'boaters' is delivered - Target: 80% achieved								
Percentage of public enquiries for consent information completed within 10 working days - Target: Maintain or increase								
ENVIRONMENT								
Land and Water	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
Complete the Land and Water Regional Plan (LWRP) - Target: Freshwater hearing panel nominations and required documents submitted to Chief Freshwater Commissioner by 30 June 2025.								
ORC led and community/landowner supported workshops and events are delivered which promote best practice land management for soil conservation, water quality and/or the efficient use of water. Target: At least 12 ORC led workshops or events are delivered annually								
Site specific projects are developed for selected degraded waterbodies - Target: New projects and associated milestones are developed and reported to Council								
Site specific projects are developed for selected degraded waterbodies - Target: Project actions have been progressed as scheduled (>80%)								
Catchment Action Plans (CAPs) give effect to the ICM programme and are developed in partnership with iwi and in collaboration with the community. Target: One Catchment Action Plan (CAP) to be presented to Council for approval by 30 June 2025								
Report the results of environmental monitoring for freshwater, land use, estuarine, and regional coastal environments. Target: Annual report for each of the 4 environments to Council prior to 30 June 2025.								
Biodiversity & Biosecurity	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**
Actions within the Biosecurity Operational Plan (BOP) are identified and progressed - Target: 100% of targets for priority pests are delivered.								
Externally funded biosecurity projects/programmes are implemented as per their agreements - Target: 90% of deliverables in the agreements with Central Government are progressing as scheduled								
Biodiversity Forum-based joint projects to enhance indigenous biodiversity are developed - Target: New projects and associated milestones are developed and reported to Council and forum partners								
Joint projects are implemented against milestones - Target: Project actions have been progressed as scheduled (>80%)								
Alignment between initiatives and deliverables receiving Council funding, and Council's strategic biodiversity strategic objectives - Target: 80% alignment								
Externally funded freshwater projects/programmes are delivered as per their agreements - Target: 90% of deliverables in the agreements with Central Government are progressing as scheduled								
Report the results of environmental monitoring for regional indigenous biodiversity ecosystems - Target: Annual report completed prior to 30 June 2025								
Actions within the Biosecurity Operational Plan (BOP) are identified and progressed - Target: 90% of actions achieved within timeframes specified.								
Air	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**
Implement a regional air monitoring programme - Target: Annual report on monitoring programme completed and reported to Council								
Report the results of environmental monitoring for air. - Target: Annual report for air monitoring for previous financial year reported to Council by 30 Sept 2024. Note: ≥95% = achieved								
Complete review of the Regional Plan Air - Target: Council approves Regional Plan Air for notification by 30 June 2025								
CLIMATE CHANGE AND RESILIENCE								
Natural Hazards & Climate Change Adaptation	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**
Natural hazards information is available via the web-based Otago Natural Hazards Database - Target: Database is accessible and up-to-date 100% of the time								
Percentage of flood warnings that are issued in accordance with the flood warning manual - Target: 100%								
Implement the findings of the regional natural hazards risk assessment and inform adaptation planning and implementation - Target: Implementation and additional assessments of natural hazards and risks based on the findings of the Otago Natural Hazards Risk Assessment. Phased delivery Yr 1 to 10								
Implement prioritised natural hazard risks adaptation works - Target: The first Head of Lake Whakatipu natural hazards adaptation strategy completed by 31 December 2024; Actions developed, implemented and reviewed, as per Head of Lake Whakatipu natural hazard adaptation strategy.								
Implement prioritised natural hazard risks adaptation works - Target: Support the South Dunedin Future Programme - South Dunedin Future natural hazards adaptation plan progresses as per annual work plan								
Flood protection & River Management	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**
Percentage of scheme renewals programme: Major flood protection and control works are maintained, repaired, and renewed to the key standards defined in relevant planning documents. - Target: > 85% of renewal programmes completed								
Percentage of scheme maintenance programme: Major flood protection drainage and control works are maintained, repaired, and renewed to the key standards defined in relevant planning documents. - Target: > 85% of planned maintenance programme completed								
Percentage of planned maintenance programme: Channel works are maintained, repaired, and renewed to the key standards defined in relevant planning documents - Target: >85% of planned maintenance programme completed								
Respond within defined timelines for reported issues and to flood events in a timely manner - Target: Flood repair programme: Damage identified, prioritised and a repair programme is made available to affected communities within 3 months of the event/100%.								
Respond within defined timelines for reported issues and to flood events in a timely manner - Target: Reported issues that have been investigated and appropriate action determined and communicated to affected landholders within 20 working days.								
Emergency Management	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**
Emergency Management Otago staff are available to respond 24/7 to a Civil Defence emergency - Target: Maintain a duty roster for 24/7 365 coverage for initial responses to Civil Defence emergencies								
Provide a regional coordination facility (ECC) capable of coordinating a region-wide emergency - Target: An appropriate facility as defined in the CDEM Partnership Agreement is available for immediate activation. Adequate staff (as defined in the Group Training and Capability Strategy) are trained and capable to coordinate a region wide response								
Support is provided to Emergency Management Otago to fulfil Otago CDEM Group requirements as defined in the CDEM Act and CDEM - Target: Fulfil all requirements as the administering authority and the Otago CDEM Partnership Agreement								

Provide a regional coordination facility (ECC) capable of coordinating a region-wide emergency - Target: Adequate staff (as defined in the Group Training and Capability Strategy) are trained and capable to coordinate a region wide response								
TRANSPORT								
Transport	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**
Percentage of scheduled services on-time (punctuality – to five minutes) - Target: 95%								
Overall passenger satisfaction with Dunedin Public Transport system at annual survey - Target: Maintain or increase 3 yr rolling average >=90%								
Annual public transport boardings in Queenstown - Target: Increase								
Annual public transport boardings in Dunedin - Target: increase								
Percentage of scheduled services delivered (reliability) - Target: 95%								
Overall passenger satisfaction with Whakatipu Public Transport system at annual survey - Target: Maintain or increase 3yr rolling average >=90%								
Percentage of users who are satisfied with the provision of timetable and services information - Target: Maintain or increase 3 yr rolling average >=90%								
Percentage of users who are satisfied with the overall service of the Total Mobility scheme- Target: Maintain or increase 3 yr rolling average >=90%								

On Track	At Risk	Off Track	Reporting Overdue

Otago Regional Council

STATEMENT OF COMPREHENSIVE REVENUE AND EXPENSE
FOR THE PERIOD ENDING 28 FEBRUARY 2025

	February 2025 Actual	February 2025 Budget	Variance Actual	2025 Forecast	2025 Budget	Forecast
Revenue	Year to Date	Year to Date	Year to Date	Full Year	Full Year	Full Year
Revenue from non-exchange transactions						
Rates Revenue	43,264	43,262	2	64,883	64,893	(10)
Grant revenue and subsidies	15,292	13,380	1,912	25,457	21,991	3,466
Other Revenue non exchange	6,380	6,384	(4)	9,844	9,179	665
Revenue from exchange transactions						
Interest and investment revenue	6,268	6,510	(242)	8,720	9,765	(1,045)
Dividends	12,298	12,000	298	18,278	18,000	278
Other Revenue Exchange	3,547	3,398	149	5,706	5,321	385
Total Revenue	**87,049**	**84,934**	**2,115**	**132,888**	**129,149**	**3,739**
Expenditure						
Employee benefits expense	26,285	26,383	98	39,136	39,574	438
Depreciation and amortisation	2,622	2,201	(421)	3,816	3,302	(514)
Finance Costs	5,434	6,283	849	9,019	9,424	405
Other Expenses	47,102	47,202	100	82,155	78,759	(3,396)
Total Expenditure	**81,442**	**82,068**	**626**	**134,126**	**131,059**	**(3,067)**
Other gains/(losses)						
Other (gains)/losses	6,506	995	5,511	2,493	1,493	1,000
Total Other gains/(losses)	**6,506**	**995**	**5,511**	**2,493**	**1,493**	**1,000**
Operating Surplus/(deficit)	**12,113**	**3,861**	**8,252**	**1,255**	**(417)**	**1,672**
Fair value gain/loss on shares in subsidiary	0	0	0	28,156	28,156	0
Total Comprehensive Revenue and Expense	**12,113**	**3,861**	**8,252**	**29,411**	**27,739**	**1,672**
Operating Surplus/(deficit)- as per SCRE above	**12,113**	**3,861**	**8,252**	**29,411**	**27,739**	**1,672**
Less:						
Birch/Kichener gain on sale (budgeted in 2023/24 year)	4,550	-	4,550	-	-	-
Transport Rates Deficit - Dunedin	1,207	1,207	-	1,810	1,810	-
Transport Rates Deficit - Whakatipu	309	309	-	463	463	-
Underlying Surplus/(Deficit)	**6,047**	**2,345**	**3,702**	**27,138**	**25,466**	**1,672**

Otago Regional Council

STATEMENT OF FINANCIAL POSITION - ANNUAL REPORT

AS AT 28 FEBRUARY 2025

	February 2025 Actual $000s	June 2024 Prior Year Actual $000s	Year to Date Variance $000s	June 2025 Budget $000s
Assets				
CURRENT ASSETS				
Cash and cash equivalents	32,266	13,605	18,661	2,455
Trade and other receivables	19,697	17,139	2,558	18,180
Property held for sale	0	3,350	(3,350)	0
Current related party receivable	66,688	38,480	28,208	0
Other financial assets	29,627	27,284	2,343	29,181
Other Current Assets	2,015	1,561	455	1,433
Total Current Assets	**150,294**	**101,419**	**48,875**	**51,249**
NON-CURRENT ASSETS				
Shares in subsidiary	732,720	732,720	0	780,239
Property, plant and equipment	96,910	96,161	749	109,835
Intangible assets	247	408	(162)	2,025
Non current related party receivable	55,990	75,198	(19,208)	150,088
Investment Property	16,850	16,850	0	17,134
Borrower Notes	500	500	0	500
Total Non-current Assets	**903,217**	**921,838**	**(18,621)**	**1,059,821**
Total Assets	**1,053,510**	**1,023,256**	**30,254**	**1,111,070**
Liabilities				
CURRENT LIABILITIES				
Trade and other payables	30,136	20,281	9,855	22,594
Employee entitlements	2,513	3,293	(780)	2,716
Borrowings	81,276	48,359	32,916	69,878
Total Current Liabilities	**113,925**	**71,934**	**41,991**	**95,188**
NON-CURRENT LIABILITIES				
Non current borrowings and other financial liabilities	66,678	90,528	(23,850)	110,438
Total Non-current liabilities	**66,678**	**90,528**	**(23,850)**	**110,438**
Total Liabilities	**180,603**	**162,462**	**18,141**	**205,626**
NET ASSETS (Assets minus Liabilities)	**872,907**	**860,794**	**12,112**	**905,444**
Equity				
PUBLIC EQUITY				
Public Equity	114,579	102,467	12,112	120,576
Total Public Equity	**114,579**	**102,467**	**12,112**	**120,576**
RESERVES				
Reserves	758,328	758,328	0	784,868
Total Reserves	**758,328**	**758,328**	**0**	**784,868**
Total Equity	**872,907**	**860,794**	**12,112**	**905,444**

10.1. Air Quality Management Ambition and Approach

Prepared for: Council

Report No. GOV2514

Activity: Governance Report

Author: James Adams, Senior Policy Analyst

Endorsed by: Anita Dawe, General Manager Regional Planning and Transport

Date: 19 March 2025

PURPOSE

[1] The purpose of this report is to seek:

- Endorsement of Council's level of ambition for the Air Quality Strategy (the Strategy) and Air Regional Plan (the Plan).
- Endorsement of the non-regulatory and regulatory methods to be explored further.
- Direction on the approach to public engagement.

EXECUTIVE SUMMARY

[2] On 20 February 2025, Committee members at the Environmental Science and Policy (ESP) Committee workshop discussed different levels of ambition that Council could aspire to for air quality management, and a range of approaches for achieving desired outcomes. These were presented in the Air Quality Management Options report.

[3] Based on feedback received from Committee members, staff have proposed levels of ambition for the various activities to be addressed by the Air Quality Strategy. This will inform what needs to be delivered through the various regulatory and non-regulatory methods available.

[4] Staff have identified the most effective approaches for achieving the desired air quality outcomes and are seeking direction before further work is undertaken to determine exactly how the various methods would be applied in Otago.

[5] ESP Committee members also asked whether further public engagement was possible before notifying a proposed Air Plan. This paper provides options for Council to consider in relation to this.

RECOMMENDATIONS

That the Council:

1. ***Notes** this report.*

2. ***Endorses** Council's level of ambition regarding **home heating** (meet NESAQ by 2040) and direct staff to prepare the draft Air Quality Strategy and Otago Air Regional Plan based on the approach described.*

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3. ***Endorses*** *Council's level of ambition regarding* ***urban outdoor burning*** *(avoid undermining restrictions on indoor burners and reduce localised amenity and health effects) and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.*

4. ***Endorses*** *Council's level of ambition regarding* ***Air Zones*** *and direct staff to prepare the Air Zone maps based on the approach described.*

5. ***Endorses*** *Council's level of ambition regarding* ***rural outdoor burning*** *(reduce effects on air quality in priority towns over winter and reduce localised amenity and health effects) and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.*

6. ***Endorses*** *Council's level of ambition regarding* ***Buffer Zones*** *and direct staff to prepare the Buffer Zone maps based on the approach described.*

7. ***Endorses*** *Council's level of ambition regarding* ***agrichemical and fertiliser discharges, farming, industrial and trade*** *(maintain a similar regulatory framework to that provided in the current Regional Plan: Air, but with improvements) and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.*

8. ***Endorses*** *Council's level of ambition regarding* ***vehicle emissions*** *(raise awareness of health impacts) and direct staff to prepare the Air Quality Strategy based on the approach described.*

EITHER

9. ***Agrees*** *that the planned statutory pre-notification consultation activities on the draft rules in the Air Plan are sufficient consultation prior to making a decision on notification in August 2025.*

OR

10. ***Requests*** *that staff undertake public engagement alongside the statutory pre-notification consultation on the draft rules in the Air Plan, prior to making a decision on notification in August 2025.*

OR

11. ***Requests*** *that staff undertake public engagement on the draft Strategy and draft Air Plan at the same time in September / October 2025, and complete pre-notification consultation in late 2025 / early 2026.*

If 10 or 11 is chosen:

12. ***Approves*** *unbudgeted expenditure to undertake additional public engagement on the draft Air Plan.*

BACKGROUND

[6] In 2023, ORC staff began a review of our approach to managing air quality issues in Otago, with the aim of producing an Air Quality Strategy and Air Plan.

[7] The Air Quality Strategy will connect ORC's Strategic Directions to ORC's operational functions. It will articulate ORC's level of ambition for air quality management, and the approaches that ORC will take to achieve this ambition. The Air Strategy will inform approaches and activities across all of ORC's activities.

[8] The Air Plan is a regulatory tool and one of the 'tools in the box' that Council can use to achieve the ambition of the Strategy. Other regulatory and non-regulatory 'tools' (methods) that ORC has used in the past include monitoring, research, education, advocacy, enforcement, and financial incentives.

[9] A draft Air Plan is scheduled to be presented to Council in August 2025 for consideration and a decision on public notification. The draft Air Quality Strategy will be presented at the same time, for endorsement prior to public engagement.

[10] Staff have been working closely with Kāi Tahu throughout this process and will continue to do so as drafting progresses. Aukaha and TAMI identified values including rakatirataka, kaitiakitaka, whakapapa, mauri, hauora, tapu, and mātauraka to be relevant to the air strategy and policy options for managing Otago's air, as well as the partnership approach underpinning ki uta ki tai. While this list is not exhaustive, many of these values are demonstrated through the Objectives and Visions in the Kāi Tahu iwi management plans (Attachment 1). It will be important to ensure that the ambition of the Strategy and Plan align with these, but we are yet to ask Kāi Tahu to provide an assessment of the air quality management options presented in this report.

DISCUSSION AND OPTIONS

[11] Based on feedback received from Committee members on 20 February 2025, staff have proposed levels of ambition for the various activities to be addressed by the Air Quality Strategy and identified the most effective approaches for achieving the desired outcomes using both non-regulatory and regulatory methods.

[12] Based on feedback from Committee members, staff have taken the approach of prioritising non-regulatory methods to ensure that the degree of regulatory intervention required is minimal.

[13] This paper is divided into the following sections for each of the activities being addressed, with options presented at the end of each section:

- Home heating
- Urban outdoor burning
- Air Zones
- Rural outdoor burning
- Buffer Zones

- Agrichemical and fertiliser, farming, industrial and trade
- Vehicle emissions
- Public engagement.

[14] For the various activities, the recommended approach is presented as a package of non-regulatory and regulatory methods, with further information provided on these in Attachment 2. If any of the methods in the package are not supported, they can be removed, but that will increase the amount that we need to rely on the remaining methods, and relying heavily on non-regulatory methods might limit our chances of success. This is particularly true where certain non-regulatory methods are not guaranteed to eventuate (due to funding not having been secured yet) and/or where there is no guarantee for how long they will be in place.

SECTION 1 – HOME HEATING

Problem Definition and Ambition

[15] National air quality limits, which are set in the National Environmental Standards for Air Quality (NESAQ) for the purpose of protecting human health, are not being met in certain parts of the region and are unlikely to be met by 2040 under the status quo. This will impact on our ability to deliver maximum practicable health outcomes for our communities.

[16] Central government direction, ORC's 2024-2034 Strategic Directions, the 2021 proposed Otago Regional Policy Statement (pORPS), the Kāi Tahu Resource Management Plan, and Te Tangi o Tauira all indicate that air quality across the region should, at the very least, meet the NESAQ.

Feedback from ESP Committee

[17] Feedback from the ESP Committee members included:

- No support for an outright ban on burners in any part of the region.
- Interested to see an option that includes only ULEBs for new installs and replacement burners across the region.
- Interested in exploring the provision of some form of, potentially cost neutral, financial assistance to support the phase-out of non-ULEB burners.
- Would like greater focus and more information on non-regulatory options, including good wood programme, smoky chimney programmes and home heating education.
- Would like more detail on a point-of-sale bylaw approach for upgrading burners.

Approach

[18] As the Committee was clear that it did not support an outright ban on burners in any part of the region, region-wide compliance with WHO guidelines will not be possible by 2040 (according to modelling). The package of home heating methods presented below are expected to ensure that air quality across the region will meet the NESAQ by 2040 or earlier.

[19] The non-regulatory methods below have worked successfully in other regions across New Zealand to help homeowners heat their homes more efficiently, switch to cleaner forms of heating, and ultimately reduce their contribution to ambient air quality issues.

[20] As with other regions, the regulatory methods are a necessary back-stop – particularly in priority towns (Alexandra, Arrowtown, Clyde, Cromwell, Milton, Mosgiel) – to ensure that non-compliant burners do not continue to be used and impinge on the collective efforts of others.

[21] As a package, this looks like:

- Phase out of non-ULEBs in priority towns (regulatory – rules in the plan)
- New/replacement wood burners in all other urban areas post-notification to be ULEBs to prevent future issues (regulatory - rules in the plan)
- Bylaw (regulatory, but sitting outside of the Air Plan)
- Good Wood Programme/Dry Wood Certification Scheme (non-regulatory)
- Home heating financial assistance (non-regulatory)
- Smoky chimney programme (non-regulatory)
- Educational outreach and events (non-regulatory)
- In-house assessments (non-regulatory)

[22] More information about each component of this package is available in Attachment 2. If any of the methods in the above package are not supported, they can be removed, but that will increase the amount that we need to rely on the remaining methods.

[23] It is important however to note that phase out of non-ULEBs in priority towns is a key method in this package and its removal will significantly reduce our chances of achieving NESAQ-compliance by 2040.

OPTIONS

[24] Home Heating Option 1: Endorse Council's level of ambition regarding home heating (meet NESAQ by 2040) and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.

[25] Home Heating Option 2: Direct staff to prepare the Air Quality Strategy and Air Plan based on a different level of ambition and/or approach.

[26] Option 1 is the option recommended by staff. The approach sees ORC prioritising the use of non-regulatory methods and only using regulatory methods as necessary to ensure that non-compliant burners do not continue to be used and impinge on the collective efforts of others. This approach should ensure that NESAQ limits are met region-wide by 20240 or earlier, ensuring alignment between the Strategy and ORC's Strategic Directions, the 2021 pORPS, and Kāi Tahu aspirations, and ensuring we deliver maximum practicable health outcomes for our communities.

[27] Option 2 is not recommended because removing methods from our approach would undermine our ability to achieve the NESAQ, resulting in misalignment between the Strategy and ORC's Strategic Directions, the 2021 pORPS, and Kāi Tahu aspirations.

SECTION 2 – URBAN OUTDOOR BURNING

Problem Definition and Ambition

[28] Outdoor burning in urban areas is at a smaller scale than rural outdoor burning, usually consisting of burning of green waste, and is currently generally restricted to properties exceeding 1 ha in size due to the minimum 50 m setback requirements in Air Zones 1 and 2. Air Zone 3 has no such setbacks, even though it does contain some urban areas.

[29] Outdoor burning in urban areas has the potential to affect neighbours' amenity and also affects ambient air quality, albeit to a lesser extent than domestic burning. As such, it is also a barrier to meeting national air quality limits in the priority towns, and expert advice is that it should be restricted further. It can also be very conspicuous and have localised adverse effects on neighbours' amenity.

[30] The issue of equity as discussed for domestic burning arises in this instance as well; some people might struggle to understand why domestic indoor burners are restricted if outdoor burning activities on some sites in urban areas can still occur. Additionally, it is usually more feasible for people within urban areas to use alternatives to outdoor burning of green waste due to their proximity to waste transfer stations and availability of kerbside collection.

[31] An equitable solution needs to be found for urban burning that does not undermine restrictions on domestic burners and prevents unreasonable effects on neighbours, while still allowing people to continue doing activities that have minimal adverse effects.

Feedback from ESP Committee

[32] Feedback from the ESP Committee members was that they would like to see clear rules for managing outdoor burning in urban areas, including distinguishing between larger-scale activities (including burning of piles of green waste) permitted on large properties under certain circumstances and small-scale activities such as barbecues.

Approach

[33] Based on feedback from the ESP Committee, staff have presented a package of non-regulatory and regulatory methods that build on our existing rules and have worked successfully in other regions across NZ to reduce the impact of outdoor burning on neighbouring properties and local airsheds.

[34] As a package, this looks like:

- Improved rules for urban outdoor burning (regulatory – rules in the plan)
- Educational outreach and advice (non-regulatory)

- Information at point of sale (non-regulatory)

[35] More information about each component of this package is available in Attachment 2. The key method in this package is improved rules for urban outdoor burning.

OPTIONS

[36] Urban Outdoor Burning Option 1: Endorse Council's level of ambition regarding urban outdoor burning (avoid undermining restrictions on indoor burners, and reduce localised amenity and health effects) and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.

[37] Urban Outdoor Burning Option 2: Direct staff to prepare the Air Quality Strategy and Air Plan based on a different level of ambition and/or approach.

[38] Option 1 is the option recommended by staff as it will ensure that backyard activities do not impinge on the collective efforts of others and will reduce localised amenity and health impacts.

[39] Option 2 is not recommended because removing methods from our approach would undermine our ability to achieve the desired outcomes, possibly resulting in misalignment between the Strategy and ORC's Strategic Directions, the 2021 pORPS, and Kāi Tahu aspirations.

SECTION 3 – AIR ZONES

Problem Definition and Ambition

[40] The existing Air Plan defines 22 urban areas within Air Zone 1 and 2, with Air Zone 3 being the rest of Otago. This is for the purpose of ambient air quality management. Air Zones 1 and 2 have more stringent requirements for solid fuel burners and urban outdoor burning than Air Zone 3 (see table below).

	Air Zone 1	**Air Zone 2**	**Air Zone 3**
Areas	Arrowtown Alexandra Clyde Cromwell	Naseby, Ranfurly, Roxburgh, Green Island, Milton, Mosgiel, Palmerston, South Dunedin, Balclutha, Central Dunedin, North Dunedin, Oamaru, Port Chalmers, Waikouaiti, Hawea, Kingston, Queenstown, Wanaka	Rest of Otago
Rules – solid fuel burners	Emission rate less than 0.7g/kg and a thermal efficiency of	Emission rate of less than 1.5g/kg and thermal efficiency of no less than	Emission rate of less than 1.5g/kg and thermal efficiency of

	no less than 65%.	65%.	no less than 65% on properties 2 hectares or smaller (MfE guidelines).
Rules – outdoor burning	Only burn dry organic material, 50m setback on residential properties, 100m setback on non-residential properties.		No setbacks. On production land: permitted to burn off material other than dry organic material. Everywhere else: only burn dry organic material.

[41] The existing Air Zones were made operative in 2003 and now require updating, due to urban growth and improved ambient air quality monitoring. Staff recommend boundaries are adjusted accordingly in areas of urban growth. Monitoring data demonstrates that Milton and Mosgiel would benefit from the same restrictions the Air Zone 1 towns. Staff recommend some re-grouping of the Air Zones, and amalgamation of the Dunedin Air Zones. Analysis of emissions density and dispersal rates identify additional areas which require ambient air quality management.

Feedback from ESP Committee

[42] Feedback from the ESP committee was largely concerned about changing of boundaries, and new areas. Feedback was generally supportive of the boundaries presented, however amendments to boundaries were suggested in the areas of Clyde, Queenstown, Oamaru, Cromwell and Mosgiel, which staff have implemented.

[43] Staff were directed to consider whether Tarras, Bannockburn and Waitaki Bridge should be included in the new towns. Analysis of Tarras and Waitaki Bridge did not find sufficient emissions density or population density to support air quality management in these areas. Bannockburn is a growing urban area adjacent to Cromwell, an Air Zone 1 town, as such, staff recommend that it is included in the air quality management areas.

Approach

[44] Based on feedback from the ESP Committee, staff have presented a package of changes to the current Air Zones.

[45] As a package this looks like:

- Amalgamation of the Dunedin Air Zones
- Changes to boundaries
- New Areas
- Regrouping of Air Zones

[46] **Amalgamation of the Dunedin Air Zones:** Dunedin currently is split into 5 Air Zones: Green Island, Port Chalmers, South Dunedin, Central Dunedin and North Dunedin. Staff recommend combining these into a single Dunedin Air Zone and including Brighton and Portobello.

[47] **Changes to boundaries:** Staff recommend the following changes to the Air Zone boundaries:

- Extension of boundaries to accommodation urban growth in: Alexandra, Arrowtown, Clyde, Oamaru, Hawea, Clyde, Oamaru, Cromwell and Mosgiel.
- Extension of the Queenstown boundary to include Arthur's Point, Lake Hayes, Jacks Point, Hanley's Farm.
- Extension of the Wanaka boundary to include Albert Town.
- Extension of the Kingston boundary to include Kingston Village.

[48] **New Areas:** Emissions density modelling combined with modelling of dispersal rates, and predicted urban growth were analysed, and based on the results, staff recommend extending air quality management to the following rural settlements: Glenorchy, Hampden, Moeraki, Kaitangata, Luggate, Tapanui, Benhar, Stirling, Pisa Moorings, and Bannockburn.

[49] **Regrouping of Air Zones:** Staff recommend arranging the regrouping the Air Zones to include Milton and Mosgiel into Air Zone 1, and the new areas into Air Zone 2. The recommended new Air Zones are:

- **Air Zone 1:** Alexandra, Arrowtown, Cromwell, Clyde, Milton, Mosgiel.
- **Air Zone 2:** Naseby, Ranfurly, Roxburgh, Palmerston, Dunedin, Balclutha, Oamaru, Waikouaiti, Hawea, Kingston, Queenstown, Wanaka, Glenorchy, Hampden, Moeraki, Kaitangata, Luggate, Tapanui, Benhar, Stirling, Pisa Moorings and Bannockburn.
- **Air Zone 3**: Rest of Otago

OPTIONS

[50] Air Zones Option 1: Endorse Council's level of ambition regarding Air Zones and direct staff to prepare the Air Plan based on the approach described.

[51] Air Zones Option 2: Direct staff to prepare the Air Plan based on a different level of ambition and/or approach.

SECTION 4 – RURAL OUTDOOR BURNING

Problem Definition and Ambition

[52] Otago people see rural outdoor burning as one of the main sources of air pollution[1] and it is the most common source of air discharge complaints. Rural outdoor burning can affect ambient air quality, with smoke plumes carrying particulate matter more than 15

[1] Otago Regional Council, Community and Stakeholder Feedback Summary Report, 20 February 2025

km from source. It also has localised adverse effects on amenity and, depending on the material burned, can result in discharges of odour, ash/soot and noxious or dangerous gases. Current rules permit plastic agricultural wrap to be burnt, contributing to localised adverse effects.

[53] Burning is safest in winter months when there is lower fire risk. However, this is the worst time for air quality effects with cold still air and inversion layers trapping smoke over polluted airsheds, particularly in Central Otago. Some people in urban areas view it as inequitable that domestic burners should be regulated when the emissions from large and conspicuous rural fires in winter are relatively uncontrolled.

[54] Nonetheless, burning is an important tool in rural land management. Rural burning will need to continue, and the Strategy will articulate the suite of regulatory and non-regulatory methods that ORC will adopt to mitigate its adverse effects, especially with respect to at-risk airsheds.

Feedback from ESP Committee

[55] Feedback from the ESP Committee members included:

- Support for incorporating good practice into permitted activity rules and using non-regulatory education to encourage good practice.
- Support for new rules for burning agricultural wrap (polyethylene) alongside a wider implementation plan that includes coordination with the waste disposal industry and communication with rural communities. Need to address disposal of bale netting, which is not recyclable.
- Our messaging and non-regulatory programmes need to acknowledge that outdoor burning is a necessary part of land management and fire safety, including that it can reduce the overall fuel load for unplanned / uncontrolled fires.

Approach

[56] Based on feedback from the ESP Committee, staff have presented a package of non-regulatory and regulatory methods that have worked successfully in other regions across NZ to reduce the impact of rural outdoor burning on neighbouring properties and nearby urban areas.

[57] As a package, this looks like:

- Good practice guidelines (non-regulatory)
- Raising awareness of planned outdoor burning activities (non-regulatory)
- Good practice requirements incorporated into permitted activity conditions (regulatory – rules in the plan)
- Ban burning of agricultural wrap and work with providers of alternative solutions (regulatory and non-regulatory)

[58] More information about each component of this package is available in Attachment 2.

OPTIONS

[59] Rural Outdoor Burning Option 1: Endorse Council's level of ambition regarding rural outdoor burning (reduce effects on urban ambient air quality and reduce localised amenity and health effects) and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.

[60] Rural Outdoor Burning Option 2: Direct staff to prepare the Air Quality Strategy and Air Plan based on a different level of ambition and/or approach.

[61] Option 1 is the option recommended by staff as it will ensure that rural burning near priority towns in winter will not impinge on the collective efforts of others, will help improve understanding of planned outdoor burning activities, and will reduce localised amenity and health impacts.

[62] Option 2 is not recommended because removing methods from our approach would undermine our ability to achieve the desired outcomes, possibly resulting in misalignment between the Strategy and ORC's Strategic Directions, the 2021 pORPS, and Kāi Tahu aspirations.

SECTION 5 – BUFFER ZONES

Problem Definition and Ambition

[63] As Section 4 discussed, rural outdoor burning can impact urban ambient air quality. This is particularly true for the six priority towns, where air quality is already poor and meteorological conditions hinder smoke dispersion. Additional management of rural outdoor burning near priority towns is needed for their air quality to meet the NESAQ by 2040.

[64] Other regions have used buffer zones to reduce the impact of outdoor burning on urban ambient air quality. This approach allows outdoor burning to still be used as a rural land management tool, but restricts it over winter, when its impacts on air quality are greatest.

Feedback from ESP Committee

[65] Feedback from the ESP Committee members included:

- Support for a buffer zone approach around priority towns to control winter outdoor burning.
- Preference for a shorter restriction timeframe due to the fire risk associated with outdoor burning in warmer months.
- Interest in whether restrictions could be tied to inversion layer conditions rather than times of the year.
- Concern about the impact of buffer zones on large scale burn-offs, which can only occur in a very narrow window of time due to fire risk and are planned well in advance.

- The method for determining the size of buffer zones would need to be supported by science.

Approach

[66] The Air Plan could introduce buffer zones around the six priority towns, and rules restricting larger-scale outdoor burning activities within these over zones during winter months. Exemptions could be provided for activities that may need to occur over winter.

[67] Based on feedback from the ESP Committee, staff recommend that bespoke buffer zones are created around each of the priority towns, based on the following principles:

- Buffer zones extend no more than 10 km from the priority town's air zone.
- Buffer zones only include places where there is a reasonable risk that large scale outdoor burning could impact the priority town's ambient air quality, taking into account land use type, topography and elevation.

[68] The duration of winter restrictions within buffer zones and the activities to be restricted would be determined through discussion with experts and key stakeholders prior to Claude 3 and Clause 4A consultation. The focus will, however, be on having the minimum restrictions necessary to be effective in minimising impacts on priority towns' ambient air quality.

[69] Staff explored the concept of restricting some outdoor burning activities only when inversion layers and/or other meteorological conditions were present but found that this would be not practicable to enforce, and rules would be challenging to write, as the conditions would change from day to day, meaning no certainty for plan users.

OPTIONS

[70] Buffer Zones Option 1: Endorse Council's level of ambition regarding buffer zones and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.

[71] Buffer Zones Option 2: Direct staff to prepare the Air Quality Strategy and Air Plan based on a different level of ambition and/or approach.

SECTION 4 – AGRICHEMICAL AND FERTILISER DISCHARGES, FARMING, INDUSTRIAL AND TRADE

Problem Definition and Ambition

[72] Production and industrial activities can have localised adverse effects on properties and people, affecting amenity values, vegetation (including crops) and human health. These types of effects are generally well-managed by the current regulatory approach, although in some cases may need updating to reflect changes in best practice since the Air Plan was made.

Feedback from ESP Committee

[73] Feedback from the ESP Committee members was that they were generally supportive of the current regulatory framework, but wanted to ensure that there is alignment, where appropriate, with the setback distances for agrichemical use in other plans. The issue of odour from certain farming activities was raised as a matter that may not be well-managed.

Approach

[74] Based on feedback from the ESP Committee, staff will draft the new Plan based on the rule framework in the current Regional Plan: Air, along with updates to improve clarity and ensure alignment with current planning practices, national planning standards, the pORPS, the draft LWRP, and TA plans.

OPTIONS

[75] Agrichemical and Fertiliser Discharges, Farming, Industrial and Trade Option 1: Endorse the above ambition (status quo) and direct staff to prepare the Air Quality Strategy and Air Plan based on the approach described.

[76] Agrichemical and Fertiliser Discharges, Farming, Industrial and Trade Option 2: Direct staff to prepare the Air Quality Strategy and Air Plan based on a different level of ambition and/or approach.

[77] Option 1 is the option recommended by staff so that resources are instead focussed on activities where a different approach is required because the current approach is not resulting in the desired outcomes.

[78] Option 2 is not recommended because significantly changing the way that these activities are managed may reuslt in lesser outcomes for our communities, and may divert resources from managing more challenging issues.

SECTION 5 – VEHICLE EMISSIONS

Problem Definition and Ambition

[79] According to the Ministry for the Environment[2], the impacts of air pollution from motor vehicles are much higher than previously understood, causing health issues for people each year along with substantial social costs. Whilst ORC is not in a position to introduce regulatory methods to manage vehicle emissions, the Strategy should include non-regulatory approaches and aligment with other strategies and plans.

Feedback from ESP Committee

[80] Feedback from the ESP Committee members was that, although ORC is not in a position to regulate vehicle emissions, possible non-regulatory approaches to vehicle emissions should be explored.

[2] Ministry for the Environment & Stats NZ (2024). New Zealand's Environmental Reporting Series: Our air 2024 | Tō tātou hau takiwā.

Approach

[81] Based on feedback from the ESP Committee, staff have presented a package of non-regulatory methods.

[82] As a package, this looks like:

- Health focus in the Regional Land Transport Plan (non-regulatory)
- Prioritise transport mode shift (non-regulatory)
- Sector advocacy (non-regulatory)
- Community outreach (non-regulatory)

[83] More information about each component of this package follows. If any of the methods in the above package are not supported they can be removed, but that will decrease the chances of influencing the issue.

[84] **NO2 focus in the Regional Land Transport Plan**: ORC's current RLTP has a health focus, but it is not specifically linked to NO2. Other Regional Councils have made this link; both Bay of Plenty and Waikato include reducing NO2 as a Key Performance Indicator, making this an indicator for success of RLTP objectives, and bringing it into transport-related decisions.

[85] The Otago and Southland Regional Transport Committee is responsible for incorporating indicators into the RLTP, so ORC could not unilaterally include a KPI related to NO2. If the RLTP were to include such an indicator, it would need to include investments to reduce emissions specifically.

[86] **Prioritise transport mode shift:** Improving air quality across the region through our efficient and affordable public transport services and making active transport the preferred option for short journeys, are strategic priorities for ORC (2024-2034 Strategic Directions). Increasing patronage on busses is very much a priority for ORC's Transport Team, who have also been tasked with developing a plan for increasing more shift to more active forms of transport. There are policies proposed in the draft Regional Public Transport Plan to this effect. Many of the levers involved are not within ORC's scope of responsibility, so mode shift will require working closely with partner agencies, such as Territorial Authorities and NZTA.

[87] **Sector advocacy:** ORC uses its role in developing Future Development Strategies with TAs to advocate for better public transport and active transport infrastructure, as well as more compact and traversable urban form. This could be supported by making these factors a priority in ORC submissions on District Plans and Central Government proposals and advocacy to other agencies, e.g. making submissions asking for active transport infrastructure if included in TA LTPs; advocating to NZ Police for great enforcement of controls around smoky exhausts. ORC could also proactively approach Central Government regarding the effects of NO2 requiring more rigorous vehicle

regulation, rigorous emission screening for new vehicles, and funding for public transport.

[88] **Community outreach:** This could include proactive media campaigns regarding the dangers of NO2 and benefits of public and active transport, and/or support for transport-related community projects through the Ecofund. Other options include partnering with TAs to produce public signage, e.g. advising against car idling and provide a good example with ORC's fleet vehicles.

OPTIONS

[89] Vehicle Emissions Option 1: Endorse Council's level of ambition regarding vehicles emissions (raise awareness of health impacts), and direct staff to prepare the Air Quality Strategy based on exploring the approach described.

[90] Vehicle Emissions Option 2: Direct staff to prepare the Air Quality Strategy and Air Plan based on a different level of ambition and/or approach.

[91] Option 1 is the option recommended by staff as it will see ORC having a greater role in influencing decisions relating to vehicle emissions in the pursuit of better outcomes for our communities, whilst avoiding diverting resources into areas where we have limited influence or control.

SECTION 6 – PUBLIC ENGAGEMENT

[92] The current timeline for this project sees staff returning to the ESP Committee in June 2025 with a draft Strategy and draft Plan for consideration. The Air Plan will have completed the statutory pre-notification consultation (according to Schedule 1, clause 3) by that time. This consultation is with specified parties including mana whenua, Ministers and local authorities.

[93] Any amendments to the draft Plan and draft Strategy will be made before they are brought to Council in August for endorsement, and for the Air Plan, a decision on whether to publicly notify. At the 20 February 2024 workshop, some Committee members asked whether further public engagement would be occurring before a proposed Air Plan was notified, and staff undertook to provide advice in this paper.

[94] ORC staff undertook extensive community and stakeholder engagement on air quality management from July to September 2024, which involved a survey, public drop-in sessions and discussions with key stakeholders. Over 500 respondents from across the region responded to the questionnaire, although staff acknowledge that the turnout at drop in events was low. The results of this engagement are provided in the Community and Stakeholder Feedback Summary Report in Attachment 3. This feedback was considered when designing the approaches described in this paper.

[95] In September / October 2025, there will be opportunity for the general public to provide feedback on the draft Strategy and make submissions on the proposed Air Plan (assuming it is notified following the August 2025 Council meeting). Submitters on the Air Plan will be given the opportunity to be heard according to statutory processes.

[96] If Council is satisfied that adequate public engagement has been undertaken on the subject matter to date, and that there will be further opportunity for members of the public to inform the Strategy and Plan beyond August, then staff will proceed as currently planned. This is presented as Option 1 below. Should, however, Council wish staff to undertake further non-statutory engagement prior to notification of the proposed Air Plan, Options 2 and 3 have been provided.

OPTIONS

[97] Option 1 Status Quo: The draft Plan will be considered and a decision on notification will be made at the August 2025 Council meeting. The draft Strategy will be made available for public engagement at the same time.

[98] Option 2 Wider Clause 3 Consultation: Continue with the same timeframes but undertake broader public engagement at the same time as Clause 3 consultation in May / June. The draft Plan would be considered for a decision on notification at the August 2025 Council meeting. The draft Strategy will be made available for public engagement in September / October as originally planned.

[99] The advantage of this option over Option 1 is that it would allow for greater public input prior to notification. The main downside of this option is that the public engagement on the Plan would occur without the wider context of the Strategy. Also, staff may not have sufficient time to consider the feedback received in time for the Plan to be redrafted prior to the notification decision in August. If this occurred, staff would seek to delay notification, and effectively the Plan would be on the same timeframe as Option 3 below.

[100] Option 3 Delay Notification of the Plan: Instead of notifying a *proposed* Air Plan in September/October, ORC could instead release a *draft* Plan for public feedback. This would be accompanied by the draft Strategy, so they would be consulted on as a package. Feedback would be sought for a period of 4-8 weeks, and staff could prepare an online survey and/or make themselves available at strategic locations throughout the region to assist the general public to comprehend and provide feedback on the material.

[101] The main advantage of this option is that the public would be able to see the Strategy and Plan together and understand how they would work together to improve air quality. It would also allow Council to adjust the Air Plan prior to notification to reflect changes to the Strategy, and finalise the Strategy at the same time as notifying the Plan.

[102] The downside of this option is that notification of the proposed Plan would be delayed until after local government elections. The Strategy and draft proposed Plan would not be brought to the new Council for a decision on notification until at least February 2026. This may have flow-on implications for resourcing other Planning work.

[103] There are pros and cons with each of these options and staff do not have a strong preference for a particular option.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[104] The Air Strategy will form a key part of ORC's strategic framework, extending across the breadth of its activities. It connects the Strategic Directions to ORC's work programme for matters related to air quality.

[105] Accordingly, tools that impact air quality will sit across a range of ORCs plans and programmes.

Financial Considerations

[106] There is currently no budget assigned to implementation of the Air Plan or Air Strategy. Cost and funding for the regulatory and non-regulatory approaches that support ORC's desired outcomes for air will need to be considered as a part of the next Long Term Plan process.

[107] The costs associated with the review of the Plan and Strategy are budgeted for in the Long Term Plan. Any change to the public engagement approach for the Air Plan is not budgeted for, and therefore would need Council approval to incur unbudgeted expenditure. The quantum of additional expenditure required would depend on a number of factors such as how many events would be held, what materials would need to be produced for the events, how much advertising of the engagement would be done.

Significance and Engagement

[108] This work meets the threshold for significance under the Local Government Act 2002, as it will have major effects on people's wellbeing, through the application of costs and delivery of health improvements, and will affect the ability of the ORC to perform its role in managing discharges to air for the purposes of the Resource Management Act 1991 (RMA).

[109] The ORC carried out public engagement on the programme in July – September 2024. The Air Plan will be further subject to public scrutiny through the Schedule 1 process under the RMA, and engagement on the Strategy is currently planned to occur at the same time. Options for further public engagement are provided above.

Legislative and Risk Considerations

[110] The success of the Strategy and Plan will impact on ORC's ability to achieve the Air Quality Limits set out in the NESAQ, and consequently its ability to perform its role in managing air discharges under the RMA.

[111] Current scientific evidence suggests that air quality in New Zealand has a significant effect on people's health, and poor air quality represents a significant cost both socially and directly to the health system. Failing to appropriately manage these effects represents a risk to people's health, and to ORC's reputation and reliability as an environmental regulator.

Climate Change Considerations

[112] Whilst components of this work programme are focussed on delivering better human health outcomes, reducing emissions from home heating and transport has the co-benefit also influence climate change emissions (this has not been quantified).

[113] Some available heating options that have low PM emissions are, however, fuelled by fossil fuels rather than renewable sources (e.g. gas and oil fuelled appliances). The Strategy may include methods of discouraging homeowners from switching non-compliant burners to one of these alternatives for climate change reasons.

Communications Considerations

[114] Several initiatives proposed are likely to generate considerable public interest. ORC has already initiated communications on these issues in association with its earlier engagement process. This process included a survey garnering over 500 responses.

[115] Following the 19 March 2025 Council meeting, staff will move forward with developing a communications plan to support the ongoing drafting of the Air Plan and Strategy.

NEXT STEPS

[116] Staff will use the decisions from today to further develop the draft Strategy and Plan ready for consideration at the June ESP Committee workshop.

ATTACHMENTS

- Attachment 1 – Kāi Tahu Values and Outcomes for Otago's Air
- Attachment 2 – Further information about the methods in the home heating, rural outdoor burning, and urban outdoor burning packages
- Attachment 3 – Community and Stakeholder Feedback Summary Report, 20 February 2025

1. Attachment 1 - Visions and Objectives from Kai Tahu Iwi Management Plans [**10.1.1** - 2 pages]
2. Attachment 2 Further information about the methods no buffer zones [**10.1.2** - 4 pages]
3. Attachment 3 - Air engagement 2024 report 20 Feb - FINAL [**10.1.3** - 32 pages]

ATTACHMENT 1 – Kāi Tahu Values and Outcomes for Otago's Air

The Kāi Tahu kaupapa of *ki uta ki tai* – from the mountains to the sea – emphasises holistic management of te taiao (the environment): from the air and atmosphere to wai māori (freshwater), land, and the coastal environment. The ORC's Strategic Directions 2024-2034 adopts ki uta ki tai into the Council's overall vision for Otago. The pORPS 2021 includes provisions related to Kāi Tahu rakatirataka, values, and outcomes for the Otago region, and for managing activities and the effects of activities on te taiao.

Aukaha and TAMI identified values including rakatirataka, kaitiakitaka, whakapapa, mauri, hauora, tapu, and mātauraka to be relevant to the air strategy and policy options for managing Otago's air, as well as the partnership approach underpinning ki uta ki tai. While this list is not exhaustive, many of these values are demonstrated through the Objectives and Visions in the Kāi Tahu iwi management plans (Table 1).

Aukaha and TAMI seek that these high-level values are reflected in outcomes including:

- Partnership with Kāi Tahu in development of policies and plans for managing air;
- Access to, abundance, and health of mahika kai;
- Avoiding and managing inappropriate activities which affect the mauri of air, and the relationship between mana whenua and sites of significance.

Kāi Tahu have particular interest in a coordinated response to improve air quality ,and will seek to actively practice kaitiakitaka to protect the mauri of the atmosphere.

Table 1: High-level Kāi Tahu values assessment of air objectives in iwi management plans. Source: Aukaha & TAMI, 2025.

Provision	Key values identified by Aukaha and TAMI
Kāi Tahu ki Otago NRMP 2005 *Objectives for Air and Atmosphere | Hau me te Hau Takiwā* i. Kāi Tahu ki Otago sites of significance are free from odour, visual and other pollutants.	Rakatirataka, kaitiakitaka, whakapapa, tapu, mauri
ii. Kāi Tahu ki Otago are meaningfully involved in the management and protection of the air resource.	Rakatirataka, kaitiakitaka, mātauraka, whakapapa
iii. The life supporting capacity and mauri of air is maintained for future generations.	Rakatirataka, kaitiakitaka, whakapapa, mauri, hauora, mātauraka
Te Tangi a Tauira NREIMP 2008 *Vision for the Region's Ambient Air* • That it is ensured that Māori cultural and traditional beliefs are recognised and provided for when dealing with discharges of contaminants into air.	Rakatirataka, mātauraka, mauri, tapu, hauora
• That Ngāi Tahu ki Murihiku shall actively engage in and contribute to a co-ordinated response to the improvement of existing air quality within Southland.	Rakatirataka, kaitiakitaka, mātauraka, mauri
• That the life supporting capacity, mauri, of the global atmosphere will be understood and protected through the principle of kaitiakitanga.	Rakatirataka, kaitiakitaka, mauri, mātauraka, hauora
• To understand that the activities in the region are contributing towards the production of greenhouse gases and support necessary change to minimise adverse effects.	Rakatirataka, mauri, whakapapa, mātauraka
• That the impacts of change on resources including air should be seen as part of a whole and not in part.	Rakatirataka, whakapapa, mauri

• That the amenity values of special taonga (landmarks, significant places, wāhi tapu site) will be protected.	Rakatirataka, kaitiakitaka, tapu, whakapapa, mauri
• That the quality of our environment will be protected from inappropriate, intrusive and offensive development, change or resource use	Rakatirataka, kaitiakitaka, tapu, mauri, hauora, whakapapa, mātauraka

ATTACHMENT 2 – Further information about the methods included in the home heating, rural outdoor burning, and urban outdoor burning packages.

HOME HEATING

[1] **Phase out of non-ULEBs in priority towns (Alexandra, Arrowtown, Clyde, Cromwell, Milton and Mosgiel):** A rule can be introduced in the Plan that will mean burners cannot be operated more than 20 years from the installation date unless they are a ULEB. There would be a phase-in period for this rule so that older burners are not immediately non-compliant upon notification of the Plan, even though many will already be non-compliant under the current Regional Plan: Air.

[2] **New/replacement wood burners in all other urban areas:** A rule can be introduced in the Plan requiring all replacement and new burners in other urban areas to be a ULEB. Owners of existing burners would be allowed to use them indefinitely, regardless of their emissions rate (unless they cause offensive/objectionable discharges), but if/when they are replaced then the replacement burner will need to be a ULEB. There may need to be a phase-in period for this rule as some developments/renovations involving non-ULEB burners may already be planned/underway at the time the Plan is notified.

[3] **Bylaw:** A bylaw developed in conjunction with TAs could require non-compliant burners to be removed from any house in a priority town before it is sold. The benefit of a bylaw is that it can regulate the appliance, rather than the discharge. A bylaw would also apply to other towns, requiring ULEBs for any new/replacement burner. This could be enforced by the TA through the building consent process. The bylaw is a regulatory tool that sits outside the Plan and could be developed independently of the timeframe for the Plan.

[4] **Good Wood Programme/Dry Wood Certification Scheme:** This can be operated as a voluntary scheme whereby firewood suppliers that are certified as providing dry wood receive an accreditation and/or promotion. This is so customers know who they can rely on for dry firewood. Suppliers will need to ensure they have enough dry wood to meet the demand, and promotional material can also include educational information to encourage customers to buy their firewood well in advance and store it correctly.

[5] Whilst this is a non-regulatory method, staff will investigate whether it is possible for ORC or others to regulate the suppliers through mechanisms other than the Plan.

[6] **Home heating financial assistance:** Advice from other councils and experts advising ORC is that financial assistance is a key part of supporting the transition from older burners to cleaner forms of heating and achieving desired air quality outcomes. This is also in line with policy AIR-M5 from the 2021 pORPS. On that basis, staff will investigate options for ORC to provide financial assistance to homeowners replacing non-ULEB burners, particularly in priority towns. Matters to consider include:

- Who needs the assistance? Advice from other Councils is that some homeowners on low incomes can struggle to afford burner upgrades. Bay of Plenty Regional Council (BOPRC) trialled a payback scheme (achieved through a Voluntary Targeted Rate) and found that, even with low interest rates, the loan repayments were still beyond the reach of some homeowners. A means-tested grant may be more appropriate in such circumstances.
- What is the assistance for? There are a range of heating options and support (e.g. insulation, dry wood storage, removing old burners) that could be targeted to improve emissions. Lower emission heating options could include ULEB, pellet fires, or heat pumps.
- What does providing assistance require? A financial assistance scheme requires administrative supports that would also require funding. For instance, vetting eligibility, in-home assessments, and coordinating building consents and providers. Some of this assistance could be provided through a partner agency.
- Who pays? Cleaner air has a significant public health benefit, as shown by the HAPINZ 2016 report and scientific investigations throughout New Zealand and internationally. The ratio of public to private benefit can be modelled, and funding sources considered in that light.

[7] Staff will also explore the various mechanisms for securing the funding and are mindful that some Committee members expressed a preference for a cost-neutral solution (e.g. loan scheme / voluntary targeted rate scheme rather than providing grants).

[8] ORC has provided financial assistance in the past through the Clean Heat, Clean Air programme, developed as part of ORC's 2007 Air Quality Strategy. The programme began in 2008, and funding was collected for 5 – 6 years. The programme was funded by a targeted rate, which built up a reserve for Clean Heat Clean Air that lasted some years after rating ceased, before being finally wound up in 2020. ORC employed its own assessor to manage the range of options, organise contracts and approved contractors, and building consents. Through this programme, ORC assisted more than 1,250 homes transition to cleaner heating options.

[9] Other councils have made use of financial assistance. BOPRC created a fund to meet the shortfall of funding provided by the Warmer Kiwi Homes grant provided by Energy Efficiency and Conservation Authority (EECA). This applied in the Rotorua Airshed, and only allowed replacements with heat pumps. Environment Canterbury (ECan) provides up to $5000 as a subsidy to people with an expired or expiring burner, who also hold a Community Services Card or live in an eligible Social Deprivation Index area 8-10. Nelson has previously run a subsidy scheme, which expired with the phase out date for non-compliant burners. Some councils in Southland waive building consent fees for compliant burners.

[10] **Smoky Chimney Programme:** Using patrolling staff during the winter months to spot houses with smoky chimneys and offer targeted advice about burner use to householders. Such a programme may be better offered by a partner agency. Those who regularly have smoky chimneys may be targeted for compliance purposes if their burner is non-compliant. Such an approach would need to be backed up by the rules about burner use. This has been used by

ECan in Timaru. Advice was delivered by notice into letterboxes, offering advice and contacts to get in touch with council for further information. Note that regional councils do not have the power to enter dwellings.

[11] **Educational outreach and advice:** A comprehensive programme of advice available to the community providing information on air quality and improving contributors (home heating). This could include events for information sharing. It could also include the provision of publicly available information, and could extend to, for example, publicly visible air quality monitors in priority urban areas that give the public immediate feedback on current Air Quality.

[12] **In-house assessments:** In conjunction with territorial authorities, undertake in-house assessments for how to improve home heating and build better for heat retention and management.

RURAL OUTDOOR BURNING

[13] **Good practice guidelines:** Work with communities to develop updated good practice guidelines for outdoor burning, irrespective of any regulatory requirements around good practice. This could include approaches for preventing forest fires.

[14] **Raising awareness of planned outdoor burning activities:** Having very large-scale activities registered with ORC and shared with the public on an online map could help improve public awareness that outdoor burning is an expected part of rural land management. It would also allow members of the public to check whether a fire they encounter is mapped before reporting it to ORC.

[15] **Good practice requirements incorporated into permitted activity conditions:** Permitted activity rules for discharges from outdoor burning could incorporate several 'good practice' requirements, such as having minimum setbacks from neighbouring property boundaries, informing immediate neighbours in advance of very large scale activities, and registering these very large scale activities with ORC (very large scale could mean outdoor burning that lasts multiple days or covers a very large area e.g. large hill country burn-offs). Having these activities registered with ORC would simplify searches for Compliance staff. The details around good practice requirements, including the threshold for registering an outdoor burning activity with ORC, can be developed through initial drafting and Clause 3 and Clause 4A consultation. Staff will also investigate whether FENZ is already gathering the information we would require to see where efficiencies can be made, and whether approaches for preventing forest fires should be included in good practice requirements.

[16] **Agricultural wrap (silage and bale wrap):** The Air Plan rules already ban outdoor burning of most plastics, and the exemption for polyethylene could be removed so that outdoor burning of agricultural wrap is also banned. ORC will need to work with the waste disposal industry and rural communities to encourage alternative methods of agricultural wrap disposal, including netting. This will likely include working with the waste disposal industry about ways to access waste disposal services for both recyclable and non-recyclable materials. ORC would then

promote the disposal methods available for different materials. It is understood that much of this work is already underway.

URBAN OUTDOOR BURNING

[17] **Improved rules:** The current Regional Plan: Air includes restrictions for burning of various materials on different sized properties in urban areas. Similar controls should be carried through into the new Air Plan but with amendments to make them easier to understand, comply with, and enforce. Improved rules might include:

- Better clarity around small-scale and/or infrequent activities. Discharges from outdoor burning for cooking and celebratory fires are currently permitted, but the rule framework around braziers and outdoor fireplaces is less clear and could be improved.
- Winter restrictions on some small-scale activities (e.g. braziers, outdoor fireplaces) in priority towns to avoid impacts on airsheds and perceptions of inequality.
- Pathways for larger-scale activities like burning piles of green waste, allowing them to occur only when appropriate.
- The urban areas where these rules would apply, along with which activities would be permitted/restricted, can be developed through initial drafting and Clause 3 and Clause 4A consultation.

[18] **Educational outreach and advice:** A programme of advice available to the community providing information on what activities are permitted and how to access alternatives methods of waste disposal. This could include providing information on the ORC website, providing information at relevant events, and providing Compliance officers with information to share when they respond to urban outdoor burning incidents.

[19] **Information at point of sale:** Liaise with suppliers of any appliances restricted over winter (e.g. braziers) so that consumers are aware of winter restrictions at the point of sale. This would be similar to what currently happens with domestic burners, where suppliers provide information about which burners are permitted where.

Community and Stakeholder Feedback Summary Report

Air Quality Engagement July–September 2024

20 February 2025

Acknowledgements

Otago Regional Council wishes to acknowledge all the community members and stakeholders who took part in the air quality management engagement process. All the feedback received through the survey, drop-in sessions, emails and discussion with stakeholders is greatly valued by the ORC Policy and Planning team and Strategy team. It is one of the key inputs that will inform the development of ORC's refreshed approach to air quality management in Otago.

Community and Stakeholder Feedback – Council Workshop 20 February 2025

Executive summary

ORC staff undertook community and stakeholder engagement on air quality management from July to September 2024, which involved a survey, public drop-in sessions and discussion with key stakeholders. This report summarises the feedback received through these different avenues.

There were 510 valid responses to the survey. Almost all were from urban areas, and around half were from Central Otago. Around half of respondents thought poor air quality was a problem where they lived at least sometimes, and 40% had changed their behaviour because of poor air quality.

Home heating and outdoor burning were the activities most often identified by survey respondents as the main sources of air pollution in Otago, and were the issues most often brought up by attendees at drop-in sessions. The most popular approaches for addressing both issues were non-regulatory.

Most respondents did not support approaches to managing home heating that would result in people not being allowed to have solid fuel burners—survey respondents, drop-in session attendees and stakeholders all expressed concerns about these measures resulting in people having cold homes. However, there was majority support for banning coal burning and gradually replacing higher-emitting burners.

A significant minority of survey respondents supported restrictions on outdoor burning based on property location, or over winter. However, most respondents and some stakeholders were not supportive, mainly due to concerns about unintended consequences and costs to farmers.

Community feedback suggests community members do not see management of vehicle emissions as something ORC should prioritise, and that efforts in this area should be focused on improving public transport.

There was general support among survey respondents for management of industrial emissions, odour, dust and agrichemical spraying, but most respondents also did not think these were main sources of air pollution in Otago.

The survey results suggest that in general, there may be more support for air quality management interventions, including on home heating, in Dunedin City District and Queenstown Lakes. Although Central Otago's urban areas have some of the poorest air quality in Otago, achieving community support for interventions in these areas may be more challenging.

The community feedback received is not representative of the Otago population, so it does not provide statistically reliable quantitative data. However, it still provides a useful insight into Otago residents' views on air quality and their levels of support for different approaches to air quality management.

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Community and Stakeholder Feedback – Council Workshop 20 February 2025

1. Introduction

1. ORC staff are currently reviewing the Air Quality Strategy for Otago ('Strategy') and the Regional Plan: Air for Otago ('Plan'). To inform development of a new strategy and plan, staff have undertaken community and stakeholder engagement on air quality management in Otago.
2. The scope of this engagement was based on the key air quality issues for Otago and possible options for addressing them identified in the 4 December 2023 Council paper 'Air Plan: Issues and Options' ('issues and options paper'). The paper focused mainly on the Plan and regulatory approaches managing air quality, but it also identified a range of non-regulatory approaches. In December 2023, the issues and options identified in the paper, along with additional options suggested by councillors, were approved by Council for engagement in 2024.
3. Engagement was undertaken from July to September 2024 and involved a survey, public drop-in sessions and discussion with key stakeholders. A few members of the public also reached out to ORC to give their feedback separately. This report summarises the feedback received through these different avenues.

2. Methodology

2.1. Survey

4. The purpose of the survey was to provide an avenue for individual members to give feedback on air quality management and was open from 22 July to 26 August 2024. It was available online and paper copies were provided at the drop-in sessions. It was advertised through local newspapers, Google, Facebook and radio.
5. The survey included both multi-choice questions and open-ended questions that allowed respondents to answer in their own words. A copy of the survey is attached as Appendix 2.
6. The survey had five sections:
    - *Section A 'About you and your household' (Questions 1–3)* asked respondents demographic questions.
    - *Section B 'Air quality in Otago' (Questions 4–9)* asked respondents about their views on air quality where they lived and in Otago generally.
    - *Section C 'Rethinking air quality management' (Questions 10–14)* asked respondents about their level of support for the options identified in the issues and options paper, and whether there are other air quality issues ORC should focus on.
    - *Section D 'Your home heating' (Questions 15–23)* asked about the age and insulation of respondents' homes, their current heating sources and barriers to changing their heating sources to lower-emitting options.
    - *Section E 'Additional comments' (Question 24)* provided an opportunity for respondents to share any other comments about air quality.
7. All respondents were asked to complete Sections A–C, Questions 15–19 in Section D and Section E. Respondents who had a solid fuel burner and burned wood in it also completed Questions 19A– 20 in Section D, which were about their burners and wood burning practices. Respondents with ultra-low emission burners (ULEB) were directed straight to Section E after

Question 20. The final questions in Section D, about barriers to changing heating sources, with a solid fuel burner that was not an ULEB and to respondents who were unsure whether their burner was an ULEB.

8. Questions 10–13 were important, as they addressed the management options approved by Council for engagement in 2023. These options were related to domestic (home) heating, outdoor burning, vehicle emissions, discharges from industrial and trade premises, agrichemical spray drift, odour and dust. The last four topics were grouped together in the issues and options paper and in the survey, due to overlap in the suggested options for addressing them. Respondents were asked to rate each of the suggested options from 1 (do not support) to 5 (fully support).

9. Staff inputted all paper survey responses into the online survey form. After the survey closed, the results were exported from SurveyMonkey for analysis in Microsoft EXCEL. In total, 512 responses were received, but two were considered invalid and were removed from all further analysis. They were considered invalid because one was made on behalf of an organisation rather than an individual and the other was duplicate of another response. The organisation response was instead considered as part of the primary industry stakeholder feedback.

10. Data cleaning also included the following:

    - Some respondents gave a written response using the ‘other – please specify’ option that overlapped completely with one of the other multi-choice options. These responses were represented as the appropriate multi-choice option.
    - Some respondents used the ‘other – please specify’ option to explain why they had selected other multi-choice options. These responses were only represented as the other multi-choice options they selected.
    - Some respondents gave responses that did not answer the question, and these were marked as not applicable ‘N/A’.
    - The paper surveys allowed for more errors than the online survey—for instance, respondents could select more than the two multi-choice options allowed in response to a question. When this occurred, the response to that question was marked as ‘N/A’.

11. When a response to a particular question was marked as ‘N/A’ it was excluded from the analysis of that question. For instance, one respondent answered ‘Noyb’ to Question 17, ‘What is the main heating source in your home?’ So for this question, n = 509 rather than 510.

12. The responses to the survey’s open questions were analysed using coding, which involved identifying key commonalities among the written responses. The resulting information was used to assist with interpreting the quantitative survey data.

2.2. Other community feedback

13. Individual members of the public also gave feedback through drop-in sessions and by emailing ORC. Staff received 5 emails from members of the public who wished to give feedback that way.

14. Between 29 July and 22 August, ORC staff held public drop-in sessions in towns across Otago, and online. 16 sessions were held in 11 towns (Mosgiel, Dunedin, Ōamaru, Balclutha, Milton, Ranfurly, Arrowtown, Wānaka, Alexandra, Cromwell, and Roxburgh), and 2 online sessions were held on 5 August. These sessions were an opportunity for community members to discuss air

quality management with staff and councillors. Attendance was low, ranging from 1 to 12 people at each session and less than 100 attendees across all the sessions. Feedback from the drop-in sessions was recorded as notes taken by staff while talking to community members.

15. The community feedback collected through the drop-in sessions and emails represents a very small number of people, and often people at the drop-in sessions were attending because they had strong views on air quality management or a specific question they wanted answered.

16. Community feedback received through avenues other than the survey therefore only provided qualitative data. This information, along with the qualitative survey data, was used to assist with interpreting the quantitative survey data. It also allowed staff to identify some key considerations not captured by the survey results.

2.3. Stakeholder feedback

17. Key stakeholders were categorised into four focus groups: primary industry, production and processing, community, and territorial authorities. A list of the stakeholders who provided feedback is provided in Appendix 1. Online sessions for discussion with each of these focus groups were held between 23 August and 12 September and a few individual discussions were held with stakeholders who could not attend the focus group sessions. Some stakeholders also provided written feedback on air quality management and one primary industry stakeholder submitted feedback through the survey. As the development of the new Strategy and Plan was in its very early stages during engagement, most of the stakeholder feedback was fairly general, so it has only been briefly summarised in this report. Staff will continue to engage with stakeholders throughout the process of developing the new Strategy and Plan.

3. Community feedback summary

3.1. Survey respondent demographics

18. The survey received 510 valid responses and almost half were from Central Otago. The Dunedin City and Queenstown-Lakes Districts had around 20% of respondents each, while the Waitaki and Clutha Districts each had less than 10%. Alexandra was the town with the most respondents; there were 131, representing one quarter of the total respondents (Figure 1, Table 1).

19. The vast majority of respondents overall and in each district were urban residents; respondents who selected ‘Other’ as their location were in rural areas or very small towns. However, a significant proportion of respondents from the Clutha District were in places less populated than Milton or Balclutha; there were 7 ‘Other’ respondents, representing more than one third of the respondents from Clutha.

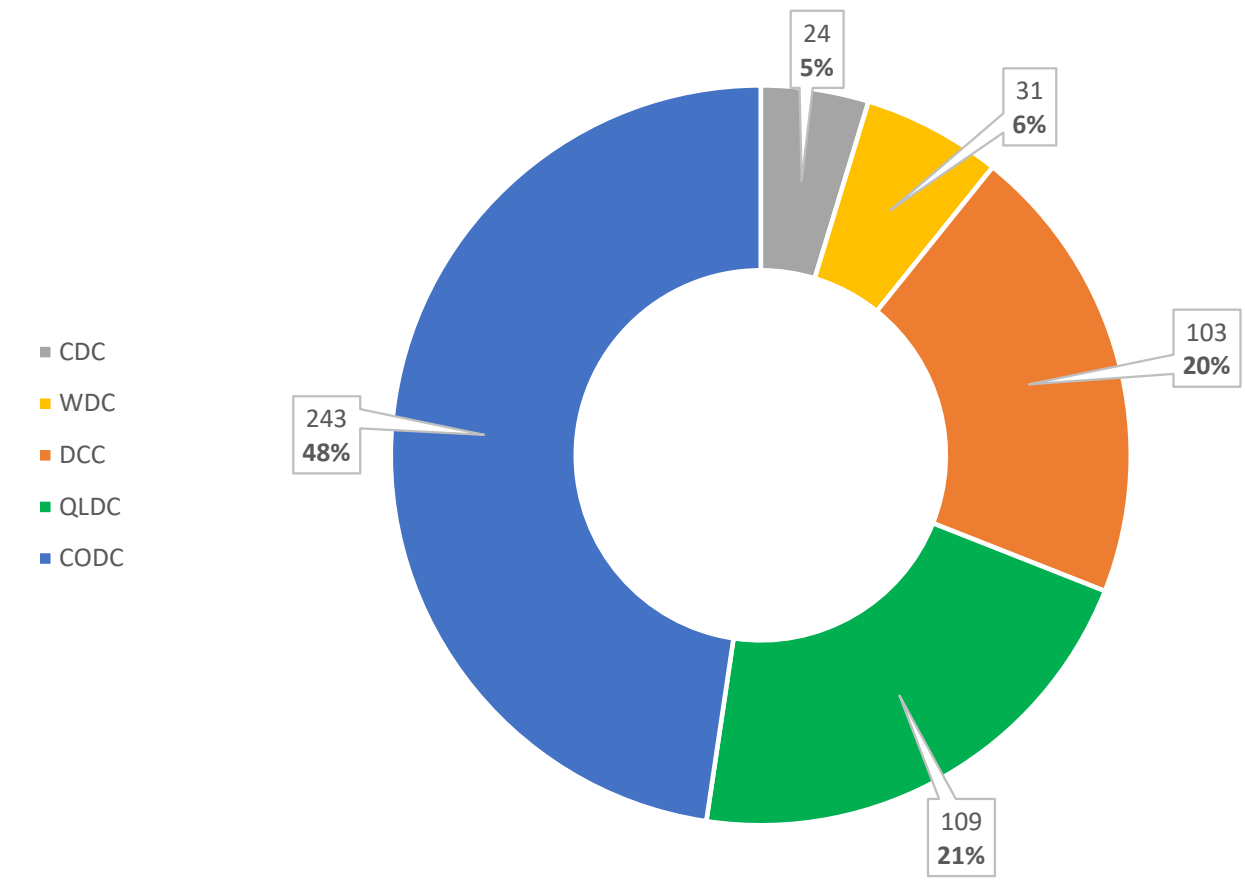


Figure 1. Survey respondents by district: Clutha (CDC), Waitaki (WDC), Dunedin (DCC), Queenstown-Lakes (QLDC) and Central Otago (CODC) (n = 510).

Table 1. Survey respondents by town (Question 1). The district each town is in is shown in brackets.

Location	No. of respondents	% of respondents (n = 510)
Alexandra	131	26%
Dunedin	87	17%
Arrowtown	75	15%
Cromwell	34	7%
Clyde	33	6%
Ōamaru	28	5%
Roxburgh	21	4%
Wānaka	18	4%
Mosgiel	13	3%
Milton	9	2%
Queenstown	8	2%
Balclutha	8	2%
Hāwea	7	1%
Ranfurly	3	1%
Palmerston	1	< 1%
Naseby	1	< 1%
Other	34	7%

20. Most respondents (89%) owned the home they lived in; only 57 respondents (11%) did not (Question 1). Excluding those with pellet burners, around three-quarters of respondents (375, 74%) used a solid fuel burner as either their primary or secondary source of heating. 372 (73%) had a solid fuel burner they burned wood in, and 9 had a multi-fuel burner that they fuelled using both wood and coal (Questions 17 and 18).

21. Around half of respondents used a wood burner as their main heating source, while one third used a heat pump and 16% used a different heating source (Figure 2). Other heating sources selected by at least 1% of respondents were diesel heating, gas heating, electric heaters, multi-fuel/coal burners and pellet burners. However, the split between different heating sources varied across districts. There was a fairly even split between wood burners and heat pumps in Dunedin City District and Queenstown Lakes, while respondents from other districts were more likely to have a wood burner as their main source of heating. There was particularly low reliance on heat pumps among respondents from Central Otago and Clutha, and respondents from Clutha were also more likely to have a multi-fuel/coal burner.

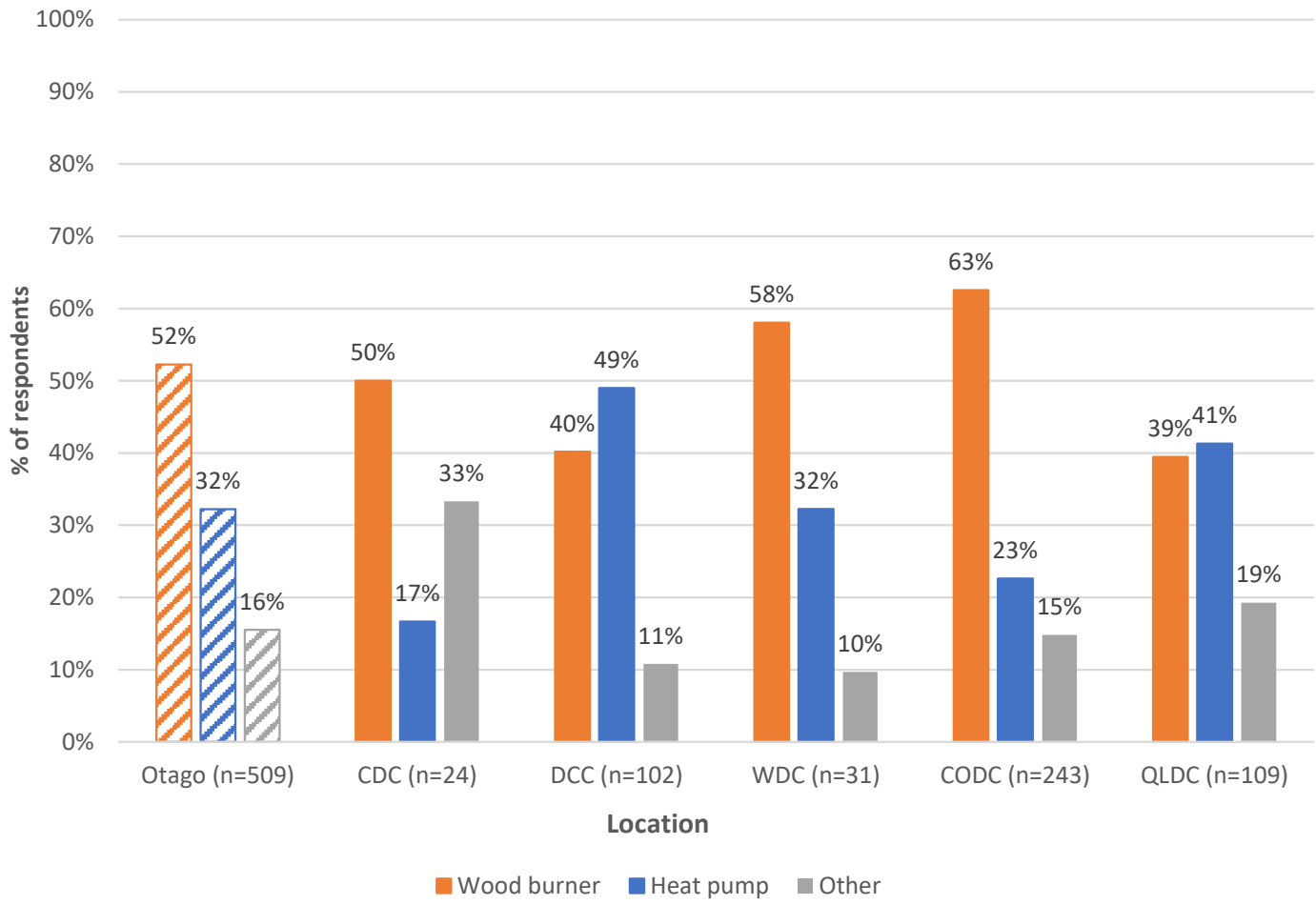


Figure 2. Responses to Question 17 'What is the main heating source in your home?' for all respondents across Otago and by district: Clutha (CDC), Waitaki (WDC), Dunedin (DCC), Queenstown-Lakes (QLDC) and Central Otago (CODC).

3.2. Frequency and impact of poor air quality

22. Respondents were asked how often poor air quality is a problem where they live. Across Otago, only 2% selected 'Always', but there was a more even split between the other four options: 'Often' (21%), 'Sometimes' (28%), 'Rarely' (26%) and 'Never' (23%) (Figure 3). Overall, there was an approximately 50:50 split between respondents who believed poor air quality was a problem at least sometimes and those who thought it was a problem rarely or never.

23. Arrowtown, Alexandra, Cromwell and Clyde have some of the poorest air quality in Otago.[1] Most (77%) respondents from Queenstown Lakes thought poor air quality was a problem where they lived at least sometimes, and most respondents from this district lived in Arrowtown. However, while most of the respondents from Central Otago lived in Alexandra, Cromwell or Clyde, only 43% thought air quality was a problem where they lived at least sometimes (Table 2).

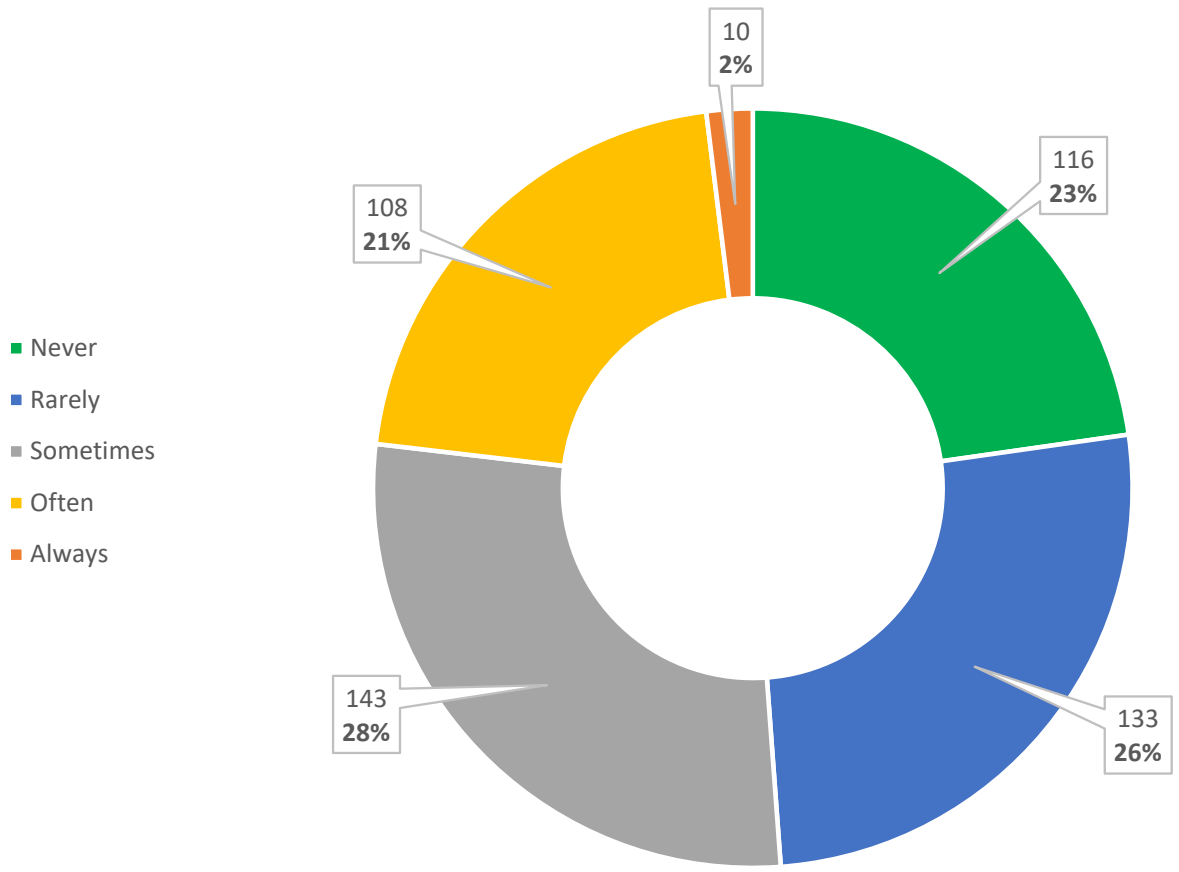


Figure 3. Responses to Question 6 'How often is poor air quality a problem where you live?' (n = 510). Respondents could only select one option.

[1] Harrison, S. (2024) State of the Environment report: Air quality trends 2005–2023 Otago Regional Council, Dunedin.

Table 2. Responses to Question 6 'How often is poor air quality a problem where you live?' across Otago and by district: Clutha (CDC), Waitaki (WDC), Dunedin (DCC), Queenstown-Lakes (QLDC) and Central Otago (CODC).

	Otago (n=510)	CDC (n=24)	DCC (n=103)	WDC (n=31)	CODC (n=243)	QLDC (n=109)
Never	23%	38%	23%	26%	26%	11%
Rarely	26%	33%	29%	19%	31%	12%
Sometimes	28%	25%	27%	29%	28%	28%
Often	21%	4%	18%	23%	14%	44%
Always	2%	0%	2%	3%	1%	5%
At least sometimes	51%	29%	47%	55%	43%	77%

24. Respondents were also asked if they ever change their behaviour because of poor air quality and whether they had a health condition that could be affected by air quality (Questions 7 and 8). Most respondents had not changed their behaviour because of poor air quality (308, 60%), but a significant minority (202, 40%) had done so.

25. Respondents with a health condition affected by air quality were twice as likely to change their behaviour because of poor air quality than those without a health condition. There were 105 respondents who said they had a health condition affected by air quality, and 64% of them changed their behaviour. In comparison, only 32% of the 377 respondents without a health condition affected by air quality changed their behaviour.

26. Of the 202 respondents who had changed their behaviour because of poor air quality, 180 described how they changed their behaviour. There were three main types of behaviour change described:

    a. **Changed outdoor activity**, including spending less time outdoors, avoiding going outdoors at certain times of the day and avoiding areas that have poor air quality.

- **Reducing house ventilation** by keeping doors and windows closed.
- **Not drying washing outside** and either hanging it inside or using a drier more often.

27. Changed outdoor activity was the most common impact of poor air quality; half of respondents who changed their behaviour described changes in their outdoor activity, representing 20% of all respondents (Table 3).

28. Most respondents who changed their behaviour did so because of smoke, although a few mentioned other issues such as vehicle emissions or industry.

Table 3. How respondents changed their behaviour because of poor air quality (Question 8A).

	No. of respondents	% behaviour change (n = 202)	% total (n = 510)
Changed outdoor activity	101	50%	20%
Reduced house ventilation	73	36%	14%
Not drying washing outside	56	28%	11%
Other	27	13%	5%

3.3. Perceived sources of air pollution

29. Respondents were asked what they thought the main sources of air pollution in Otago were and were allowed to select up to two options. Home heating and outdoor burning were the most commonly selected sources of air pollution—each was selected by around half of respondents. These were also the issues that generated the most discussion at drop-in sessions. Vehicle emissions (33%) and industrial emissions (27%) were the next most commonly selected sources of air pollution, and only 12% of respondents selected spraying of agricultural chemicals (Figure 4).

30. The results suggest there may be some discrepancies between what Otago residents perceive as the main sources of air pollution and the science on this topic—in particular, they may underestimate the contribution of home heating emissions to air pollution compared to outdoor burning.

31. In Otago, the main sources of air pollution are burning of solid fuels for home heating (particulate matter) and vehicle emissions (nitrogen dioxide).[2] However, almost half of respondents did not think home heating was one of the main sources of air pollution in Otago. Queenstown Lakes was the only district where significantly more than half of respondents thought home heating was a main source of air pollution (Table 2).

32. Although outdoor burning and home heating are both sources of particulate matter, outdoor burning has a much smaller influence on ambient air quality than home heating. However, equal numbers of respondents selected home heating and outdoor burning as sources of air pollution. This may be partly because the effects of outdoor burning are very visible, which can lead to it generating more concern in communities than home heating.[3]

[2] Harrison, S. (2024) State of the Environment report: Air quality trends 2005–2023 Otago Regional Council, Dunedin.

3 Memorandum: Impacts of outdoor burning on urban areas in Otago. (Harrison, S. 2023).

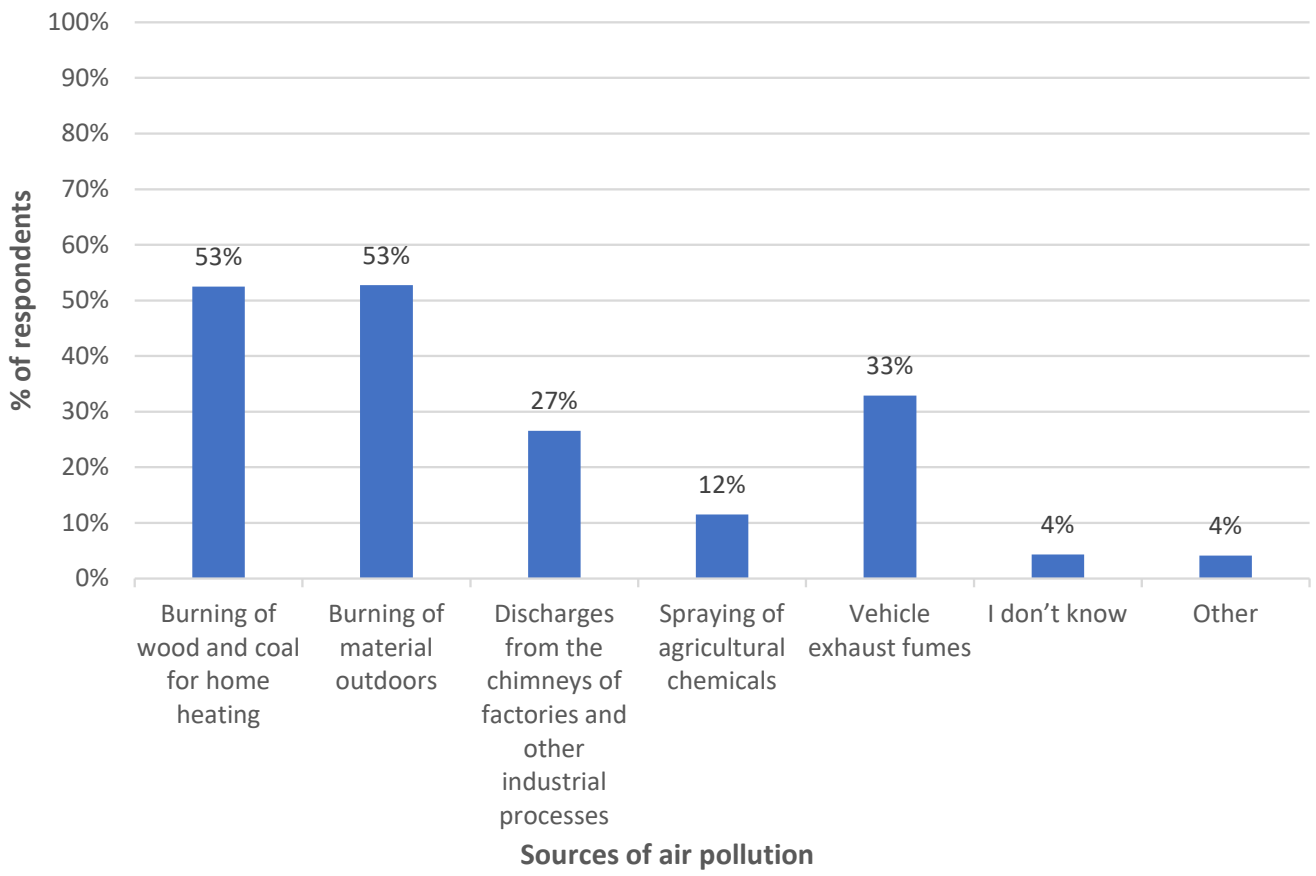


Figure 4. Responses to Question 5 'What do you think the main sources of air pollution are?' (n = 495). Respondents could select up to 2 options.

Table 4. Responses to Question 5 'What do you think the main sources of air pollution are?' across Otago and by district: Clutha (CDC), Waitaki (WDC), Dunedin (DCC), Queenstown-Lakes (QLDC) and Central Otago (CODC).

	Otago (n=495)	CDC (n=24)	DCC (n=99)	WDC (n=30)	CODC (n=237)	QLDC (n=106)
Burning of wood and coal for home heating	53%	35%	54%	30%	38%	77%
Burning of material outdoors	53%	35%	18%	33%	63%	53%
Discharges from industrial processes	27%	35%	40%	40%	22%	9%
Spraying of agricultural chemicals	12%	17%	6%	7%	15%	6%
Vehicle exhaust fumes	33%	26%	51%	43%	24%	24%
I don't know	4%	9%	3%	3%	1%	6%
Other	4%	0%	0%	3%	4%	4%

3.4. Home heating

3.4.1. Support for different management options

33. Most of the suggested options for managing home heating were supported by more than half of respondents. However, the most stringent regulatory options (preventing new solid fuel burner installations and removing all existing ones) were not supported by the majority of respondents. A significant minority of respondents were supportive of these options, and very few gave neutral responses. Overall, there was more support for non-regulatory options than for regulatory options, but gradually replacing higher-emitting solid fuel burners and banning coal burning were regulatory options supported by the majority of respondents (Table 4).

Table 5. Respondents' level of support for approaches to managing home heating (Question 10). 'Supportive' respondents rated an approach 4 or 5, while those 'not supportive' rated it 1 or 2. 'Neutral' respondents rated an approach 3. For each option, the highest percentage is bolded.

Approach	% Supportive	% Not supportive	% Neutral
Gradually replace existing solid fuel burners if they have high emissions (n=507)	**52%**	34%	14%
Prevent new installations of solid fuel burners (n=507)	28%	**64%**	8%
Gradually stop burning coal (n=507)	**64%**	12%	24%
Gradually remove all existing solid fuel burners (n=507)	20%	**72%**	8%
Financial support (n=507)	**55%**	28%	17%
Education about wood burner best practice (n=508)	**72%**	14%	14%
Firewood certification scheme (n=508)	**44%**	38%	18%
Support improvements in housing standards and housing insulation programmes (n=508)	**74%**	11%	15%

34. Many respondents commented that burners are necessary in Otago. Common themes in respondents' comments were that the cost of electricity makes heat pumps too expensive to run, electricity supply is not reliable enough to use only a heat pump, and heat pumps do not heat homes adequately over winter (especially in older houses and in colder districts like Central Otago and Queenstown Lakes). Respondents also often commented on the impact of burning practices, noting that emissions from solid fuel burners can be reduced by only using dry firewood and ensuring there is sufficient airflow during combustion.

35. Respondents were more supportive of gradually replacing only higher-emitting solid fuel burners than the more stringent restrictions. Comments suggested many people would like to see improvements in air quality but are concerned that not allowing burners would result in people having cold homes. Replacing higher-emitting solid fuel burners with lower-emitting ones was seen as a more balanced approach (Figure 5). These were also common themes of discussion in the drop-in sessions.

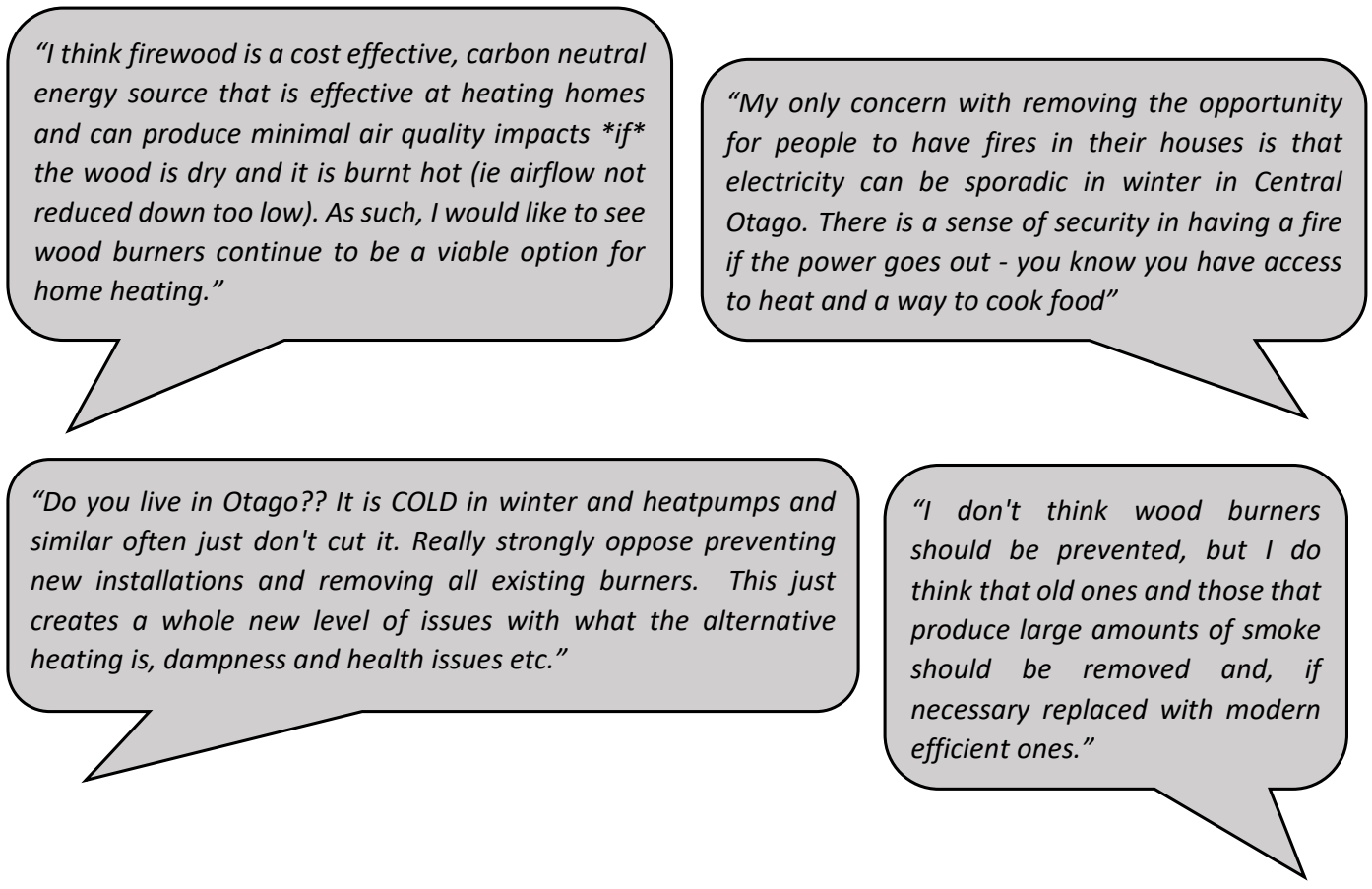


Figure 5. *Examples of respondent comments about solid fuel burner restrictions.*

36. Banning coal burning was a much less controversial option: 64% of respondents were supportive, and 20% were neutral. Respondents commented that compared to wood burning, coal burning is non-renewable, more polluting, and its smell is more offensive (Figure 6).

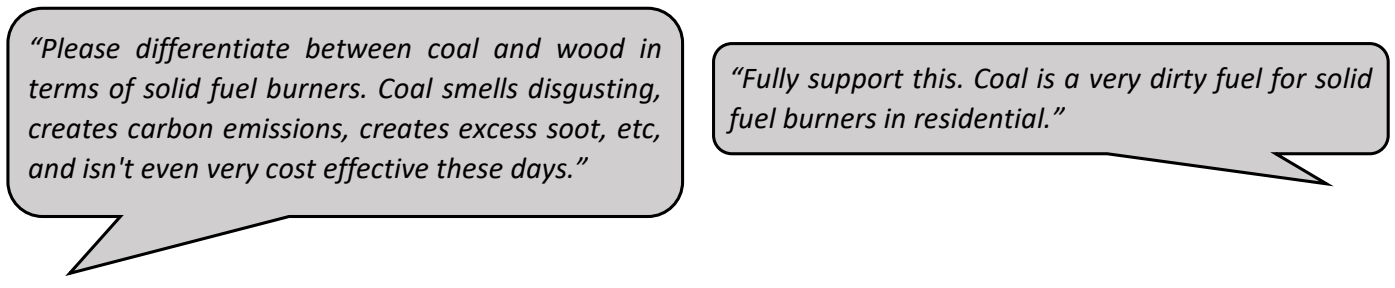


Figure 6. *Examples of respondent comments about coal burning.*

37. The most popular approaches overall were non-regulatory: almost 75% of respondents were supportive of ORC providing education about wood burner best practice and ORC supporting improvements in housing standards and insulation programmes. As well as education on burning practices, respondents suggested that ORC supports education on insulation, the health impacts of solid fuel burning and available lower-emitting burners.

38. A firewood certification scheme was supported by 44% of respondents, but almost as many were not supportive, while 18% were neutral. Comments from the respondents suggest it may have been unclear that a firewood certification scheme would be only for firewood suppliers, not individual households, so some of the opposition was likely for this reason. Some respondents who were not supportive also explained that this was because they thought a certification

scheme would be ineffective, due to many people sourcing their own firewood. However, surveys conducted as part of emissions inventories in Otago indicate that in most urban areas—except for Milton—most people purchase firewood from suppliers rather than sourcing it themselves.[4]

3.4.2. Responding to a very smoky chimney

39. Respondents were asked what they would do if they saw a very smoky chimney in their neighbourhood and could select all the options they agreed with. Most respondents said they would do nothing, and several explained that this was because they believe no one should interfere with someone else's home heating choices, or because they believe acting on a smoky chimney is ORC's responsibility.

40. Additionally, several respondents commented that they did not know ORC had a pollution hotline and would consider using this in the future. Considering this, promoting awareness of the pollution hotline and the ability to make a report through ORC's website could be valuable (Figure 8).

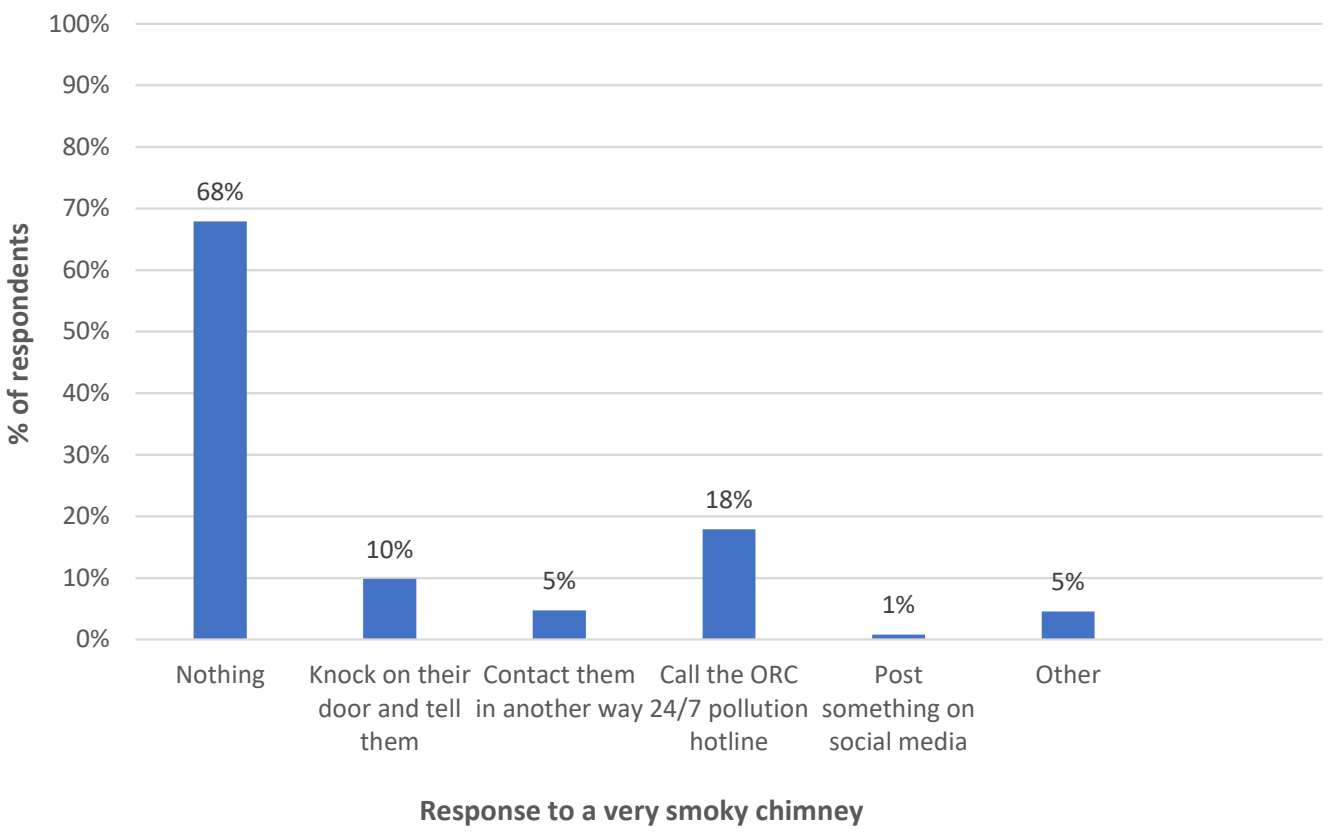


Figure 7. Responses to Question 9 "What would you do if you saw a very smoky chimney in your neighbourhood?" (n = 508). Respondents could select all the options they agreed with.

[4] Wilton, E. (2023) Air quality management in Otago: an evaluation of management options to achieve air quality targets for PM_{10} and $PM_{2.5}$ in Arrowtown, Clyde, Cromwell, Milton and Mosgiel.

3.4.3. Burning practices and knowledge

41. The 372 respondents who had a solid fuel burner and burned wood in it were asked questions about their burners and wood burning practices.

42. Respondents were asked whether they run their burner so that it emits as little smoke as possible (Question 19B). Of the 372 respondents, 84% answered 'Yes', 9% answered 'I'm not sure, I'd like more information about how to do this', and only 7% answered 'No; I know how to do this it's just not always practical.' However, when these respondents were asked how they would like to receive information on good wood burning practices, most respondents (64%) were interested in receiving the information, while only 36% answered that they were not interested. The preferred ways of receiving the information were accessing it online (56%) and an information pack delivered to their home (42%) (Figure 9).

43. In 2014 ChangeHub, on behalf of Environment Canterbury, surveyed households from Auckland, Christchurch and Otago to understand their wood burning practices. Nearly all respondents to the ChangeHub survey claimed not to have a smoky chimney or not to know. Among Otago respondents, 60% strongly agreed that they run their wood burners very well and only 35% were interested in knowing how to run their wood burner as efficiently as possible.[5] The results of this survey are similar in that most respondents claimed to run their burner as efficiently as possible. However, compared to the 2014 ChangeHub survey, respondents were more open to receiving information about good wood burning practices.

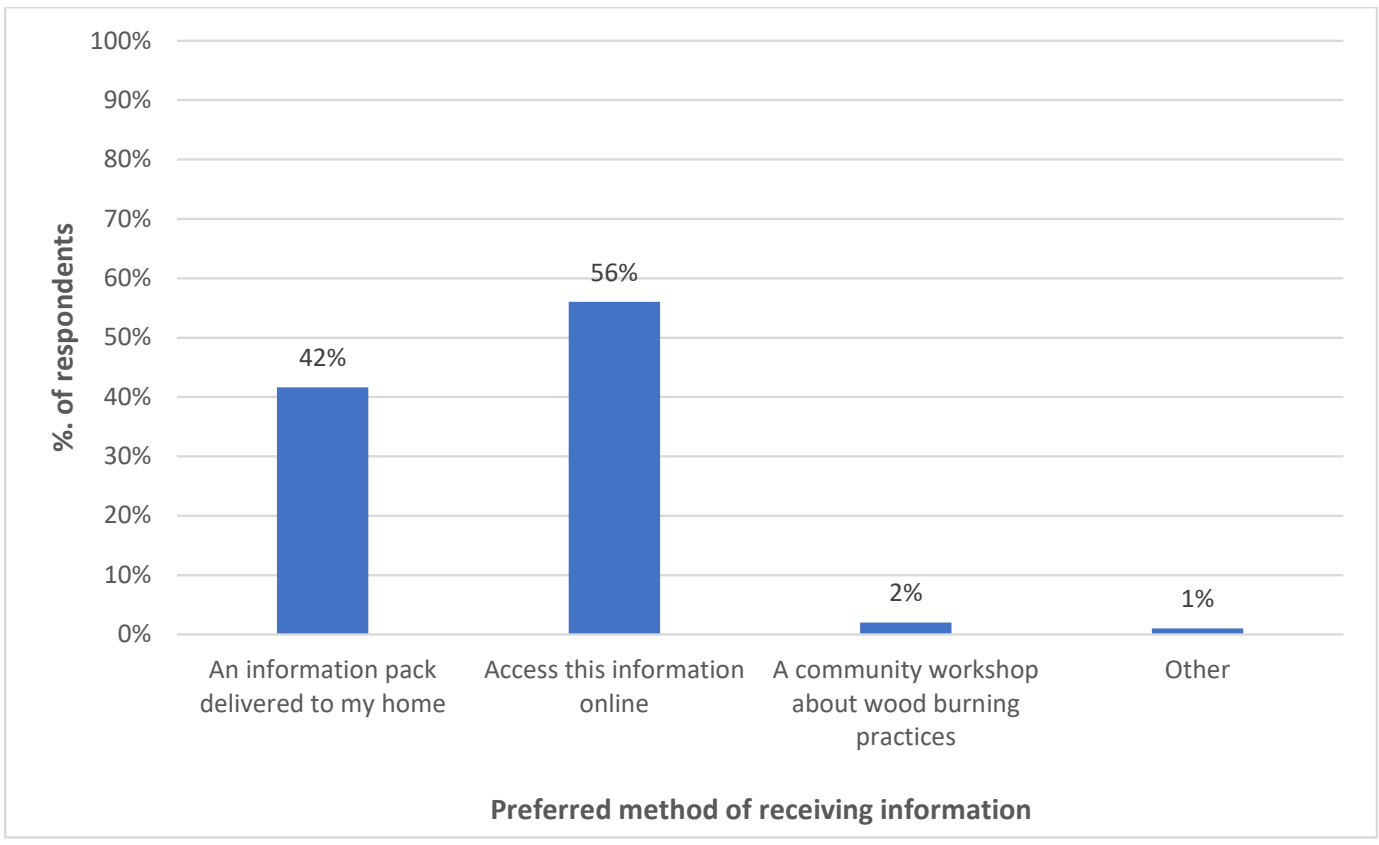


Figure 8. Responses to Question 19C 'Good wood-burning practices reduce the smoke your burner emits and makes your firewood last longer. How would you like to receive information about good wood burning practices?' (n = 372) Respondents could select all the options they agreed with.

5 ChangeHub (2015) Household Woodburner Behaviour Change Programme. Summarised in Jacobs (2024) Non-statutory approaches to managing air quality in Otago.

44. The 372 respondents who used wood in their solid fuel burner were asked if they had an ULEB. 31% answered 'Yes', 44% answered 'No' and 25% did not know. The 256 respondents who did not have an ULEB or did not know were then asked when their burner was installed (Table 6).

45. The first ULEBs were authorised between 2014 and 2016, so all respondents who said they had an ULEB can be assumed to have a burner installed from 2014 onwards. Therefore, around three-quarters of respondents had a burner that they thought was installed 20 years ago or less There were 40 respondents (11%) who did not know whether their burner was an ULEB or when it was installed (Table 6).

46. Given a significant number of people may not know much about the type and age of their burner, so it could be valuable to promote awareness of how to access this information. If a burner has been legally installed, territorial authorities usually hold information about the type of burner and when it was installed.

Table 6. *Responses Question 21 'When was your burner installed?', along with the number of respondents who said they had an ULEB (as they did not answer Question 21). The percentage column shows the number of respondents as a percentage of respondents who used wood in their solid fuel burner (n = 372).*

	No. of respondents	% of respondents
ULEB	53	31%
Before 2005	53	14%
2005–2015	76	20%
2016–2020	42	11%
After 2020	45	12%
I don't know	40	11%

3.4.4. Barriers to change

47. The 256 respondents who did not have an ULEB or did not know were asked if there are any barriers preventing them from replacing their current burner with a lower-emitting heat source. Question 22 was 'Is anything stopping you from buying a ULEB?' and Question 23 was 'Is anything stopping you from relying only on a heat pump and not using a burner?' Respondents could select all the options they agreed with (Table 7, Table 8).

48. Cost was the standout barrier to buying an ULEB; it was the only barrier selected by more than half of respondents (61%). However, this does not necessarily mean the majority of respondents would require financial support to replace their current burner with an ULEB.

49. The next most common barrier was 'I prefer my current burner' (46%), and respondents' comments suggest there were wo main reasons why respondents felt this was a barrier. Some simply did not want to replace their current burner while it still functioned well; this is unsurprising, considering the survey results indicate that most respondents had a burner that was installed no more than 20 years ago. Others were concerned that an ULEB would not have the features they liked in their current burner, such as wetback and the ability to burn overnight. Although there are fewer ULEB models with these capabilities compared to other burners, they

are available.[6] This, combined with 17% of respondents selecting 'I don't know enough about them' as a barrier, suggests that promoting awareness of the different types and capabilities of ULEBs could be valuable.

50. Inconvenience of renovation and complexity of the building consent process were both selected by 30% of respondents. Allowing secondary technology (devices that scrub emissions after combustion) such as chimney filters could help to address these barriers. Some chimney filters can reduce the emissions of certain wood burners[7] so that they are equivalent to those of an ULEB. These filters cost a similar amount to some ULEBs,[8] but they may be a preferable option for people who want to avoid replacing their current burner.

51. The results also indicate that it could be valuable for ORC to work with territorial authorities to make the process of replacing solid fuel burners less daunting—for instance, by providing guidance on solid fuel burner replacement and covering the cost of building consent.

Table 7. Percentage of respondents (n = 254) who selected each option for Question 22 'Is anything stopping you from buying a ULEB?'. Respondents could select all the options they agreed with.

Barrier	No. of respondents (%)
Cost	61%
I prefer my current burner	46%
Inconvenience of renovation	30%
Complexity of the building consent process	30%
I don't know enough about them	17%
Not owning my own home	7%
Other	11%
Nothing, I intend to buy one	1%

52. Cost was also the most common barrier to relying on a heat pump, but in this case, it was cost of electricity. In contrast, only 23% of respondents chose 'cost of installation' as a barrier.

53. The other barriers listed were all selected by more than half of respondents, suggesting that while cost may be the single biggest barrier to installing a ULEB, there are a range of concerns that present significant barriers to relying solely on a heat pump. This aligns with the responses to Question 10, where many respondents commented that they believe burners are necessary in cold climates because of the cost and reliability of electricity and because they are more effective at heating in cold temperatures.

6 Wilton, E (2020) Evaluation of technologies for reducing particulate emissions in Otago Airsheds.

7 Only if they are installed on a wood burner that meets the emissions and efficiency standards required by the National Environmental Standards for Air Quality: particulate matter emissions of no more than 1.5 g/kg and 65% thermal efficiency.

8 Wilton, E (2020) Evaluation of technologies for reducing particulate emissions in Otago Airsheds.

Table 8. Percentage of respondents (n = 256) who selected each option for Question 23 'Is anything stopping you from relying only on a heat pump and not using a burner'. Respondents could select all the options they agreed with.

Barrier	No. of respondents (%)
Cost of electricity	71%
I think a burner provides more heat	63%
Reliability of heat pumps in cold temperatures	60%
Reliability of electricity supply	57%
I prefer the ambience/cosiness of a fire	52%
Cost of installation	23%
Other	7%
Nothing, I intend to use only a heat pump in the future	2%

3.5. Outdoor burning

54. The approaches to managing outdoor burning supported by less than half of respondents were bans on outdoor burning (over winter or on properties smaller than 2 ha) and establishing a particulate matter limit at properties boundaries. As with home heating, the most popular options were non-regulatory (Table 9).

55. However, both the approaches involving bans were still supported by a significant minority of respondents, and just as many supported the option of banning outdoor burning on properties smaller than 2 ha as did not support it (42%).

56. Themes in the comments of respondents who were supportive of stronger rules for outdoor burning were the belief that outdoor burning is used when it is not necessary, alternatives are under-utilised, and that outdoor burning has a noticeable impact on nearby areas—especially on still winter days. Respondents also expressed the view that there are fewer controls on outdoor burning compared to solid fuel burners, and that this should be changed (Figure 9). Some respondents were more concerned about large scale burning undertaken as part of rural land management (e.g. land clearance, large burn piles of green waste) while others were more concerned about noxious and dangerous discharges from burning of rubbish.

Table 9. Respondents' level of support for approaches to managing outdoor burning (Question 11). 'Supportive' respondents rated an approach 4 or 5, while those 'not supportive' rated it 1 or 2. 'Neutral' respondents rated an approach 3. For each option, the highest percentage is bolded.

Approach	% Supportive	% Not supportive	% Neutral
Prevent outdoor burning during winter months (n=506)	**45%**	38%	16%
Require smoke management plans for large-scale/long-lasting outdoor burning (n=506)	**59%**	26%	15%
Prevent outdoor burning on properties smaller than 2 ha (n=506)	**42%**	**42%**	16%
Require alternatives to outdoor burning where practicable (n=506)	**55%**	29%	16%
Education programmes about the role of outdoor burning and smoke management (n=507)	**65%**	21%	14%
Liaise with city/district councils to make sure they have adequate waste collection services (n=507)	**66%**	20%	14%
Establish a particulate matter limit for outdoor burning at property boundaries (n=505)	**47%**	38%	15%

"I see this as the main issue as most winter days there are large burn offs, most with black smoke, filling the town with a horrible haze. There is no need for burn offs, mulching, composting, reusing materials, green waste options. People need to heat their homes, they don't have to burn off wet green waste and goodness knows what other rubbish in their piles. Compliance needs to start here."

"Current rules for outdoor burning are completely inadequate. Smoke pollution from outdoor burning is significant and atrocious at times, particularly on inversion layer days. I disagree with the contrary rules between urban and rural areas.

"I do think toxic burn offs close to towns are bad for our heath as it's usually during the warmer months when you are sitting outside or want to have your windows open. Smelling burning plastic and toxic things is not nice."

***Figure 9.** Examples of comments from respondents who supported stronger rules for outdoor burning.*

57. Most respondents who did not support bans on outdoor burning emphasised its role as a rural land management and green waste disposal tool. One key concern was that limiting outdoor burning over winter would result in increased fire risk if these burns then took place in warmer months. Another concern about winter bans specifically was that this could have the effect of a total ban on outdoor burning, given it is usually prohibited or restricted over warmer months by Fire and Emergency New Zealand. Some respondents were more concerned about the cost of alternative disposal methods, including for household rubbish—although outdoor burning of household rubbish is already prohibited under the current Plan (Figure 10).

58. The concerns outlined above likely contributed to the greater support for non-regulatory options, which encourage better practices but avoid the risk of people not being able to burn when they need to. Some respondents commented that they thought people would be more likely to change their behaviour if approaches such as education on best practice and reduced disposal costs were used (Figure 10).

59. An outdoor burning topic that did not appear in the survey results but was discussed in multiple drop-in sessions was agricultural wrap burning. One rural attendee mentioned that they recycled their bale wrap, and that this is required for certain industry certifications such as the New Zealand Farm Assurance Programme. Another rural contractor emailed ORC to request banning of bale wrap burning, noting that this has been done in Southland. However, all drop-in session attendees who discussed agricultural wrap burning also noted that recycling it is a more time consuming and costly option.

"Burning in winter during an inversion layer is dumb. However, we can't burn in summer, so it would leave a narrow burn season. Worth considering though. It is about managing the burn off emissions when they make the least environmental impact. This takes a mind shift. I would be concerned if farmers weren't allowed to burn the hill country and it got rank feed on it which fuelled a summer fire. It would burn everything in its way, including houses, creating massive emissions."

"Going to the dump is so expensive when you can just burn at home. More convenient to light a match then try find a trailer and load things up."

"High country burnoffs can have a significant effect on air quality. Again, these have their place but maybe there's a place for discussions with the station owners about how to best manage these to minimise effects."

Figure 10. *Examples of comments from respondents who opposed bans on outdoor burning.*

3.6. Vehicle emissions

60. The only approach to managing vehicle emissions that was supported by more than half of respondents across Otago was improving public transport. The other approaches had the support of less than half of respondents and more than one third were not supportive (Table 8).

61. Respondents from Dunedin City District and Queenstown Lakes were more supportive of all the approaches. This was likely because these districts contain the most populated urban areas in Otago (Dunedin and Queenstown), which have greater volumes of traffic as well as public transport. All the options for managing vehicle emissions were supported by more than half of respondents from these districts, although improving public transport was still the most popular one, supported by almost 70% of respondents.

Table 10. Respondents' level of support for approaches to managing vehicle emissions (Question 12). 'Supportive' respondents rated an approach 4 or 5, while those 'not supportive' rated it 1 or 2. 'Neutral' respondents rated an approach 3. For each option, the highest percentage is bolded.

Approach	% Supportive	% Not supportive	% Neutral
Policies that recognise the effects of nitrogen dioxide emissions and focus on reducing them (n=506)	**43%**	36%	21%
Improve public transport to reduce reliance on private vehicles (n=508)	**58%**	28%	14%
Decarbonise ORC's fleet vehicles and buses (n=507)	**45%**	34%	21%
Joint education campaigns with city/district councils (n=507)	**47%**	34%	19%
Work with other organisations to reduce vehicle emissions (n=508)	**48%**	34%	18%

62. Respondents' comments suggest that improving public transport may have been considered the best value for money. It is already part of ORC's work programme and provides co-benefits such as reduced carbon emissions and greater transport choices.

63. The most common theme among respondents' comments was that most of the options were not worth the cost to ratepayers because they would have little impact on vehicle emissions and/or because they did not think managing vehicle emissions was ORC's responsibility. Additionally, many respondents were from smaller towns with little or no public transport, and where alternatives to cars are less likely to be viable in the foreseeable future.

64. Regarding decarbonising ORC's fleet vehicles and buses, respondents' comments indicated there was more support for electric buses than fleet vehicles. Some respondents thought that ORC should set an example and demonstrate the benefits of electric vehicles, while others were concerned that this would be a cost to ratepayers but would not improve air quality (Figure 11).

It is not your business to get people out of cars and onto bikes. However it is your job to take responsibility for public transport. Get trains to Mosgiel, impove the bus service. It is unusable to get around Dunedin. Tbe buses dont go often enough and dont get to where people live.

"We don't have any public transport in our area & it doesn't seem likely we will in the near future, so the options on survey are not really relevant for us."

"I wouldn't agree with rate payers funding the changeover in vehicles but agree with it being a great idea in principle to change the fleet of ORC's vehicles.

"Do NOT waste money on education campaign or more policy rubbish. Just clean up your fleet and provide public transport. If public transport is cheaper than running a vehicle, people will eventually use it."

Figure 11. *Examples of respondent comments about managing vehicle emissions.*

3.7. Industrial emissions, odour, dust and agricultural spraying

65. The suggested approaches to managing industrial emissions, odour, dust and agricultural spraying generally received less opposition compared to those for home heating, outdoor burning and vehicle emissions. More respondents were neutral and supportive. No approaches stood out as particularly popular; they were all supported by 50%–60% of respondents (Table 10).

Table 11. *Respondents' level of support for approaches to managing industrial emissions, odour, dust and agricultural spraying (Question 13). 'Supportive' respondents rated an approach 4 or 5, while those 'not supportive' rated it 1 or 2. 'Neutral' respondents rated an approach 3. For each option, the highest percentage is bolded.*

Approach	% Supportive	% Not supportive	% Neutral
Require that dust and odour from permitted industrial and trade activities don't leave the site (n=506)	**58%**	19%	23%
Require discharge permit applicants to use the best practicable option to minimise impacts on air quality (n=506)	**60%**	19%	21%
Define adequate setbacks or buffer zones to minimise the adverse effects of new activities on air quality (n=505)	**59%**	22%	19%
Require discharge permit applicants to provide dust or odour management plans (n=506)	**58%**	21%	21%
Provide information about FIDOL assessments[9] to complainants and emitters(n=505)	**57%**	20%	23%
Strengthen existing rules for agricultural spraying (n=506)	**50%**	27%	23%

66. Unlike the options for managing the other air quality issues, the options for managing industrial emissions, odour, dust and agricultural spraying would only directly impact a minority of respondents. This may have contributed to the higher numbers of both neutral and supportive responses. Additionally, some respondents commented that they didn't know enough about these issues or the management options, which is also likely to have contributed to the higher number of neutral responses (Figure 12).

"Industry causes more pollution than the individual."

"Focus on irresponsible business and farmers. Residents can't take any more cost Burden … we are literally breaking under the weight."

Figure 12. *Examples of comments from respondents who supported the suggested options for industrial emissions, odour, dust and agricultural spraying.*

[9] FIDOL (frequency, intensity, duration, offensiveness, location) factors are the standard criteria used in New Zealand to assess whether a discharge to air is having offensive or objectionable effects.

67. The most common theme among the comments on these management options was the importance of not over-regulating. Respondents often commented that they were supportive of the suggested options in principle but were concerned about the risk of discouraging commercial activities and about costs being passed on to consumers (Figure 13).

"It is very unrealistic for anyone to buy a rural property and expect peace and quiet. The reality of living amongst the industries that actually generate economy is that they require energy and effort, be that an engine of a tractor or a wind machine. They are already operating to very tight regulations to reduce emissions and control drift."

"The above is all well and good but we need to encourage new industries to the area and support existing industries. There needs to be a balance and not too onerous that prevents progress."

"I agree with strengthen existing rules for agrichemical spraying but to what extent is the important issue, yes there needs to be control but there needs to be a practical set of rules that can be followed without impeding the actual job from being done or requiring a level of compliance box ticking that becomes cost prohibitive and essentially time wasting to those that are involved in agrichemical spraying."

Figure 13. *Examples of comments from respondents concerned about over-regulation of commercial activities.*

68. Only 12% of respondents selected agrichemical spraying as a main source of air pollution in Otago, and accordingly, there were few comments on this issue. However, a community member did email ORC staff about an agrichemical spray drift incident they had experienced. This involved helicopter spraying over a nearby rural property on Otago Peninsula, and increasing wind speeds resulting in spray drift. This was a particular concern for the community member, as their domestic water supply was from rooftop tanks and they also kept bees. They suggested neighbours should be notified before this type of spraying occurs, so that they can make any necessary preparations (Figure 14).

"What I want to see is a simple notification of neighbours via a letterbox drop with a number to call if any issues and advice re disconnecting the water supply if applicable. We could have prepared for it but by the time we realised what was happening - it was too late."

Given there are 20,000 domestic self suppliers [of water] within Dunedin city boundaries this is very relevant and given we value our biodiversity highly and how important bees are in pollination."

Figure 14. *Excerpt of an email from a community member about agrichemical spray drift.*

3.8. Overall support for air quality management approaches

69. The overall level of support for the suggested approaches to air quality management varied between districts. Respondents from Queenstown Lakes and Dunedin City District tended to be the most supportive; almost all the suggested approaches were supported by more than half of respondents from these districts. Respondents from the other districts tended to be comparatively less supportive (Figure 15).

70. This general pattern was reflected across all the air quality issues: home heating, outdoor burning, vehicle emissions and industry, odour, dust and agrichemical spraying. Although most respondents from Central Otago were from urban areas with poor air quality (Alexandra, Cromwell and Clyde), they tended to be less supportive of air quality interventions, particularly those involving more stringent regulation. Respondents from Central Otago were also less likely to think that air quality was a problem where they lived. This suggests that although Central Otago is a priority area for intervention on air quality, achieving community support for this may be more challenging.

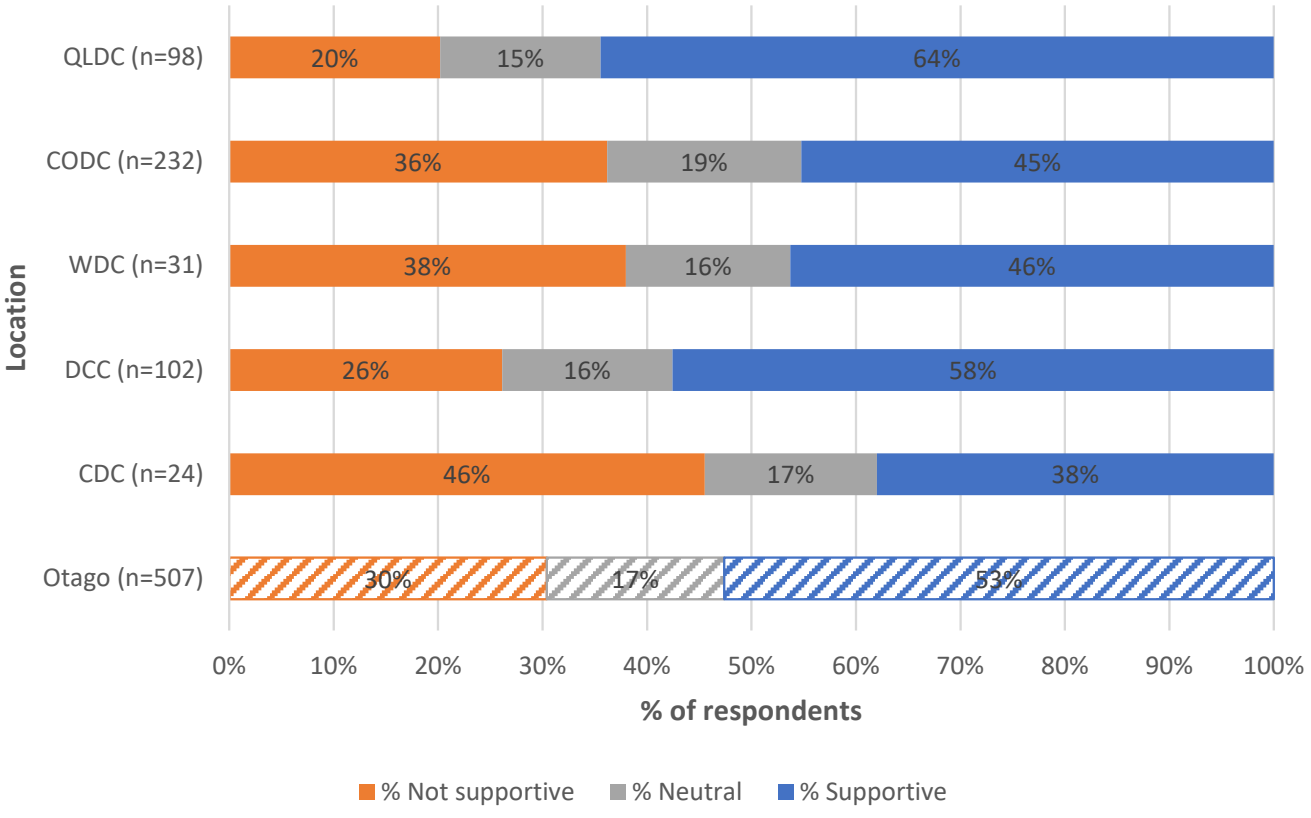


Figure 15. Respondents' overall level of support for approaches to air quality management across Otago and by district: Clutha (CDC), Dunedin (DCC), Waitaki (WDC), Central Otago (CODC) and Queenstown-Lakes (QLDC) (Questions 10–13). 'Supportive' respondents rated an approach 4 or 5, while those 'not supportive' rated it 1 or 2. 'Neutral' respondents rated an approach 3.

4. Stakeholder feedback summary

71. This section briefly summarises the stakeholder feedback received through the 2024 engagement process. Discussion with key stakeholders will continue during the drafting of the new Strategy and Plan.

4.1. Community stakeholders

72. In general, community stakeholders were most interested in the issue of home heating and thought that ORC's current approach to managing it is not sufficient to improve air quality. However, although they tended to support restrictions on solid fuel burners, they also emphasised the need for non-regulatory support to prevent regulations from having unintended consequences such as colder homes. Non-regulatory measures mentioned by stakeholders included:

    - Financial support to help households transition to alternative heating sources and potentially for other home improvements such as insulation.

73. Education programmes about good burning practices, burner maintenance, ways to keep homes warm and dry (e.g. insulation, curtains and extractor fans) and the impact of home heating.

4.2. Primary industry stakeholders

74. Primary industry stakeholders discussed the issues of outdoor burning, agrichemical spraying and fertilisers and home heating.

75. There were varying views on additional restrictions on outdoor burning. Some stakeholders opposed any changes from the current Plan rules on the basis that outdoor burning should not be restricted when home heating is the main contributor to particulate matter pollution. Like some community members, they highlighted the importance of outdoor burning in rural land management, expressed concern about the practicality of winter restrictions on outdoor burning, and noted that not allowing outdoor burning of agricultural wrap would be a significant change for many in rural communities. Other stakeholders were less opposed to restrictions on outdoor burning, noting that most of the suggested approaches exist in other regions, but they emphasised the importance of burning to control diseases in all situations.

76. In general, primary industry stakeholders supported agrichemical rules reflecting the industry standard, NZS 8409:2021 Management of Agrichemicals. Some thought Otago's current rules were adequate in that they referred to this standard, while others identified areas for improvement, particularly user qualifications and notification of neighbours. One stakeholder who has been involved with agrichemical management across New Zealand mentioned that lack of notification has been a key issue in other regions, with many complaints occurring simply because they were not aware large-scale spraying was going to occur on a neighbouring property. This is reflected in the experience of the community member who emailed ORC staff about agrichemical spray drift.

77. Primary industry stakeholders also mentioned reverse sensitivity[10] in relation to outdoor burning and agrichemical spraying, noting that certain discharges are anticipated in rural areas. They emphasised the importance of ensuring that regulation does not prevent essential rural activities from occurring in rural areas.

78. On the issue of home heating, primary industry stakeholders emphasised that air quality is primarily an urban issue and that wood burners are essential for resilience in rural areas, particularly in more remote places.

4.3. Industry and processing stakeholders

79. There was general interest among industry and processing stakeholders in ensuring that activities with existing resource consents have a straightforward pathway to consent renewal, and that reverse sensitivity does not present a barrier to this. Stakeholders noted that industrial activities can have significant localised adverse effects but are not significant contributors to air pollution in Otago, and regulations should reflect this. No major issues with the current framework were identified, but stakeholders noted that consideration should be given to the organisation of airsheds, considering the impact of the "polluted airshed" designation on consenting.

4.4. Territorial authorities

80. Discussion with territorial authorities was more focused on outlining ORC's process to date and understanding what territorial authorities are doing in air quality related areas such as waste disposal and building consents for solid fuel burners.

5. Limitations

81. The community feedback received through the survey, drop-in sessions and emails provides a useful insight into Otago residents' views on air quality and their levels of support for different approaches to air quality management. However, it is not representative of the Otago population, so it does not provide statistically reliable quantitative data. The relative population of different locations in Otago is not reflected in the survey sample (e.g. Central Otago represents 10% of Otago's population, but around half of the survey respondents). The results were not transformed to account for this, although splitting the results by location provided insight into how the overall results might be skewed by location. Additionally, the total number of survey respondents (510) represents less than 1% of Otago's population, and it is likely that the survey attracted respondents with strong views on air quality management (as the drop-in sessions tended to do).

[10] In the case of air discharges, reverse sensitivity can occur when a new sensitive activity is established near an existing activity that involves discharges to air. Complaints from the new activity can stifle the existing activity, or even drive it elsewhere.

6. Conclusion

82. ORC staff undertook community and stakeholder engagement on air quality management in 2024 and provided multiple avenues for feedback. Drop-in sessions were not well attended, but 510 valid responses to the survey were received. Almost half of these respondents lived in Central Otago, and around three-quarters of all respondents used solid fuel burners as a heating source.

83. Around half of survey respondents thought poor air quality was a problem where they lived at least sometimes, and the other half thought it was a problem rarely or never. 40% of respondents had changed their behaviour because of poor air quality—usually because of smoke. The most common type of behaviour change was in outdoor activity (20% of respondents).

84. Home heating and outdoor burning were the activities most often identified survey respondents as the main sources of air pollution in Otago, and were the issues most often brought up by attendees at drop-in sessions. The most popular approaches for addressing both issues were non-regulatory.

85. There was strong support for education programmes as an approach to managing air quality, particularly for home heating. 73% of survey respondents supported education on wood burner best practice and more than half of respondents who burned wood in a solid fuel burner were interested in receiving information about wood burner best practice. Additionally, the survey results suggest that some people may lack knowledge about the type and age of their own burner and about ULEBs, so education on these fronts could also be valuable.

86. A complete ban on solid fuel burners and a ban on new installations of solid fuel burners were the least popular options for addressing home heating emissions. It is likely that if they were introduced, these measures would face significant public opposition.

87. More acceptable regulatory options for managing home heating emissions (supported by more than half of survey respondents) were banning the use of coal for home heating and gradually replacing higher-emitting solid fuel burners, which were both supported by more than half of respondents. Cost was the stand-out barrier to changing from a higher-emitting burner to an ULEB, but the survey results and discussion at drop-in sessions suggest that there are a range of concerns that present significant barriers to relying solely on a heat pump. Requiring solid fuel burners to be more efficient but allowing people to continue using them would help to address some of the key concerns: the cost and reliability of electricity and the ability of heat pumps to provide sufficient heating.

88. Restrictions on outdoor burning based on property size or over winter were supported by a significant minority of respondents, but most respondents and several primary industry stakeholders were not supportive. Respondents and stakeholders who were not supportive expressed concerns about the potential unintended consequences of these measures and their and costs to farmers. However, more than half of respondents supported education around outdoor burning.

89. Feedback suggests that community members may not see vehicle emissions as something ORC should prioritise in their air quality management approach, particularly in smaller urban areas. Survey respondents' comments suggest many people are aware that ORC has limited control over vehicle emissions, and therefore any interventions are less likely to result in significant reduction

in vehicle emissions. Improving public transport was the most supported option, likely because it is an existing ORC programme with multiple co-benefits.

90. All the approaches for addressing emissions from industry, odour, dust and agricultural spraying were supported by at least half of respondents. However, a common theme in comments from respondents was support for the approaches in principle, but concern about over-regulation of commercial activities. This was broadly consistent with stakeholder feedback.

91. The survey results suggest that in general, there may be more support for air quality management interventions, including on home heating, in Dunedin City District and Queenstown Lakes. Although Central Otago's urban areas have some of the poorest air quality in Otago, achieving community support for interventions in these areas may be more challenging.

Appendix 1. List of key stakeholders

Stakeholders who provided feedback during the 2024 engagement on air quality management are listed in Table 12.

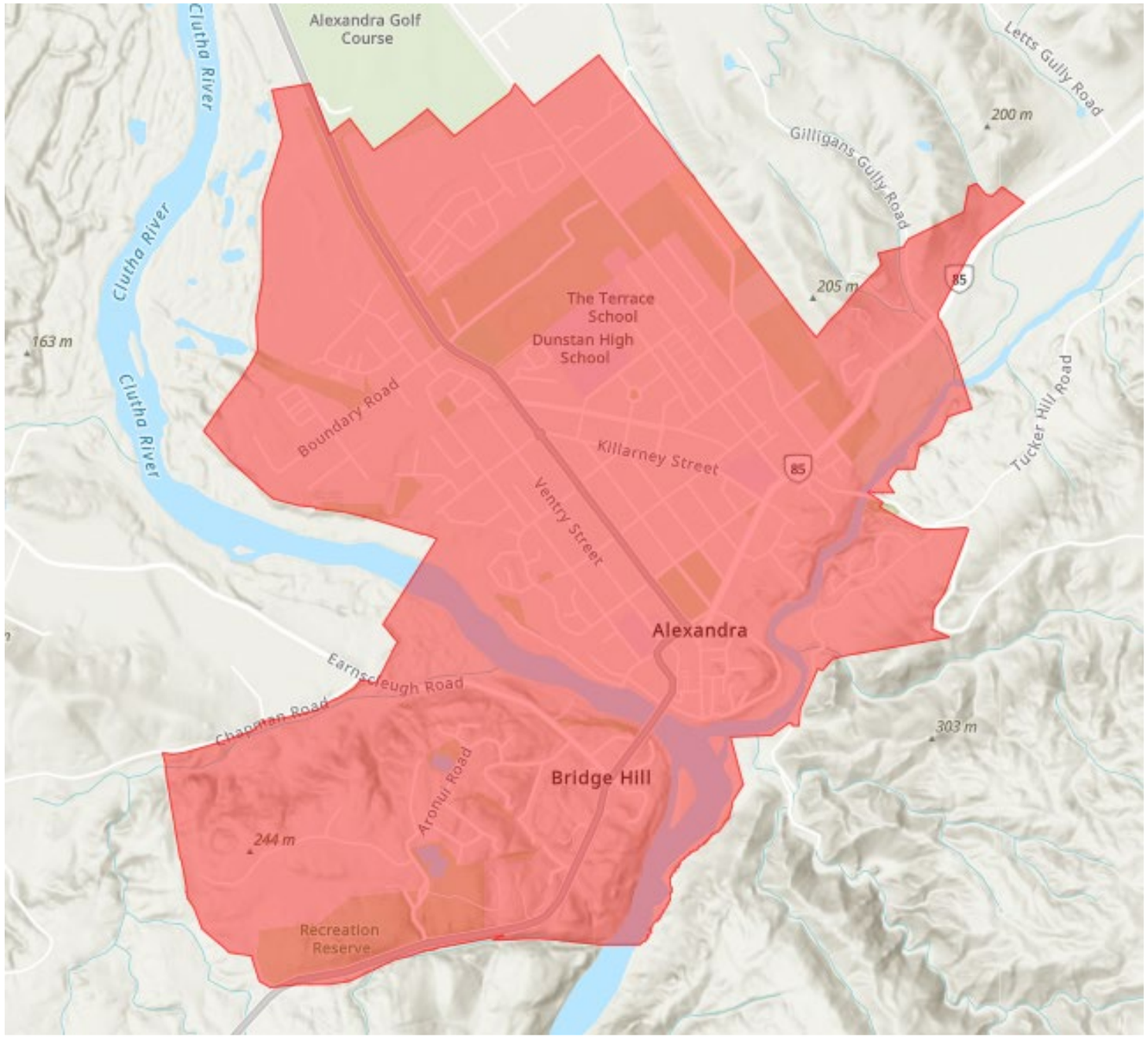
Table 12. Stakeholders who provided feedback during ORC's 2024 engagement on air quality management.

Primary industry	Federated Farmers Beef + Lamb New Zealand Horticulture New Zealand New Zealand Agricultural Aviation Association Groundspread New Zealand Growsafe Poultry Industry Association New Zealand Egg Producers Federation of New Zealand AgResearch Limited
Production and processing	Port Otago Fonterra Ravensdown Enviro NZ
Community	Southern Health Dr. Alex Macmillan Cosy Homes Trust CleanSweep Chimney Sweeps Te Pūkenga Otago Polytechnic Otago University Disabled Persons Assembly
Territorial authorities	Dunedin City Council Waitaki District Council Central Otago District Council Queenstown Lakes District Council

Appendix 2. Air quality survey 2024

Draft Air Zones

Air Zone 1 – Alexandra



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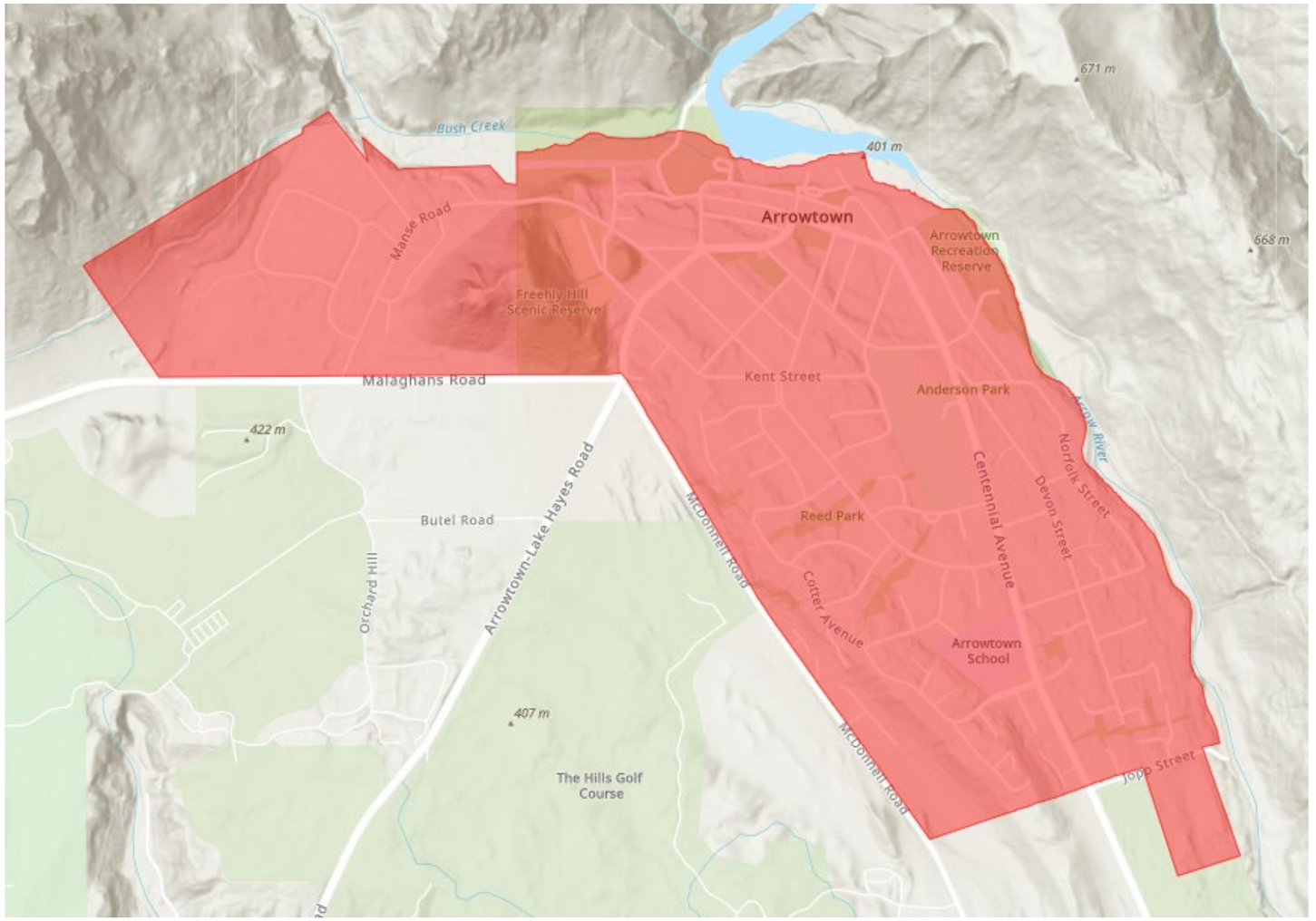

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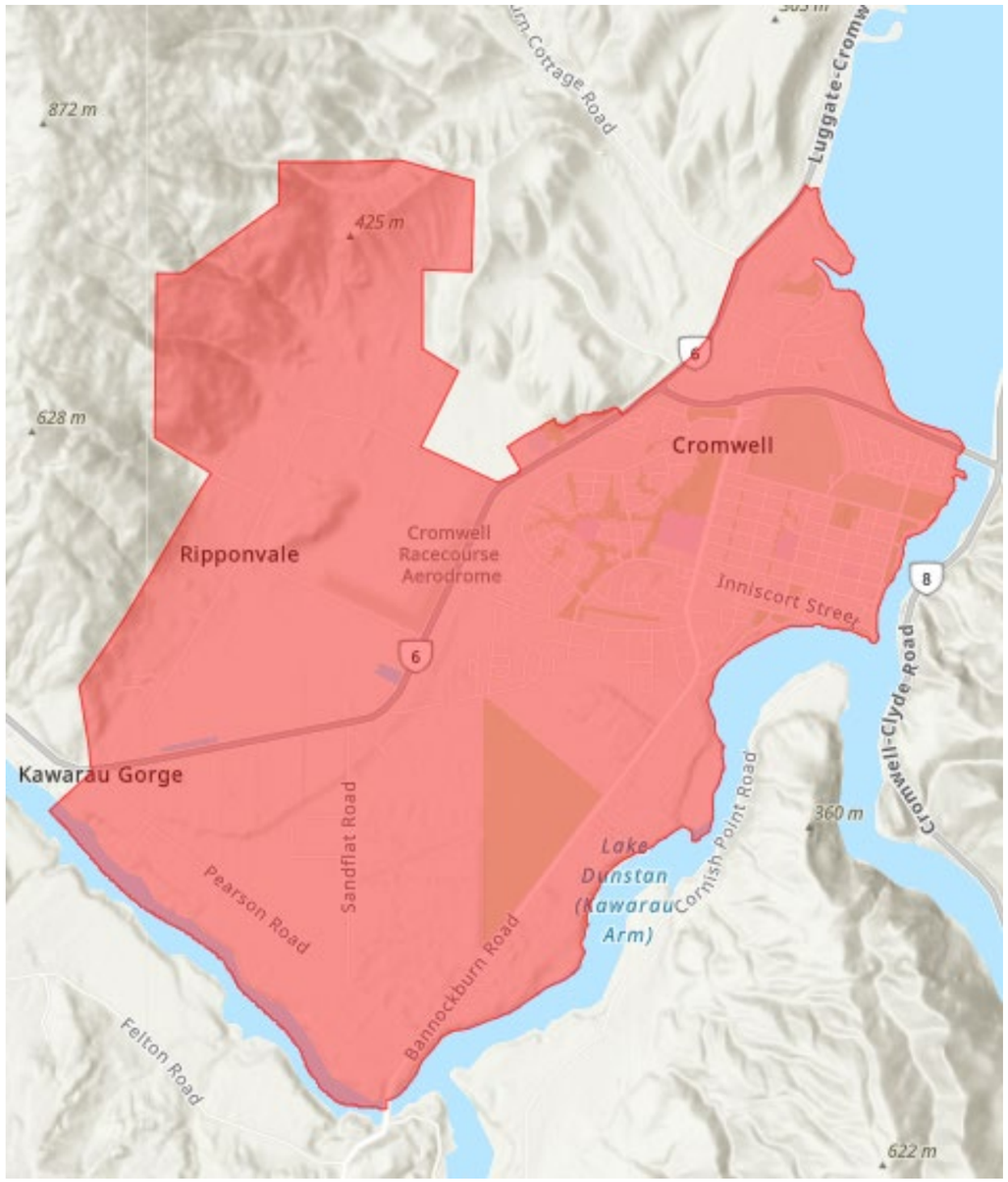
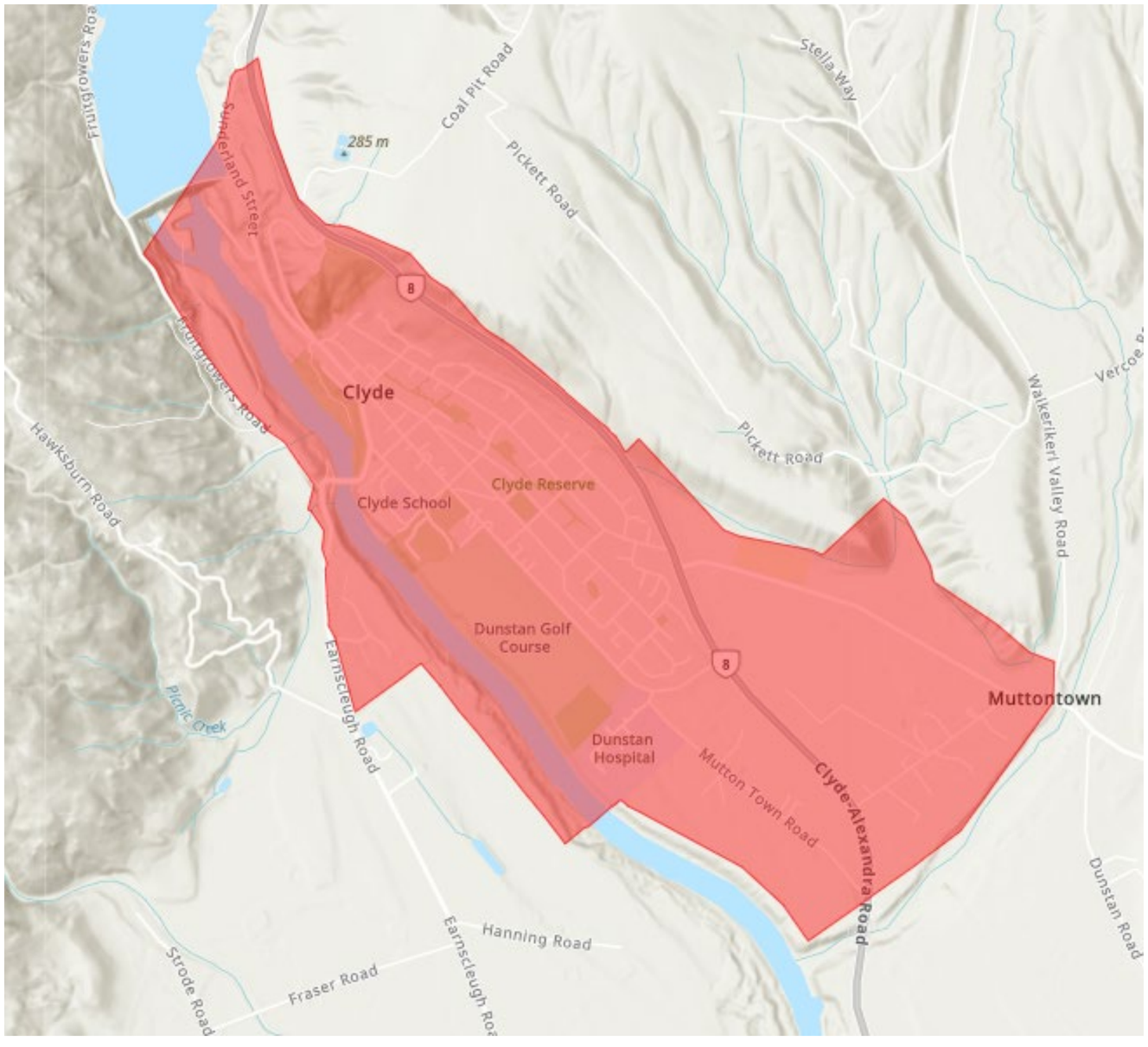
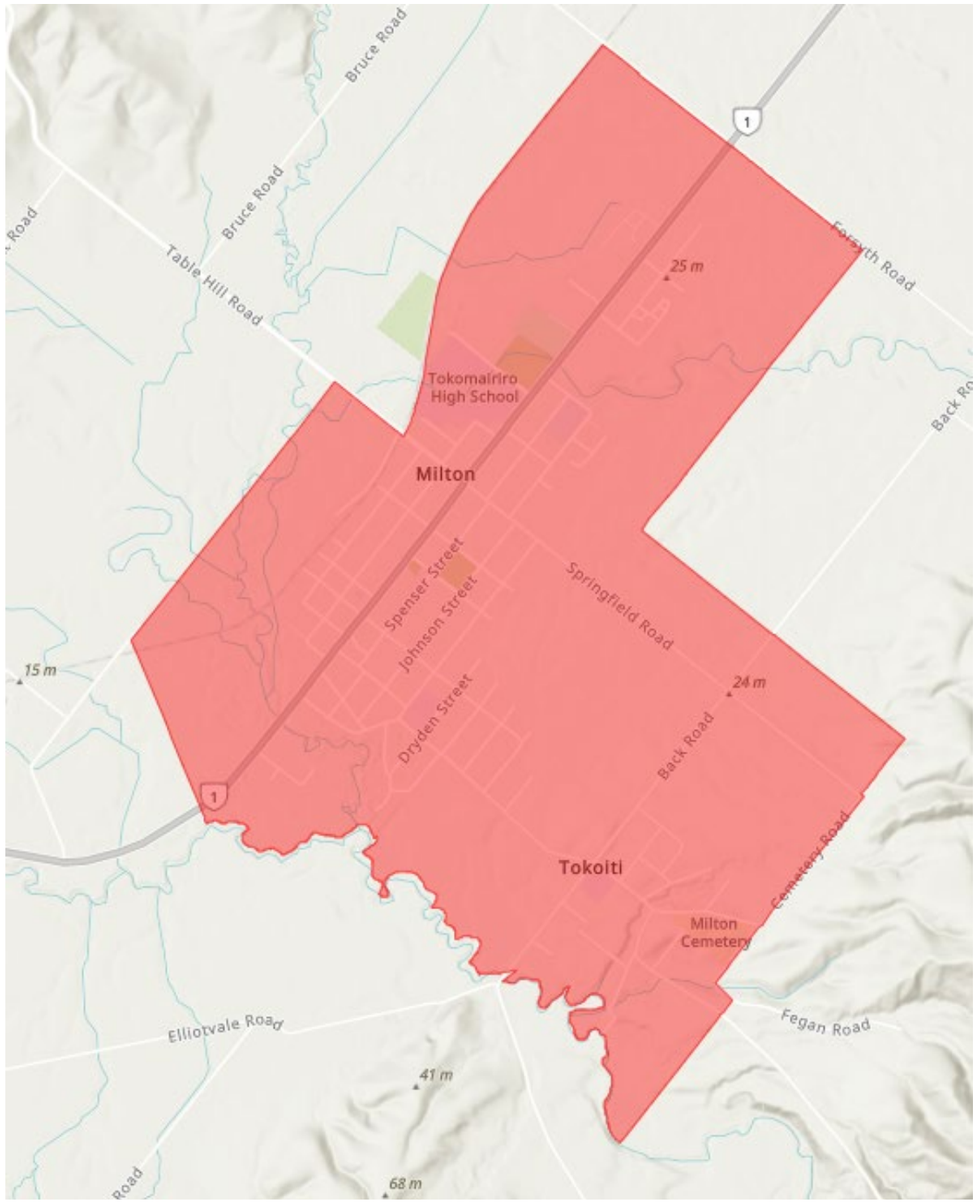


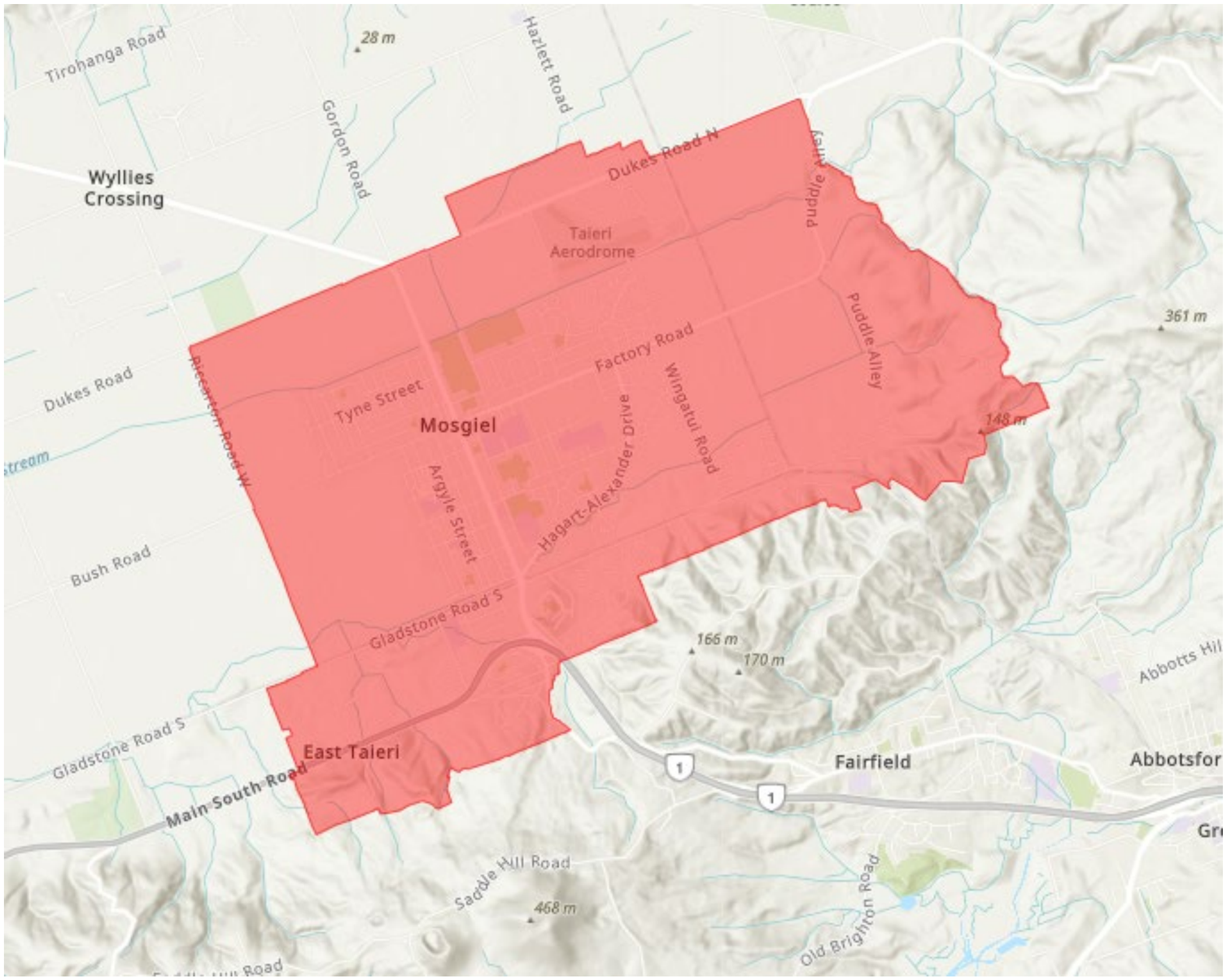
Air Zone 1 – Clyde



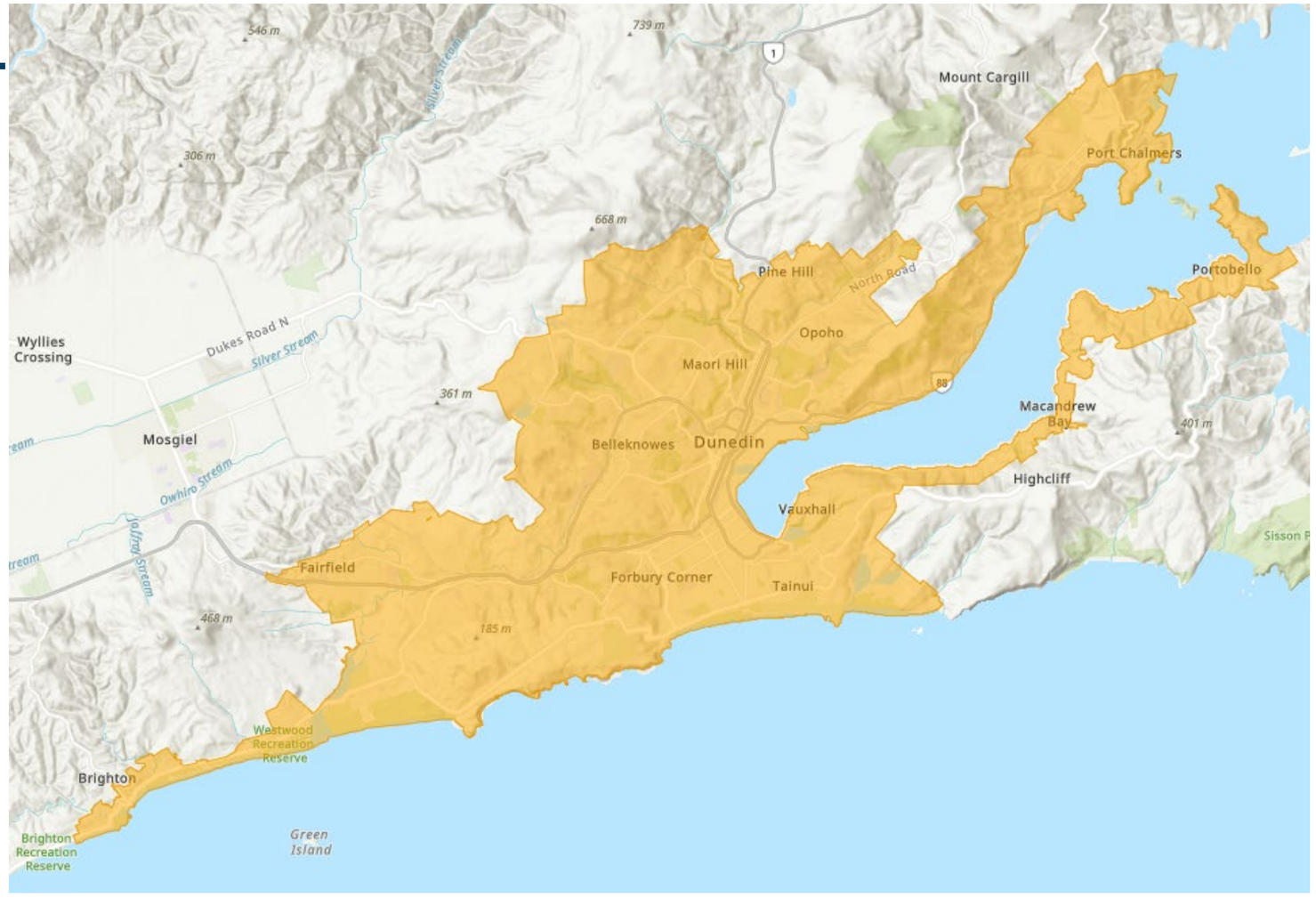
Air Zone 1 - Milton



Air Zone 1 – Mosgiel

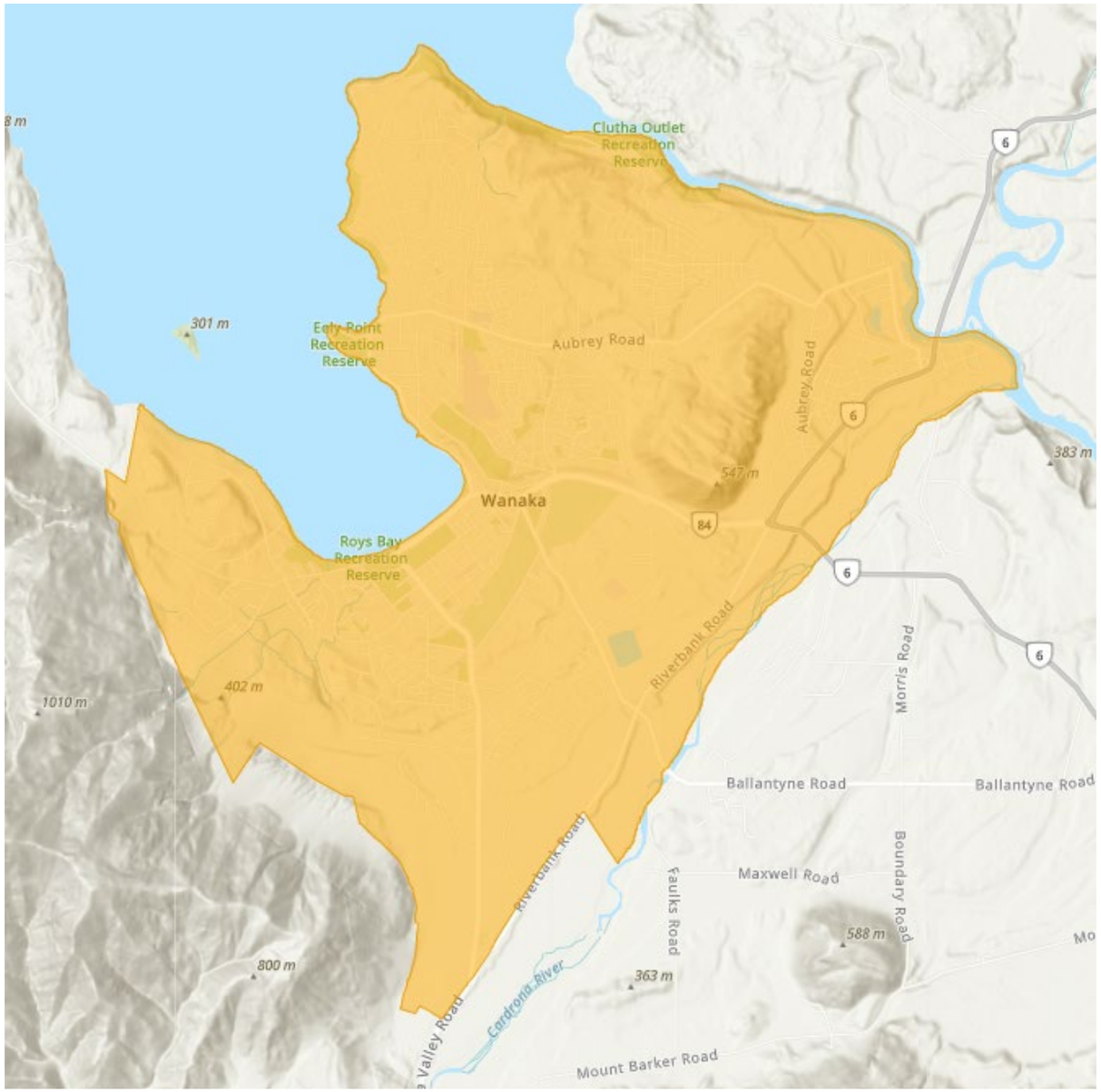


Air Zone 2 – Dunedin



Air Zone 2 – Queenstown

Air Zone 2 – Wanaka



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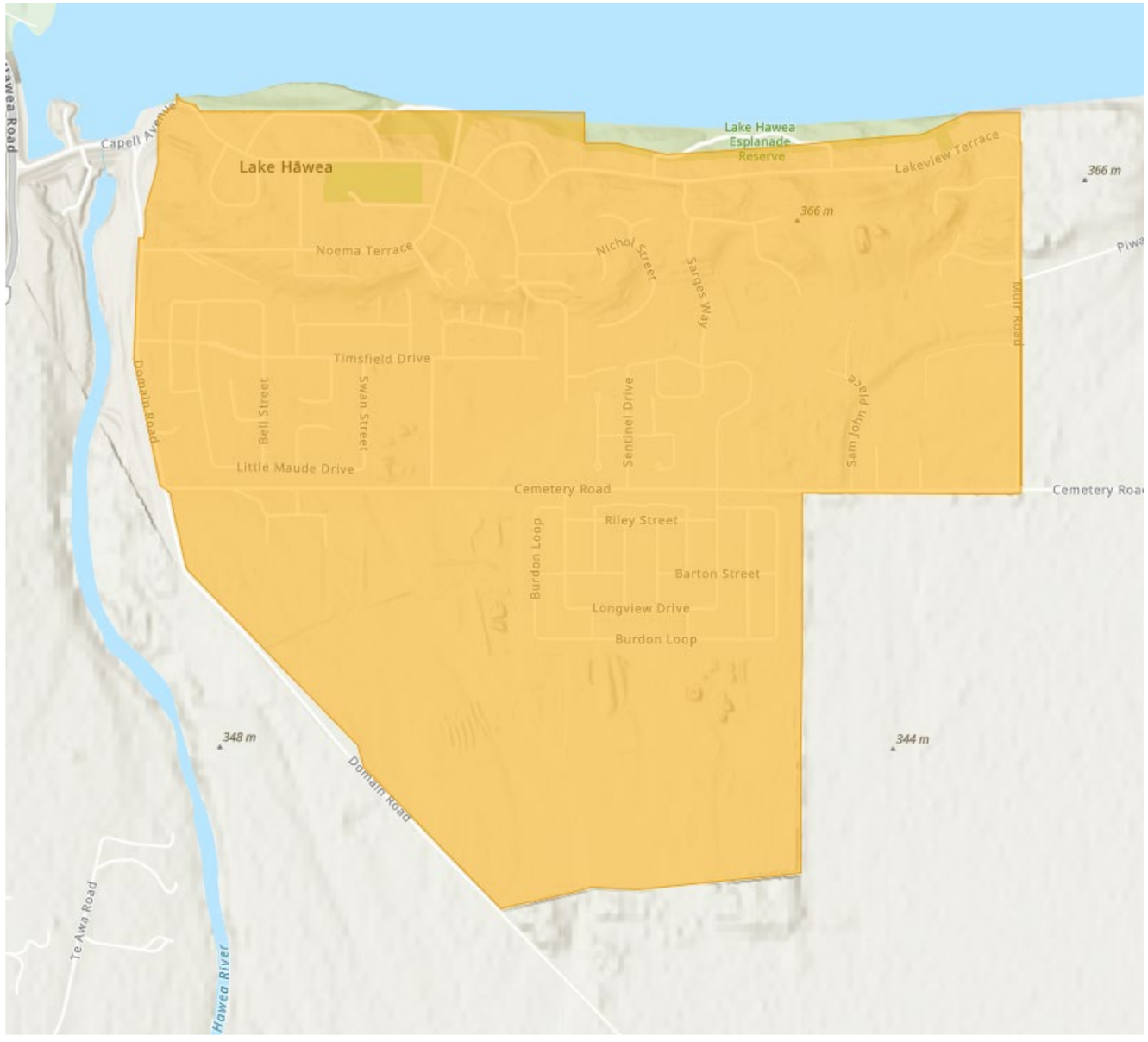

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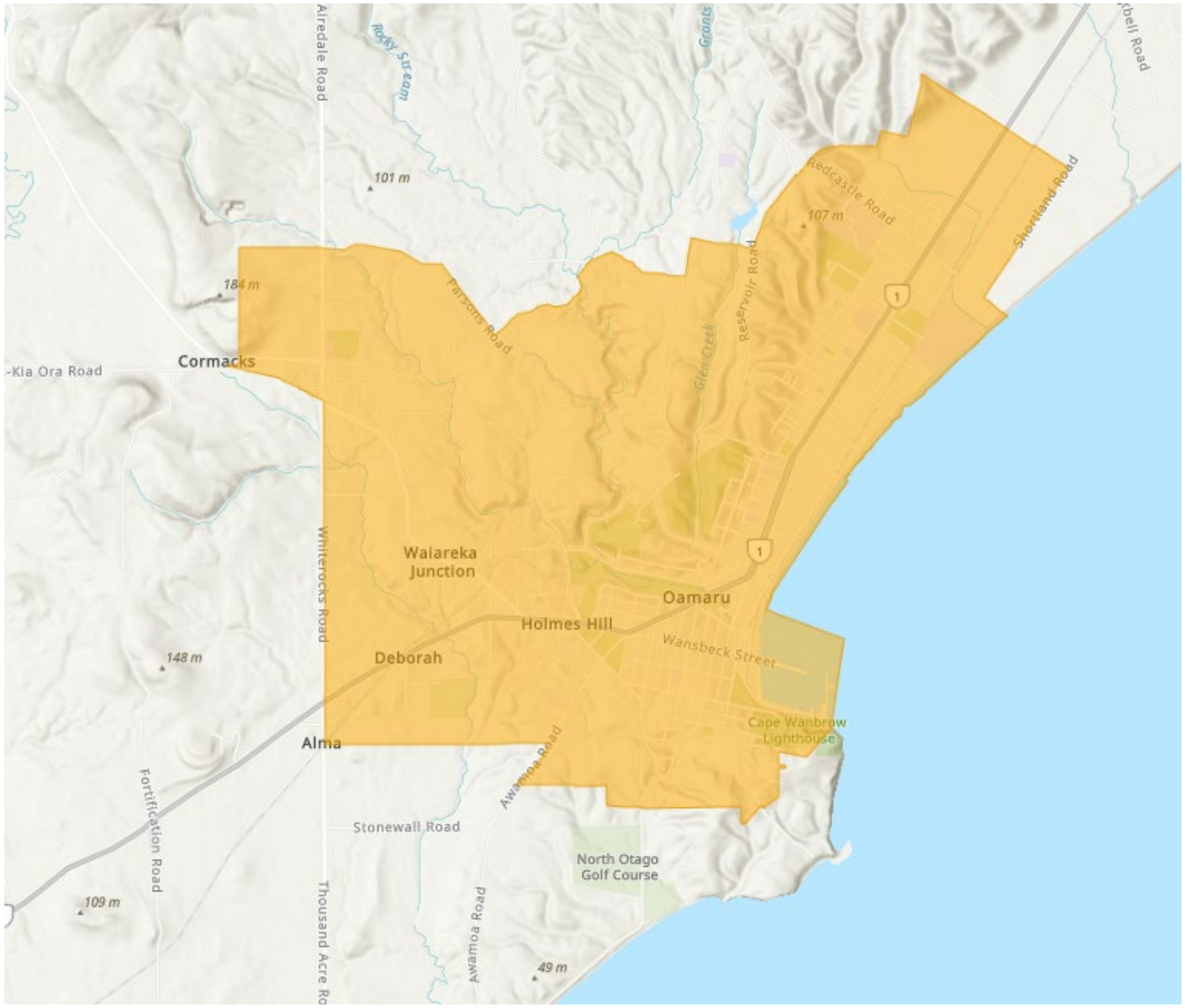

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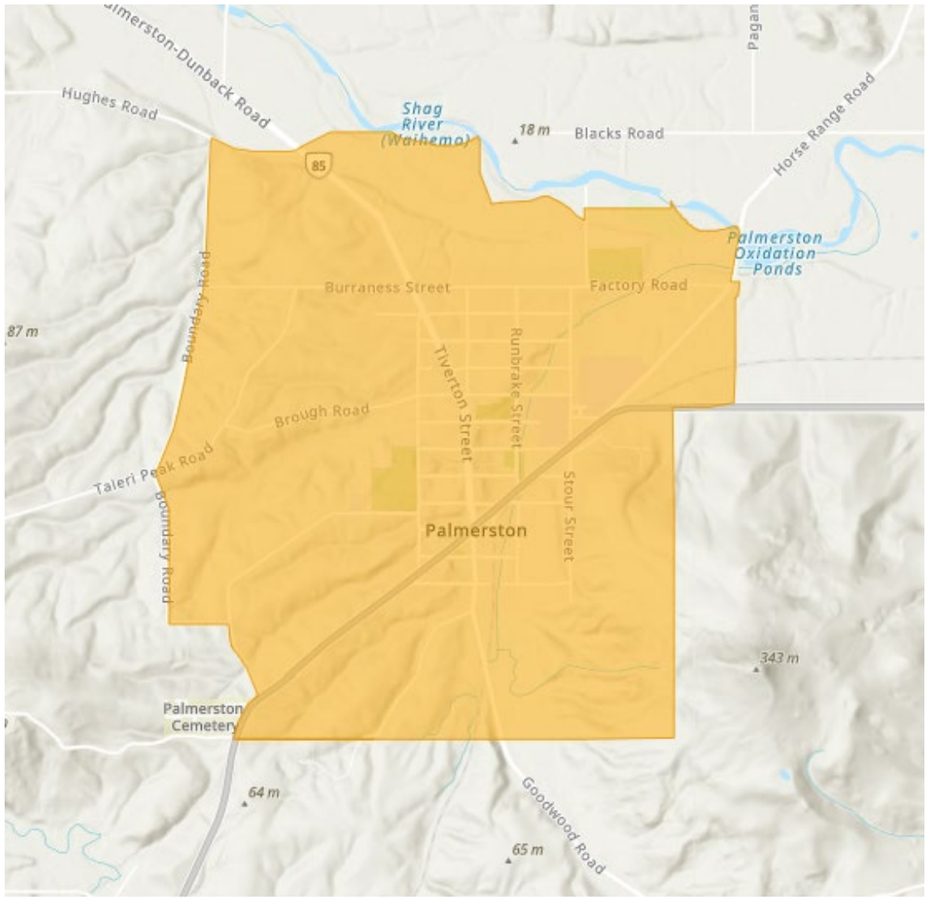
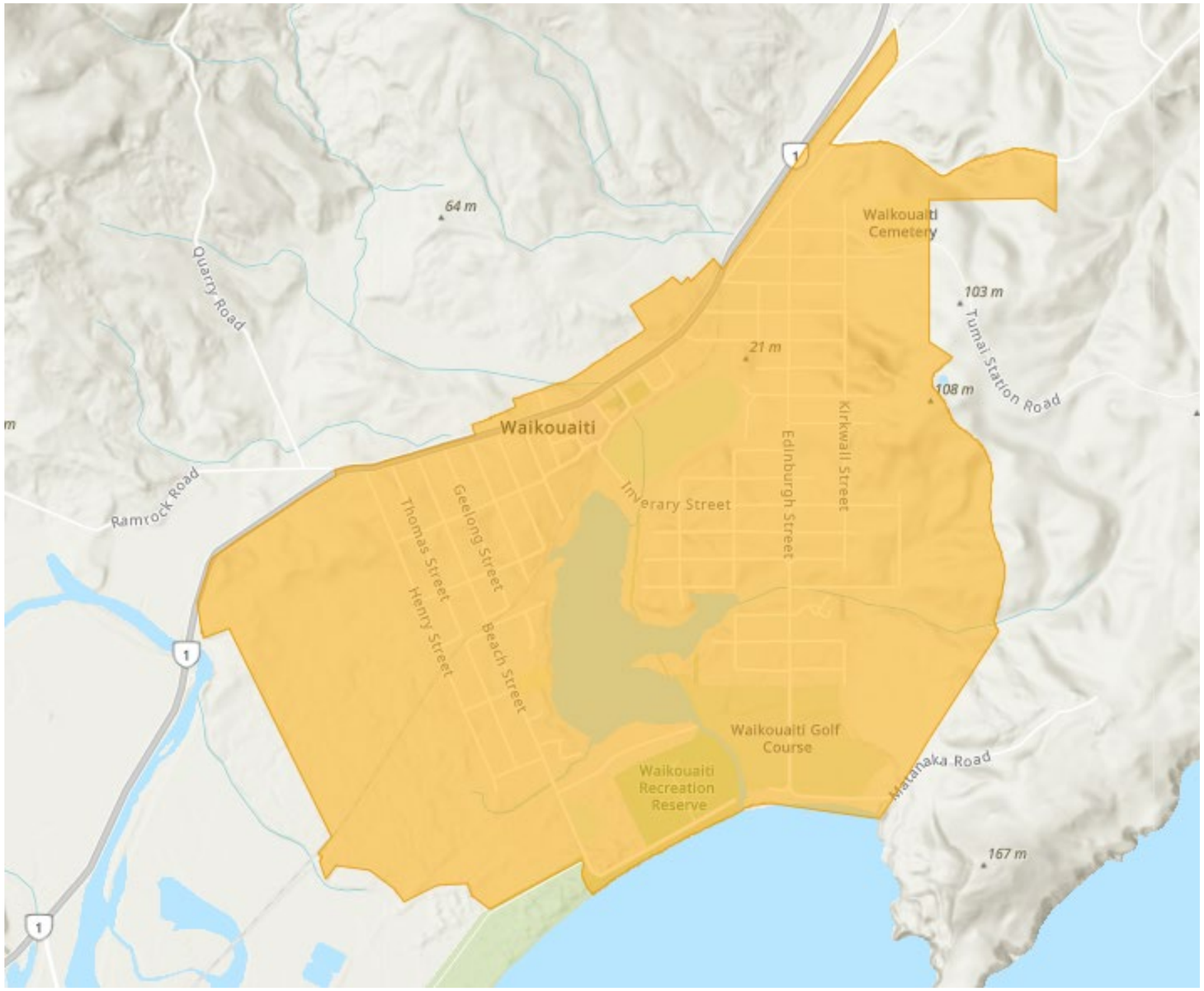


Air Zone 2 – Waikouaiti



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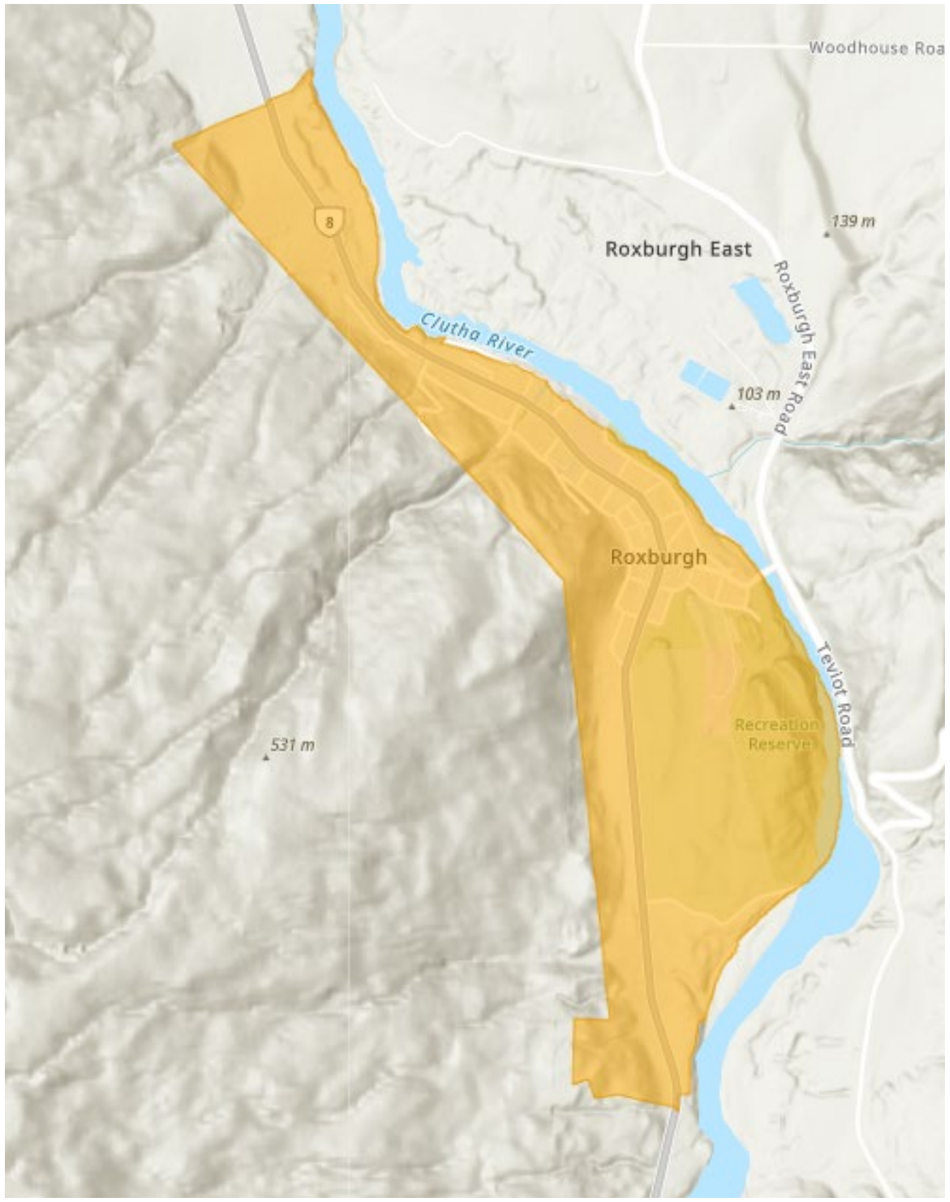

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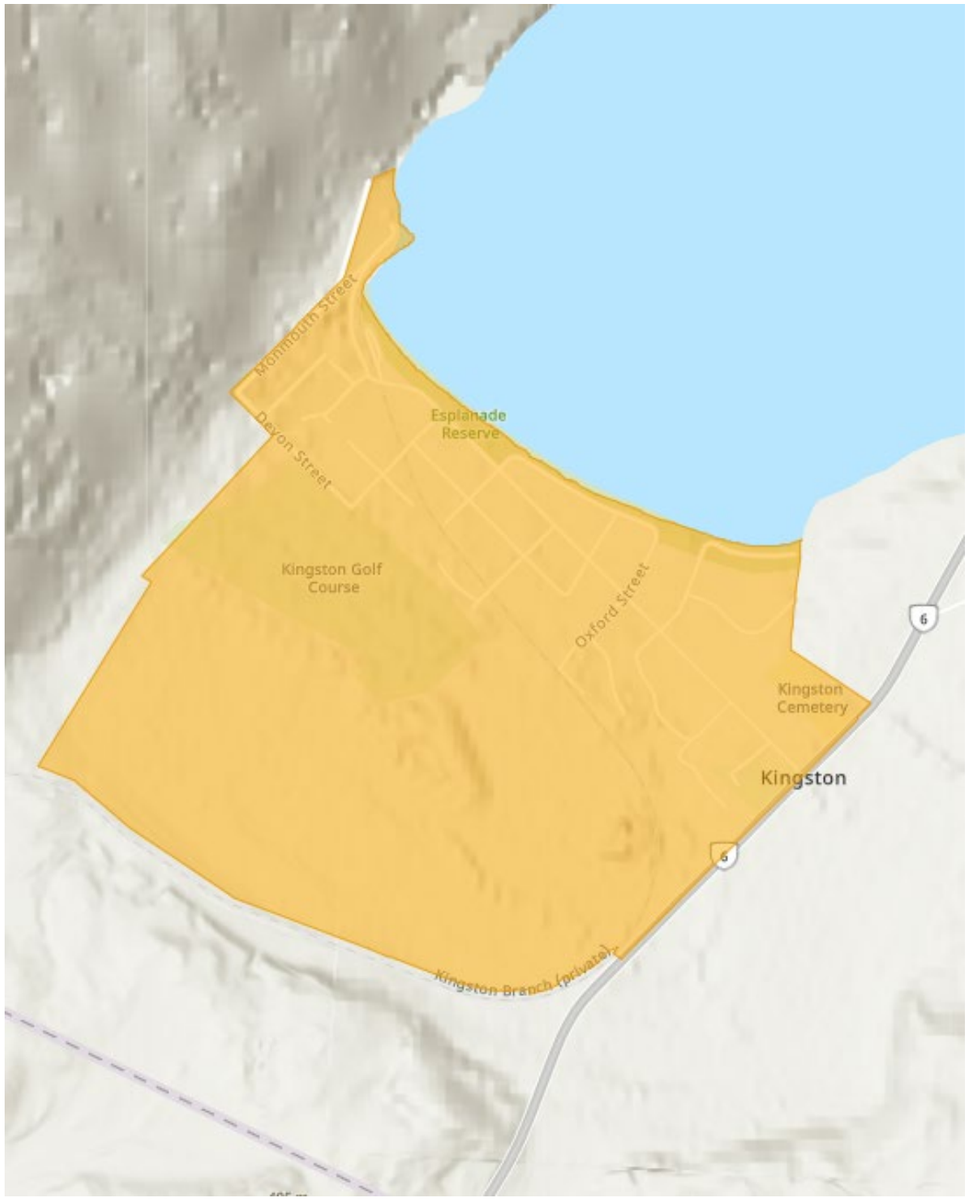
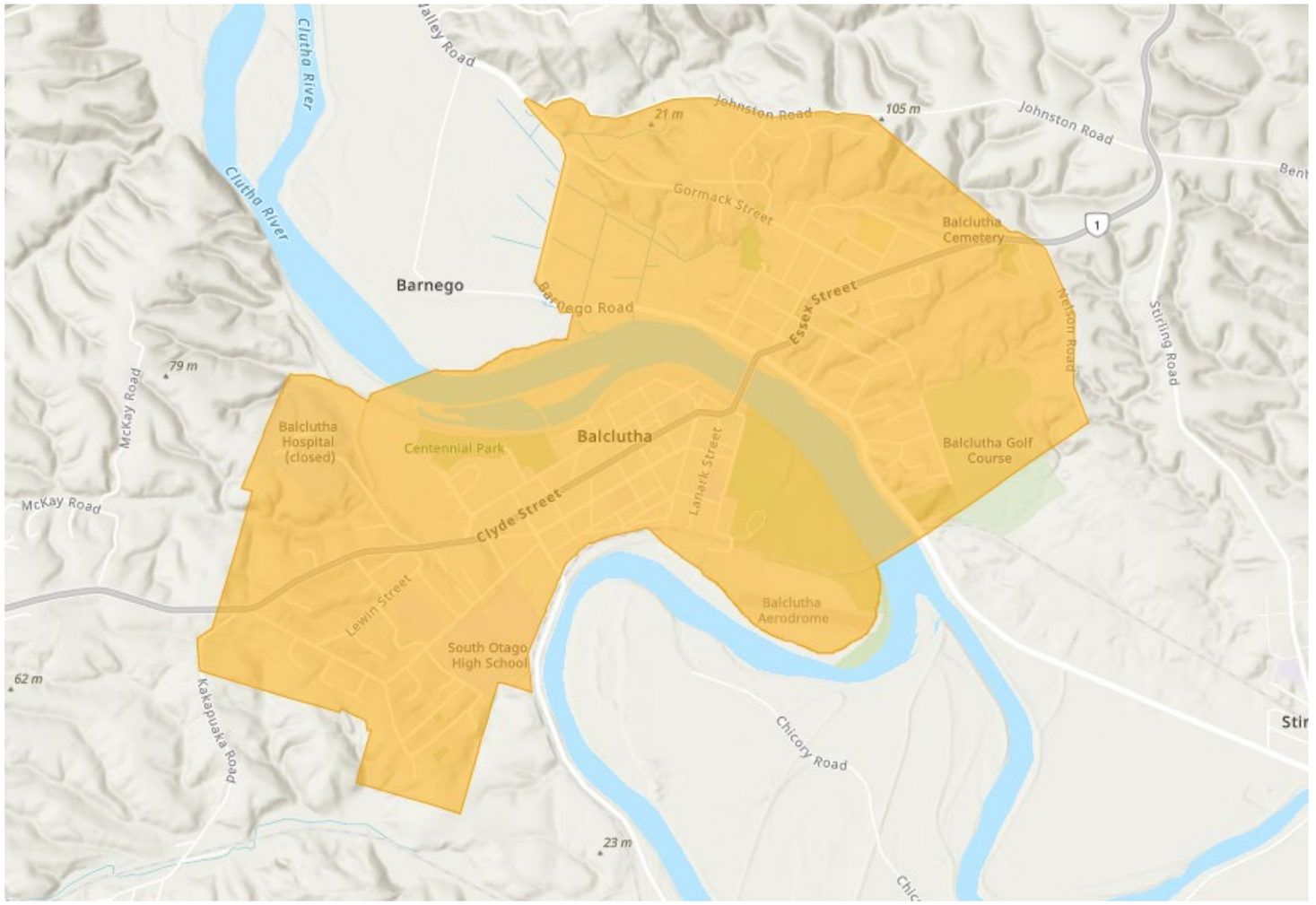


Air Zone 2 – Balclutha



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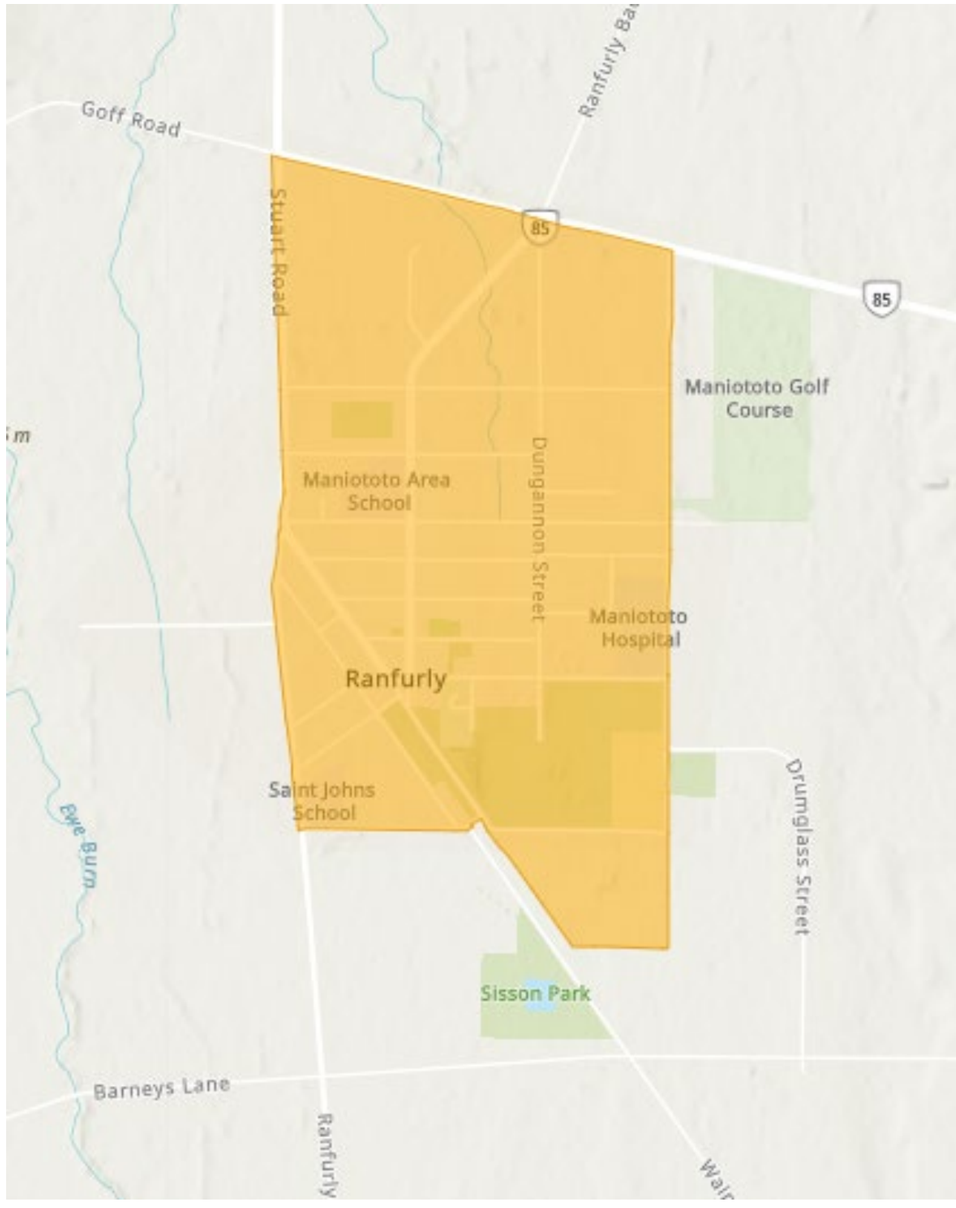

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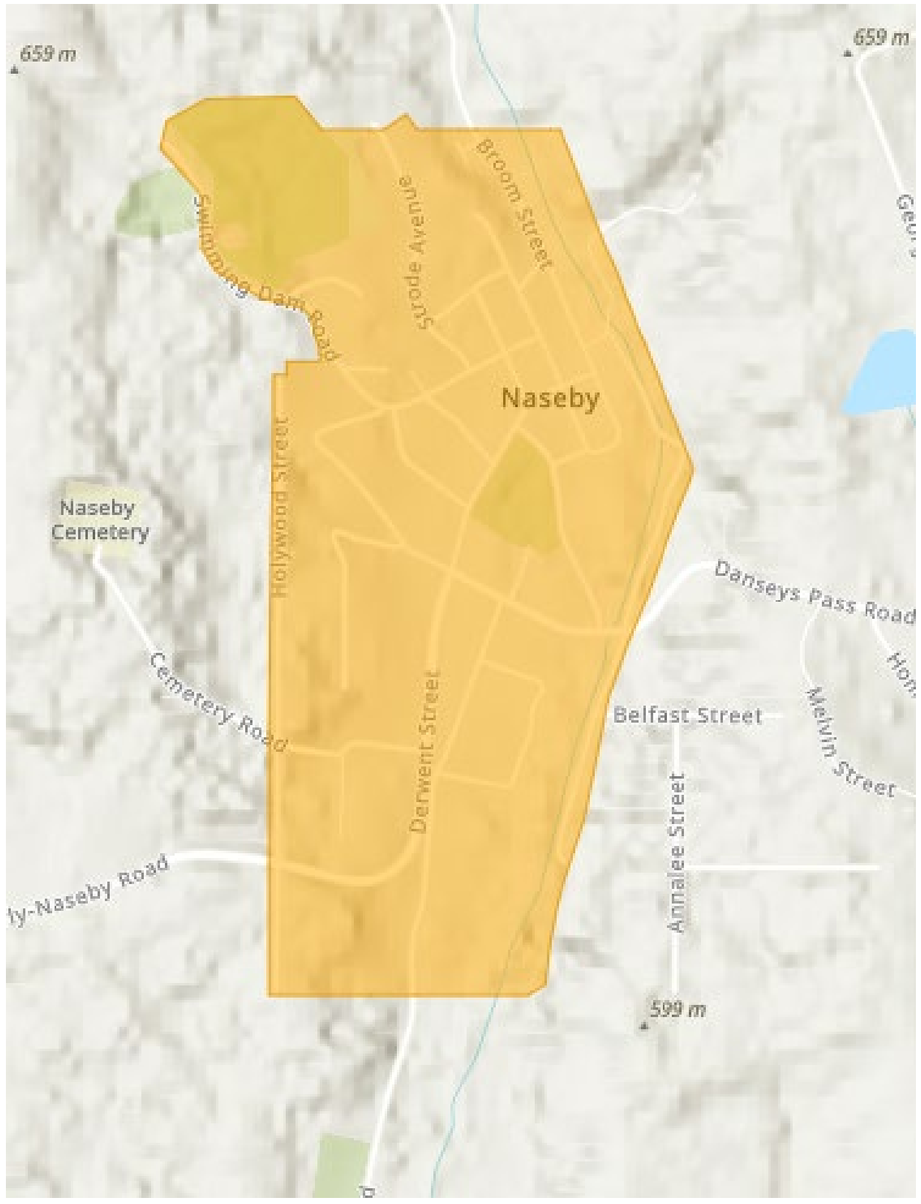

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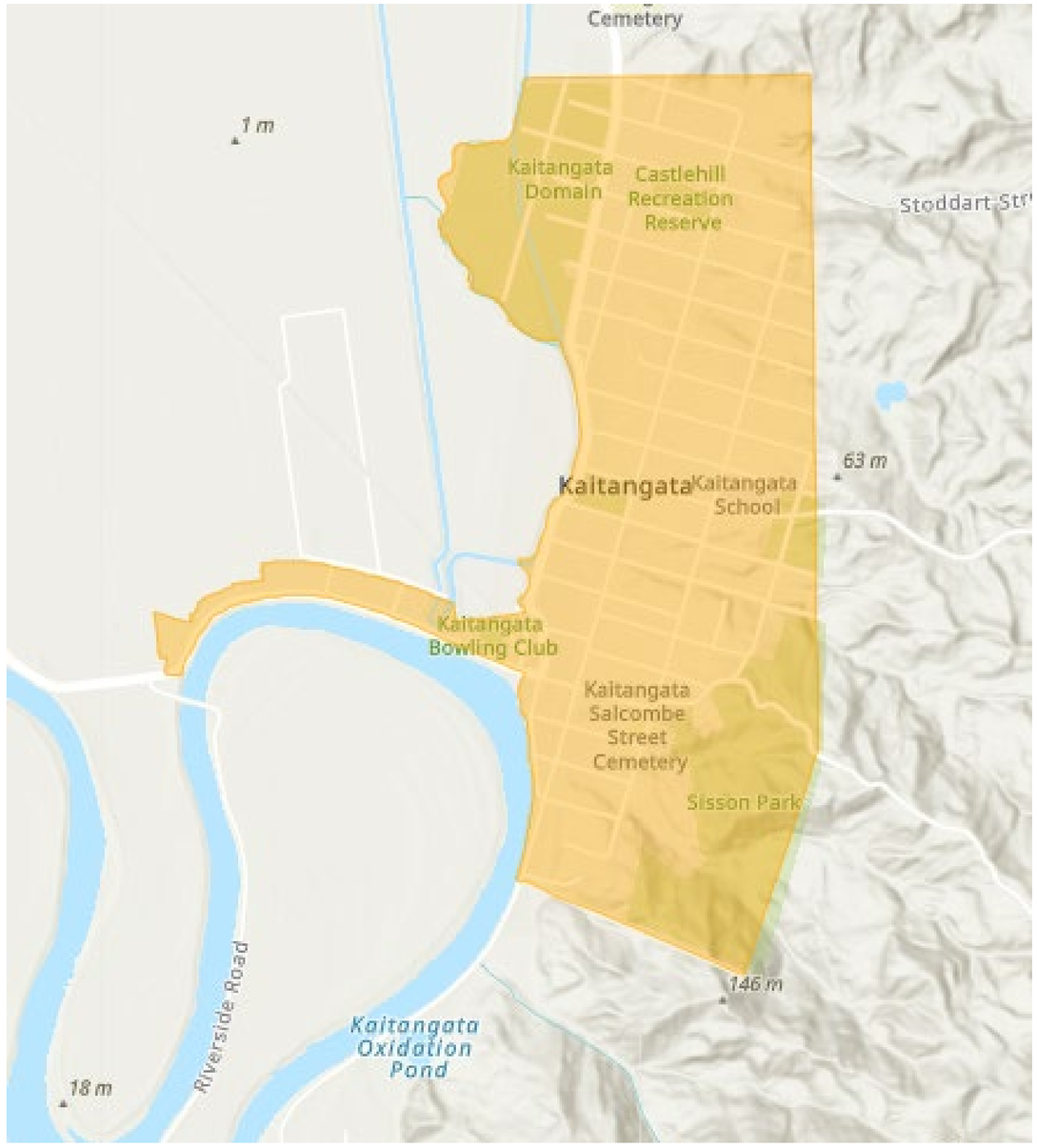

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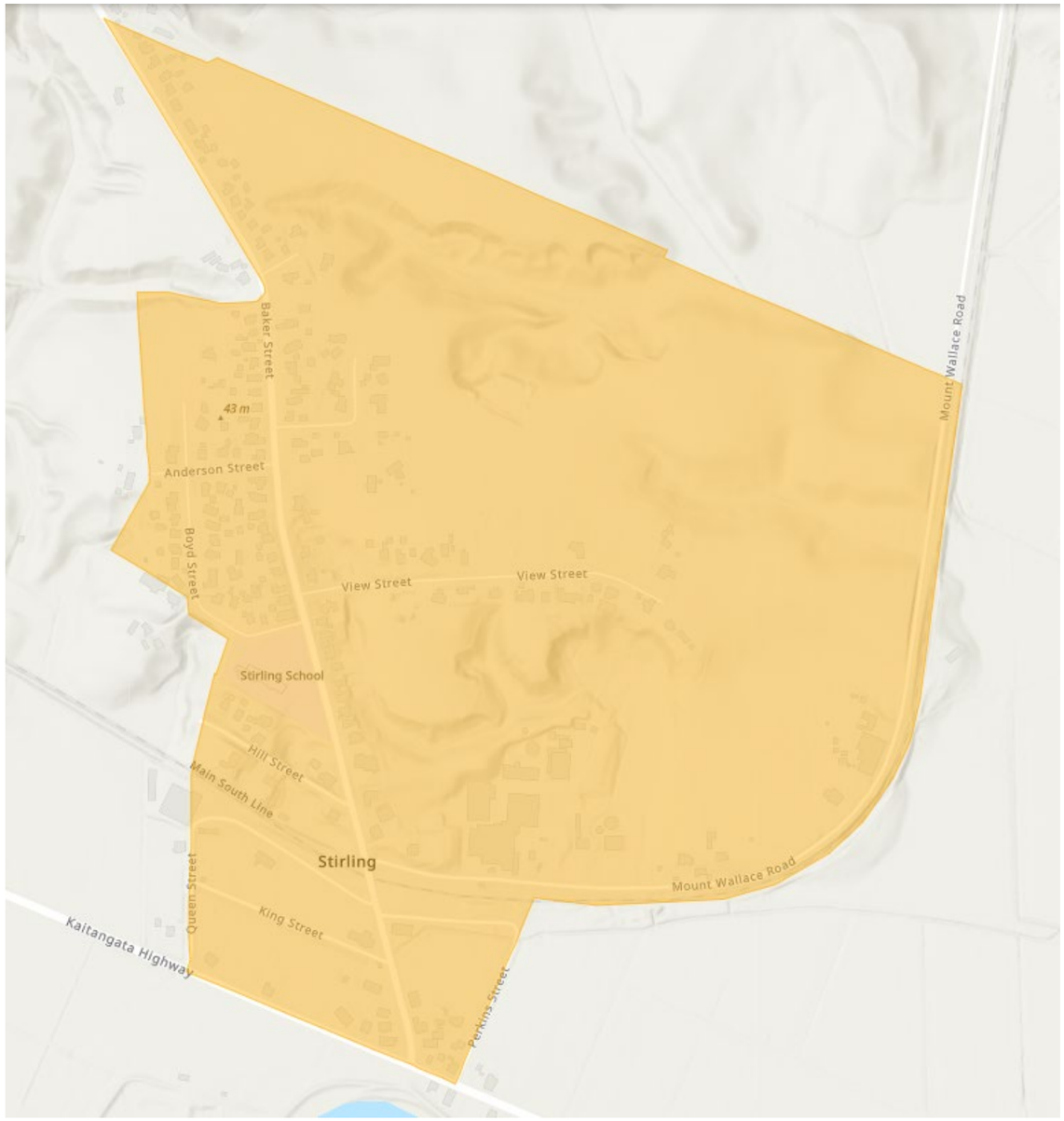

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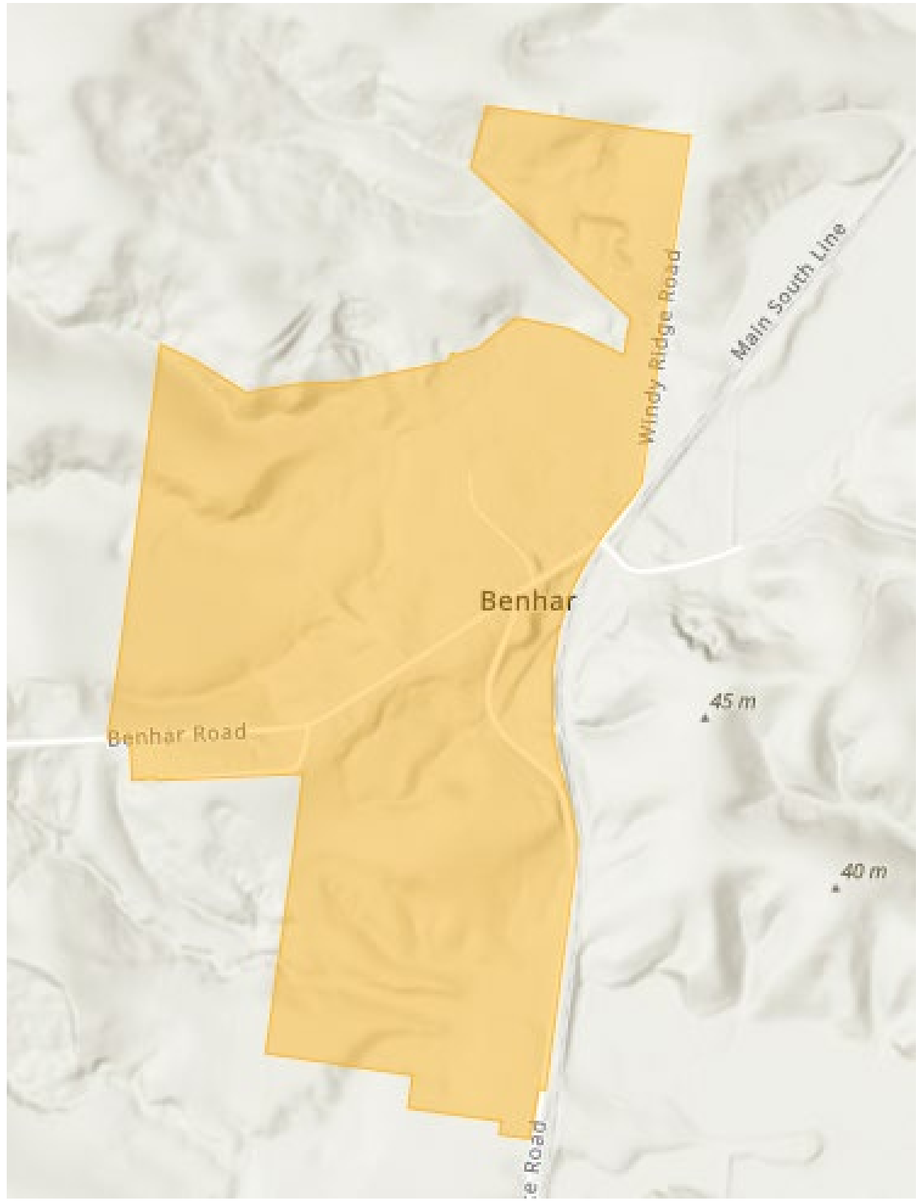

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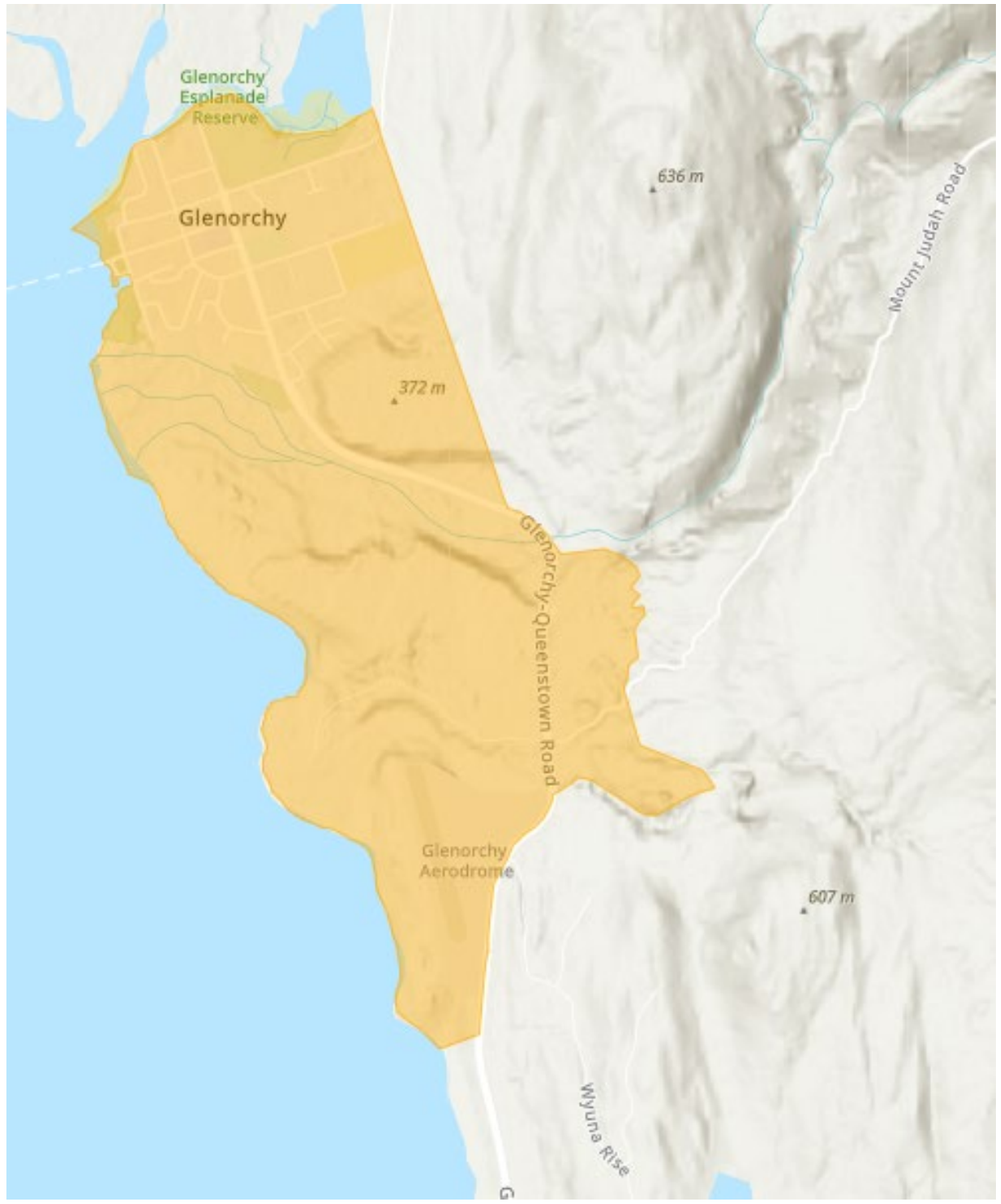

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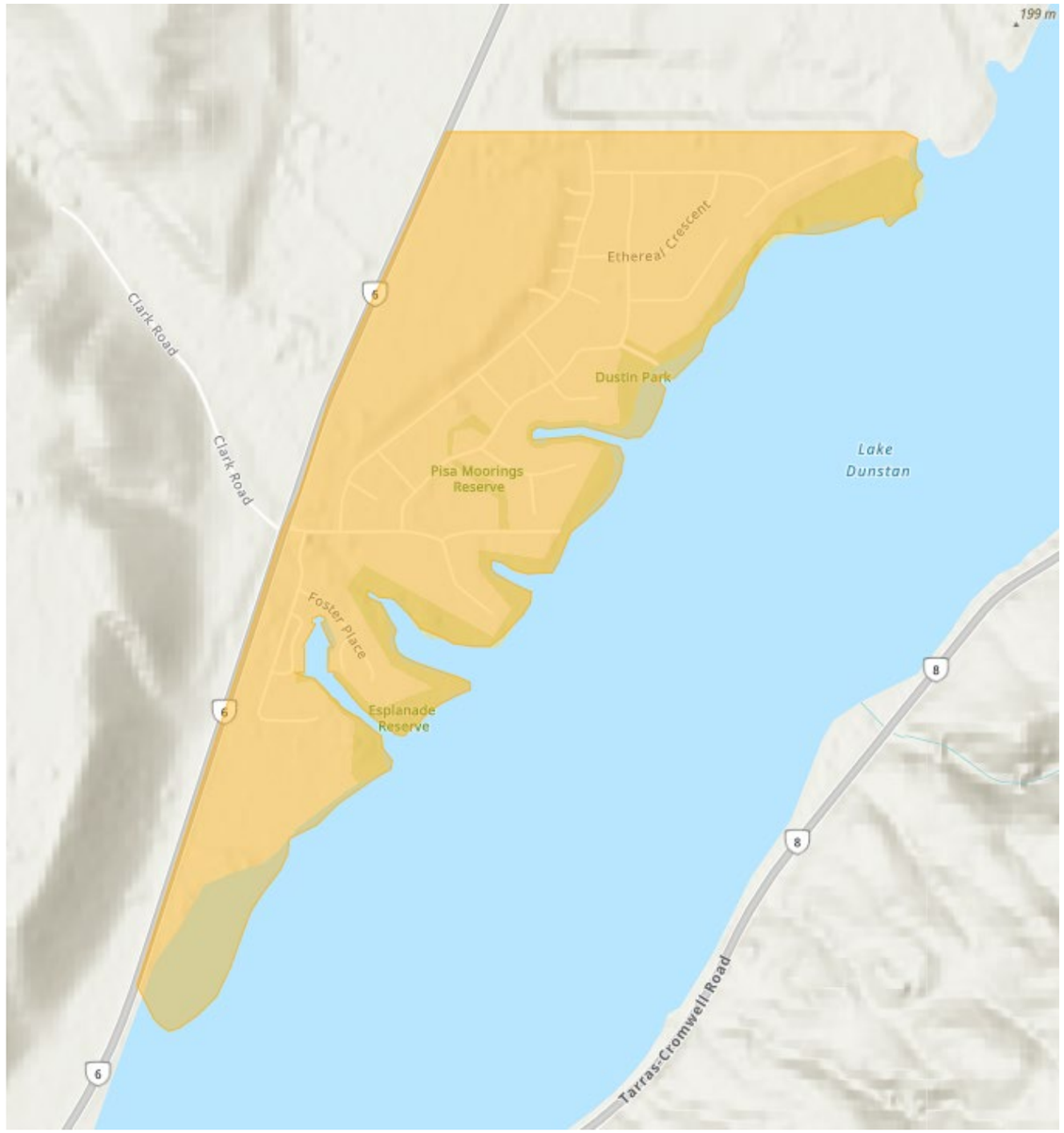

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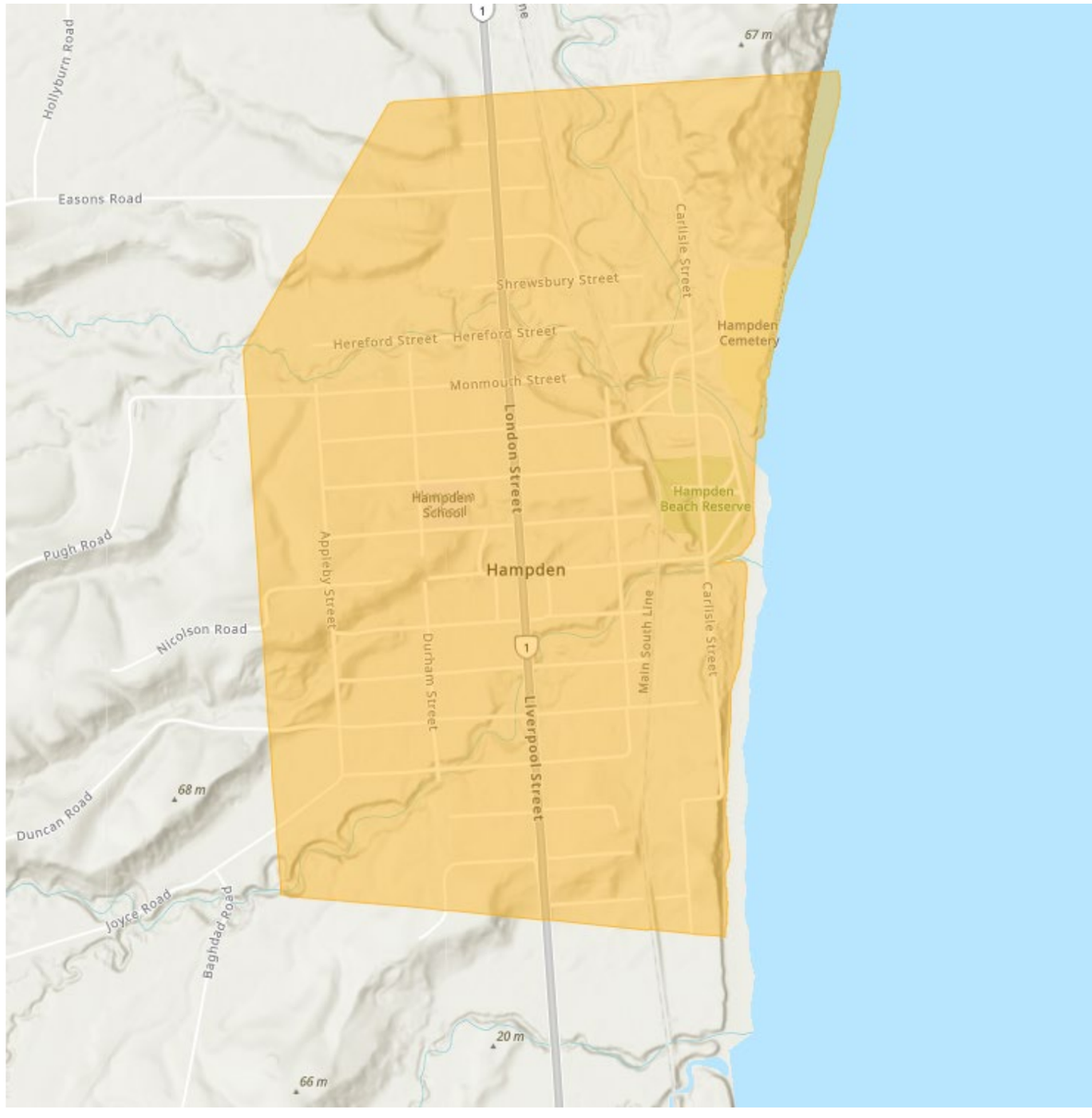

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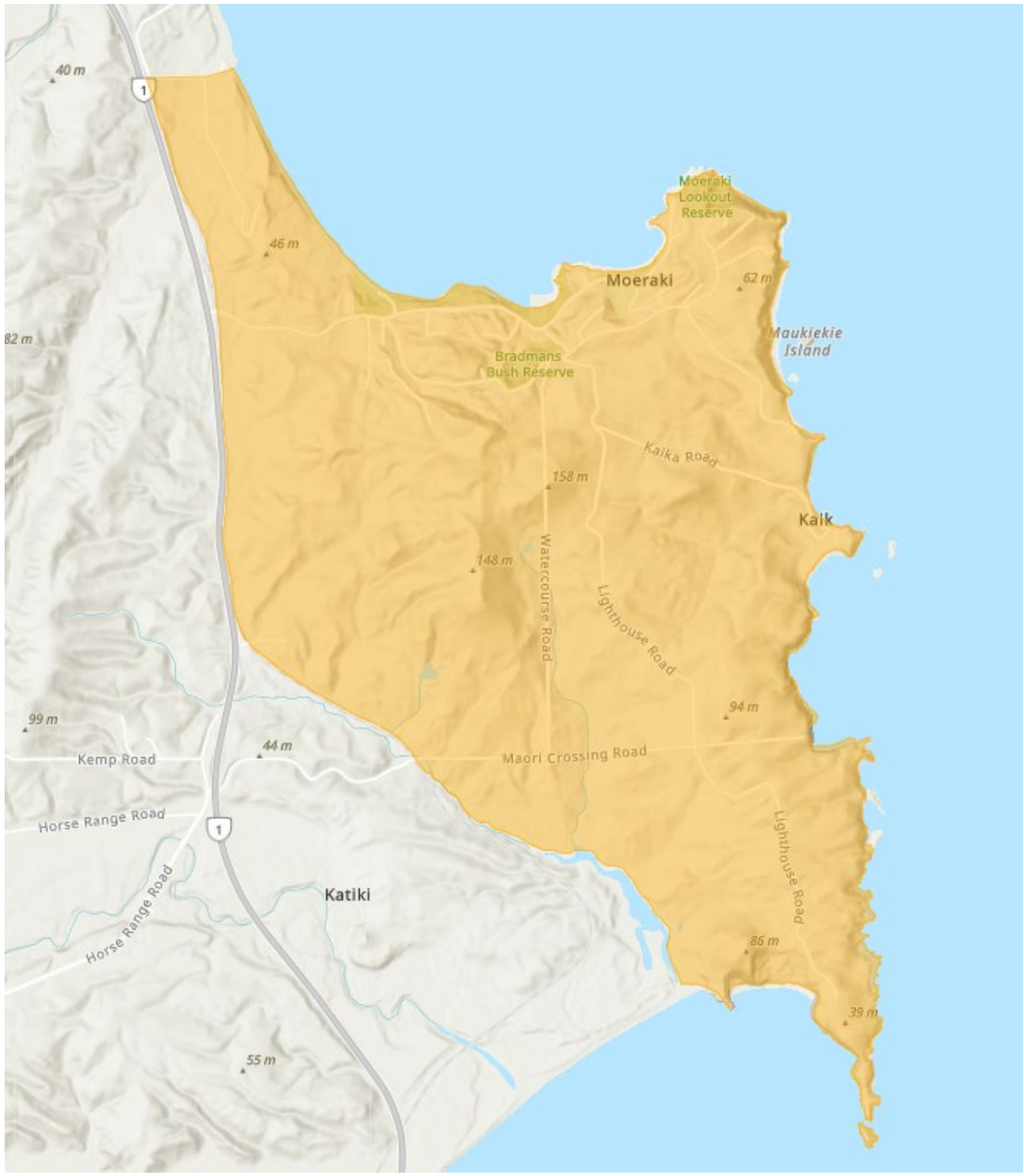

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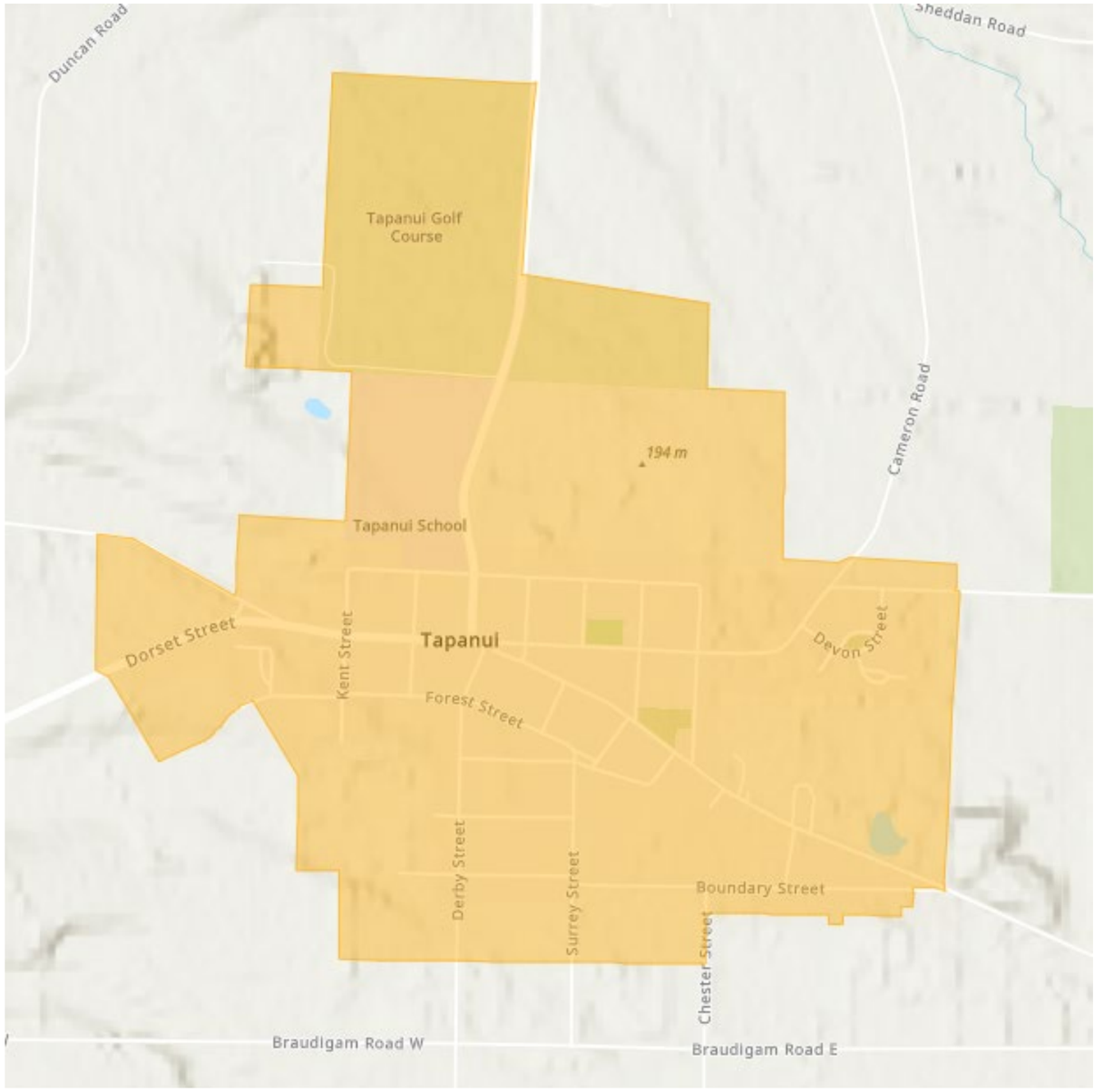

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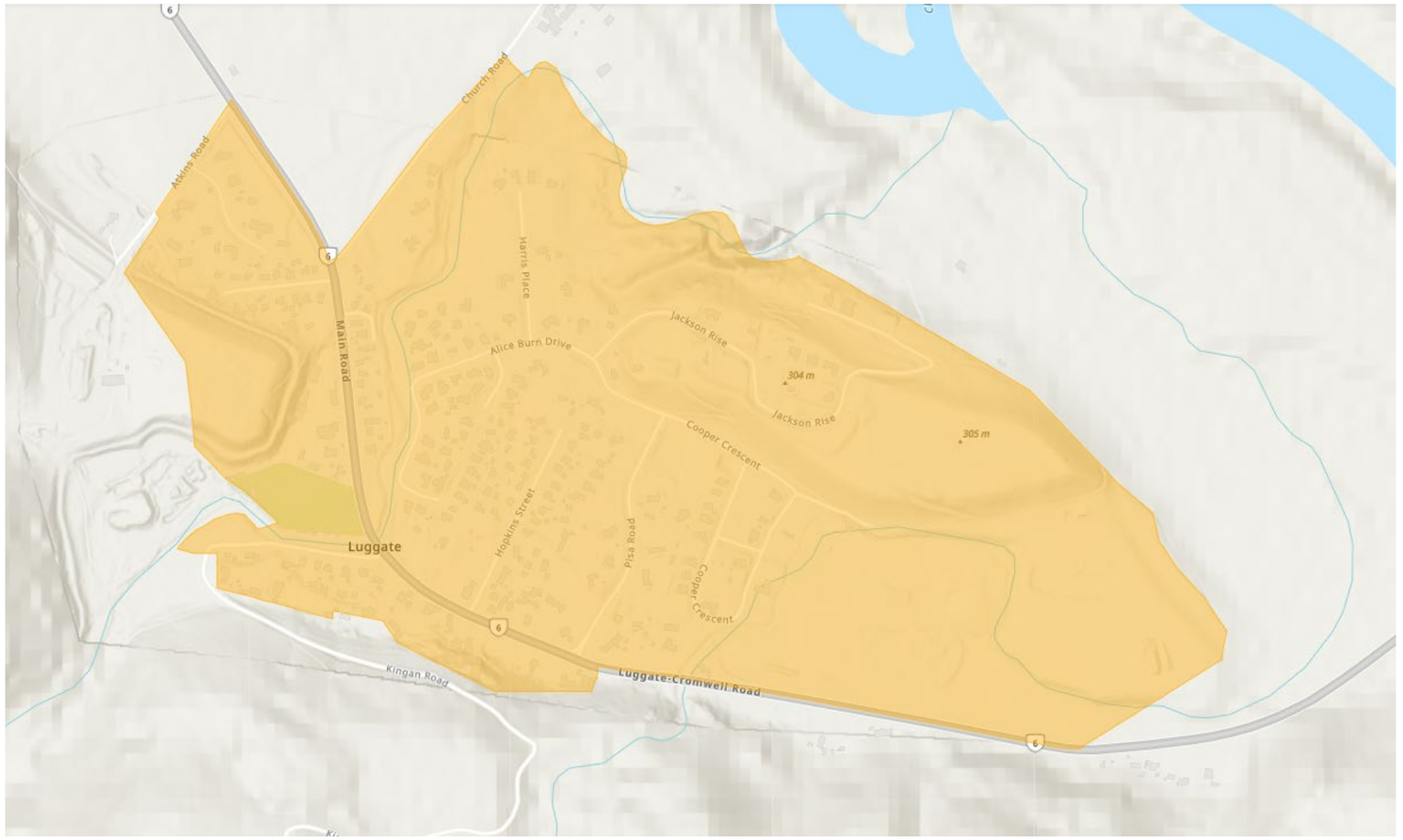

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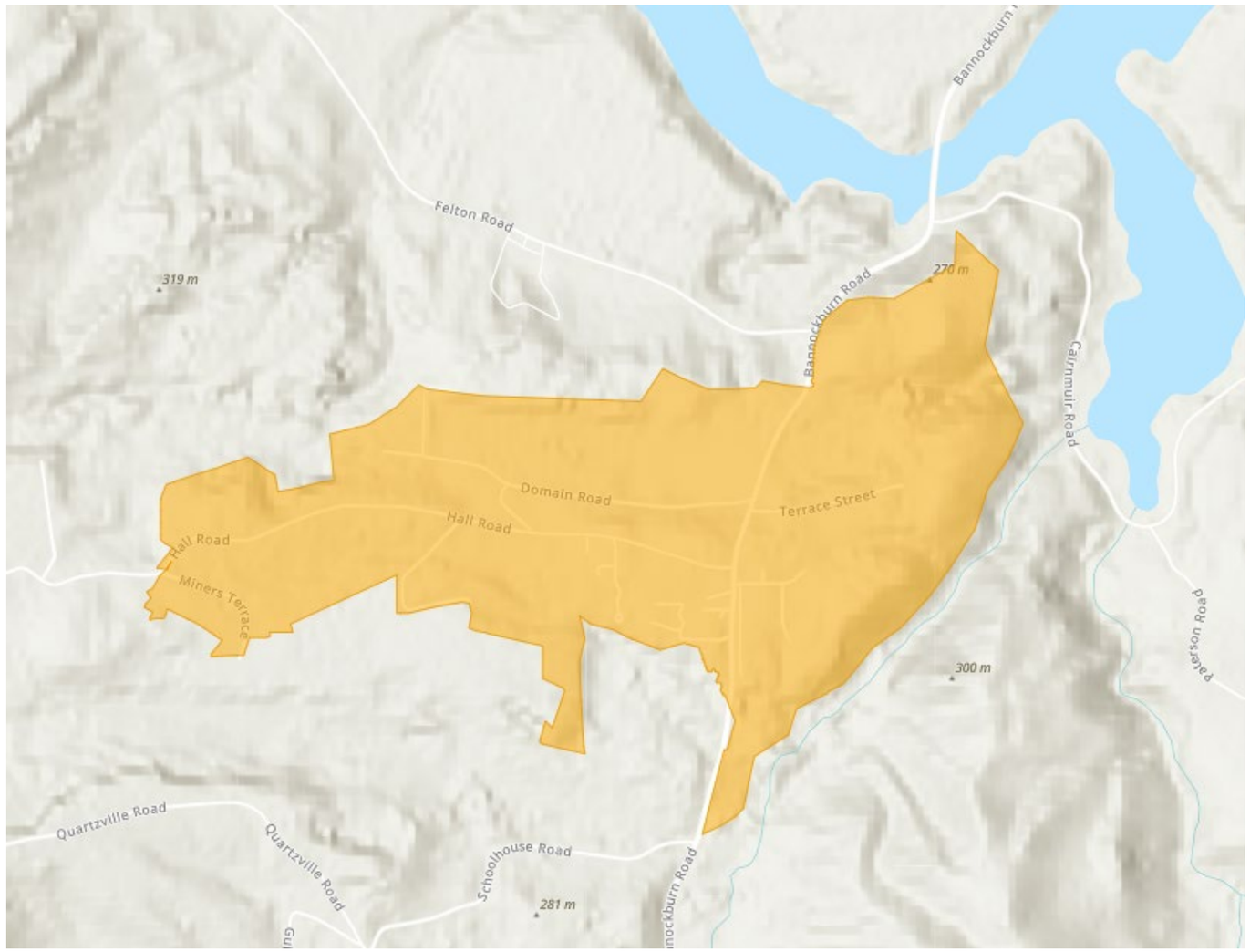

Draft Buffer Zones

Clyde/Alexandra Buffer Zone

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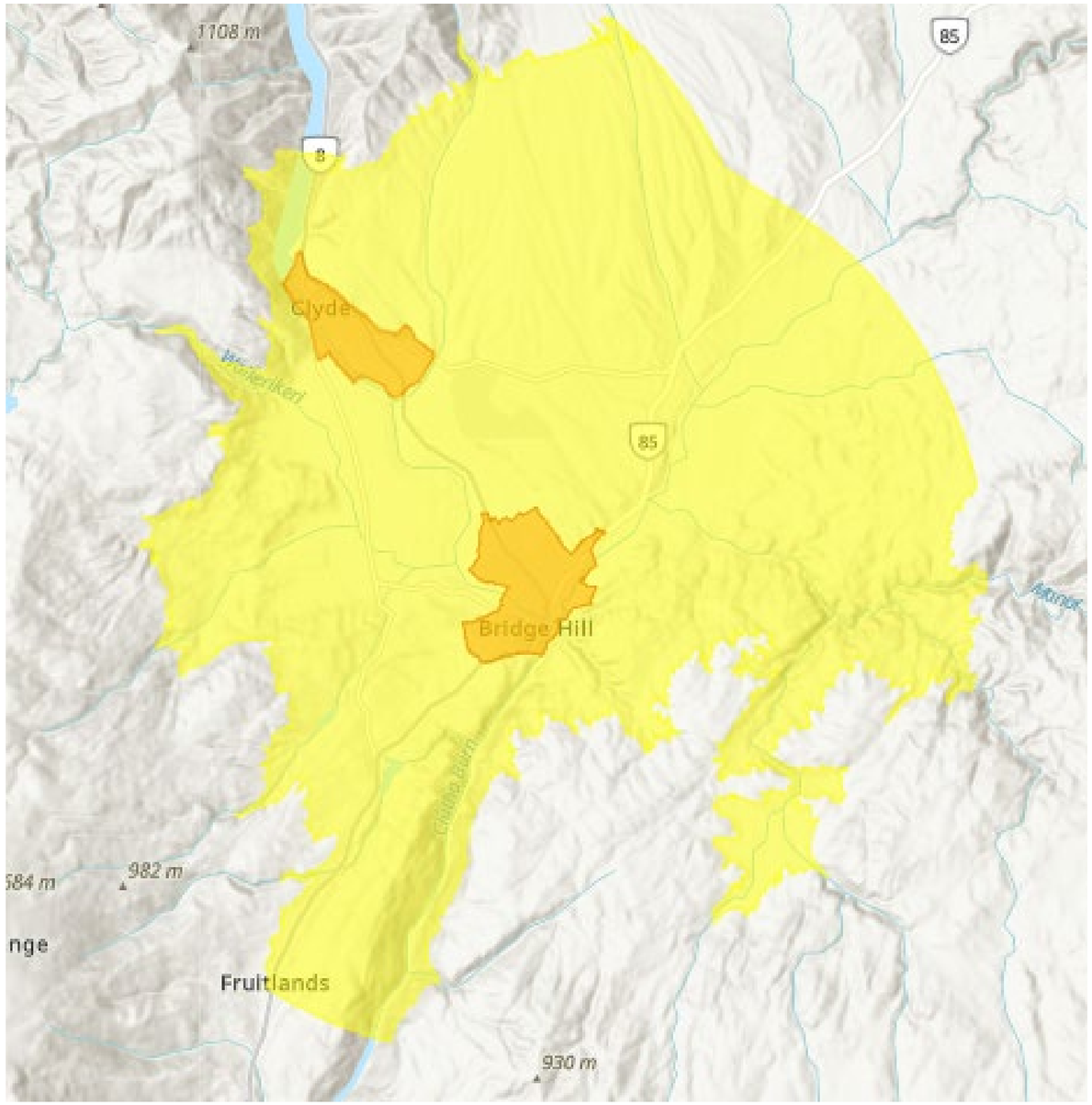

Cromwell Buffer Zone

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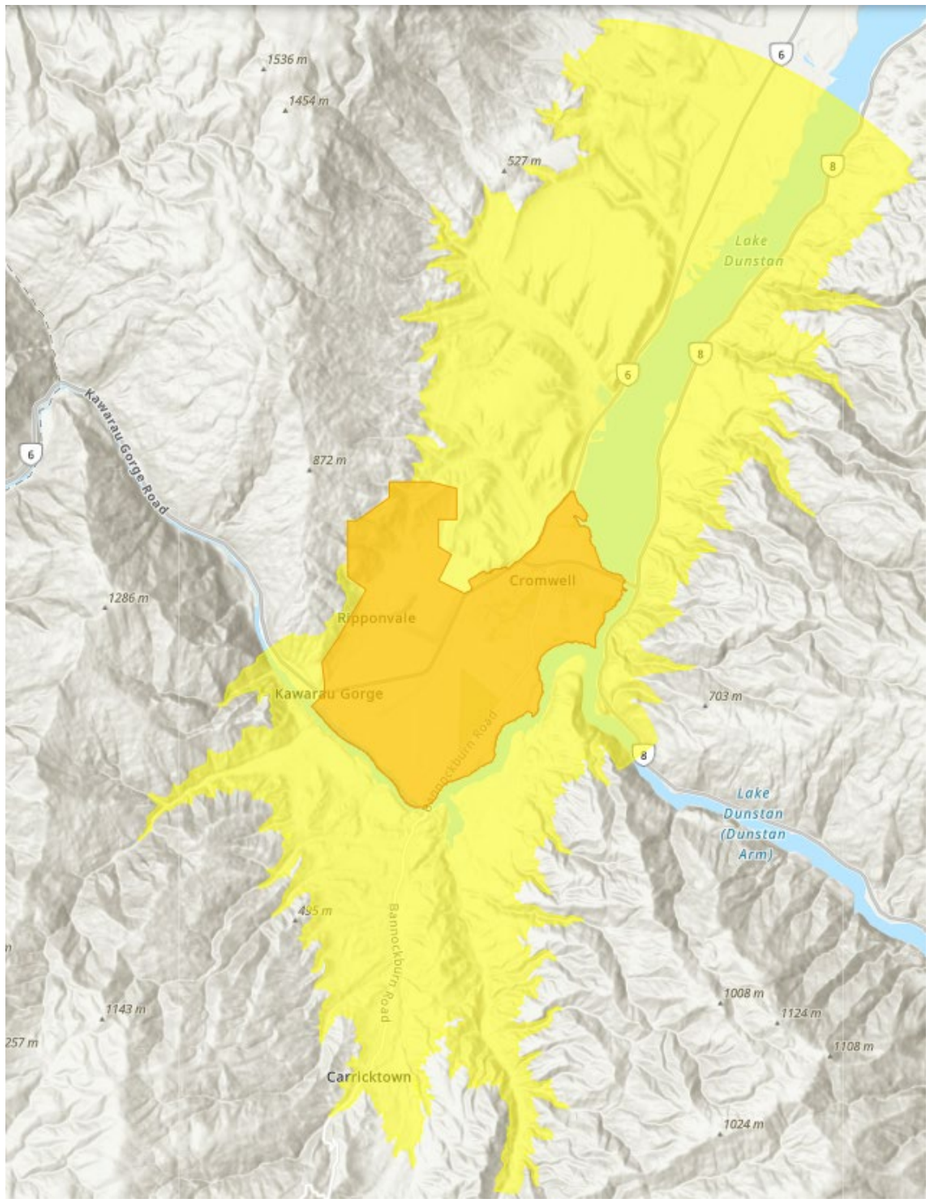
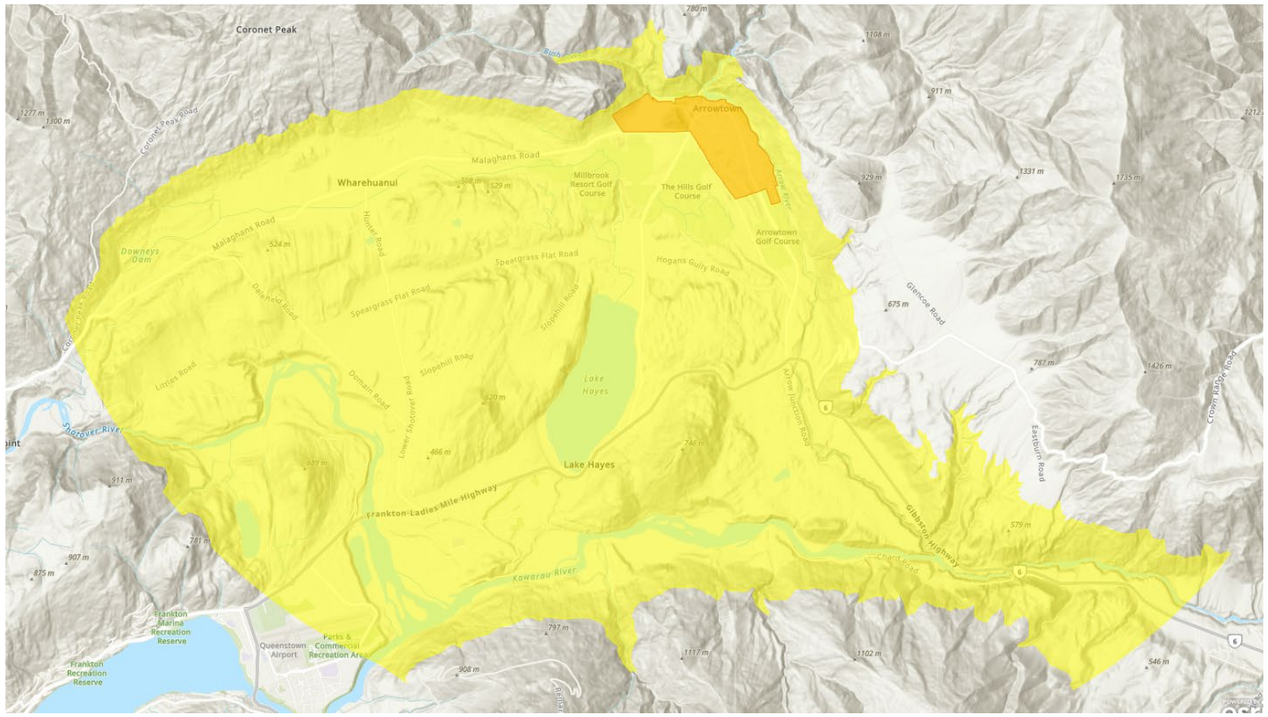


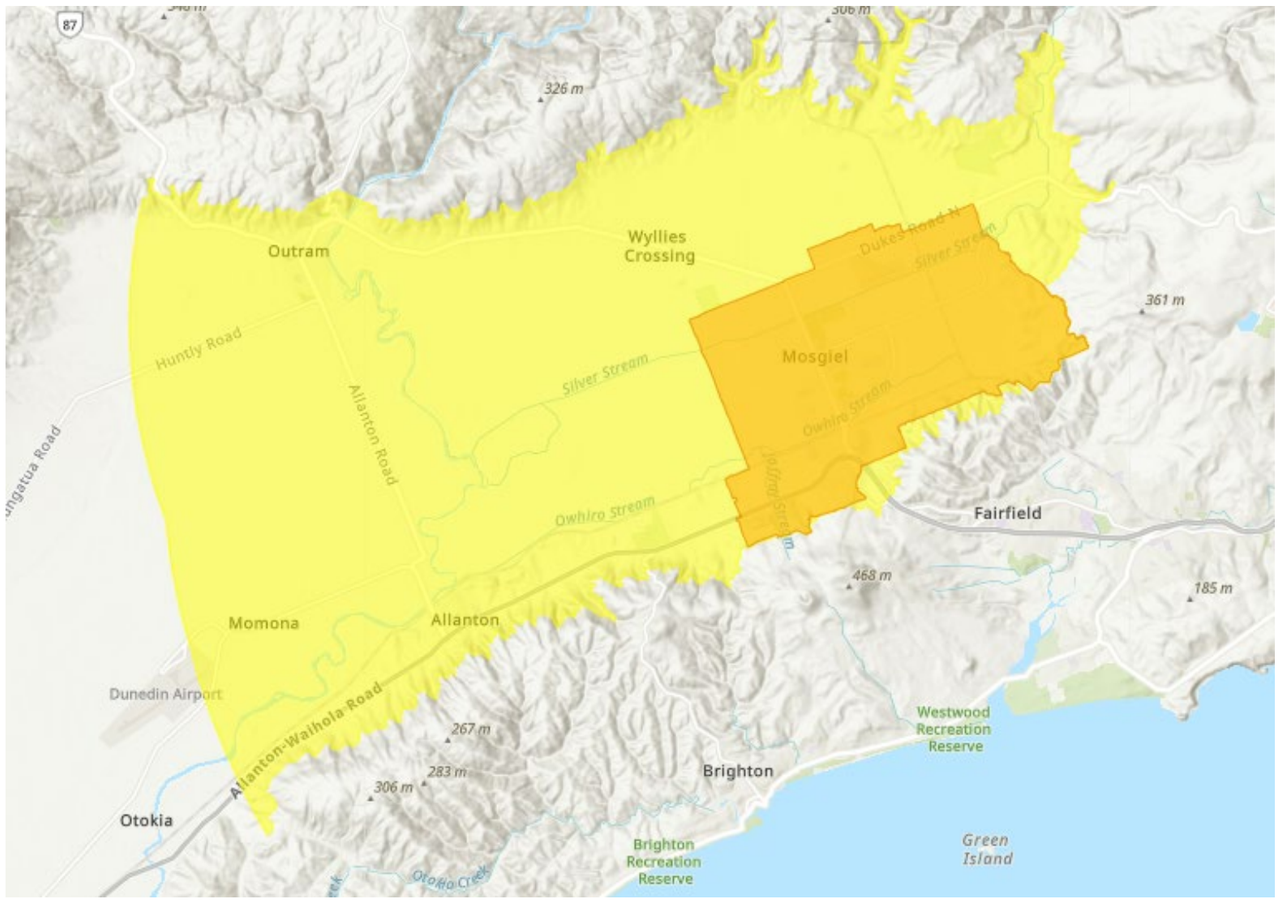
Arrowtown Buffer Zone

Maximum 10km from Air Zone boundary, clipped to elevation level 200m above ground level



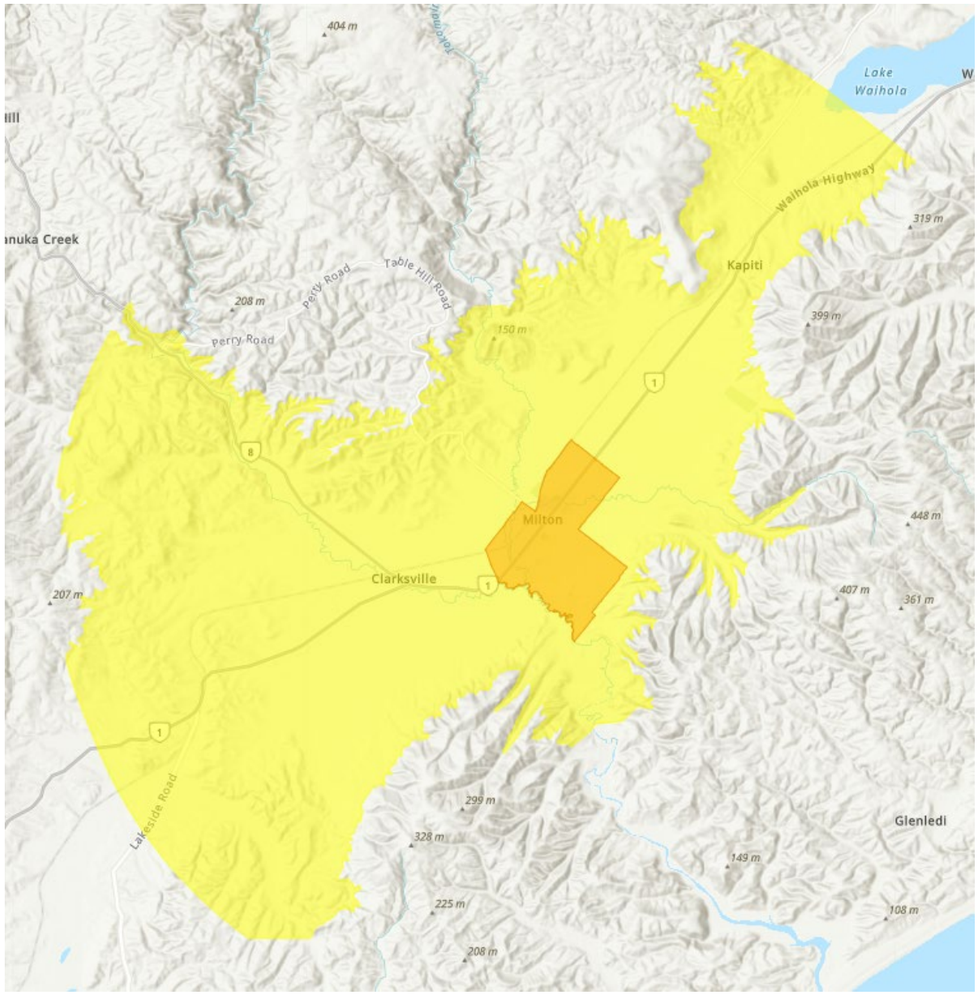
Mosgiel Buffer Zone

Maximum 10km from Air Zone boundary, clipped to elevation level 100m above ground level



Milton Buffer Zone

Maximum 10km from Air Zone boundary, clipped to elevation level 100m above ground level



10.2. Te Awa Otakou Issues and Opportunities Report

Prepared for:	Council
Report No.	STG2501
Activity:	Community: Governance & Community
Author:	Hilary Lennox, Manager Strategy
Endorsed by:	Amanda Vercoe, General Manager Strategy and Customer Richard Saunders, Chief Executive
Date:	19 March 2025

PURPOSE

1 To present the Te Awa Ōtākou Issues and Opportunities report and seek endorsement of the next steps for improving the harbour's management.

EXECUTIVE SUMMARY

2 Te Awa Ōtākou (Otago Harbour) is crucial to the cultural, social, and economic wellbeing of Dunedin (Ōtepoti) and the wider Otago region, but it faces ongoing pressures.

3 In response to concerns from councillors, mana whenua and the wider community, the Otago Regional Council (ORC) engaged consultants to assess environmental, cultural, recreational, and commercial challenges and opportunities in the harbour. The output of this work is the attached Te Awa Ōtākou Issues and Opportunities report.

4 The report highlights a lack of coordinated action among stakeholders and recommends an Integrated Catchment Management (ICM) approach to align efforts under a shared vision.

5 Mana whenua play a central role as kaitiaki (guardians) of the harbour, with deep ancestral, cultural, and economic connections to these waters. Their voices have been carefully woven into the report to ensure that their historical knowledge and aspirations shape future management strategies.

6 A key outcome of this work is the strengthened partnership between mana whenua, ORC, and Dunedin City Council (DCC), which provides a foundation for future governance and decision-making.

RECOMMENDATION

That the Council:

1. ***Notes** this report.*
2. ***Notes** the attached Te Awa Ōtākou Issues and Opportunities report and the attached table of opportunities.*
3. ***Endorses** the recommended next steps as set out in paragraph 23 of this report.*

BACKGROUND

7 Te Awa Ōtākou has played and continues to play a critical role in the cultural, social, and economic wellbeing of Ōtepoti (Dunedin) and wider Otago. With its strategic location,

the harbour supports commercial fisheries, trade access, and serves as a significant asset for both local and regional economies. Te Awa Ōtākou is also highly valued for recreation and amenity, deeply embedded in the city and region's identity.

8 Te Awa Ōtākou has a pivotal role in the wellbeing of the Ōtākou hapū and whānau. The harbour is a source of identity and a bountiful provider of kaimoana, and the pathway to fishing grounds, mahika kai locations and villages throughout the harbour and for seaward journeys beyond. Traditionally, it was the mode for other hapū to visit, and in today's world it is the lifeline to the international trade that benefits the region. The ebb and flow of the harbour tides is a valued certainty in a world of change; a taoka to be treasured and protected for the benefit of current and future generations.

9 The health and sustained function of the harbour are, however, under ongoing pressure. Human activities such as land development, roading, stormwater management, wastewater overflow, harbour dredging, land reclamation and fishing have led to habitat degradation, pollution, and the loss of ecological, recreational, and cultural values. Climate change - rising sea levels, changing rainfall patterns, and increasing temperatures - compounds these challenges, demanding decisive, long-term planning and action.

10 In response to concerns raised by mana whenua and the wider community, ORC commissioned a team of consultants to assess these challenges and identify opportunities for improvement. The project team included:

- Morphum Environmental Ltd – environmental analysis.
- Studio Pacific Architecture – urban and spatial planning.
- University of Otago's Department of Marine Science – ecological expertise.
- Aukaha Ltd – representing mana whenua and providing the cultural narrative.

11 Aukaha Ltd worked closely with mana whenua to ensure that their perspectives, histories, and aspirations were authentically represented in the report.

12 This project considered the history and cultural landscape of the harbour, physical setting, environmental trends, previous studies and reports, district and regional plans, anecdotal information, consented and non-consented activities, current and planned work programmes, competing uses, community aspirations, and the implications of climate change. The project also explored the current management framework that exists i.e. roles and responsibilities of various agencies and other stakeholders.

DISCUSSION

13 The Te Awa Ōtākou Issues and Opportunities Report was informed by engagement with over 40 individuals and organisations, including two workshops with ORC and DCC councillors.

14 The project team also produced a spreadsheet of recommended actions (attached) that were identified through the engagement process. These recommended actions have not been arranged according to any sort of order of priority, no commitment has been made to address these (although some of the identified actions are already underway), and no assessment has been undertaken to determine whether delivering some actions may complement or detract from others.

15 The Te Awa Ōtākou Issues and Opportunities report is not itself a management plan or strategy for the harbour. It is simply an overview of issues and opportunities, along with a recommended approach for addressing these.

16 The report provides examples of the extensive ongoing effort by mana whenua, councils and national government agencies, communities, businesses and conservation groups. The report notes, however, that much of this is focussed on specific aspects or areas and there is not the level of collective understanding, vision and objectives for the harbour or a mechanism for coordinating planning, funding, and resources towards optimising the effort nor assessing potential negative consequences of certain interventions on the system or other users.

Proposed Approach

17 The Integrated Catchment Management (ICM) approach is recommended to provide a structured plan for collaboration. The process commences with establishing an Integrated Catchment Group. It is through this group that a Catchment Action Plan (CAP) is initiated. The CAP will articulate an agreed vision and supporting objectives to inform the further refinement and prioritisation of actions.

18 The ICM process is focussed on natural environment and the principle of that if this is healthy then those socio-economic factors that are supported by the environment will be healthy.

19 This process should recognise mana whenua as equal partners with protected and enabled rakatirataka. The commissioning of this work by ORC and the authentic partnership with DCC and mana whenua leading the narrative voice in this first phase demonstrates intent and serves as a solid foundation for achieving this.

20 The establishment of a governance structure that provides strategic oversight, guidance and regular review of progress against objectives is an option for further strengthening this partnership. This is something that could be considered as part of the ICM process.

21 The ICM programme is being rolled out at a Freshwater Management Unit (FMU) scale with the harbour falling within the Dunedin and Coast FMU. However, given the highly developed nature of the catchment and the multiple uses/users and strategic importance of the harbour, it is recommended that it is rolled out at a modified scale for Dunedin, centred around Te Awa Ōtākou. Staff from ORC's ICM Team will present a paper to the Environmental Implementation Committee in June seeking approval to roll out the ICM programme for Te Awa Ōtākou later in 2025.

22 Most of the recommended actions in the attached table will be considered through the ICM programme and arranged according to order of priority. For actions that might not be captured under the ICM programme, we have identified who is best to consider these and discussed this with them. DCC has a significant role in implementing actions related to urban planning, stormwater and wastewater management, and public space improvements. Many of these actions align with existing work programmes, while others will be considered for prioritisation in the next 10-Year Plan (2027).

23 In summary, the recommended next steps are:

a. ORC's ICM Team will present a paper to the Environmental Implementation Committee in June seeking approval to commence the ICM programme for Te Awa Ōtākou later in 2025.
b. The Integrated Catchment Group (once formed) will consider many of the actions listed in the attached table to determine whether, how, and when they should be addressed and by whom. This prioritisation process will be informed by an agreed vision and objectives (yet to be developed).
c. Other agencies will be asked to consider actions that may not be captured by the ICM programme. Many of these are already currently underway or could be actioned in the very near future.

24 Endorsement of this approach is sought from Council to enable staff to commence work on this programme.

OPTIONS

25 There are no options presented for this report.

CONSIDERATIONS

Strategic Framework and Policy Considerations

26 Assuming the ICM programme for the Te Awa Ōtākou unfolds as anticipated, then the recommended next steps could be particularly aligned with the following goals from the 2024-2034 Strategic Directions:

a. Te Ao Māori concepts of intergenerationally and deeply connected systems are incorporated throughout Council's work programmes.
b. Mātauraka Māori and the principle of te mana o te wai are incorporated into our environmental planning, management, and decision making.
c. We always go above and beyond our statutory responsibilities (as prescribed in local government and treaty settlement legislation) to support the intention of the Crown to uphold the principles of Te Tiriti o Waitangi / The Treaty of Waitangi.
d. Our communities trust us, and they are satisfied with us and the outcomes that we are delivering.
e. Our communities are supported and empowered to achieve better environmental outcomes.
f. The social, cultural, economic, and environmental wellbeing of Otago is consistently improving.
g. Ecosystems are healthy, our water and air are clean, and biodiversity loss is arrested across the region.
h. 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.
i. Climate change mitigation and adaption are key considerations in all our decisions.

27 The recommended next steps are not misaligned with any of the goals from the 2024-2034 Strategic Directions.

Financial Considerations

28 Rolling out the ICM programme at a modified scale for Dunedin, centred around Te Awa Ōtākou, can be achieved within the ORC ICM Team's exiting 2024-2034 LTP budget.

Significance and Engagement

29 The Te Awa Ōtākou Issues & Opportunities report was developed in collaboration with Te Rūnanga o Ōtākou through Aukaha, and in consultation with Kāti Huirapa Rūnaka ki Puketeraki.

30 As noted above, a highlight of this process has been the effective partnership between mana whenua, the ORC and DCC, and involvement of staff and councillors from both organisations. This partnership serves as a solid foundation for taking this mahi forward.

31 Also noted above, the ICM process should recognise mana whenua as equal partners with protected and enabled rakatirataka.

Legislative and Risk Considerations

32 It should be noted that the Te Awa Ōtākou Issues and Opportunities report is not itself a management plan or strategy for the harbour, and no commitment has been made to give effect to any new recommended actions identified within the report or attached spreadsheet.

33 No other identified legislative or other risks have been identified at this stage.

Climate Change Considerations

34 Climate change impacts are discussed in the Te Awa Ōtākou Issues and Opportunities report and will need to be a consideration for the Catchment Action Plan.

Communications Considerations

35 A copy of the Te Awa Ōtākou Issues and Opportunities report and an update on the next steps (if endorsed) will be provided on the ORC website.

NEXT STEPS

36 See paragraph 23 above.

ATTACHMENTS

Te Awa Ōtākou Issues and Opportunities Report
Te Awa Ōtākou Recommended Actions

1. 250210 Te Awa Otakou Issues Opportunities Report FINAL [**10.2.1** - 175 pages]
2. 250214 Te Awa Otakou Recommended Actions [**10.2.2** - 5 pages]

Overview	Code	Specific Considerations	Relevant Plans/ Programmes/Projects
1. ACCESS - Access to and around the awa for multiple uses is an integral value held by all. Persisting loss and diminished quality of access is consequently a major issue across all interest and user groups. **Issues** - Limited accessibility to the awa - Restricted accessibility around the awa - Lack of connectivity to the harbour waterfront			
1.1 Enhancing existing access Providing improved access to and across the harbour with a focus on enhancing existing access whilst avoiding further adverse effects, particularly from reclamation and dredging.	1.1.1	Options to extend Te Aka Ōtākou out to Harrington Point should be investigated and actioned.	DCC Transport and/or Parks & Recreation teams
	1.1.2	A forum for tourism operators and recreational boaties needs to be identified or established to address navigational clashes in the shipping channel. This should provide for engagement with the Harbour Master to recognise past usage practices, other user needs, and find a medium for navigation. It is not conducive to a flourishing tourist industry to have tourism vessels holding at sea, and there is poor transparency as to where the new rule is coming from.	Existing - ORC Harbour Master
	1.1.3	Solutions should be investigated to address the siltation at North End Wharf to restore its functionality for recreational and visiting boats.	Possible action resulting from the ICM process
	1.1.4	The St Andrews Street upgrade will provide an opportunity to require walking and cycling safety integration through DCC vesting.	9YP - Zero Carbon potential workstream
	1.1.5	A bike hub could be established along Portabello Road, on the harbourside. This would provide an ideal location, well connected to the ferry terminal; linking the upper harbour to Portobello.	DCC Transport and/or Parks & Recreation teams
	1.1.6	Existing walking tracks around the awa should be maintained, enhanced and promoted with signage, and public maps provided / updated. Where feasible, linkages between tracks should be formalised.	DCC Parks & Recreation Team (Tracks Strategy)
	1.1.7	Develop an inventory (spatial referenced database) and collate data from audits of the condition of all wharfs, jetties, boat ramps and access infrastructure owned and managed acrosss key organisations (e.g. Port Otago, DCC, DOC, ORC, Ravensdown), including current and potential future uses.	Possible action resulting from the ICM process
	1.1.8	Develop a unified approach for access and recreation across the harbour. Key actors in this may include Mana Whenua, Port Otago, ORC, DCC, and DOC in collaboration with relevant local boards and tourism operators.	Possible action resulting from the ICM process
1.2 Harbour waterfront regeneration Redevelopment of the harbour is a widely shared ambition across user and interest groups. While it is a complex for Ōtepoti, it is likely a matter of when, not if, the potential of Steamer Basin and surrounds are realised. Potentially phasing the process may assist in overcoming capital investment challenges that have stalled progress in the past.	1.2.1	Regeneration must address the Octagon-Harbour connection, providing safe pedestrian access across or over the state highway and rail lines. This should focus on providing connection through Queens Garden. Opportunities to enhance safe connections outwards towards Forsyth Barr Stadium and Kitchener Street Reserve should be explored.	DCC Central City Plan, plus Zero Carbon and Transport teams
	1.2.2	Draw on international and local experiences, with a focus on enhancing local community wellbeing and visitor experiences.The transformation of Te Whanganui-a-Tara / Wellington's central waterfront from working port to the bustling crown jewel of 'Welly on a good day' provides a hugely successful model from a similar setting to reflect on. Through consultation, there were many references to Te Whanganui-a-Tara as an aspiration for the Ōtepoti waterfront, especially given both are afflicted by exposure to high winds. In particular, the way the northern example speaks to its industrial past – retaining, repurposing and enhancing existing buildings and structures, whilst celebrating the natural elements and Te Ao Māori - should be reflected on. Port Otago / Chalmers Property holds the majority of land ownership across the waterfront industrial area; rather than a complex mosaic of land owners. They are a key roleplayer and potential enabler.	DCC Central City Plan, plus Zero Carbon and Transport teams
	1.2.3	Relocate industrial activities from the harbour basin area, enabling land use change to occur.	Port Otago
2. ENVIRONMENTAL HEALTH - The harbour has been subject to several centuries of human intervention which have translated into a steady and then rapid decline in the extent and condition of natural systems and habitat, and the ecological processes that underpin their function, which has resulted in a decline in the abundance and diversity of indigenous plant and animal species. In short, the capacity and resilience of the natural asset has been significantly diminished and with it the values and benefits derived from its use, and resilience in the face of a changing climate. **Issues** - Degradation and loss of habitat. - Native biodiversity Declining and At Risk - Pollution - Fragmented understanding and response			
2.1 Monitoring and Research A holistic, whole-of-harbour environmental monitoring approach would be beneficial. This should: - improve understanding of the state and trends in environmental health, to inform education and management; - address marine, freshwater and terrestrial ecosystem health; - be co-designed by Mana Whenua and ORC, in collaboration with the University of Otago, DCC, community environmental groups, NGOs, Port	2.1.1	Establsish a holistic, whole-of-harbour marine health monitoring programme. This should take into account holistic habitat, species, and system dynamics. It should consider monitoring outcomes rather just indicators of decline, and be designed to inform responses and include review processes to inform adaptive management.	Possible action resulting from the ICM process
	2.1.2	Assess cultural and citizen science to identify opportunities to strengthen and build into the overarching monitoring programme.	Possible action resulting from the ICM process
	2.1.3	Develop a Cultural Health Index (by Mana Whenua) for monitoring the health of ecosystems through a mātauraka lens.	Possible action resulting from the ICM process
	2.1.4	Establish avenues for Mana Whenua-directed research.	Possible action resulting from the ICM process
	2.1.5	Access, review and integrate consent monitoring (including DCC stormwater consent monitoring) into the overarching monitoring programme.	Possible action resulting from the ICM process
2.2 Education Education is crucial for improving understanding of the harbour's health and social and cultural wellbeing, and it is essential that knowledge generated through monitoring and research is shared with the community. The community is well aware of and prizes the life within the harbour. However, limited understanding of the causes, scale, and impacts of existing results in inconsistent community participation in stewardship roles and actions, such as sustainable recreational fishing practices and prevention of littering. This impacts not just the environment, but also cultural practices and connection to place. The >50 schools in the harbour catchment, Youth Council, and University should also be engaged in this process.	2.2.1	Develop avenues for more accessible communication of research and information about the harbour ecosystems through a variety of mechanisms including social media and/or a book or leaflet about Te awa Ōtākou – what's special about it or an account of the living history. Make this available to habour residents and the wider Ōtepoti community, including visitors.	Possible action resulting from the ICM process
	2.2.2	The Yellowfish campaign for avoiding littering and polluting around stormwater drains could be revitalised with an accompanying digital element.	Possible action resulting from the ICM process
	2.2.3	Improve education on the fate of piped urban water including Toitu and Ōpoho through visual arts, story telling and potentially renaming of piped streams on DCC asset plans and consenting documents. This needs to highlight the role of this infrastructre in linking the harbour and headwaters.	Possible action resulting from the ICM process
	2.2.4	There is a clear need to improve visibility of cultural perspectives in existing educational programs and initiatives.	Possible action resulting from the ICM process
	2.2.5	The visibility and celebration of unique species could be enhanced, for example an underwater camera could be installed at Anderson's Bay to capture the octopus migration; and engaging signage could be installed celebrating the Otago Shag.	Possible action resulting from the ICM process

	2.2.6	Education opportunities throughout the education pathway (primary – tertiary) are fundamental to the wellbeing of the harbour and community. This needs to be supported by providing equitable access to the harbour, e.g. providing affordable and reliable transport to Quarantine Island. Options to embed the Kaumautaurua in environmental education programmes should also be explored.	Possible action resulting from the ICM process
2.3 Kaitiakitanga in action There is and has been over a long time considerable effort from a range of organisations towards the improved state of natural systems at a habitat and species scale, including combatting of threats like pest species and restoration. This effort needs to be celebrated, supported and upscaled. Mana whenua need to be at the centre of this effort to facilitate the effective understanding of mātauraka so that informs and is central in restoration, protection and monitoring.	2.3.1	Green corridors linking areas of regenerating native cover can be pathways for taoka species. The feasibility of formally developing, restoring and protecting a continuous biodiversity corridor connecting Orokonui Sanctuary through the inner islands and across to Hereweka could be investigated. The expansion of the formalised corridor to connect to Moore's Bush, OPERA and Pukekura could follow.	Possible action resulting from the ICM process
	2.3.2	Promote planting of native vegetation along riparian margins to protect and help filter the waterways entering into the harbour.	Possible action resulting from the ICM process
	2.3.3	Promote NES-FM 2020 requirements for older structures to address fish passage barrier issues.	Possible action resulting from the ICM process
	2.3.4	Revisit conceptual restoration plans for the naturalisation and restoration of the Ōwheo catchment and functions of the area of tidal influence.	Possible action resulting from the ICM process
	2.3.5	Create coastal bird roosting habitat.	Possible action resulting from the ICM process
	2.3.6	Investigate culturally sensitive options for restore parts of the intertidal zone.	Possible action resulting from the ICM process
	2.3.7	Integrate mātauraka into planting plans to ensure appropriate habitat and food for native bird species.	Possible action resulting from the ICM process
	2.3.8	Cruise ship outreach programme. In partnership with Mana Whenua, give a presentation Te Awa Ōtākou to visitors prior to disembarking at Port Chalmers. This should include the environmental & human history of the harbour and coast, and how to be a responsible, respectful visitor.	Possible action resulting from the ICM process
	2.3.9	Increase the area of native biodiversity under protection.	Possible action resulting from the ICM process
	2.3.10	Celebrate STOP, PFD, OPERA, OPBG, Halo Project, City Sanctuary, Pukekura Trust, and others for their habitat restoration, pest management, and species conservation efforts.	Possible action resulting from the ICM process
	2.3.11	Work with private landowners to increase native vegetation cover on the Otago Peninsula.	Possible action resulting from the ICM process
	2.3.12	Provide support to progress the Sustainable Peninsula concept.	Possible action resulting from the ICM process
	2.3.13	Youth engagement and volunteer drive (beyond Enviroschools). Provide equitable access (e.g., Monarch shuttle to bring kids from town; Councils/community board provide/fund as an act of manaakitanga). Undertake review of what's already happening, what has & hasn't worked, work with schools to identify opportunities to weave this into the curriculum. Enable year round participation in the 'fun stuff' – monitoring (learning with ecologists/specialists), participating & planting	Possible action resulting from the ICM process
	2.3.14	Mana Whenua to lead the progression of a Fisheries Management Plan for the harbour, including but not exclusive to tuaki, scallops, fin fish and kōura.	Possible action resulting from the ICM process
	2.3.15	Enable and support manawhenua to rejuvenate and lead the sustainable management of tuaki populations.	Possible action resulting from the ICM process
	2.3.16	Extend the Mātaitai to whole harbour.	Possible action resulting from the ICM process
	2.3.17	Mana Whenua and UoO investigate the possibilities for regenerative ocean farming to create commercial opportunities balanced with methods of farming that regenerate fishing grounds, filter water and store carbon.	Possible action resulting from the ICM process
	2.3.18	Develop a conservation management strategy for mahika kai (species harvested for food sources), keystone (essential to healthy ecosystem structure and function), and flagship (conservation 'icons' for community engagement) species of Te Awa Ōtākou catchment.	Possible action resulting from the ICM process
2.4 Pollution reduction The harbour receives a wide variety of pollutants often transported via the stormwater network. This includes heavy metals, hydrocarbons, sediments, litter and wastewater. Change in practice and education is needed to support infrastructure improvements and better decision making by Councils, community, business, industry and transport agencies.	2.4.1	Work with Keep Ōtepoti Beautiful, University of Otago Student Association to identify/manage litter from the student precinct.	Possible action resulting from the ICM process
	2.4.2	Work with DCC to investigate solutions to wind-blown litter pollution & ongoing improvement of disposal and recycling infrastructure/services.	Possible action resulting from the ICM process
	2.4.3	Rubbish education programme. Collaborate with Keep Ōtepoti Dunedin Beautiful and Para Kore. This could tie to the revitalised Yellowfish campaign.	Possible action resulting from the ICM process
	2.4.4	Ensure that the District Plan and DCC's Te Ao Tūroa – The Natural World Strategy directly address stormwater quality and volume in Te awa Ōtākou catchment with specific policies and rules.	DCC Planning Team
	2.4.5	Investigate opportunities to provide treatment for the existing Portobello Road pump station flows.	DCC Three Waters Team
	2.4.6	Woka Kotahi and DCC to work together to ensure transport projects integrate best practice.	DCC Roading Team
	2.4.7	Investigate options and funding for ongoing retrofitting of stormwater management interventions across existing urban areas.	DCC Three Waters Team
	2.4.8	Continue ongoing investigations and targeted improvements to reduce the frequency and severity of wastewater discharges to the stormwater network.	DCC Three Waters Team
	2.4.9	Develop improved, locally relevant Erosion and Sediment Control guidance and standards.	DCC Three Waters Team
3. TOURISM - There is significant opportunity to enhance the region's appeal as a premier tourist destination while ensuring that growth is sustainable, contextually appropriate and strategically phased. **Issues** - Seasonality and Climate - Market Challenges for Operators - Access & Connectivity - Authenticity vs. Commercialisation - Underutilisation of Tourism Assets			
3.1 Building on the Destination Ōtepoti Strategy There is significant opportunity to enhance the region's appeal as a premier tourist destination while ensuring that growth is sustainable, contextually appropriate and strategically phased. Issues. All relevant parties should be brought together —tourism operators, businesses, governing bodies, and Mana Whenua, port Otago—under a shared vision for the harbour's tourism future.	3.1.1	Embrace the existing Tourism Growth Framework by DunedinHOST to ensure that key ambitions are translated into specific, actionable steps, aligning efforts across the region to fully realise the harbour's tourism potential.	Enterprise Dunedin
	3.1.2	Embody Mana Whenua values and practices and ensure that these are integral to this effort.	Enterprise Dunedin
	3.1.3	Be phased with clearly defined ownership and allocation of responsibilities. A phased approach also provides flexibility, enabling the strategy to adapt to changing conditions and emerging opportunities.	Enterprise Dunedin
	3.1.4	Balance tourism growth with environmental conservation efforts to maintain the harbour's natural beauty and ecological health, ensuring its long-term appeal as a destination. Balancing tourism growth with community wellbeing and identity is also vital to ensure sustainability.	Enterprise Dunedin
	3.1.5	Focus development on the enhancement of attractions and services that operate year-round, embracing and celebrating the Otago climate, to help mitigate the impacts of seasonality and provide more stable economic opportunities for local businesses.	Enterprise Dunedin
	3.1.6	Ensure that Mana Whenua lead the curation and development of experiences that promote the rich Māori heritage of the harbour in an authentic manner, which centres mana whenua ownership and agency. Mana Whenua could develop these as purchasable standalone resources for self-guided tours, for use by operators under license, or developed as tourism destinations.	Enterprise Dunedin
3.2 Support for Small Operators There are multiple small niche operators that are most vulnerable to a	3.2.1	Promoting Visibility: Building on DunedinHOST's marketing platforms to ensure small businesses are integrated into the region's wider tourism narrative.	Enterprise Dunedin

variety of factors - seasonal weather, pandemics, economic climate (current recession), and so on. A focus on supporting them through marketing, upgrade of shared infrastructure and use of other resources would improve their resilience and optimise the marketing of their shared tourism experience they provide.	3.2.2	Collaborative Resources: Facilitating cooperative ventures such as shared marketing, transport, or booking systems to reduce operational overheads.	Enterprise Dunedin
	3.2.3	Encouraging Innovation: Developing incentives to support new offerings aligned with the harbour's unique natural and cultural context, including eco-tourism and low-season activities.	Enterprise Dunedin
3.3 Enhancing Infrastructure and Connectivity The provision of high quality visitor experience is reliant on safe, visually appealing and comfortable visitor infrastructure from wharfs to visitor centres and signage.	3.3.1	Upgrade amenities and signage at key attractions, such as The Mole, Aramoana, and other underutilized sites, to enhance visitor experiences.	DOC and DCC are developing storytelling signage with help from Mana Whenua.
3.4 Diversifying Tourism Offerings There are opportunities to support the long-term resilience and growth of tourism at Te awa Ōtākou, by diversifying tourism offerings, aiming to continue to attract a wide range of visitors and repeat visits in a sustainable manner. This growth must maintain the authenticity and integrity of the harbour's natural and cultral assets. It should be informed by a a carrying capacity assessment.	3.4.1	Adventure and Recreational Tourism: Cater more specifically for adventure tourism activities that take advantage of the harbour's natural landscapes, such as water-based activities (kayaking, sailing, and paddleboarding) or land-based activities (hiking/tramping, mountain biking, camping or off-grid experiences).	Enterprise Dunedin
	3.4.2	Food and Creative Markets: Expand successful events like the Port Chalmers Seafood Festival into a broader initiative celebrating local cuisine, art, and cultural experiences.	Ara Toi
	3.4.3	Dark Sky Tourism - Optimise the harbour's low light pollution by pomoting dark sky tourism around the Southern Lights (Aurora Australis), stargazing, night tours, and aurora viewings.	Enterprise Dunedin
3.5 Environmental and Cultural Stewardship	3.5.1	Ensure that Mana Whenua values and practices are embedded in tourism initiatives, allowing them to lead the curation of Māori heritage experiences.	Enterprise Dunedin
	3.5.2	Promoting education on sustainable tourism practices for visitors and operators to minimise the environmental footprint of tourism activities.	Enterprise Dunedin
4. ARTS AND CULTURE - As acknowledged in the report, consultation with the creative community is yet to, and must happen for this kaupapa, given how integral this community is to the harbour and vice versa. However, several opportunities were identified through preliminary consultation. **Issues** - There is a need for more art, sculpture and cultural design to celebrate the harbour and to elevate the cultural value of the landscape to the audience. - There is a lack of Mana Whenua representation (including arts) around harbour, which has stemmed from a legacy of colonial practices that have marginalised Mana Whenua and privileged the 'Scottish' heritage of the city, resulting in a diminished visible cultural identity and connection to place for Mana Whenua. - Limited public funding for arts and culture poses a barrier to improving the visibility of both around the harbour.			
4.1 Funding and Support Use the revision of Ara Toi Ōtepoti (Dunedin's arts and culture strategy) to identify opportunities to increase support to the sector and enhance collaboration with Mana Whenua for enhanced representation of cultural values and connections to the harbour.	4.1.1	Promote collaboration between DCC Creative Partnerships and Mana Whenua to identify further key areas for creative representation.	Ara Toi
	4.1.2	Explore avenues to improve the availability and sustainability of funding, in recognition of the benefits returned to the harbour and its communities.	Ara Toi
	4.1.3	Enhance the structure and promotion of community grants and funding. Identify barriers to applying for and securing funding and address these through consultation with the community.	Ara Toi
	4.1.4	Ara Toi Ōtepoti (DCC's city-wide arts and culture strategy) is 10 years old in 2025. When the strategy is refreshed, this process should seek to interface with the kaupapa of this report and its recommendations – seeking opportunities for the arts and culture to thrive in a way that celebrates and benefits Te Awa Ōtakou.	Ara Toi
	4.2.1	A waterfront regeneration project could shine a spotlight on the Ōtepoti arts community, providing opportunities for the creative sector to contribute both in conceptualising what regeneration could look like, and in bringing that vision to life. The Ōtepoti arts community could be instrumental in identifying how space can be created for the arts to thrive in a revitalised waterfront precinct.	DCC Central City Plan
	4.2.2	Explore the feasibility of a sculpture trail to connect the city to the coast along Portobello Road – Harrington Point Road and SH88 - Aramoana Road, enhancing cultural and recreational offerings. This should include elements to engage rakatahi such as interactive installations.	DCC Parks & Recreation Team
5. INFRASTRUCTURE RESILLIENCE - Access to and protection of the harbour and its surroundings is dependent on several types of key infrastructure, including: access routes, protection and erosion control, marine and port operations, water and environmental management, streamworks. These systems are vital to the daily lives of residents, visitors, and the businesses that depend on them and the services they provide. A key challenge lies in their management, as fragmented ownership and unclear allocation of responsibility can make coordination difficult. Many of the systems are also vulnerable to the harsh coastal environment, rising sea levels, changing climate and ongoing maintenance needs.			
5.1 Integrated Infrastructure and Access Strategy Building on ongoing initiatives by DCC, ORC, and Port Otago, an integrated approach to infrastructure and access will ensure cohesion for harbour infrastructure. Existing efforts such as the DCC Infrastructure Strategy, Otago Harbour Reserves Management Plan, and Harbour Arterial Project have laid valuable groundwork. Stakeholder suggestions are to expand and coordinating efforts responding to patterns of use / demand, to address gaps and ensure equitable outcomes.	5.1.1	Leverage existing plans: Build on the DCC Infrastructure Strategy and the Otago Harbour Reserves Management Plan to shape a unified approach to wharves, moorings, parking, and public facilities at these key nodes to ensure cohesive and efficient development. This will ensure alignment with broader citywide goals and facilitate cohesive development.	Otago Harbour Reserves Management Plan - implementation plan
	5.1.2	Hierarchy of use: Prioritise high-use areas where improved access will benefit the greatest number of users, guiding targeted investment and ensuring immediate improvements in critical areas.	Otago Harbour Reserves Management Plan - implementation plan
	5.1.3	Phased development: Focus initially on key locations such as Dunedin City, Port Chalmers, and Portobello, with future expansion to Pukekura. This phased approach allows decision-makers to target infrastructure that maximises socio-economic benefits and system resilience.	DCC Transport Team, Tracks Trails Network, Otepoti Tracks and Trails Trust
	5.1.4	Address historic inequities, particularly in communities, such as Harwood and Ōtākou, where infrastructure improvements have been neglected. Peninsula Connection roading improvements bypassed these areas, leaving roads in poor condition. Additionally, the Te Aka Ōtākou cycleway ceases at Portobello, excluding the kāik community that contributed to the cycle network's name.	DCC Transport Team
5.2 Stormwater and Wastewater System Upgrades The aging stormwater and wastewater systems require significant upgrades to meet the demands of urban development around the harbour. These upgrades align with ongoing efforts under the DCC Infrastructure Strategy and ORC's Three Waters initiatives, which focus on addressing critical infrastructure challenges across Dunedin. These upgrades will form a critical component of the intergenerational mission to eliminate wastewater and heavy metal contamination in Te Awa Ōtākou.	5.2.1	Stormwater and wastewater capacity: The aging stormwater and wastewater systems require significant upgrades to meet the demands of urban development around the harbour. Upgrade existing stormwater and wastewater systems to handle heavy rain events and rising groundwater levels to safeguard water quality and prevent pollution. These upgrades, along with operational maintenance regimes, are critical to eliminating wastewater and heavy metal contamination from urban areas in Te Awa Ōtākou.	DCC Three Waters Team
	5.2.2	Address unreticulated systems: Beyond Portobello, wastewater reticulation remains absent, with reliance on domestic septic tanks. Developing resilient long-term solutions for these systems is essential.	DCC Three Waters Team
	5.2.3	Focus on redevelopment: Current rules in the District Plan emphasise 'new development mapped areas,' which are largely outside the harbour catchment. There is a need for clear and unambiguous rules to support intensified redevelopment of existing residential and commercial areas, ensuring continuous improvement in water quality outcomes at all scales.	DCC Three Waters Team

	5.2.4	Incorporate innovative practices: Build on efforts under the DCC Infrastructure Strategy to prioritise water-sensitive design principles, such as raingardens, constructed wetlands, and incentivised water-sensitive practices.	DCC Three Waters Team
	5.2.5	Ensure all upgrades on existing piped streams (Toitu and Ōpoho) recognise the cultural and ecological value of these systems as connectors to remnant headwater ecosystems. Long term strategies for daylight reaches (e.g. as part of a waterfront redevelopment project) could improve ecological connectivity and should be integrated into asset plans.	DCC Three Waters Team
	5.2.6	Leverage the South Dunedin Future programme: Acknowledge the progress under this programme and explore ways to integrate stormwater management improvements with coastal resilience projects, such as constructing wetlands.	DCC Three Waters Team
5.3 Diversifying Active Transport Offering There is an opportunity to build on the recent developments to enhance public active transport opportunities - including further enhancement of cycling and other sustainable options.	5.3.1	Build on existing initiatives: Reference the success of the cycleways and ORC's additional bus services for cruise ship arrivals as a foundation for expanding active transport offerings.	DCC Roading Team
	5.3.2	Engaging the community and stakeholders in consultations can help assess the potential benefits, which include easing pressure on existing road infrastructure, reducing congestion, and promoting sustainable living. Involving residents ensures new active transport options are tailored to local needs while advancing environmental and resilience goals.	DCC Roading Team
6. CLIMATE RESILIENCE - The October 2024 storm events were a timely reminder that community education and action are urgently needed to address both the current poor state of the health of the harbour, and resilience of the harbour landscape and infrastructure as we face imminent challenges assocaited with climate change. Collaboration, partnerships, working groups, community initiatives, governance solutions, legislative ideas - macro and micro solutions - are all required. **Issues** - Vulnerability of low-lying communities - Wāhi tūpuna and coastal archaeology at risk from flooding and erosion - Climate change models isolated from mātauraka māori - Rising marine and terrestrial temperatures - Community private structures that have not been designed in regard to climate change - Aramoana sandspit dredging and erosion			
6.1 Increasing Resilience Build understanding and consideration of Mātauraka Māori experiential, ecological and climatic indicators along with DCC and ORC climate risk assessments, and take learnings from the South Dunedin project to inform ecologically sensitive, long-term solutions that bolster resilience.	6.1.1	Mātauraka Māori is a rich kete holding experiential, ecological and climatic indicators gathered over generations and bound to place, which has much to teach us in our preparation for the changes to come. It is fundamental that mana whenua participate in climate change risk assessment and mitigation planning initiatives, including technical modelling, looking through the lenses of matāuraka Māori and empirical science as they complement one another. Te Tahū o te Whāriki, the Ngāi Tahu Climate Change strategy sets the framework to achieve this.	DCC city wide and South Dunedin adaptation team
	6.1.2	The drivers and long-term need for erosion mitigation along Harwood and at Te Rauone Reserve need to be clarified. Any ongoing mitigation measures must be ecologically sensitive, long-term solutions that bolster resilience.	DCC city wide and South Dunedin adaptation team
	6.1.3	The Sustainable Peninsula concept could explore opportunities for the Otago Peninsula to go off-grid. This could greatly improve resilience of the communities along the peninsula in the face of a natural disaster.	DCC city wide and South Dunedin adaptation team
	6.1.4	Mapping and monitoring of invasive pest plant species will be essential to inform adaptive management and protect the gains achieved through restoration efforts.	Possible action resulting from the ICM process
7. GOVERNANCE - Given the dynamic nature of the harbour at the interface of the land, ocean, and freshwater, and its complex web of users and multiple values, the need for coordination was expressed a primary overarching need. The commissioning of this work by ORC and the authentic partnership with DCC and mana whenua leading the narrative in this first step demonstrates intent and serves as a solid foundation for taking this mahi forward. The ORC's Integrated Catchment Management (ICM) Programme provides the blueprint for making ths happen. **Issues** - Lack of a holistic vision and action plan - Lack of a Coordinating Institutional Structure - Regulatory-driven decision making - Tension between societal landscape outcomes and personal property rights - Access to finance and resources - Fragmented policy framework diminishes Mana Whenua capacity to engage meaningfully and particpate in decision making - Lack of transparency and accountability in decision making - Access to information			
7.1 Develop an Integrated Wide Catchment Group As per the ICM process, development of a representative Integrated Catchment Group (ICG) is a key first step in ensuring effective representation in the development of a Catchment Action Plan (CAP) for the harbour. The ICG structure should serve to facilitate coordinated decision making in giving effect to the overarching vision and objectives. Formation of the ICG will go a long way to confirming the council's commitment to the community, shown by this foundational work.	7.1.1	Ensure that formation of the Integrated Catchment Group recognises Mana Whenua not as mere stakeholders, but as equal partners with protected and enabled rakatirataka. The commissioning of this work by ORC and the authentic partnership with DCC and Mana Whenua leading the narrative voice in this first phase, demonstrates intent and serves as a solid foundation for achieving this. The establishment of a governance structure that provides strategic oversight, guidance and regular review of the progress is an option for strengthening this partnership.	ICM process
	7.1.2	Promote involvement of the Port and University of Otago in the ICM process. These two organisations are notable for their long history with and play an important role. Early engagement would enhance involvement of these key organisations in the next phase.	ICM process
	7.1.3	Identify and look to optimise/build on any existing relationships and institutional structures, both formal and informal, several of which were noted across the report. These may morph into working groups for each of the themes.	Possible action resulting from the ICM process
	7.1.4	Utilise the stakeholder database produced alongside the Te Awa Ōtākou Issues and Opportunities Report as a starting point for identifying key players and structuring engagement.	ICM process
	7.1.5	Consider establishing an appropriate legal entity that serves as the co-ordinating organisation, or delegate this to an appropriate existing organisation. It is preferable that the institution be of a type and nature that is able to receive and administer funding. It is similarly beneficial if the entity is not a government organisation, primarily to align with the community ownership, but also to avoid bureaucracy and provide resilience against changes associated with political change and short-term cycles.	Possible action resulting from the ICM process
7.2 Develop a Harbour Catchment Action Plan Build on the work to date - including the relationships fostered - to develop a Catchment Action Plan. Consider identifying and prioritising actions that are proven successes, desired by the majority of stakeholders, and have limited barriers (consent/funding) to progressing them in the immediate/short term. Nothing demonstrate commitment like action, and so quick wins should be identifed and prioritised.	7.2.1	Provide the time, space, and resources to assist the Integreated Catchment Group with developing a Catchment Action Plan.	ICM process
	7.2.2	Ensure that the Catchment Action Plan is co-developed with Mana Whenua at the forefront.	ICM process
	7.2.3	The vision should include objectives and outcomes against which success can be measured. These high-level objectives should also serve as a basis against which to prioritise actions.	ICM process
	7.2.4	The mahi should be supported by principles that guide the way role-players work together in subsequent action planning and implementation. These principles should be imbedded in the institutional mechanism and arrangements that are developed to enable and sustain collaborative and inclusive relationships across the user and interest groups.	ICM process

	7.2.5	Ensure that the Catchment Action Plan is intergenerational and accounts for a complex and dynamic system where changes are often beyond the control of any one agency. Emsure that the Catchment Action Plan is responsive to remain relevant and effective. A monitoring and evaluation framework that also includes reflection on the strength, effectiveness and health of the governance arrangements and relationships they support will be important to ensure this is acheived.	ICM process
7.3 Develop a Communications Plan and Platform Along with the importance of information, are the systems to share information in an accessible and timely manner so that stakeholders are able to know about events, have the information to inform input to planning processes, share information and learnings, and connect with other people and organisations.	7.3.1	Develop a Communications Plan and supporting tools (websites, social media) and processes (meeting structures and communication protocols) to support the effective coordination and collaboration of role-players across the harbour. Lean into the many community-led platforms that already exist, including Facebook groups and networks connected to schools and boating clubs etc.	ICM process
	7.3.2	Share succesess and learnings broadly across role-players to maintain energy, interest and momentum and motivation for attracting additional funding (a successful track record is an important criterion for funders).	ICM process
7.4 Develop Financial Instruments to incentivise Conservation and Land-use Management Build on the significant body of work internationally around the development of market-based and other financial instruments to incentivise biodiversity restoration and conservation on private land and test these in a local context.	7.4.1	Prioritise the testing and piloting of these instruments to support unlocking of access to private land to achieve landscape level objectives, through appropriate compensation for the associated opportunity cost.	Possible action resulting from the ICM process
	7.4.2	Ensure that these instruments ensure the effective accomodation of Mana Whenua realities, such as collectively owned land and intergenerational equity.	Possible action resulting from the ICM process
	7.4.3	Develop a database of funding opportunities.	Possible action resulting from the ICM process

10.3. Report on implications of changes to the RMA in relation to Land and Water

Prepared for: Council

Report No. GOV2466

Activity: Governance Report

Author: Tom De Pelsemaeker, Team Leader Freshwater and Land

Endorsed by: Anita Dawe, General Manager Regional Planning and Transport

Date: 19 March 2025

PURPOSE

[1] This paper provides a summary of:

a. The implications and unintended consequences for Otago Regional Council (ORC) of the legislative change preventing the notification of freshwater planning instruments; and
b. The options recommended by staff for addressing these issues.

EXECUTIVE SUMMARY

[2] Legislation passed in October 2024 that prevented ORC from notifying its draft Land and Water Regional Plan (LWRP), prevented all regional councils from notifying freshwater planning instruments earlier than the date on which a new National Policy Statement for Freshwater Management (NPSFM) is published, or 31 December 2025 (whichever is sooner). This has several unintended consequences for ORC in performing its function to sustainably manage freshwater.

[3] The unintended consequences relate to continuing with the current planning framework and are a particular issue for managing rural diffuse discharges and water quantity in Otago.

[4] A more detailed assessment of the unintended consequences and proposed options to address them is provided in:

a. Attachment 1: Implications of the legislative change preventing the notification of freshwater planning instruments for managing rural diffuse discharges in Otago;
b. Attachment 2: Implications of the legislative change for notifying freshwater planning instruments for the management of water permits in Otago.

[5] All options considered have drawbacks. On balance, staff recommend that Council request that the Minister for the Environment make legislative amendments to override particular provisions of the Regional Plan: Water and extend existing water permits.

RECOMMENDATIONS

That the Council:

1) ***Notes*** *that legislation passed in October 2024 has had unintended consequences for managing rural diffuse discharges and water quantity in Otago.*

2) ***Agrees*** *to Option 3: Request that Central Government undertake a legislative amendment to address the unintended consequences of delaying the notification of the LWRP.*

<u>For managing rural diffuse discharges:</u>

3) ***Agrees*** *to request that Central Government undertake a legislative amendment to ensure that Rules 12.C.1.1A and 12.C.1.1.3 of the Regional Plan: Water do not come into effect until a new Land and Water Regional Plan for Otago is made operative.*

<u>For managing water quantity:</u>

4) ***Agrees*** *to request that Central Government undertake a legislative amendment to extend the duration of existing water permits so their expiry date is after a new Land and Water Regional Plan is made operative; and override the 31 December 2025 date in the provisions of Chapter 10A of the Water Plan and extend it to 31 December 2031.*

<u>Next steps</u>

5) ***Requests*** *that staff prepare a draft request to the Minister for the Environment for Council consideration.*

6) ***Directs*** *staff to work with officials at the Ministry for the Environment to identify the necessary legislative amendments, should the Minister be supportive of this approach.*

7) ***Delegates*** *approval of the request to the Minister for the Environment to the Chair of Council and Chief Executive.*

BACKGROUND

[6] In December 2019, following Professor Peter Skelton's review of ORC's planning functions, a work programme was agreed between ORC and the previous Minster for the Environment. The agreed work programme involved:

a. The development of an interim planning and consenting framework to manage freshwater up until the time that new discharge and allocation limits are set, in line with the requirements in the relevant NPSFM at that time;
b. A complete review of the Regional Policy Statement; and
c. The development and notification of a new LWRP for Otago.

[7] To meet the agreed work programme, Plan Change 7 (Water Permits Plan Change) (PC7) introduced a new chapter, Chapter 10A, to the Water Plan. This plan change became operative in 2021 and contains interim provisions to facilitate the transition to a new LWRP by managing the granting of water permits for:

a. New takes and uses of freshwater, and

b. The replacement of 'deemed permits'[1] and existing water permits to take and use surface water that expire prior to 31 December 2025.

[8] In 2014, Plan Change 6A (PC6A) whose purpose was to address a gap in the Water Plan by introducing a suite of rules to manage rural diffuse discharges became operative, with two of the rules to come into force in April 2020. However, due to issues associated with implementing these rules, Plan Change 6AA (which became operative in April 2020) amended this date to April 2026, by which time a new LWRP was expected to be in place.

[9] An additional Plan Change, Plan Change 8 was also developed as an interim measure to respond to gaps created by Plan Change 6AA.

[10] Following PC6AA, PC7 and PC8, work commenced on the draft LWRP, as agreed with the Minister. A Council decision on whether to notify the new LWRP was scheduled for the 23 October 2024 Council meeting.

[11] Prior to the 23 October meeting, the Resource Management (Freshwater and Other Matters) Amendment Act 2024 was introduced that prevented ORC from notifying a freshwater planning instrument earlier than the date on which a new NPSFM is published or 31 December 2025, unless an exception applies.[2] This has several unintended consequences for ORC in performing its function to sustainably manage freshwater.

UNINTENDED CONSEQUENCES – RURAL DIFFUSE DISCHARGES

[12] Under section 15 of the Resource Management Act (RMA) a person may only discharge contaminants to water, or to land in circumstances where it may enter water, if the discharge is permitted by a rule in a plan or the person has a resource consent that authorises the discharge. There are many farmers in Otago currently operating in reliance on the permitted activity discharge rules introduced by PC6A.[3] If the two problematic rules come into force in 2026, these farmers may not be able to comply with the additional permitted activity conditions and will require a resource consent to continue to operate lawfully.

[13] Changes to the national regulations means that there are matters that ORC intended to be managed by the draft LWRP that, in its absence, create gaps in Otago's planning framework for managing water quality issues that result from diffuse discharges because:

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1 'Deemed permits' are mining privileges granted to goldminers to use water. As gold mining in Otago started to decline, mining privileges were increasingly being exercised to use water for irrigation and stock water supply. They were deemed a water permit when the RMA was enacted in 1991 with an expiry date of 1 October 2021.

2 The Minister may approve an exemption for specified reasons including to address any provisions in a plan or policy statement that have unintended consequences, are unworkable or lead to inefficient outcomes.

3 There are approximately 3,300 farms in Otago, and we expect most of them would be relying on the permitted activity rules (StatsNZ https://www.stats.govt.nz/indicators/farm-numbers-and-size)

a. The notification of the LWRP has been deferred,
b. The temporary standards for intensification under the National Environmental Standards for Freshwater no longer apply,
c. The intensive winter grazing standards have been amended and no longer manage intensive grazing on slopes over 10 degrees, or set limits on an area of a farm that can be used for intensive winter grazing,
d. The stock exclusion regulations have been amended and beef cattle and deer on low slope land are now only excluded from waterbodies when intensively grazing,
e. The operative Water Plan provisions have been shown to not manage diffuse rural discharges in an effective and efficient manner.

[14] A more detailed assessment of the implications of the legislative change for notifying freshwater planning instruments on the management of rural diffuse discharges in Otago is provided in Attachment 1.

UNINTENDED CONSEQUENCES – WATER QUANTITY

[15] Plan Change 7 to the Water Plan introduced interim provisions to facilitate the replacement of 'deemed permits' and the granting of water permits to take and use water while a fit for purpose LWRP was developed. While all the deemed permits have now been replaced with water permits, those permits were generally issued for a short term, on the assumption that a new management framework would be in place that better addressed water quantity limits.

[16] Central Government changes to freshwater planning prevent ORC from notifying a new LWRP prior to 31 December 2025. The unintended consequences of continuing with the interim framework from Plan Change 7 can be summarised as follows:
a. It results in an unfair and complex planning regime for water users, allowing some to apply for longer consent terms while others are unable to; and
b. It impacts on the council's ability to manage water quantity and/or water quality under a future freshwater planning framework.

[17] A more detailed assessment of the unintended consequences of continuing with the transitional framework for granting water permits under the operative Water Plan is provided in Attachment 2.

Options for addressing unintended consequences for managing water quantity and rural diffuse discharges

[18] This paper seeks direction from council on how to respond to the issues and associated risks from central government changes to freshwater planning in relation to the management of freshwater in Otago. Three reasonably practicable options have been identified for Council to consider whether, and how, to address the unintended consequences of the delayed plan notification with respect to the management of rural diffuse discharges and consenting of water permits.

[19] These options are:

Option 1: Do nothing, await new national policy direction and implement new national direction as quickly as possible.

Option 2: Plan Change to the operative Water Plan to fix the unintended consequences.

Option 3: Request that Central Government undertake a legislative amendment to fix the unintended consequences.

Option 1: Do nothing

[20] Option 1 requires no action from the Otago Regional Council or Central Government and entails the continued reliance on the operative provisions for managing water permits and rural diffuse discharges in the plan.

Option 2: Plan Change to the operative Water Plan to fix the unintended consequences

[21] Option 2 involves the development of a plan change to the operative Water Plan to fix the unintended consequences of delaying the notification of the LWRP on the management of rural diffuse discharges and water permits. Specifically, this option proposes to:

a. Amend Rules 12.C.1.1A and 12.C.1.1.3 through a plan change so that the time that these rules will not come into effect until 31 December 2030 (which is the date in the future when we could expect a new LWRP to be made operative); and,
b. Amend the Chapter 10A provisions through a plan change so that these provisions would continue to apply to all applications to replace existing water permits that expire prior to 31 December 2031 (This proposed date is selected to ensure that all consent holders of a water permit previously granted under Chapter 10A of the operative Water Plan will continue to be subject to the same policies).

[22] Staff have considered the likely timeframes for developing a plan change and making it operative. Table 1 sets out the key steps in the development of a plan change and the anticipated minimum timeframes for undertaking each of these steps (based on previous experiences with Plan Changes 6AA and 7).

Table 1: Estimated minimum timeframe for undertaking a plan change

Step	**Estimated minimum timeframe**
Scoping of plan change	1 month
Preparation of draft Plan Change & S32 report	3 to 4 months
Pre-notification consultation under Clauses 3 and 4A, Schedule 1 RMA	1 to 2 months
Seek an exemption from the Minister under s42(1)(d) of Schedule 12 of the RMA	Uncertain
Council decision on notification and preparation of notification	1 month
Estimated time up to notification	6-8 months
Notification, submissions and further submissions	2 months (PC6AA) - 4 months (PC7)
Preparation of reports to support the Hearing (section 42A reports)	1 month (PC6AA) - 5 months (PC7)
Hearings & deliberations	1 month (PC6AA) - 9 months (PC7)
Estimated time from notification to operative	7 – 20 months
Appeal period	Indefinite

[23] Table 1 illustrates that the estimated minimum timeframe needed to develop a plan change would be at least 6 months, while it would take at least another 6 months to make the plan change operative. When considering the viability of developing a plan change and making it operative within the minimum timeframe, the following should be noted:

a. It is unlikely to allow for comprehensive public consultation to be undertaken prior to notification;
b. This Plan Change would be conducted under the Freshwater Planning Process, meaning the Chief Freshwater Commissioner would need to appoint the Panel and Council would have less control over the scheduling of the Hearing;
c. Any appeal process would further delay the plan change becoming operative;
d. The scope of this Plan Change would be larger than Plan Changes 6AA and 7, likely with more submitters;
e. The timeframes for Council decisions would need to account for the 2025 local government elections.

[24] In addition, the requirement to seek an exemption from the Minister to notify the Plan Change creates uncertainty for the content and timeframes of the process.

Option 3: Legislative amendment to fix the unintended consequences

[25] Option 3 involves ORC requesting the Minister for the Environment to make a legislative amendment to:

a. Override the provisions of the Water Plan so that Rules 12.C.1.1A and 12.C.1.1.3 do not come into effect until the framework for managing rural diffuse discharges in a new Land and Water Regional Plan will be operative; and
b. Extend the duration of existing water permits so their expiry date is after a new Land and Water Regional Plan is made operative; and
c. Override the 31 December 2025 date in the provisions of Chapter 10A of the Water Plan and extend it to 31 December 2031.

[26] The effect of the proposed legislative fix is that landholders who may not be able to comply with Rules 12.C.1.1A and 12.C.1.1.3 of the Water Plan and water users that currently hold an existing permit will not be required to apply for a new consent prior to a new Land and Water Regional Plan becoming operative.

[27] The proposed legislative amendment to override the 31 December 2025 date in Chapter 10A and extend it to 31 December 2031 also addresses a gap in the policy framework by ensuring that, if a consent holder sought to replace an existing permit, it would be considered under Chapter 10A's policies and subject to a 6-year consent duration (but with the benefit of a controlled activity pathway).

[28] The proposed legislative fix would extend the duration of existing water permits in all circumstances except where consent holders currently operating under a short term or transitional consent already have a "replacement" consent in place that allows them to take water beyond the expiry of the short-term consent.

[29] Table 2 summarises the pros and cons of each of the proposed options.

Table 2: Pros and cons of proposed options to address unintended consequences of changes to freshwater planning in relation the management of freshwater in Otago.

Option	Pros	Cons
Option 1: Do nothing	• Avoids the expense of a plan change. • Allows Council to focus on responding to the new NPSFM once it is in force.	• Does not resolve the unintended consequences of delaying the notification of the LWRP for rural landholders and water permit holders. • Creates uncertainty for farmers, who may not be able to comply with the permitted activity rules at all times. • May result in farmers requiring a consent to continue to operate within legal boundaries. This could result in option 1 becoming the most expensive option for rural landholders. • Creates an unfair regime for water permit holders (some can apply for long term consents, while others cannot). • Allowing some water permit holders to apply for long term consents could hamper the effective and efficient transition towards a new freshwater management regime.
Option 2: Plan Change to the operative Water Plan	• Council has greater control over the process. • Will address the unintended consequences.	• Plan changes take a long time, and in the meantime, the unintended consequences will be felt. • Will be expensive and resource intensive for Council and the community. • Preparing a plan change will delay other planning work (e.g. reviews of the Air Plan and the Coast Plan)

Option	Pros	Cons
		• Will delay implementation of new national direction, as focus is on Plan Change. • Minister may not grant an exemption to allow Plan Change to be notified.
Option 3: Request that Central Government undertake a legislative amendment	• Avoids costly and lengthy plan change processes for Council and community. • The unintended consequences will be addressed. • Will allow Council to implement national direction most quickly.	• Risk that the Minister may not agree to progress the legislative amendment. • Risk that the Minister may choose to do something different to Council's request which may have its own unintended consequences. • Uncertainty that the amendment comes into force before the unintended consequences become a problem. • There could be little (or no) opportunity for community engagement.

[30] A more detailed assessment of the pros and cons of each of the above options (and other discounted options) for rural diffuse discharges and water quantity is provided in Attachments 1 and 2.

Conclusion

[31] Having considered the pros and cons of each of the options, staff consider that Option 3, requesting a legislative fix is the best option for addressing the unintended consequences for both rural diffuse discharges and water quantity.

[32] Option 3 provides for an efficient transition to a new fit-for-purpose freshwater management regime. It also provides a timelier and more efficient solution than a plan change as a legislative fix becomes 'operative' on the date the legislation commences and there is no requirement for applicants and consent planners to consider two sets of rules. Option 3 is more efficient than both Option 1 and Option 2 for farmers and the most cost-effective option for Council and the community.

[33] There are downsides to Option 3. There is a risk that the Minister may not agree to progress the legislative amendment, or the amendment does not come into force before December 2025. The lack of opportunity for stakeholder or community input into the amendments to the Water Plan is also a concern. Council may choose to consult under the LGA either prior to making a request, or during preparation of the legislative instrument. There is also uncertainly about the level of resources required from ORC to engage with central government in the process, however it is likely to be significantly less than the resources required for a plan change.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[34] ORC formally committed to a review of the operative Water Plan in October 2018. A new LWRP was scheduled to be notified by the end of October 2024, but the notification of this instrument has currently been put on hold until new national direction is gazetted.

[35] This report outlines various options for managing rural diffuse discharges and the consenting of takes and uses of water in the interim period. Staff consider that, of all the options discussed in this paper, the recommended option best provides for an efficient and effective transition towards a new freshwater management framework in the draft LWRP that gives effect to relevant national direction and higher order planning framework.

[36] The recommended options also best achieve Council's key goals under ORC's Strategic Directions by:

a. Ensuring ecosystems are healthy, water is clean, and biodiversity loss is arrested across the region
b. Addressing emerging environmental issues before they arise
c. Ensuring that regional plans are effective at sustainably managing resources in a planned and considered way
d. Ensuring that Otago's communities are satisfied with the outcomes that we are delivering
e. Supporting and empowering communities to achieve better environmental outcomes
f. Improving the social, cultural, economic, and environmental wellbeing of Otago.

Financial Considerations

[37] Any costs associated with addressing the unintended consequences of delaying the notification of the LWRP are unbudgeted.

[38] The financial considerations of this paper vary depending on the option that is adopted by council. Costs associated with undertaking a plan change are likely to be significant, involving both staff time and legal costs (as well as possibly consultants and technical experts) associated with the development and notification a plan change, hearings and any appeals that may arise.

[39] The costs associated with a legislative amendment, while currently unknown, are likely to be considerably less than the cost of a plan change.

Significance and Engagement Considerations

[40] Any of the options proposed will trigger the requirements of *He Mahi Rau Rika* as they are likely to have significant impacts on resource consent holders, industries and the community at large.

[41] If Council resolves to adopt the option of a plan change to the operative Water Plan, then the RMA Schedule 1 process can be followed. This process will automatically satisfy the requirements of *He Mahi Rau Rika*.

[42] If Council resolves to adopt the option that seeks a legislative fix, Council may choose to consult under the LGA.

Legislative and Risk Considerations

[43] Legislative and wider risk considerations associated with the options presented in this paper are outlined in the tables setting out the pros and cons of all proposed options in Attachments 1 and 2.

Climate Change Considerations

[44] The decisions in this paper are not expected to have climate change impacts.

Communications Considerations

[45] Given the significant interests of many stakeholders, and the broader community, it will be important to be as transparent as possible around Council decisions on the options proposed in this paper.

NEXT STEPS

[46] The next steps are:

a. ORC staff to implement the option adopted by Council.
b. If the Plan Change option is chosen: ORC staff will report back to Council with a proposed scope and timeframes for a Plan Change.
c. If the legislative amendment option is chosen: ORC staff will work with the Chair and Chief Executive to finalise the letter to the Minister for the Environment, and report back to Council with a more detailed proposal for a legislative amendment.

ATTACHMENTS

1. Attachment 1 Implications of the legislative change for managing rural diffuse discharges in Otago [**10.3.1** - 10 pages]
2. Attachment 2 Implications of the legislative change for managing water permits [**10.3.2** - 10 pages]

Attachment 1: Implications of the legislative change preventing the notification of freshwater planning instruments for managing rural diffuse discharges in Otago

Purpose

1. The purpose of this paper is to identify the unintended consequences and gaps created by the Government's changes to the freshwater planning system for the management of activities typically associated with rural diffuse discharges and to identify options for addressing those issues and gaps.

Background

2. The Resource Management Act (RMA)[1] prohibits any discharge of a contaminant into water or onto or into land in circumstances which may result in the contaminant entering water unless the discharge is expressly authorised by a rule in a regional plan, a national environmental standard, or a resource consent.

3. The approach of the Regional Plan: Water for Otago (the Water Plan) has been to manage the discharge of contaminants to water rather than to manage the uses of land that lead to those discharges occurring. This approach implements the Rural Water Quality Strategy 2011[2] that set out an effects-based approach to managing rural discharges (primarily diffuse discharges) to water. The Strategy outlined ORC's decision to control the discharge of contaminants from land to water instead of controlling land use activities and nutrient inputs.

4. Latest state of the environment (SoE) monitoring indicates that, while water quality in some areas of Otago may be improving over the most recent 10-year period, water bodies in other parts of the region are degrading and there is potential for further degradation to occur[3]. Discharges from both urban expansion and rural intensification can contribute to degradation in water quality.

5. The Water Plan currently manages point source discharges for rural and urban activities. However, it does not have a workable comprehensive framework for managing rural diffuse discharges or rural intensification. Plan Change 6A to the Water Plan sought to provide a framework for managing diffuse rural discharges, but several of the provisions had a transition time and were due to come into effect from 1 April 2020.

6. Plan Change 6AA to the Water Plan further deferred those provisions until 1 April 2026 as they were considered to be ambiguous, uncertain and unenforceable. The problematic nature of the framework for managing rural diffuse discharges and the lack of a framework for managing land use intensification was intended to be resolved in a new Land and Water Regional Plan which was to be considered for notification by 31 October 2025. However, the deferral of the notification of the draft Land and Water Regional Plan (LWRP) and continued reliance on the

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1 Section 15 RMA

2 https://www.orc.govt.nz/media/5383/rural-water-quality-strategy-summary-fact-sheet-web.pdf

3 https://www.orc.govt.nz/media/yosn5oj3/memo_lwrp-surface-water-quality-programme-regional-summary_j-augspurger_feb-2024.pdf

provisions of the Water Plan creates risks for the environment as well as technical issues for landowners and plan administrators.

Otago's framework for managing rural diffuse discharges (Plan Change 6A)

7. Plan Change 6A (PC6A) to the Water Plan was notified in 2012 and became operative in 2014. PC6A sought to address a gap in the Water Plan by introducing a suite of rules to manage diffuse (non-point source) discharges (primarily rural discharges). There are no other provisions in the Water Plan for managing diffuse rural discharges.

8. PC6A rules permit discharges of water or any contaminants to water or onto or into land in circumstances where it may enter water, if they comply with specified standards[4]. Application of nitrogen onto land where nitrogen may enter groundwater is also permitted if it complies with the limits specified in the rule as calculated by Overseer version 6[5]. Discharges which are not permitted by the rules are restricted discretionary if their duration is less than five years[6], or less than two years for a short-term activity with a short-term effect[7]. Consents for durations longer than five years are a discretionary activity[8].

9. PC6A also included rules prohibiting discharges to water that have an obvious adverse effect in receiving water, including sediment entering water from land disturbance[9]. Discharges to water from animal waste systems, silage storage or a composting process are also prohibited[10]. A prohibited activity is one for which no consent can be sought or granted.

10. Two PC6A rules were to come into force in April 2020. However, for the reasons discussed below Plan Change 6AA amended this date to April 2026. The specific rules are the following:

    - Rule 12.C.1.1A is a permitted activity rule. In addition to Rule 12.C.1.1[11], it sets discharge contaminant concentration thresholds (nitrate-nitrite nitrogen (NNN), ammoniacal nitrogen, dissolved reactive phosphorus (DRP), and *E. coli*,) that apply to surface run off to rivers, lakes, wetlands or water races; and to discharges from drains and water races to rivers, lakes or wetlands. The rule requires compliance with the contaminant limits in Schedule 16A to the Water Plan, which must be measured when the water flow at the relevant flow monitoring site is at or below the reference flow in Schedule 16B. Schedule 16A contains numerical thresholds for the contaminants, however it is silent on the application of those values[12]. A practical application of this rule would see activities permitted on some days and requiring consent on others.
    - Rule 12.C.1.3 is a permitted activity rule which permits the application of nitrogen to land in circumstance that may result in nitrogen entering groundwater providing the nitrogen

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4 Rules 12.C.1.1 to 12.C.1.3
5 Overseer is a model that describes nutrient flows on farms, it takes nutrients that are present or introduced to the farm, models how they are used by plants and animals on the farm, and then estimates how they leave the farm and in what form.
6 Rule 12.C.2.1, Rule 12.C.2.3
7 Rule 12.C.2.2
8 Rule 12.C.3.2
9 Rule 12.C.0.1, Rule 12.C.0.3
10 Rules 12.C.0.2, Rule 12.C.0.4
11 Rule 12.C.1.1. is a permitted activity rule for discharges of water or contaminants to water or to land in circumstances where it may enter water provided certain conditions are met.
12 For example, it does not state whether the values are medians, averages, or 95th percentiles or what monitoring period is to be used.

leaching limit calculated using OVERSEER version 6 does not exceed the limits set out in the rule. This is challenging because OVERSEER version 6 no longer exists. OVERSEER has been updated at least four times since PC6A and version changes can alter farm estimates significantly without changes to the actual nitrogen leaching meaning that a previously permitted discharge may become non-compliant and require a resource consent. The rule also does not specify a period of time over which the Overseer estimate must be run, creating uncertainty over the interpretation of the rule.

Flaws in the framework for managing rural diffuse discharges

11. As the date (1 April 2020) approached to implement Rules 12.C.1.1A (Schedules 16A and 16B) and 12.C.1.3 (Overseer), it became apparent that implementation was going to be problematic. As they currently stand, the rules are uncertain, ambiguous, and difficult to enforce. In particular:

- Landowners cannot, in practice, ensure that the discharge contaminant thresholds set out in Schedule 16A are met everywhere on their property, at all times. Taken at its face value, the application of Schedule 16A could result in a land use activity being permitted on one day, requiring a consent the next day and then bouncing back to being permitted on another day[13];
- There are practical difficulties in locating where diffuse discharges should be sampled to check compliance with Rule 12.C.1.1A and Schedule 16A;
- It is difficult to ensure that the discharge contaminant thresholds are met, at all times when the flow at the relevant flow sites is below median flow as outlined in Schedule 16B;
- Rule 12.C.1.3 (Overseer) does not specify a time scale over which nitrogen leaching rates should be calculated;
- The nitrogen leaching rate must be estimated using Overseer version 6. That version of Overseer no longer exists, and the rule does not address Overseer version changes;
- Schedule 16A is considered to be ambiguous to the extent that it would more than likely be incapable of application[14]. While it contains numerical values for the contaminants, it is silent on the application of those values. It does not state if the values are medians, averages, or percentiles and nor does it state a monitoring period that should be used (e.g. two or five years)[15].

Delaying the implementation of the rules for managing rural diffuse discharges (Plan Change 6AA)

12. In order to avoid the flawed approach to managing diffuse contaminant discharges introduced by PC6A that were due to become operative in April 2020, ORC notified Plan Change 6AA (PC6AA) in October 2019. This plan change was an interim measure and aimed simply to delay the implementation of the problematic PC6A provisions and remove the immediate risk of many landowners having to apply for short term consents for minor discharges. The date was amended from 1 April 2020 to 1 April 2026, after which time it was expected that a new LWRP would be in place. PC6AA was made operative in May 2020.

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13 Recommendation Report Plan Change 6AA to the Regional Plan: Water for Otago page 6

14 Recommendation Report Plan Change 6AA to the Regional Plan: Water for Otago page 6

15 Schedule 15 of the Water Plan for example states: "… the limits …. are achieved when 80% of samples collected at a site, over a rolling 5-year period, meet or are better than the limits in Schedule 15.

13. PC6AA attracted 20 submitters, 10 in support, nine opposed and one neutral. The concerns raised focussed mainly on the potential risk of degradation of water quality if implementation of the provisions was pushed out before there was a new policy framework to replace it. It was considered by several submitters that a better alternative to PC6AA would be to strengthen the Water Plan's policy framework at the same time as addressing the shortcomings of PC6A. Those in support of PC6AA did so with the understanding that a full review of the Water Plan and the development of a new LWRP was imminent and a new framework would be in place before 2026.

Issue 1: Risks of continued reliance on the framework for managing rural diffuse discharges

14. The PC6A provisions will come into force in April 2026, resulting in the same issues which prompted the development of PC6AA. It is considered that these provisions will not be able to deliver the expected water quality outcomes, nor will they necessarily drive good farm management practices[16].

15. As stated above in paragraph 2 of this paper, under section 15 of the RMA a person may only discharge contaminants to water, or to land in circumstances where it may enter water, if the discharge is permitted by a rule in a plan or the person has a resource consent that authorises the discharge. At present, there are farmers that are operating in reliance on the permitted activity discharge rules. From 1 April 2026, if Rules 12.C.1.1A and 12.C.1.3 come into effect, there will be additional conditions in the permitted activity rules that will need to be complied with. As discussed above, farmers may not be able to comply with these conditions. Therefore, they won't be able to rely on the permitted activity rule and will need to obtain a resource consent to authorise their discharge. If they do not obtain a resource consent, the discharge will be unlawful. If Council allows these rules to come into force, there will be a window of time when many farmers will require a resource consent, even when their discharges have minor environmental effects.

16. Relying on consent applications for the management of water quality is neither effective nor efficient. The discharge policies in the Water Plan are vague and do not provide much guidance over when consents should be granted and under what conditions. Without strong policy guidance, consent decisions cannot adequately manage the cumulative effects of discharges on water quality.

17. Any consents granted under the existing framework will not be affected by subsequent changes to rules and policies during the term of the consent, unless Council calls them in for a review. However, reviews can only be undertaken under certain circumstances and there are limits to the Council's ability to impose measures through the review process to safeguard the health of water bodies[17]. This means that requiring and granting discharge consents ahead of notifying a new LWRP could undermine the effectiveness of any revised rule framework as it may lock in standards that are not necessarily appropriate.

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16 https://www.orc.govt.nz/media/7356/section-32-evaluation-report-plan-change-6aa.pdf Page 6

17 S128 RMA: a review of consent conditions can only be undertaken in certain circumstances, including (i) any unforeseen environmental effects of that activity that weren't originally anticipated, or (ii) to align the activity with the provisions of a new plan. Furthermore, any review must ensure the consent remains viable. A consent can only be cancelled for very specific reasons i.e. the information in the application was inaccurate and there are significant adverse effects on the environment as a result of exercising the consent.

Issue 2: Gaps in Otago's planning framework for managing land uses that can have an impact on water quality

18. The draft LWRP intended to manage diffuse discharges by managing known high-risk land uses, mainly through a suite of good management practices that can be adopted on-farm to reduce losses of excess nitrogen, phosphorous, sediment and *E.coli*.

19. The government has indicated that it expects regional councils to consider rules to manage intensive winter grazing, land-use intensification and stock exclusion from water bodies at a regional level, which the draft LWRP intended to do. Changes to the national regulations (i.e. the National Environmental Standards for Freshwater (NES-F) and Resource Management (Stock Exclusion) Regulations 2020) means that there are matters that ORC intended to be managed through the draft LWRP that are now gaps in Otago's planning framework. These are:

- Intensive winter grazing (IWG) regulations now only manage setbacks from waterbodies and management of critical source areas[18].
- There are currently no controls on land-use intensification[19].
- Beef cattle and deer on low slope land are only excluded from waterbodies when intensively grazing[20].

Options

20. Three options have been identified for Council to consider whether to, and then how to address the unintended consequences of the draft LWRP notification being deferred with respect to the management of rural diffuse discharges. These are:

Option 1: Await new national policy direction and implement new national direction as quickly as possible.

Option 2: Plan Change to the operative Water Plan to address the issues with Rules 12.C.1.1A and 12.C.1.1.3.

Option 3: Request that Central Government undertake a legislative amendment to override Rules 12.C.1.1A and 12.C.1.1.3.

21. The paragraphs below describe these options in more detail. The pros and cons each of these options are discussed in Table 1.

Option 1: Await new national policy direction (Do nothing).

22. This option proposes to wait until a new NPSFM has been gazetted, and review and notify a revised LWRP which implements the new higher order policy direction while also addressing the issues outlined above.

Option 2: Develop a plan change to the operative Water Plan to address the issues with Rules 12.C.1.1A and 12.C.1.1.3.

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[18] Regulations 26 and 27 NES-F

[19] Since 2020, the NES-F included regulations across New Zealand that required consent for most types of land-use intensification, which expired at the end of 2024. The expiration date reflected the RMA date when all Councils were required to have regional-level rules to manage these activities, and this was not updated when the date was changed.

[20] Regulations 14 and 15 of the Stock Exclusion Regulations have been revoked.

23. This option proposes the development of a Plan Change to make amendments to the operative Water Plan. Within this option, there are a number of possibilities for the scope of a Plan Change, which are outlined below.

24. A narrow scope Plan Change would be similar to PC6AA. This Plan Change would extend the time that Rules 12.C.1.1A and 12.C.1.1.3 will come into effect until a date in the future when we expect a new LWRP to be made operative.

25. The possibility of simply deleting Rules 12.C.1.1A and 12.C.1.1.3 was discarded in PC6AA as it removes the incentive of landowners to monitor and record nutrient inputs to their farms and removes the policy drivers for improving discharge management practices. The s32A report that was prepared in support of PC6AA highlighted a concern this option may result in reduced environmental outcomes[21]. For the same reasons, this possibility is not considered to be a reasonably practicable option.

26. A wider scope Plan Change would be to revoke Rules 12.C.1.1A and 12.C.1.3 and amend the Water Plan to include provisions from the draft LWRP that:

    a. address the water quality issues associated with PC6A by introducing some land use rules, and/or

    b. introduce limits on intensification, and/or

    c. introduce limits on stock access to water on low slope land, and/or

    d. introduce controls on IWG beyond those in the NES-F.

Option 3: Request that Central Government undertake a legislative amendment to ensure that Rules 12.C.1.1A and 12.C.1.1.3 do not come into effect.

27. This option involves ORC requesting the Minister for the Environment make a legislative amendment to override the provisions of the Water Plan so that Rules 12.C.1.1A and 12.C.1.1.3 do not come into effect until a new LWRP is made operative.

Pros and cons of proposed options

28. Table 1 assesses the pros and cons of each of the proposed options.

[21] https://www.orc.govt.nz/media/7356/section-32-evaluation-report-plan-change-6aa.pdf

Table 1: Pros and cons of proposed options to address unintended consequences for rural diffuse discharges

Options	Pros	Cons
Option 1: Await new national policy direction (Do nothing)	• Consents, while costly, would provide certainty for landholders and resource users for their farming operations. • Avoids a costly plan change process. • Enables ORC to address diffuse discharge issues at same time as giving effect to new national policy direction.	• All farmers who cannot comply with the conditions of Rules 12.C.1.1.A and 12.C.1.3 would require a resource consent. • Costs associated with farmers potentially applying for resource consents when Rules 12.C.1.1A and 12.C.1.1.3 come into effect. Although the cost of resource consents can vary widely, they could range from $15,000 to $50,000 in this particular context, to account for experts' input in preparing the application. There are approximately 3,300 farms in Otago and other land uses may be captured by these rules as well. • There will be additional pressure on ORC staff resources if a large number of farmers apply for resource consent at the same time. • Granting discharge consents for rural discharges ahead of notifying a new LWRP has the potential to undermine the effectiveness of the revised rule framework of the LWRP because consents are not affected by subsequent changes to rules and policies during their terms, unless Council calls them in for a review. • If ORC chooses this option but did not enforce the rules in the plan (i.e. did not require resource consents to be obtained when they need to be), this would give rise to a risk of legal challenge against the Council that it has failed to meet its statutory duties (i.e. that it has failed to enforce its plan). • Rural diffuse discharges would continue to contribute to degrading water quality. • Resource consents will be required from April 2026 until the replacement planning framework (i.e. a revised LWRP) is operative. It is likely that the earliest ORC could notify a LWRP is 31 December 2025, meaning the earliest it could be operative is late 2027, and with appeals could be significantly later.

Options	Pros	Cons

Option 2: Develop a plan change to the operative Water Plan to address the unintended consequences of Rules 12.C.1.1A and 12.C.1.3 coming into force. Scope of plan change could be narrow (similar to PC6AA) or wider (including some or all of the diffuse discharge rules in the draft LWRP)	• Likely to address the unintended consequences more quickly than Option 1.
	• Enables ORC to retain control of the timeline and content of the process.
	• If wider scope:
	  ○ New land use rules will provide some certainty for landowners and resource users on managing diffuse rural discharges.
	  ○ Introduction of land use rules could facilitate the transition to a new regime as the proposed rules will be tested through the court process.
	  ○ Gives ORC the opportunity to address issues associated with water quality that PC6A intended to address.
	  ○ Give ORC the opportunity to find solutions to the other gaps created by changes in national direction (NPSFM, NES-F and Stock Exclusion Regulations).
	  ○ While generating the short-term costs of a plan change, there may be longer term (cost and time) benefits when notifying the draft LWRP by including provisions that have already been tested by the Environment Court.
		• Plan changes are resource intensive in terms of both staff time and community resources.
		• Plan changes are costly for both Council and submitters. For example, the combined cost of Plan Changes 7 and 8 to the Water Plan cost more than $3 million and took approximately 3 years to complete.
		• It is almost certain that a plan change would not be operative before April 2026 when the relevant rules come into effect.
		• Between the time the plan change is notified and the provisions become operative, both the provisions in the proposed plan change and operative plan would need to be complied with, meaning this option will not address the unintended consequences.
		• If an exemption is required under clause 42(1)(d) of Schedule 12[22] to progress the plan change, there is uncertainty as to whether ORC would obtain the exemption, and doing so would take additional time.
		• If narrow scope:
		  ○ it continues the 'holding pattern' that was created by deferring Rules 12.C.1.1A and 12.C.1.1.3 coming into effect and getting a revised water quality framework in place, potentially contributing to degrading water quality.
		  ○ May not be supported by stakeholders.
		• If wider scope:
		  ○ The costs will be higher as the plan change would be more complex, taking longer to develop and likely involve more hearing time.

[22] Clause 42 of Schedule 12 of the RMA provides for exemptions to the requirement to comply with section 80A(4A), which prohibits regional councils from publicly notifying a freshwater planning instrument earlier than the date on with a new NPSFM is published or 31 December 2025 whichever is sooner. The Minister **may** approve an exemption for specified reasons including to address any provisions in a plan or policy statement that have unintended consequences, are unworkable or lead to inefficient outcomes.

Options	Pros	Cons
		○ There may be additional complexity in progressing a change without the rest of the LWRP, if there is a significant change in direction. ○ The Minister may refuse to grant an exemption for a Plan Change with a wider scope. ○ The costs of developing the plan change would be borne out before the Minister considered whether an exemption was able to be granted.
Option 3: Request the Government undertake a legislative amendment to override Rules 12.C.1.1A and 12.C.1.1.3.	• Avoids costly and lengthy plan change processes. • Removes the possibility of farmers requiring a resource consent for all activities that may generate a diffuse discharge. • Once legislation is in place it will override the operative Water Plan meaning that only one set of provisions need to be taken into account, instead of two as with a plan change. • Enables ORC to address diffuse discharge issues at same time as giving effect to new national policy direction.	• Potentially no (or at least, less) opportunity for stakeholder or community input into the amendment to the Water Plan[23]. • Risk that the Minister may not agree to progress the legislative amendment, or the amendment does not come into force before April 2026. • The level of resources required from ORC to engage with central government in the process is uncertain. • Continues the 'holding pattern' that was created by deferring Rules 12.C.1.1A and 12.C.1.1.3 coming into effect and getting a revised water quality framework in place, potentially contributing to degrading water quality. • Does not address the other gaps created by changes in national direction (NPSFM, NES-F and Stock Exclusion Regulations).

[23] If Council are concerned about the lack of public participation, ORC could consult under the LGA either prior to making a request, or during preparation of the legislative instrument.

Conclusion

29. The key consideration for Council is whether to accept a window of time where farmers may need a resource consent because they cannot comply with the conditions of Rules 12.C.1.1A or 12.C.1.3 (Option 1 or Option 2). If this is not an acceptable situation, the only reasonably practicable option identified to address the unintended consequences is Option 3.

30. Whichever option is chosen, there is a need to ensure that any change made to the Water Plan or through legislation or regulations still results in some form of permitted activity. If there is no permitted activity for the discharge, the discharge will be unauthorised unless a resource consent is obtained.

Recommendation

31. *Option 3: Request the Government undertake a legislative amendment to override Rules 12.C.1.1A and 12.C.1.1.3* is the recommended option. It is considered the only effective and efficient option to address the unintended consequences for managing water quality of not notifying the draft LWRP by 31 October 2024.

Attachment 2: Implications of the legislative change preventing the notification of freshwater planning instruments for managing water permits in Otago

Purpose

1. This paper identifies the unintended consequences resulting from Central Government changes to freshwater planning in relation to the transitional framework for granting water permits under the operative Regional Plan: Water for Otago (Water Plan). This paper also proposes options for addressing the consequence of these changes.

2. Staff recommend option 3 presented in this paper, which proposes that council requests central government to undertake a legislative amendment to:

    a. extend the duration of existing water permits so their expiry date is after a new Land and Water Regional Plan is made operative; and

    b. override the 31 December 2025 date in the provisions of Chapter 10A of the Water Plan and extend it to 31 December 2031.

Background

3. In December 2019, following Professor Peter Skelton's review of ORC's planning functions, a work programme was agreed between ORC and the previous Minster for the Environment. The agreed work programme involved the following:

    a. by March 2020 the development of an interim planning and consenting framework to manage freshwater up until the time that new discharge and allocation limits are set, in line with the requirements in the relevant National Policy Statement for Freshwater Management (NPSFM) at that time; and
    b. by November 2020 [later amended to June 2021], a complete review of the Regional Policy Statement; and
    c. by 31 December 2023 [later amended to October 2024], development and notification of a new Land and Water Regional Plan (LWRP) for Otago.

4. The lack of a fit for purpose freshwater management framework in the operative Water Plan was the main reason for developing a new LWRP. One of the key drivers for establishing an interim planning and consenting framework to manage freshwater was the pending expiry of a large number of water permits in the years prior to the new LWRP becoming operative.[1]

5. The operative Water Plan at that time did not provide strong direction on the duration for which new resource consents to replace existing water permits should be granted. As a result, many consents for existing and new water takes were granted with a term of up to 35 years.[2] This

[1] Approximately 340 deemed permits were expected to expire in October 2021, while a further 400 surface water and groundwater permits were expiring between 31 December 2019 and 31 December 2025.

[2] Up until 2021, Policy 6.4.19 was the only policy in the operative Water Plan that addresses consent durations for the take and use of water. The policy does not provide strong direction on the duration for which new consents should be granted, but instead sets out several matters to consider. The explanation to the policy states that "*the duration of each resource consent to take and use water should have regard to the particular*

would likely frustrate the efficient and timely transition towards a new freshwater management framework in the draft LWRP that seeks to implement environmental flows that safeguard freshwater ecosystems and a more equitable allocation regime for all water users in Otago.

Transitional framework for granting water permits in the Water Plan (Plan Change 7)

6. Plan Change 7 (Water Permits Plan Change) introduced a new chapter, Chapter 10A, to the Water Plan. Plan change 7 (PC7) became operative in 2021 and contains 'interim' provisions to facilitate the transition to the draft LWRP by managing the granting of water permits for:
   a. new takes and uses of freshwater, and
   b. the replacement of 'deemed permits' and existing water permits to take and use surface water that expire prior to 31 December 2025.

7. Chapter 10A was intended to provide an easy consenting pathway (controlled activity pathway)[3] for the replacement of deemed permits, or water permits for takes and uses of surface water where these water permits expire prior to 31 December 2025. Chapter 10 also require certain criteria and conditions to be met, such as no increase in the area under irrigation, and no increase in the historical rate of take and volume taken.

8. In addition, the policies and rules in Chapter 10A require that new consents for both new and existing takes and uses of surface water are granted for a term of no more than 6 years, with a narrow exception for new resource consents to replace deemed permits associated with scheduled hydro-electricity generation infrastructure. The Chapter 10A policies that guide decision-making on consent durations for water permits are shown in the Appendix to this paper.

9. Chapter 10A became operative in 2021. The last deemed permits were replaced with a resource consent in October 2024. Table 1 below shows the number of short-term resource consents to take and use water granted following Plan Change 7 becoming operative. This includes water permits granted to replace deemed permits and expiring water permits that were not deemed permits. Table 1 also shows the number of existing water permits that will expire prior to 31 December 2025 that have not been replaced yet and that will be granted a consent term of 6 years in accordance with Chapter 10A.

Table 1: Resource consents granted since Plan Change 7 became operative and existing water permits that will expire prior to 31 December 2025.

Water permit type	Number of water permits *
Resource consents to take and use water granted since Plan Change 7 became operative	
Resource consents to replace deemed permits	113
Resource consents to replace water permits to take and use surface water (not deemed permits) expiring before 31 December 2025	186
Resource consents for a new take and use of freshwater	132
Resource consents to take and use water due to expire before 31 December 2025 that have not been replaced yet	25

circumstances of the activity and its likely environmental effects, but there needs to be good reason for Council to reduce the duration of consents from that required for the purpose of the use".

[3] A controlled activity requires a resource consent before it can be carried out, but the consent authority must grant consent for a controlled activity. The consent authority can impose conditions on the consent, but only for those matters over which the council has reserved control in the relevant plan.

10. There are a large number of water permits that are due to expire after 31 December 2025. Figure 1 shows the number of water permits that are due to expire in each year over the period 2025 to 2059, and illustrates the large tranche of water permits that are due to expire from 2026 to 2030. Many water permits that are due to expire in the period 2026 to 2030 have been granted under the Plan Change 7 framework.

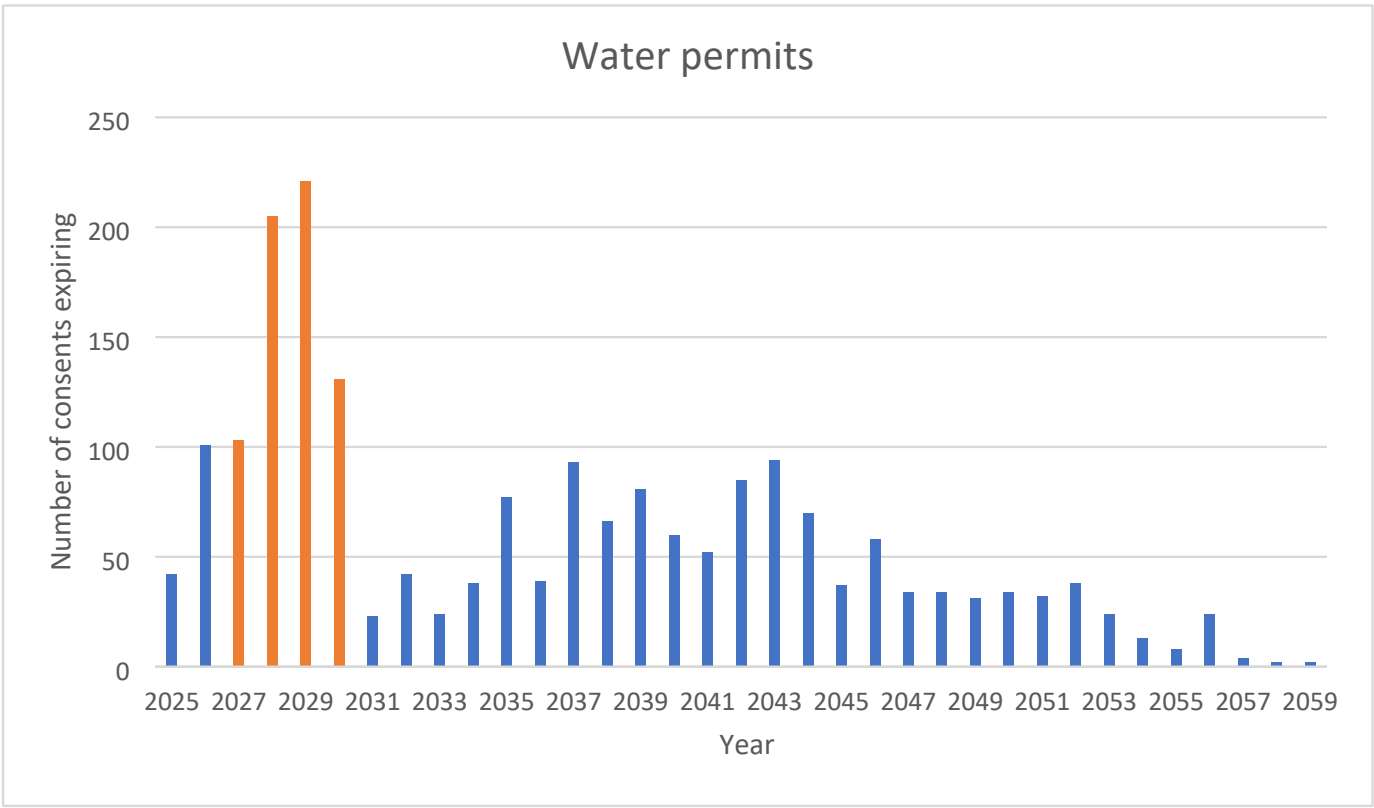


Figure 1: Number of water permits expiring by year. Note: Number of expiring water permits shown in orange includes water permits granted following Plan Change 7 to replace deemed permits and existing water permits.

Issues

11. As the provisions in Chapter 10A were intended to create a transitional framework for granting water permits under the operative Water Plan until the draft LWRP was notified, there are potential issues with the continued reliance on these provisions.

Issue 1: Inequitable regime for consenting new and existing water permits to take and use water

12. The provisions in Chapter 10A create a dual system that results in an unfair regime, whereby some water permits holders are eligible to apply for longer consent terms and others are not. Consents replacing water permits that expire after 31 December 2025, or authorising a new activity will be subject to a term of no more than 6 years (see scenario 1 and 3 in figure 2 below). In contrast, consents replacing a water permit that has previously been granted under Chapter 10A (to replace either a deemed permit or an earlier water permit that expired before 31 December 2025) can be granted for a longer term. As shown in scenario 2 in figure 2, these applications will not be subject to the Chapter 10A framework and will be considered against the provisions in Chapter 6 and 12 of the Water Plan. Any application for a new water take that has not previously been consented to take and use will also only

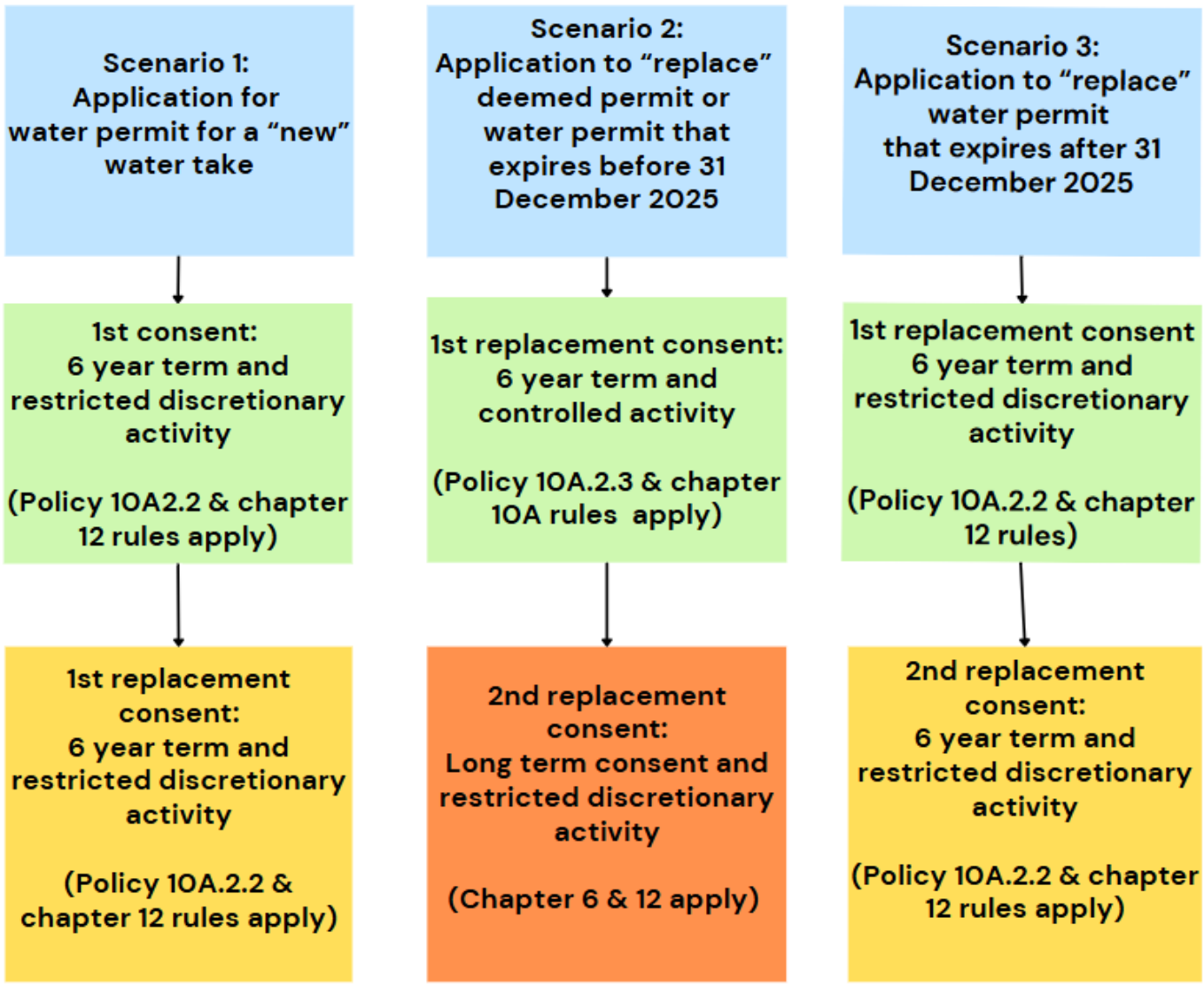


Figure 2: Application of Chapter 10A provisions for different water permit application scenarios.

13. Continuing granting consents under the provisions in Chapter 10A will impact consent holders differently. As shown in scenario 3 above, an application to replace a water permit that expires after 31 December 2025 will be subject to the Chapter 10A policy that limits consent durations to a maximum of 6 years. However, unlike a replacement in scenario 2, it will not have the benefit of the controlled activity pathway in Chapter 10A. Instead, those applicants will be required to prepare a comprehensive application addressing all relevant matters in the other relevant chapters of the Water Plan.

14. Where applications for water permits are exempt from the Chapter 10A provisions and eligible for a longer consent term, they will be considered under the general provisions of the Water Plan. However, these applicants are likely to go through a more complex hearing process, which may impose significant costs on applicants and ORC.

Issue 2: Risks for the efficient transition towards a new fit for purpose planning framework

15. Granting water permits that have longer terms and/or allow for further irrigation expansion is likely to impact on the council's ability to manage water quantity and/or water quality under a future freshwater planning framework. For example, the granting of water permits for a duration of 20 to 35 years prior to the notification of a new freshwater planning instrument will limit the ability to ORC to implement minimum flows in an efficient and cost-effective manner, and to address allocation issues.

16. If long term consents were granted prior to the establishment of a new planning framework and Council wished to impose minimum or residual flow conditions or allocation thresholds, this would require a consent review process to be undertaken by council to apply these conditions. This will result in significant costs to both ORC and consent holders. Further to this, the requirement to consider the financial viability of the activity under RMA s131 is likely to constrain the ability of ORC to set environmental conditions or manage the allocation of water through a consent review process. This will limit ORC's ability to safeguard the health of water bodies and achieve the long-term visions in the proposed Otago Regional Policy Statement (pORPS) 2021.

17. Finally, the restriction on irrigation expansion set under policy 10A.2.1 of Chapter 10A will not apply to water permits that expire after 31 December 2025. This presents a risk of further degradation of water quality in some catchments, particularly in the absence of a planning framework in the operative Water Plan that effectively manages rural diffuse discharges.

Options

18. Three reasonably practicable options have been identified to address the unintended consequences of continuing with the interim provisions in the operative water Plan:
    a. Option 1: Do nothing and await new national policy direction and implement new national direction as quickly as possible.
    b. Option 2: Plan Change to the operative Water Plan to fix the unintended consequences.
    c. Option 3: Request that Central Government undertake a legislative amendment to fix the unintended consequences.

19. These options are further discussed below.

20. Staff have also investigated options to allow for longer term consents to be granted to all consent holders through either a plan change process or legislative fix. However, these options have were discounted as the granting long term consents in the absence of a fit-for-purpose planning framework will impact ORC's ability to perform its function to sustainably manage fresh water. Additionally, there are significant issue with such options including:
    a. Options that allow for longer term consents are likely to be opposed by mana whenua and may fail to find support from some stakeholders, as such an approach will constrain ORC's ability to safeguard the health of water bodies and achieve the long-term visions in the pORPS 2021.
    b. Options that allow for longer term consents will likely result in a costly consent review process for council and consent holders to implement minimum flows in waterbodies where there are many long-term consents.
    c. A reputational risk as it may give rise to a perception that ORC has put the community through the costly Plan Change 7 process for little or no benefit.

Option 1: Do nothing and await new national policy direction and implement new national direction as quickly as possible.

21. This option proposes to wait until a new National Policy Statement for Freshwater Management has been gazetted before further consideration of addressing the unintended consequences. In the meantime, the issues as described in this paper would play out for water users. After a new policy statement is gazetted, there will be more certainty to notify a freshwater planning instrument that implements any new higher order policy direction, while also addressing the issues discussed above.

22. This option relies on the status quo and would allow the unintended consequences of the delay in the notification of the draft LWRP to apply until a new plan is made operative.

Option 2: Plan Change to the operative Water Plan to fix the unintended consequences

23. This option proposes to amend the Chapter 10A provisions through a plan change so that these provisions would apply to all applications to replace existing water permits that expire prior to 31 December 2031. This proposed date is selected to ensure that all consent holders of a water permit previously granted under Chapter 10A of the operative Water Plan will continue to be subject to the same policies.

24. This option would ensure that the provisions of Chapter 10A continue to apply and short term consents are issued in the interim until a new plan is made operative.

Option 3: Request that Central Government undertake a legislative amendment to fix the unintended consequences.

25. This option has two parts and involves ORC requesting the Minister for the Environment undertake a legislative amendment to:
    a. extend the duration of existing water permits so their expiry date is after a new Land and Water Regional Plan is made operative; and

    b. override the 31 December 2025 date in the provisions of Chapter 10A of the Water Plan and extend it to 31 December 2031.

26. Under this option, consent holders would not be required to replace their 6-year permit with another 6-year permit on the same terms. The proposed legislative fix will extend the expiry date of an existing consent to after a new plan is made operative and will provide sufficient time for an applicant to consider the new plan provisions once they are operative, and prepare an application and have it lodged 6 months before the expiry date so that an applicant can rely on section 124 of the RMA to continue operating. Providing a timeframe after the new plan is made operative, will also allow applications to be staggered and not all come in at the same time.

27. The proposed legislative fix will extend the duration of existing water permits in all circumstances except where consent holders currently operating under a short term or transitional consent already have a “replacement“ consent in place that allows them to take water beyond the expiry of this short term consent.

28. Option 3 would also ensure that if a consent holder did seek to replace an existing permit, it would be captured by Chapter 10A and subject to a 6-year consent duration (but with the benefit of a controlled activity pathway). There would be no ability to seek a longer-term consent.

Table 2: Pros and cons of proposed options for addressing the unintended consequences for managing water quantity

Pros	Cons
Option 1: Do nothing and await new national policy direction and implement new national direction as quickly as possible.	
• Avoids a costly plan change process. • Provides more certainty for ORC by allowing for planning decisions to be made once new national policy direction takes effect.	• May result in inequitable outcomes for water users. For example, some applicants will be eligible for long term consents, while others are not. This may result in differences in terms of costs for applicants depending on the framework under which applications will be assessed. • Undermines what ORC aimed to achieve through Plan Change 7 and creates risks for the efficient transition towards a new fit for purpose planning framework. For example, doing nothing may result in dependence on costly consent review process to implement minimum flows in some catchments. • Creates risks towards the long-term health of Otago's water bodies (both in terms of water quantity and water quality) and achievement of the pORPS 2021's long term visions in the absence a fit for purpose planning framework. • Creates a reputational risk and may not be supported by some stakeholders, as it reduces ORC's ability to safeguard the health of water bodies and achieve the long-term visions in the pORPS 2021.
Pros	**Cons**
Option 2: Plan Change to the operative Water Plan to amend Chapter 10A so short term consents continue until a new LWRP is operative.	
• Likely to address the unintended consequences more quickly than Option 1. • Enables ORC to retain control of the timeline and content of the process. • Some stakeholders are likely to prefer Option 2 over Option 1.	• Likely to be an expensive option as any plan change will be subject to the process prescribed in the RMA. • Extending the lifespan of the interim planning framework introduced by Plan Change 7 is likely to result in another round of short-term consent replacements. • If an exemption is required under clause 42(1)(d) of Schedule 12[4] to progress the plan change, there is uncertainty as to whether ORC would obtain the exemption, and doing so would take additional time.

[4] Clause 42 of Schedule 12 of the RMA provides for exemptions to the requirement to comply with section 80A(4A), which prohibits regional councils from publicly notifying a freshwater planning instrument earlier than the date on with a new NPSFM is published or 31 December 2025 whichever is sooner. The Minister **may** approve an exemption for specified reasons including to address any provisions in a plan or policy statement that have unintended consequences, are unworkable or lead to inefficient outcomes.

	• It is almost certain that a plan change would not be operative before December 2025, when the provisions in Chapter 10A no longer apply. • This option does not fully address the unintended consequences until the the proposed plan change is operative. • In the interim period between the plan change being notified and the provisions becoming operative, the applicants will need to comply with both the proposed and operative provisions in the Water Plan. This is likely to result in more complex and costly application processes • Creates a reputational risk and the proposal to undertake another interim plan change may not be supported by some stakeholders.
Pros	**Cons**
Option 3: Request that Central Government undertake a legislative amendment to fix the unintended consequences.	
• Addresses the unintended consequences of deferring the notification of the draft LWRP. • Addresses the issue that Plan Change 7 was trying to address (provide for an efficient transition to a new fit-for-purpose freshwater management regime). • Less cost to council. • Provides a timelier solution than a plan change, as it becomes 'operative' on the date the legislation commences. • Ensures that if a consent holder did seek to replace an existing permit, it would be captured by Chapter 10A and subject to a 6-year consent duration (but with the benefit of a controlled activity pathway)	• Potentially less (or no) opportunity for stakeholder or community input into the amendment to the Water Plan[5]. • Risk that the Minister may not agree to progress the legislative amendment, or the amendment does not come into force before December 2025. • The level of resources required from ORC to engage with central government in the process is uncertain. • Potential risk of further/same unintended consequences by extending short term consents for a set time, particularly if the new LWRP is not made operative prior to that date. • Cost to ORC associated with implementation of consent extensions, and potentially managing a large number of consents applications at the same time.

[5] If Councillors are concerned about the lack of public participation, the Council could consult under the LGA either prior to making a request, or during preparation of the legislative instrument.

Recommendation

29. Staff recommend option 3 to allow existing consented activities to continue until the LWRP is operative, and that Council seeks to achieve this through legislative intervention. This option is considered the most effective and efficient option to ensure a fair and efficient planning regime for water users until a new Land and Water Regional Plan is operative. This outcome also has the least impact on the council's ability to manage water quantity and/or water quality under a future freshwater planning framework.

Appendix: Relevant policies of Regional Plan: Water

10A.2 Policies

Replacement consents

10A.2.1 Irrespective of any other policies in this Plan, avoid granting resource consents that replace Deemed Permits, or water permits for takes and uses of surface water (including groundwater considered as surface water under Policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, except where:

(a) The Deemed Permit or water permit that is being replaced is a valid permit; and

(b) There is no increase in the area under irrigation, except where any additional area to be irrigated is only for orchard or viticulture land uses and all mainline irrigation pipes
servicing that additional area were installed before 18 March 2020; and

(c) Any existing residual flow, minimum flow or take cessation condition is applied to the new permit; and

(d) For takes other than community water supplies there is no increase in:

(i) The historical instantaneous rate of abstraction; and

(ii) Any historical volume of water taken.

Duration

10A.2.2 Irrespective of any other policies in this Plan concerning consent duration, only grant resource consents for takes and uses of freshwater, where this activity was not previously authorised by a Deemed Permit or by a water permit expiring prior to 31 December 2025, for a duration of no more than six years.

10A.2.3 Irrespective of any other policies in this Plan concerning consent duration, avoid granting resource consents that replace Deemed Permits, or resource consents that replace water permits to take and use surface water (including groundwater considered as surface water under Policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, for a duration of more than six years, except

(a) where the take and use of water replaces a Deemed Permit associated with hydro-electricity generation infrastructure listed in Schedule 10A.5.1 and the applicant takes practicable steps to remedy or mitigate any adverse effects on the environment arising from the activity.

10.4. RPTP--Adopting for Consultation

Prepared for: Council

Report No. GOV2526

Activity: Governance Report

Author: Robyn Hyde, Transport Planning Lead

Endorsed by: Anita Dawe, General Manager Regional Planning and Transport

Date: 19 March 2025

PURPOSE

[1] To seek Council's approval to consult on the draft Regional Public Transport Plan (2025-2035) (RPTP).

[2] For Council to appoint a Hearings Panel to hear submissions and deliberate on the draft RPTP.

EXECUTIVE SUMMARY

[3] The draft RPTP was presented to Public and Active Transport Committee (PATC) at the 5 March meeting. The PATC made a recommendation for the Council to approve the draft for consultation.

[4] A Hearings Panel is required to hear and make recommendations on RPTP submissions.

[5] The composition of a Hearings Panel was discussed at the 5 March PATC meeting. The PATC recommended a panel of three members comprising of regional councillors.

RECOMMENDATION

That the Council:

a) ***Receives*** *this report.*
b) ***Receives*** *the draft Regional Public Transport Plan (2025-2035).*
c) ***Approves*** *the draft Regional Public Transport Plan for public consultation.*
d) ***Notes*** *the public consultation period will be from 24 March 2025 to 2 May 2025.*
e) ***Appoints*** *the following Councillors [Insert Regional Council elected members] to a Hearings Panel to hear submissions and make recommendations on the RPTP; and,*
f) ***Appoints*** *one of the Panel members to be the Chair of the Hearings Panel,*

g) ***Delegates*** *under the Local Government Act 2002 (schedule 7, clause 32(1)), to the Hearing Panel for the Regional Public Transport Plan , all the powers, functions, and duties of the Council to hear and make recommendations regarding submissions and evidence on the proposed Regional Public Transport Plan, and to make final recommendations to Council.*

h) ***Notes*** *that hearings have been scheduled from 12-16 May 2025.*

BACKGROUND

[6] At the PATC on 5 March, the Committee passed resolutions to:

a. Recommend that Council approve the draft RPTP to go out for public consultation; and
b. Recommend that Council approve their preferred option for the composition of the Hearings Panel comprising three members who are Regional Councillors.

[7] The latest version of the draft RPTP is included as Attachment 1. The attached version contains minor editorial changes compared with the version that was provided at the 5 March PATC meeting. These minor editorial changes have been approved by the Chief Executive.

DISCUSSION

[8] Staff are requesting that Council note the resolution by the PATC and approve the draft RPTP to go out for public consultation.

[9] The proposed consultation period is 24 March – 2 May 2025. The Local Government Act requires 1 month of public consultation. This timeframe is five weeks and includes Otago Anniversary Day, Easter and ANZAC Day.

[10] Staff are also requesting that Council delegate the hearings and recommendations on RPTP submissions to a hearings panel comprising of three Regional Councillors, with one Councillor to serve as chair of the Panel.

[11] Staff propose that Hearings take place 12-16 May 2025, following the close of submissions on 2 May 2025. Deliberations are currently scheduled for 19-30 May 2025.

[12] ORC transport staff will be available to support and provide advice to the Hearings Panel by providing technical information and clarifying details around key transport issues.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[13] The RPTP is developed under the Otago-Southland Regional Land Transport Plan.

[14] 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.

Financial Considerations

[15] Development of the RPTP is a required activity by the Land Transport Management Act 2003 (LTMA). Funding of up to $200,000 is included in Council 2024/25 budget for RPTP work through the LTP excluding staff time. It is expected that the development of the RPTP will be 51% funded by the National Land Transport Fund.

[16] Policies and investment objectives in the Plan will guide future investment decisions, but do not in their own right commit ORC to funding specific projects and interventions. However, the Plan proposes changes to our funding approach to increase the private share of public transport funding, which may result in changes to concessions, fares, and fare structure.

Significance and Engagement

[17] 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 through 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.
- The level of community interest in the proposals, issues or decisions in the RPTP.

[18] Council must consult on the draft RPTP in accordance with the Special Consultative Procedure specified in Section 125 of LTMA and Sections 83 and 87 of the Local Government Act 2002.

Legislative and Risk Considerations

[19] The review of the RPTP is a requirement of the LTMA.

[20] Transport staff have a risk register of identified strategic, operational, financial, reputational and regulatory risks. This register is reviewed regularly and has recently been updated to consider new risks as the project moves into the consultation phase. Examples of these risks include timing and decision making associated with private share expectations, and alignment of consultation, hearings and reporting to PATC in June. Further, fare changes may generate large quantities of submissions to process.

[21] Transport staff have put controls in place to manage these risks and plan to review them throughout the process.

NEXT STEPS

[22] The agreed consultation period means the timeline for development of the RPTP will be:

a. **19 March 2025:** Council meeting to approve the Draft RPTP for public consultation. If approved, inform the public and engaged stakeholders about the forthcoming call for submissions on the draft RPTP.
b. **24 March – 2 May 2025:** Public consultation period. The Local Government Act requires 1 month of public consultation. This timeframe is five weeks and includes Otago Day, Easter and ANZAC Day.
c. **12 May – 16 May 2025**: Public hearings.
d. **19 May – 30 May 2025**: Deliberations. This timeframe will involve incorporating submissions into and finalising the RPTP.
e. **23 July 2025:** Council adopts RPTP.

ATTACHMENTS

Nil

10.5. Total Mobility Financial paper 2024/2025

Prepared for:	Council
Report No.	GOV2525
Activity:	Governance Report
Author:	Anita Dawe, General Manager Regional Planning and Transport, Nick Donnelly, General Manager Finance, and Lorraine Cheyne, Manager Transport
Endorsed by:	Richard Saunders, Chief Executive
Date:	19 March 2025

PURPOSE

[1] To provide some insight into the Total Mobility services for the current financial year and seek direction from Council about the forecasted overspend for the 2024/2025 financial year.

EXECUTIVE SUMMARY

[2] Since the introduction of the 75% subsidy in 2022, Total Mobility services across New Zealand has seen significant increases in usage and user behaviour. Consequently, there has been increased demand and increased costs incurred.

[3] In discussions with the finance team, staff are forecasting over expenditure in Total Mobility services and a resulting funding shortfall of $535,000.

[4] Discussions with the New Zealand Transport Authority (NZTA) indicate that their expectation is to manage within the 3-year approved funding allocation, with no guarantee of additional funding available to support the higher than budgeted demand.

RECOMMENDATION

That Council:

a) ***Notes*** this report.

b) ***Notes*** *the forecast over expenditure for the 2024/25 financial year.*

c) ***Approves*** *the continuation of Total Mobility services for the remainder of the financial year; and,*

d) ***Approves*** *bringing forward the NZTA funding contribution from Years 2 and 3 to cover the anticipated $ 310,000 shortfall from NZTA for the financial year; and*

e) ***Approves*** *over expenditure of approximately $225,000, which represents the Otago Regional Councils rates contribution toward Total Mobility; and,*

f) ***Directs*** *staff to report back to Council with a plan to manage Total Mobility services from 1 July, within approved budgets.*

g) ***Directs*** *staff to liaise with other Public Transport Authorities through the Transport Special Interest group, to determine sector support for writing to the Minister of Transport concerning funding shortfalls for Total Mobility services.*

BACKGROUND

[5] Total Mobility provides access to transport for those with long-term impairments. The role of regional councils in Total Mobility is to both administer and co-fund the scheme. It is a nationwide scheme that is 75% funded for users up to a regionally set cap, by NZTA and regional councils. For ORC the current fare cap is set at $50.00 ($37.50 maximum subsidy).

[6] Any given fare for Total Mobility operations (excluding hoist or ramp trips which are 100% funded), is currently capped at $50, and the proportion of fares is set out below:

	Who	**How**
First 25% of fare	Customer	
Second 25% of fare	NZTA	CERF funding
Of remaining 50% of fare		
60%	NZTA	
40%	ORC	General rates

[7] In practice this means for a $20 fare, the customer would pay $5, and the balance would be split as above ($5 NZTA CERF funded, $6 NZTA, and $4 ORC), and for a $60 fare, the customer would be required to pay $12.50 (being 25% of the maximum fare of $50) + $10 (being the additional amount over the $50 limit), NZTA CERF funding would be $12.50, and the balance would be $15 for NZTA and $10 for ORC.

[8] Total Mobility services are provided by Council contracting taxi companies to provide subsidised door to door transport. Contracts are monitored and managed through purpose-built software called '*Ridewise'*. *Ridewise* is additionally used to assess eligibility of potential users, as stipulated by NZTA.

[9] Since the increase in subsidy from 50% to 75% in 2022, Total Mobility across New Zealand has seen significant increases in usage, expenditure and changes in user behaviour (longer and more frequent trips taken).

[10] As well as increased use of the scheme and changes in user behaviour since the increase in subsidy, Otago has seen a significant increase in the number of Total Mobility users. The 8,660 currently registered Total Mobility clients compare to 3,700 registered users in January 2021 (an increase of 134%). The growth in eligible Total Mobility customers is in part due to the aging population, but is also a consequence of reduced funding being available through other avenues.

[11] The financial pressure that ORC currently faces is reflected across regions nationwide. Collectively the service providers have been holding ongoing conversations around limitations of the scheme, primarily the limited funding pool. Several regions are pushing for central government to reduce the Total Mobility subsidy back to 50%. To date, ORC has supported maintaining 75% subsidy.

DISCUSSION

[12] The current financial position is set out below, including the funding from NZTA from two separate funding pools, and the ORC rates contribution. The table includes the total fares claimed for the six months to December 2024, and the forecast assumes the same spending pattern occurring in the second six months (January – June).

Source	Full Year Amount	YTD Spending (to Dec24)	Remaining budget	Assumed spend Jan – Jun 25	Difference
NZTA CERF [1](2nd 25% of fare cost	$927,000	$441,000	$486,000	$441,000	$45,000
NZTA (60% of balance)	$748,000[2]	$529,000	$219,000	$529,000	-$310,000
ORC rates (40% of balance)	$480,000	$353,000	$127,000	$3553,000	-$225,000
TOTAL					***-$535,000***

Note: Total is shortfalls only (CERF surplus is not transferrable and included in total).

[13] Based on the existing pattern of Total Mobility and the cost of trips, staff are forecasting a funding shortfall of $535,000 by years end. The funding shortfall includes NZTA's 60% share ($310,000) and ORC's 40% share ($225,000). A financial summary of YTD and forecast is attached which provides detail on these amounts.

[14] ORC has already rated its budgeted share of $480,000 for the current year. Advice from NZTA indicates their expectation is that ORC will manage within the 3-year approved funding allocation, and they cannot guarantee additional funding will be available. While that means future years funding could brought forward and used to fund this year's grant shortfall that would reduce future levels of grant funding and compromise service delivery.

[1] Climate Emergency Response Fund

[2] The three year funding pool is $2,448,000, comprised of $748,000 in Year 1, $816,000 in Year 2 and $882,000 in Year 3.

[15] The financial summary shows that based on December YTD spend there is also likely to be a funding shortfall for the payment of flat rate hoist/ramp fees. That shortfall is forecast to be $76,000. As NZTA funds 100% of these fees staff expect NZTA to fully fund this shortfall although this has not been confirmed.

[16] There are policy constraints around how the service is provided and limited levers to reduce expenditure:

- Eligibility criteria to access the scheme is set by NZTA policy.
- Total Mobility card holders do not have a trip limit for how many times they can use the scheme, as set by NZTA policy. The purpose of the scheme is to access transport and community in the same manner as those without impairments.
- Available levers such as reducing the fare cap are unlikely to result in reduced local share. The Q2 2024/2025 average total fare was $30, significantly below the $50 cap fare.
- In line with NZTA guidance, taxi companies that meet health and safety and contractual requirements must be onboarded, limiting ORC agency to reduce the number of suppliers.

[17] There are no existing internal or national level procedures for suspension or withdrawing from Total Mobility.

[18] The alternative options available to ORC, is to suspend Total Mobility services for the remainder of the financial year, or to bring forward funding from year 2 to cover the shortfall.

[19] If Total Mobility services were suspended there would be contractual and legal risks associated with this. Operators will require 20 working days' notice of termination of operator agreements, in addition to resources required. This will lead to additional spending required for Q4 however it would reduce the total over expenditure.

[20] Suspending or cancelling Total Mobility contracts in Q4 will also not address long-term solutions to managing demand on the scheme. Rather it is likely that suspending or cancelling Total Mobility service contract will compound long-term impacts for ORC's approach to accessibility in Otago, due to a loss of trust and confidence of suppliers.

[21] For many taxi companies and mobility services it may not be financially viable to stay operational if Total Mobility services were to be suspended. This is especially so for mobility centred transport providers, for whom suspending services will pose the risk of significantly reducing accessibility and wheelchair access services.

OPTIONS

[22] There are three options broadly available to Council – to suspend TM services for the remainder of the financial year; to bring forward funding from NZTA from Year 2 of the NLTP funding to offset the shortfall, or to continue provision of services and investigate solutions from 1 July for the provision of Total Mobility services.

[23] Staff's recommendation to Council is the option to continue the provision of Total Mobility services, incur the over expenditure for the ORC rates portion, and manage the NZTA funding shortfall by bringing forward Years 2 and 3 funding as required. This would need to be supported by engagement with NZTA to work through funding issues associated with the provision of TM services. As noted above, ORC has limited levers for Total Mobility funding however given this conversation is occurring across the country, we anticipate that working with other Public Transport Authorities (PTA's) will enable solutions to be identified and implemented.

[24] If Council supports this option, staff will also recommend that Council write to the Minister of Transport, to outline the issues and seek some solutions at a national level. We would recommend that the issue is raised through the Transport Special Interest Group prior to any formal correspondence to the Minister, to get sector support.

[25] Staff note that Council will need to review estimates and consider the ORC share of Total Mobility funding in the Annual Plan 2025-26. This will be done as part of deliberation changes ahead of finalisation and approval of the Annual Plan in June 2025.

[26] Should Council consider suspending Total Mobility services, staff recommend that legal advice is sought to ensure any risk is minimised.

[27] Should Council wish to fully fund the shortfall this year, we would look to understand any other savings that may be realised, to offset this expenditure.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[28] The provision of the Total Mobility scheme is consistent with Council's community wellbeing aspirations to design and deliver initiatives that contribute to accessibility and connectivity within communities.

Financial Considerations

[29] The year-to-date expenditure has financial implications for ORC, with allocated funding for 2024-25 forecast to be exhausted.

[30] Suspending Total Mobility services until 2025/2026 will have financial, social and operational impacts.

Significance and Engagement

[31] Suspending/cancelling Total Mobility services for Q4 would mean the cessation of any provision of transport services for some 8,660 currently eligible Total Mobility customers.

Legislative and Risk Considerations

[32] Suspending Total Mobility services will be partially inconsistent with ORC's fulfilment of section 35 Land Transport Management Act (2003), which requires that we give consideration to the needs of transport-disadvantaged. Currently, Total Mobility is our key means of supporting accessibility and mobility for members of the travelling public who are unable to drive and who cannot use public transport.

Climate Change Considerations

[33] Not directly relevant to this paper.

Communications Considerations

[34] ORC would need to communicate a decision to cancel or suspend Total Mobility services to existing cardholders and service providers and would need to update its website and other information sources about the non-availability of these services.

NEXT STEPS

[35] Staff to report back on Total Mobility budget for 2025-26 and consideration will need to be given by Council when deciding on the Annual Plan, whether to increase the Total Mobility budget and ORC rate funding.

ATTACHMENTS

1. 2025 Total Mobility Handbook [**10.5.1** - 10 pages]
2. Total Mobility Driver training 2025 [**10.5.2** - 15 pages]
3. Total Mobility Summary Report Dec-2024 [**10.5.3** - 1 page]

Otago Total Mobility Scheme Handbook

2025

Otago Regional Council

Contents:

1. What is Total Mobility
2. Who is eligible?
3. How can I join?
4. How does the Total Mobility scheme work?
5. Reviews
6. What happens once I've applied?
7. What does Otago Regional Council do with the information?
8. Can I use Total Mobility if I get other financial assistance?
9. When and where can I use my Total Mobility card?
10. What happens if the rules are broken?
11. Resources
12. Contacts

1. What is Total Mobility?

The Total Mobility scheme is a part of public transport, providing subsidised door to door transport using approved taxi companies. Available nationwide, the scheme's aim is to provide appropriate transport for individuals with long-term impairment who cannot safely and reliably use public transport, giving registered users a 75% subsidy up to a $50 cap. The user pays for the remaining 25% or any additional cost above the $50 fare cap. Users must carry a valid Total Mobility photo ID card to access the discounted fare.

With Origins back to 1981, Total Mobility is not limited to accessing medical or social services, instead it promotes community participation and the same access to society as those without an impairment, to public transport.

2. Who is eligible?

The scheme is available to individuals who have an impairment or disability lasting longer than six months that prohibits them from using public transport unaccompanied. Components of using public transport are broken down into the following categories, if someone is unable to reliably complete any component of the journey, they are eligible for Total Mobility.

- Get to the place where transport departs
- Get onto the transport
- Handle ticketing/money
- Ride securely
- Get off the transport
- Get to final destination

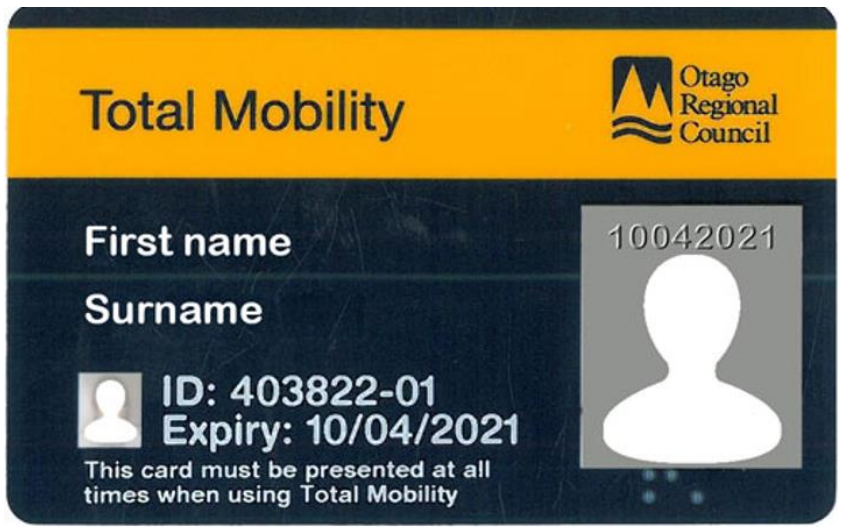
The impairment or disability can be permanent, temporary (lasting longer than six months), or fluctuating (able to use public transport some of the time, but not all of the time).

An impairment can be physical, psychological, neurological, intellectual, sensory, or other.

Total Mobility does not take into account ability to drive. As part of public transport, the Total Mobility scheme only looks at an individual's ability to use public transport such as buses, ferries, or trains. In area's where there is not a bus network, eligibility must be determined using a hypothetical bus network and if the individual could use the bus network if there was one present.

3. How can I join?

To access the Total Mobility scheme in Otago, you'll need to confirm your eligibility through an assessment at one of our approved agencies. Check out our approved agencies on the ORC Total Mobility website.



One of our accredited assessors will go through the assessment criteria with you and collect the required information about how your impairment prohibits you from using public transport in a safe and reliable manner. The assessor will also take an ID photo for the card, using the general rules of passport photos.

Some agencies may require a one-off fee or annual membership to book an assessment, this helps cover the resources involved.

Do I need to provide evidence of my disability?

You may need to provide evidence of your disability if the assessor doesn't know your history. The assessor will get your permission if they need to gather more information about your disability so you can be properly assessed. If requested, please give them the name of your caregiver, ACC assessor, GP, specialist, physiotherapist, psychiatrist, social worker, or occupational therapist. Without more information you may not be able to participate in the scheme.

4. How does the Total Mobility system work?

Let your approved taxi company know you are a Total Mobility card holder at time of booking. At the beginning of the taxi trip, the driver will confirm your ID and check the expiry date, then swipe your card. The card will also be swiped at the end of your taxi trip.

For each trip, details of the taxi journey are electronically collected, including the cost of the fare and the discount.

The Total Mobility subsidy is used for each trip you make. A return trip in the same taxi – for instance, to the shops and back home again – is counted as two trips. The taxi cannot be kept waiting while you carry out any tasks or 'quick stops'. We cannot reimburse you for any trip you undertake without having handed over your valid Total Mobility ID card at the start.

Each trip entitles you to a 75 percent discount on your taxi fare, up to a maximum fare amount. Please ensure you pay your portion of the fare at the time of the trip. The maximum subsidised fare varies throughout the region: For example, In

Otago the fare cap is $50, but is subject to change at the Otago Regional Council's sole discretion.

Total Mobility entitlement is non-transferable

The Total Mobility ID card can only be used by the registered Total Mobility member. Unauthorised use could mean the cancellation of your membership. Your family, friends and caregivers can share your taxi, but you must be in the vehicle for the entire journey.

5. Reviews:

Total Mobility cards last for three years, at which time an assessor will get in touch to confirm your details are still correct and that you still meet the criteria for the Total Mobility scheme. Cards are not automatically re-sent.

Please keep us up to date with your contact details If your address or phone number changes, please email totalmobility@orc.govt.nz or call **0800 474 082**.

6. What happens once I've applied?

Your application will be evaluated and processed by the Otago Regional Council to ensure you meet the criteria to become a Total Mobility user. If your application is successful, you will receive a photo ID card at no charge.

If you application is unsuccessful, the assessor will be informed. You can appeal this decision if you believe your application was declined unjustly.

It takes approximately two to three weeks to register a successful applicant and issue a photo ID card. We are unable to process urgent requests.

7. What does Otago Regional Council do with the information?

All information provided from your application will be held in the Otago Regional Councils database. We will ensure that all names and personal information remain private and confidential. Internal access to the database is restricted to appropriate staff.

We collect statistical information so we can report on the Total Mobility scheme and plan for its future, but this information is held separately from the information used to assess your eligibility.

If a card is not used for three or more years, the account is cancelled, and the data anonymised. This is to make sure we comply with Privacy Act 2020, and that we are not holding on to information that is not required.

8. Can I use Total Mobility if I get other financial assistance?

The Total Mobility taxi scheme may only be used for journeys that are not covered by travel income or assistance from another official source. Using financial assistance as well as the Total Mobility scheme – 'double-dipping' – is not permitted. Tell your assessor if you get travel income or assistance from another source or what journeys you get financial assistance for. You may not be eligible for Total Mobility if you get other general financial assistance e.g ACC, Workbridge or Work and Income.

9. Where and when can I use my Total Mobility Card?

Total Mobility cards can be used nationwide. You must hold a Total Mobility card of the region you reside in. If you move to a different region, contact the Regional Council to request a transfer, you won't have to get a new assessment and your new region will send you a new Total Mobility card for their region.

Your Total Mobility card can be used at any time, although there are some restrictions to the hours when taxi companies are operational.

- The scheme is not valid to use in association with work related travel, but it can be used to get to and from work.
- Residents of rest homes (not apartments) cannot use the scheme to pay for taxis for any transport that is already covered by your residential provider.

To find our participating taxi companies, check out our website:
https://www.orc.govt.nz/orbus/travel-with-us/accessibility/total-mobility/

or call **0800 474 082.**

To find our approved agencies for assessments, check out our website:
https://www.orc.govt.nz/orbus/travel-with-us/accessibility/total-mobility/

or call **0800 474 082.**

10. What happens if the rules are broken?

It's important that you follow the policies and rules of the Total Mobility scheme, or you could be suspended or excluded from accessing the subsidy.

11. Resources

For more information about the Total Mobility scheme, check out our website https://www.orc.govt.nz/orbus/travel-with-us/accessibility/total-mobility/

For more information on policies and guidance from New Zealand Transport Agency:

https://www.nzta.govt.nz/resources/total-mobility-council-guide/

For information on the Total Mobility review:

https://www.transport.govt.nz/area-of-interest/strategy-and-direction/review-of-the-total-mobility-scheme

12. Contact Otago Regional Council at:

Philip Laing House, Level 2
144 Rattray Street
Private Bag 1954
Dunedin

Phone: 03 474-0827

Free: 0800 474 082

totalmobility@orc.govt.nz

2025

Total Mobility Driver Training

Otago Regional Council

What is Total Mobility?

- Subsidised travel for people with long term impairments
- Uses commercial taxis and mobility vans
- 75% fare subsidy up to $50
- Available across New Zealand
- Administered by Regional Councils
- Funding: 60% Waka Kotahi, 40% councils

Why Total Mobility?

ACCESS TO TRANSPORT IS A HUMAN RIGHT

FIXED-ROUTE PUBLIC TRANSPORT CANNOT SERVE ALL NEEDS

FAMILY, FRIENDS, VOLUNTEER ORGANISATIONS CAN HELP, BUT OFTEN HAVE LIMITED CAPACITY

INDEPENDENCE AND **DIGNITY**

To be a Total Mobility Driver:

- A new Zealand Driver's license
- A Passenger service license
- **NZQA Standard 1748:** Passenger Service: demonstrate skills required to assist passengers with special needs
- **NZQA Standard 15165:** Transport Passengers in wheelchairs using Total Mobility vehicles equipped with hoist or ramp (*If driving a hoist equipped vehicle*)

All drivers must…

- Treat all passengers with respect and courtesy at all times
- Offer reasonable assistance to facilitate passengers' travel
- Take the most cost-effective route for each trip

Health & Disability Commissioner
Te Toihau Hauora, Hauātanga

Code of Rights

- The Right to be treated with respect
- The right to freedom from discrimination, coercion, harassment and exploitation
- The right to dignity and independence
- The right to services of an appropriate standard
- The right to effective communication
- The right to be fully informed
- The right to be fully informed
- The right to make an informed choice and give informed consent
- The right to support
- Rights in respect of teaching and research
- The right to complain

Guide Dogs/Service Dogs

Service Dogs are an important part of accessing community and maintaining independence.

Service Dogs have been granted special legal rights under the Human Rights Act 1993 and the Dog Control Act 1996. A dog who has been granted these special rights is legally entitled to public access.

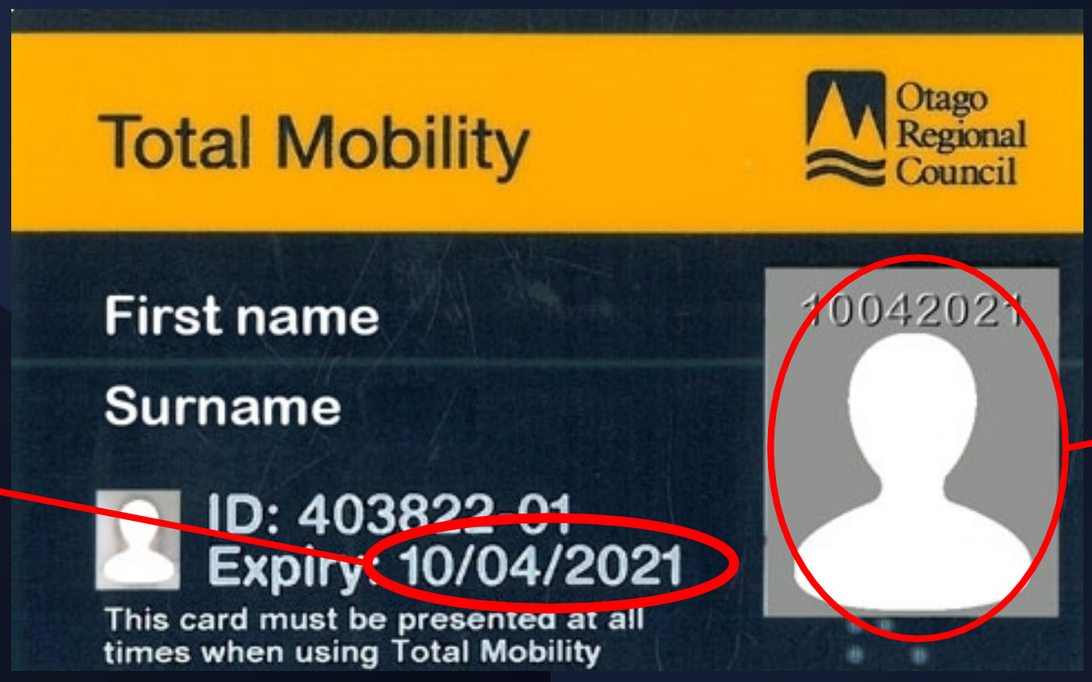
Service dogs cannot be refused entry to taxi trips

Under the Human Rights Act, if you're treated differently because you've got an assistance dog, this is discrimination on the ground of disability.

How to Use the Total Mobility Cards

- Swipe at the beginning and the end of the trip
- Only swipe one card (apart from hoist trips)
- Make sure to swipe the same card at the beginning and the end

Otago Total Mobility Cards



Check Expiry Date

Confirm ID, that it is their card

How Total Mobility trips work

- A ‘trip’ or ‘journey’ is defined as traveling from Point A to Point B.
- For example, a card holder wanting to travel from home to the shops should be broken down into two trips: home – shop, shop – home.
- ‘Long round trips’ is where the meter keeps running between home, groceries, bank etc and is not permitted. This can lead to the card holder missing out on subsidy that they are entitled to.

Hoist Trips

A hoist payment of $10 for each time a hoist is used. This is to help with the additional time that is required to operate a wheelchair hoist

Hoist installation funding is available each year to make vehicles wheelchair accessible.
Funding is subject to availability.

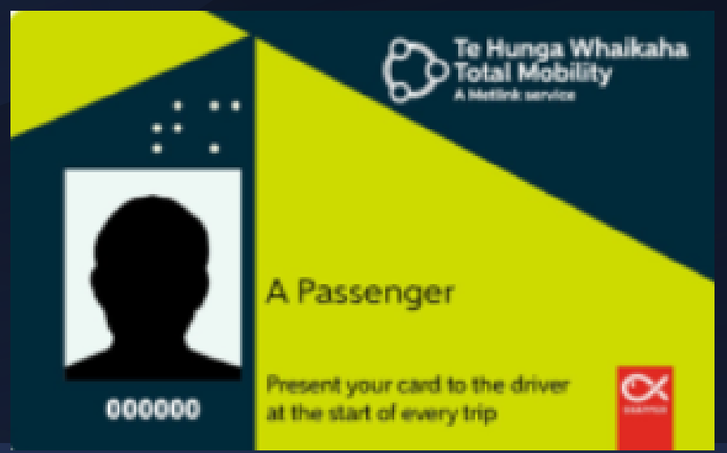
Travel Buddies

Total Mobility card holders can have additional people such as caregivers, friends or family join their taxi ride.

As long as the card holder remains in the taxi for the full length of the journey, the Total Mobility subsidy is applied to the trip.

Cards from other regions

- Total Mobility is available across New Zealand
- Cards from other regions can be used in Otago, by swiping at the beginning and end of the trip. The same way Otago cards are used.



Other Transport Funding

Total Mobility cards are **not permitted** to be used to supplement other forms of transport funding.

This means that Total Mobility cards cannot be used for ACC, Workbridge, or Ministry of education (school) trips.

Otago Regional Council
144 Rattray Street
Private Bag 1954
Dunedin

Phone: 03 474-0827

Free: 0800 474 082

totalmobility@orc.govt.nz

Total Mobility - Public Transport

For the period ending: December

517 - Total Mobility Operations	Actuals YTD (000's)	Budget YTD (000's)	Variance YTD (000's)	Full Year Budget (000's)	1. NZTA fully fund Forecast (000's)	1. NZTA fully fund Forecast Variance (000's)	2. NZTA pay up to TIO max Forecast (000's)	2. NZTA pay up to TIO max Forecast Variance (000's)	3. NZTA pay full TIO & CERF amounts Forecast (000's)	3. NZTA pay full TIO & CERF amounts Forecast Variance (000's)
Revenue										
Grants and subsidies	940	543	397	1,130	2,050	919	1,740	610	1,786	656
Rates	278	277	1	554	554	-	554	-	554	-
Total revenue	**1,218**	**819**	**399**	**1,684**	**2,604**	**919**	**2,294**	**610**	**2,340**	**656**
Expenditure										
Employee benefit expenses	55	50	(5)	99	99	-	99	-	99	-
Internal Charges/Recoveries	23	23		46	46	-	46	-	46	-
Other expenses	1,342	739	(603)	1,539	2,684	(1,145)	2,684	(1,145)	2,684	(1,145)
Total operating expenditure	**1,419**	**811**	**(608)**	**1,684**	**2,829**	**(1,145)**	**2,829**	**(1,145)**	**2,829**	**(1,145)**
Surplus/(Deficit)	**(201)**	**8**	**(210)**	**()**	**(225)**	**(225)**	**(535)**	**(535)**	**(489)**	**(489)**

519 - Total Mobility Installs Wheelchair Hoists and Ramps	Actuals YTD (000's)	Budget YTD (000's)	Var	Full Year Budget	Forecast	Forecast Variance (000's)	Forecast	Forecast Variance (000's)	Forecast	Forecast Variance (000's)
Revenue										
Grants and subsidies	7	12	(5)	24	14	(10)	14	(10)	14	(10)
Rates	8	8		16	16	-	16	-	16	-
Total revenue	**15**	**20**	**(5)**	**40**	**30**	**(10)**	**30**	**(10)**	**30**	**(10)**
Expenditure										
Employee benefit expenses	-	-	-	-	-	-	-	-	-	-
Internal Charges/Recoveries	-	-	-	-	-	-	-	-	-	-
Other expenses	11	8	(3)	40	23	17	23	17	23	17
Total operating expenditure	**11**	**8**	**(3)**	**40**	**23**	**17**	**23**	**17**	**23**	**17**
Surplus/(Deficit)	**4**	**12**	**(8)**	**-**	**7**	**7**	**7**	**7**	**7**	**7**

521 - Payments for Total Mobility Rides Wheelchair Hoists and Ramps	Actuals YTD (000's)	Budget YTD (000's)	Var	Full Year Budget	Forecast	Forecast Variance (000's)	Forecast	Forecast Variance (000's)	Forecast	Forecast Variance (000's)
Revenue										
Grants and subsidies	144	96	48	200	288	88	212	12	212	12
Rates	-	-	-	()	-		-		-	
Total revenue	**144**	**96**	**48**	**200**	**288**	**88**	**212**	**12**	**212**	**12**
Expenditure										
Other expenses	144	107	(37)	200	288	(88)	288	(88)	288	(88)
Total operating expenditure	**144**	**107**	**(37)**	**200**	**288**	**(88)**	**288**	**(88)**	**288**	**(88)**
Surplus/(Deficit)		**(11)**	**11**	**()**	**-**		**(76)**	**(76)**	**(76)**	**(76)**

10.6. Waitaki Update

Prepared for: Council

Report No. GOV2533

Activity: Governance Report

Author: Anita Dawe, General Manager Regional Planning and Transport

Endorsed by: Richard Saunders, Chief Executive

Date: 19 March 2025

PURPOSE

[1] To update Council on progress on the investigation into managing the Waitaki catchment as a single integrated catchment, and request approval to collaborate with Environment Canterbury (ECan), to undertake a section 35 assessment.

EXECUTIVE SUMMARY

[2] Work commenced on an investigation into managing the Waitaki River catchment as a single integrated catchment in March last year.

[3] Early engagement has been undertaken and the working group now wishes to progress to the next step of the investigation, and understand what the challenges are with the existing arrangements, in order to determine whether the investigation should progress to a funded and resourced project.

RECOMMENDATION

That the Council:

1. ***Notes** this report.*
2. ***Notes** the preliminary stakeholder engagement, and responses.*
3. ***Endorses** the proposal to undertake a section 35 Resource Management Act 1991 review of the existing planning frameworks for the Waitaki Catchment, to be jointly undertaken by staff from Environment Canterbury and the Otago Regional Council.*
4. ***Notes** that staff will report back on the outcomes from the section 35 review.*
5. ***Notes** that the working group will invite an official from the Ministry for the Environment to join the working group.*

BACKGROUND

[4] In March 2024, following a request from Te Rūnaka o Moeraki, Te Rūnaka o Arowhenua and Te Rūnaka o Waihao, both Environment Canterbury (ECan), and the Otago Regional Council (ORC), agreed to commence work to understand how the Waitaki catchment could be managed as a whole.

[5] A working group, comprising Councillor Kevin Malcolm, staff from ECan and ORC, and representatives the iwi groups has been meeting regularly to progress the work. Councillor Peter Scott from ECan has recently joined.

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[6] An update in August 2024 noted that some early engagement with a range of stakeholders would be undertaken, and a report back to both Councils would occur following that engagement.

DISCUSSION

[7] The working group identified a range of stakeholder, including Government Ministers, irrigators, and territorial authorities. The full list of stakeholders is attached as Appendix 1.

[8] Key messages were developed, and contact was made with all stakeholders, offering information and the opportunity for a meeting (in person, or online).

[9] Several stakeholders took up the opportunity for in-person meetings, and a range of feedback was received. The summary of feedback is attached as Appendix 2. Overall, the feedback ranged from neutral, to generally supportive. Many parties requested more information or wanted to understand the rationale for the investigative work.

[10] While the feedback did not oppose the investigation, staff consider that more work is required to progress to more detailed engagement. The working group is currently working from a principled position that managing a river catchment as a whole and integrated catchment is good practice, however, there is not great clarity on what challenges result from the cross-boundary management.

[11] The working group consider that to get a good understanding of the complexities, challenges and benefits from the current management framework, a section 35 effectiveness review (Resource Management Act 1991) should be undertaken. This would enable the working group to understand the existing regime, the practical challenges facing landowners and the wider Waitaki community across the catchment, and any administrative duplication or complexities.

[12] It is proposed that the section 35 review be jointly undertaken by policy staff from ECan and ORC and accommodated within existing budgets.

[13] The working group consider that the findings of the s35 review should be used to inform decision making on whether the investigation should progress to the next stage.

[14] In addition to the s35 review, the working group consider there is value in having a representative from the Ministry for the Environment join the group. The rationale for this is that, while the resource management reform process is ongoing, understanding the objective of the investigation will be beneficial, especially if following the s35 review, it is considered that legislative change may be part of a solution.

OPTIONS

[15] The options in relation to progressing the investigation are

a. To endorse the proposal for a section 35 review, to enable the working group to understand the challenges with the existing planning framework; or,
b. To request that work stops on the investigation.

[16] Staff recommend that the proposal to complete a section 35 review is endorsed, to enable understanding of how the existing planning framework contributes to increased complexity, and/or cost and/or lengthier processes.

[17] Alternatively, Councillors could elect to end the investigation at this stage.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[18] The proposal is consistent with *Environment – Otago has a healthy environment ki uta ki tai, including thriving ecosystems and communities and flourishing biodiversity*; *Partnership – Otago Regional Council has effective and meaningful partnerships with mana whenua, creating better outcomes for our region*; and *Communities – Otago has cohesive and engaged communities that are connected to the environment and each other.*

Financial Considerations

[19] This work is currently being managed within existing budgets. As noted in earlier reports, if this work should progress beyond the investigative phase, specific budget would be required.

Significance and Engagement

[20] As noted in previous reports, if this work progressed, then it would trigger *He Mahi Rau Rika* however depending on process, it is likely a full public participatory process would be involved, either through the Local Government Act or the Resource Management Act.

Legislative and Risk Considerations

[21] There are a number of pieces of legislation and other higher order documents that currently manage the Waitaki River, including the RMA, the RM (Waitaki Amendment) Act, the Canterbury RPS, the Otago RPS, the Otago proposed RPS, and the relevant Regional and District plans. In addition, the NPSFM 2020 is also relevant.

[22] In addition, with the Resource Management Act reform, and changes to the National Policy Statement for Freshwater Management (NPSFM) foreshadowed, these could impact the investigation.

Climate Change Considerations

[23] This is not directly relevant.

Communications Considerations

[24] Communications and engagement considerations will be factored into each step of the process. There are communications and engagement staff on the working group, providing advice as the investigation progresses.

NEXT STEPS

[25] If both ECan and ORC endorse the s35 review, then the next step will be to commence the section 35 review.

ATTACHMENTS

1. Waitaki Ki Uta Ki Tai Stakeholder List 1 [**10.6.1** - 5 pages]
2. Engagement Evaluation Waitaki ki uta ki tai [**10.6.2** - 5 pages]

Waitaki Ki Uta Ki Tai Stakeholder List

Tier	Stakeholder Group	Stakeholder Name	Contact Details
Tier 1	Government Departments	Ministry for Environment	J. Palmer C. Rowe G. Raymond N. Dommissee
		Department of Conservation	P. Nelson J. MacPherson
		MPI	K. Reilly R. Smith S. O'Connell V. Ambrose
		MBIE – Energy Generation	C. Termain
	Ministers	Rural Communities, As. Min. Agriculture, Regional Development	M. Patterson
		Environment	P. Simmonds
		Local Government, Energy	S. Brown
		Infrastructure & RMA reform	C. Bishop
		Primary Industry - Biosecurity, Food Safety, As. Min Agriculture	A. Hoggard

		Primary Industry - Agriculture	T. McClay
		Oceans and Fisheries, Regional Development, Resources, Energy	S. Jones
		Conservation, Māori Crown Relations: Te Arawhiti, Māori Development	T. Potaka
	Electricity Generators	Meridian Genesis	E. Watson J. Page
	TA's – CE's and Planning Managers	MacKenzie District Council	R. Willox A. Oosthuizen
		Waitaki District Council	J. Evered D Campbell A. Parmley G. Kircher
		Waimate District Council	E. Bush
		Te Mokihi	R. Tutty
	LINZ	LINZ	Hannah O'Donnell
	TRONT	TRONT	J. Caine M. Gibbs
	Irrigators	Benmore Irrigation Company	K. D.
		MGI	A. Barton
		North Otago Irrigation Company (Kurow-Duntroon Irrigation Scheme Limited	A. Walton A. Rodwell M. Searle

		Maerewhenua Community Irrigation Scheme)	
		Lower Waitaki Irrigation Company	R. Hamilton
		Independent Irrigators Collective	
Tier 2	Primary Industry	North Otago Fed Farmers	M. Hands E. Linscott C. Hurst L. Hume
		Fonterra	R. Stevens K. Simmonds
		Dairy NZ	J. Kitto C. Ross D. Cooper
		Beef and Lamb	D. Sinnamon H. Blackely L. Evans
		NZ Pork	info@pork.co.nz
		Hort NZ	S. Cameron
	Fisheries	High County Salmon	Sales@highcountrysalmon.co.nz
		Aoraki salmon	Info@aorakisalmon.co.nz
	Waitaki water interests	Te Arawaru	AMW@ngaitahu.iwi.nz
	Government Departments	Waka Kotahi	G. Maloney
		National Public Health Service Southern	T. Scott C. Brunton R. Pink M. Reid
Tier 3	Electricity Transmitters	Transpower	R. Eng D. Hamilton
		Network Waitaki	

	Environmental NGOs	North Otago Sustainable Land Management NOLSLaM	C. Kingan L. Strang B. McNally N. Neil
	Catchment Groups	Otago Catchment Community	C. Simpson S. Dixon K. Barnes
		Lower Waitaki River Management Society	
		Hakataramea Sustainability Collective	
	TA's (surrounding) CE's and Planning Managers	Timaru District Council	A. Hakkaart P. Cooper
	Community River Groups	ECan Water Zone Committees	M. Griffin
		River Care Groups Kakanui Water Allocation Group	D. Moore
		River Rating District Committees	L. Griffiths
		Braided river advisory groups	S. Worthington
	Local MPs	Waitaki MP Rangitata MP	M. Anderson J. Meager
		Dunedin MP	R. Brooking
		Greens Otago Portfolio	S. Willis
		Rakitata Revival Partnership	S. Worthington

		Primary Industry Network	admin@nzipim.co.nz
	Freshwater	Salmon anglers association	L. Burke
		Fisheries	MPI contacts should pick this up
		Waterways centre for freshwater management	waterways@canterbury.ac.nz
	Business	Sustainable business network	A. Kenworthy
		Business South	M. Collins
		South Canterbury Chamber of Commerce	W. Smith
	Primary Industry	Deer NZ	S. Elmes
		Apiculture NZ	info@apinz.org.nz
		Young Farmers NZ & Regional	M. Cameron
		AgFirst Consultants	N. Chisholm
		Agri Planz Consultants	L. Taylor
		Pasture production	C. Strong
		Landpro	K. Scott
		Synlait	P. Gallagher
		Oceania	S. Lodge
		Mackenzie Guardians	L. Weir
	LandCare	Lower waitaki river community liaison group.	G. van Gcklooster
	MPI	On farm support team	K. Reilly A. Sutton

Engagement Evaluation: Waitaki ki uta ki tai engagement

Purpose

The engagement process successfully gathered input from a range of stakeholders, offering key insights into perspectives on a holistic management approach for the Waitaki catchment. The following analysis provides an overview of stakeholder engagement levels, thematic feedback, and recommendations for future steps.

This evaluation aims to analyse and evaluate stakeholder feedback to inform recommendations for next steps and guide future planning for the Waitaki ki uta ki tai investigation.

Summary of feedback

- Stakeholders were open to the concept of a holistic management approach for the Waitaki catchment, however, support would depend on further clarification and detail of its need, rationale, and implementation mechanics.
- Stakeholders want to ensure that the progress made through the Waitaki Act is maintained and not lost.

Engagement Outcomes

Purpose of Engagement	Achieved	Indicator of success
Explain the reasons for investigating a holistic management approach, Waitaki river catchment plan, and the intent and scope of the investigation.	✓	Stakeholders recognized the intent of scoping exercise through providing a range of resources
Understand the views of key stakeholders on the concept, including the estimated timeframe for implementing a new approach.	✓	Engagement provided an opportunity for detailed input, however at this early stage, responses remained high-level, resulting in a general understanding of perspectives. Stakeholders did not raise any concerns about the implementation timeframe.
Understand the legal and strategic interests and views of various Government departments and Ministers.	✓	Received valuable feedback from all targeted government departments and ministers.

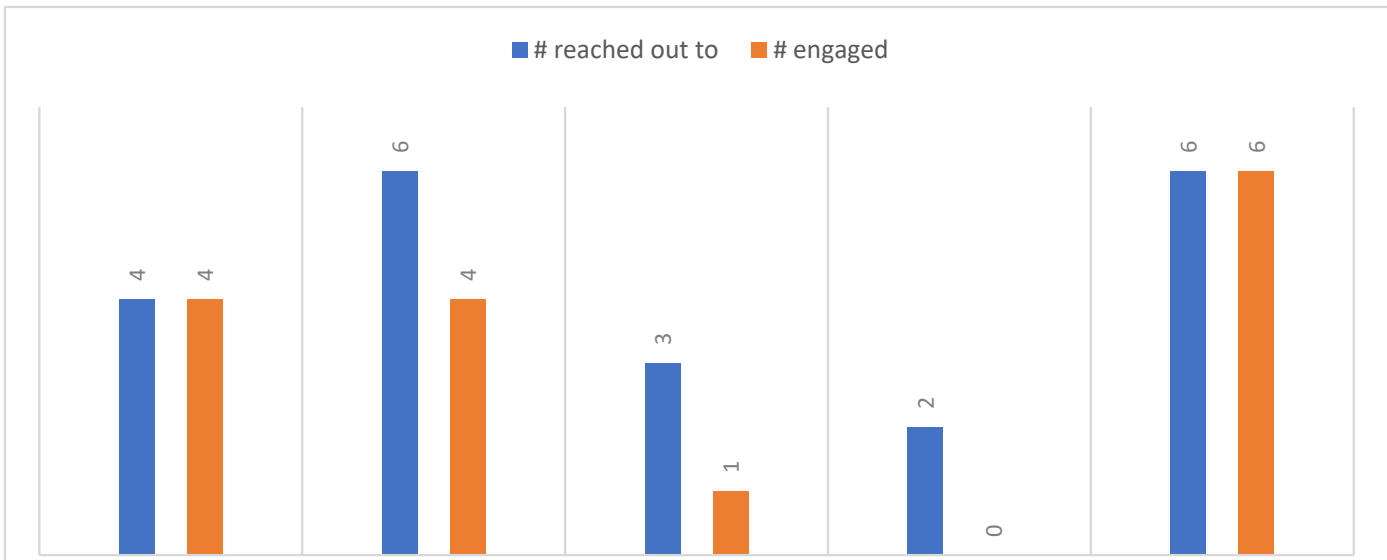
Mana Whenua Partnership

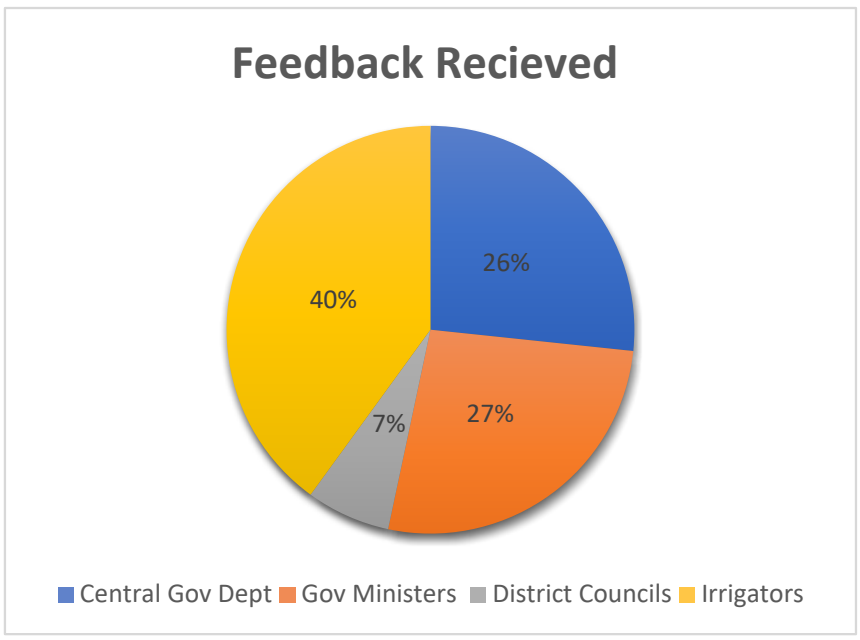
Iwi have been directly involved in the established working group with members from Te Rūnaka o Arowhenua, Te Rūnaka o Waihao, and Te Rūnaka o Moeraki.

Regular updates to TRONT have been provided through chairs.

Tier 1 Stakeholders

Stakeholder Representation





Tier 1 Stakeholder Feedback

Key Themes

Initial Support	Nearly all feedback expressed support for the investigation phase or did not indicate opposition.
Support of high-level concept	While there was broad support, stakeholders emphasized the need for clarity in execution.
Understanding of Scope	Most stakeholders recognized that this is a scoping exercise.
Need for More Information	Nearly all respondents wanted further details, particularly regarding the limitations of current measures.

Evidence Requirement	Strong request from Ministers for justification of change and an explanation of why existing measures are insufficient.
Integrated Management Approach	Some stakeholders acknowledged the need for such an approach, aligning with the concept of *ki uta ki tai*.
Ongoing Involvement	All engaged stakeholders expressed a desire to remain informed and involved.

Stakeholder Priorities

- A clearer articulation of the rationale behind proposed changes is necessary.
- Further work is necessary to explore whether legislative changes are needed or if existing mechanisms can achieve the same objectives.
- Concerns over potential disruptions to existing water allocation provisions perceived as hard-won.

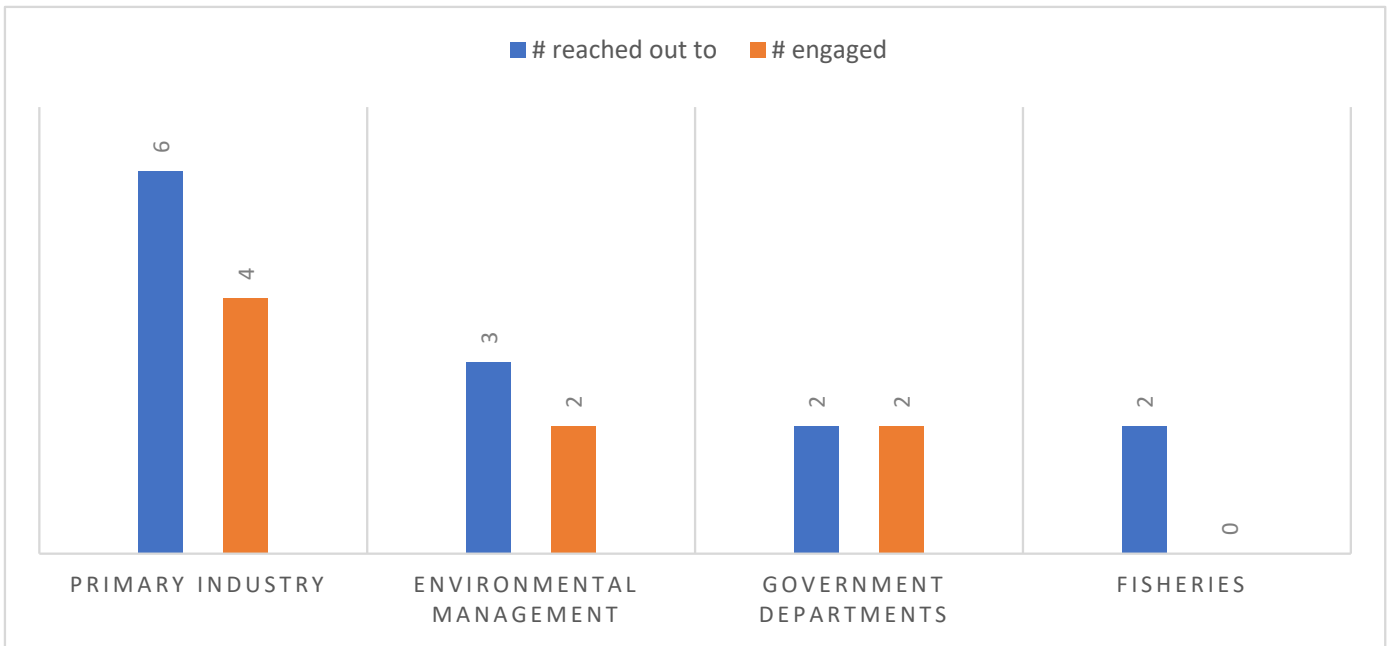
Stakeholder key suggestions

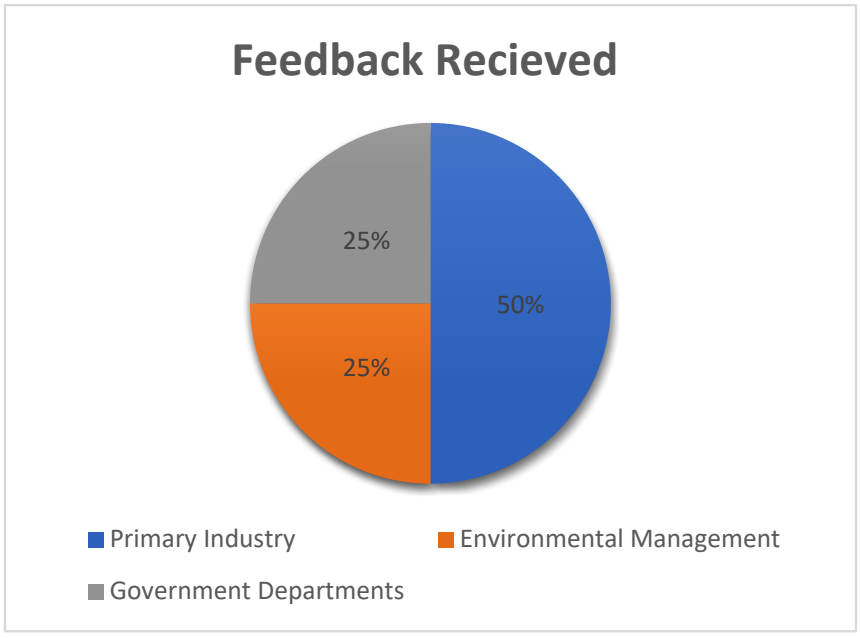
Any further engagement should provide multiple policy options which could address identified issues, including an integrated catchment management framework.

- Clear process regarding the selection of stakeholders, particularly within government agencies.
- Enhanced transparency about the investigation's motivations.
- Expand engagement to a broader range of stakeholders for more community-based conversations.

Tier 2 Stakeholders

Stakeholder Representation





Tier 2 Stakeholder Feedback

Key Themes

Initial Support	General agreement on the investigation's value.
Need for Detail	Stakeholders require additional clarity before forming strong positions.
Alignment with Ki Uta Ki Tai	Recognition that integrated catchment management is a more effective approach than division across administrative borders.
Timing Concerns:	Significant national freshwater reforms and shifting priorities pose engagement challenges for industries and resource users in the next 12 months.
Ongoing Involvement	All engaged stakeholders expressed a desire to remain informed and involved.

Stakeholder Priorities

- How proposed planning frameworks will address water allocation and quality issues and broader freshwater planning frameworks in the regions.
- Potential likelihood of better river management outcomes under a unified management system.
- The opportunity of reducing the cost and complexity of environmental management and compliance.

Stakeholder key suggestions

- Expand engagement to broader stakeholders for more community-based conversations.

- Provide multiple policy options to address the identified issues, including an integrated catchment management framework.

Assumptions

Stakeholders have been given ample opportunity to engage with the investigation, including follow-ups with those who did not engage. Given that many stakeholders did not respond, we infer that the stakeholders we did not hear from are unlikely to oppose the idea or have major objections to it.

Recommendations arising from engagement

- The next round of engagement should focus on clarifying the rationale, exploring potential changes, and the mechanics of implementation.
- More evidence is needed to demonstrate why changes are required and what aspects of the current legislation are not working, and how the proposed holistic approach would address these.
- A clear process should be established for identifying and engaging stakeholders, particularly within government, ensuring transparency on who is involved and why.
- Public engagement should be included in the next round of engagement.

10.7. Flood Recovery Update 2

Prepared for:	Council
Report No.	OPS2501
Activity:	Governance Report
Author:	Brett Paterson, Team Leader Project Delivery Ken Tarboton, Flood Repair and Recovery Programme Manager (Contractor)
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	19 March 2025

PURPOSE

[1] To provide an update on repairs from the October 2024 flood event including financial implications. Also, to seek Council approval to award the contract and authorise payments for the Kaitangata floodbank repair to damage from the 2022 flood.

RECOMMENDATION

That the Council:

1) ***Receives*** *this report.*
2) ***Notes*** *the progress on 2024 flood damage repairs.*
3) ***Notes*** *the updated cost estimates and financial implications of 2024 flood damage repairs.*
4) ***Considers*** *options 1 and 2 for the Kaitangata floodbank repair.*
5) ***Approves*** *the award of a contract to the highest scoring tenderer to undertake repairs to the Kaitangata floodbank according to option 1 up to a total amount not exceeding $700,000 (excl. GST).*

   Or,
6) ***Approves*** *the award of a contract to the highest scoring tenderer to undertake repairs to the Kaitangata floodbank according to option 2 up to a total amount not exceeding $530,000 (excl. GST).*
7) ***Authorises*** *the Chief Executive to make payments on the Kaitangata floodbank repairs against project progress claims up to the approved value for the Council preferred option.*

Introduction

[2] In October 2024 a heavy rainfall event caused flood damage spread widely across the Otago region. Details of the flood event and an initial cost estimate were provided to the 4 December 2024 Council Meeting.

[3] Council authorised at their 4 December 2024 meeting, the award of contracts and approval of progress payments on 2024 flood damage repairs up to a cumulative value of $2,540,000. No authorisation was sought on the award of contracts and approval of progress payments for 2022 flood damage as no adjustments to prior approvals were required at that time.

[4] Expenditure to date on 2024 flood recovery is $213,970. The revised cost estimate for 2024 flood damage repairs is $2,364,000 as shown in Table 2. This is slightly less than the $2,540,000 estimated in the 4 December 2024 Council Report.

[5] As flood damage repairs are unbudgeted, they are funded by scheme reserves. Alternative funding opportunities are sought through central government funding (National Emergency Management Agency (NEMA) and the Regional Infrastructure Fund (RIF)), and contribution from Contact Energy when eligible according to their consent conditions. Three projects within the flood recovery programme have been put forward as part of ORC's application to the RIF Tranche 2 programme.

OCTOBER 2024 FLOOD DAMAGE

Updated 2024 flood damage assessment

[6] An initial assessment of flood damage was presented to the 4 December 2024 Council Meeting. Following river levels receding, a more detailed flood damage assessment of all identified flood damage sites has been undertaken including an assessment of the lower Clutha River by jetboat.

[7] Table 1 shows the updated damage assessment with a total of 25 flood damage sites by location and type of damage. Two additional erosion sites on the Clutha River and one additional minor structure damage site to a drain culvert near Mosgiel were identified. Seven erosion sites identified on the Silverstream have been removed from 2024 flood recovery to be repaired as part of a Business as Usual (BAU) works.

Table 1. Updated assessment of damage from October 2024 flood event.

2024 Flood Recovery	Number of sites and type of repair required at site			
Location	**Flood bank repair**	**Structure repair**	**Erosion**	**Total**
Central Otago			2	2
Lower Clutha	6	1	8	15
Lower Taieri	1	1	5	7
Tokomairiro			1	1
Total	**7**	**2**	**16**	**25**

2024 Flood Repair works progress.

Puerua outfall / Clutha Koau training line

[8] The repair of the Clutha Koau training line and the Puerua Outfall passing through the training line remains the most significant repair within the 2024 flood recovery programme.

[9] Planning and design work for the repair is progressing along with procurement and delivery of the large (2.5m diameter) culverts required for the outfall. Professional services have been engaged for bathymetry and site survey, hydraulic modelling, structure design, consenting, and contract management support. Hydraulic modelling and analysis have been undertaken and the initial structure design prepared.

[10] Following the 4 December Council meeting, ORC staff met with the community and received feedback on the planned repairs. This feedback has been incorporated into the planning process for the repairs including undertaking additional modelling, risk assessment work, and design refinements. A further community meeting was held on the 3rd of March to communicate the planned repair works.

[11] At this stage, construction work is planned to begin on site in mid-March 2025.

[12] The current estimate for the repairs remains at $1.5M with cost to January 2025 being $115,000.

Other 2024 Flood Damage Repairs to Date

[13] Other repairs to date have included completing relatively minor structural repair on the Taieri, and floodbank and erosion repairs at 9 sites, 5 on the Lower Clutha and 4 in the Lower Taieri (see Table 2 below).

[14] Repairs to 15 flood damage sites remain to be undertaken.

Table 2. Status of 2024 flood damage repairs, cost to date and estimated total costs.

Repair Type	Number of sites	Works Completed	Costs to Date	Estimated Cost	Comments
Structure repair	2	1	$120,722	$1,504,957	Puerua training line structure ($1.5M) and minor Taieri drainage structure ($5k)
Flood bank repair	7	2	$25,621	$604,757	At 7 locations in Lower Clutha
Erosion	16	7	$67,627	$254,744	Across Otago
Total	**25**	**10**	**$213,970**	**$2,364,458**	**Less than previous estimate of $2.54M**

FLOOD REPAIR AND RECOVERY PROGRAMME

[15] ORC has had flood damage from four recent significant weather events in the years 2020, 2022, 2023 in addition to the 2024 flood damage discussed above.

[16] 2020 flood damage repairs have recently been completed (February 2025) and the final claim and closure report to the National Emergency Management Agency (NEMA) is being progressed.

[17] Flood damage information from the three remaining events in 2022, 2023 and 2024 is 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.

[18] Table 3 below shows a snapshot summary of flood damage sites by location for the four events, updated from Table 4 in the 4 December 2024 report to Council.

[19] Of the 144 flood damage sites in the programme at the end of February 2025, repairs are still required at 21 remaining sites, two from the 2022 event, four from the 2023 event and 15 from the 2024 event.

Table 3. Summary of 2020, 2022, 2023 and 2024 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	2024	
Central Otago		12		2 (2)	14 (2)
Clutha	5	4			9
Dunedin		2			2
Lower Clutha	27	11 (1)		15 (11)	53 (12)
Lower Taieri		9 (1)		7 (1)	16 (2)
Tokomairiro				1 (1)	1 (1)
Waitaki		32			32
Wakatipu	2		4		6
Wanaka	1	1	9 (4)		11 (4)
Total	**35**	**71 (2)**	**13 (4)**	**25 (15)**	**144 (21)**

Kaitangata Floodbank

[20] The Kaitangata floodbank repair is one of the two remaining 2022 flood damage repairs still to be completed. This floodbank which provides protection to the Kaitangata township has subsided over time and suffered scour damage in the 2022 flood event. Subsequent events in 2023 and 2024 have further damaged this floodbank.

[21] Works are ready to commence pending Council approval. These works include 450m of floodbank repair, 150m of return bank raising and raising of the section of Water Street that crosses the return bank.

[22] The initial estimate for these works was approximately $300,000 for 400m of floodbank repair. This estimate was included in the cost estimate for 2022 flood damage repairs of $345,000 presented to Council previously (Table 5 in the 4 December 2024 report).

[23] With the addition of the return bank and road raising the Engineer's estimate increased to $600,100.

[24] The request for tenders to procure a works contractor for the Kaitangata Floodbank repair was posted on GETS on 21 November 2024 and tenders closed on 20 December 2024.

[25] Six tenders were received, with adjusted prices following due diligence and arithmetic checks ranging from $649,462 to $1,012,858. The tenders were evaluated on a weighted price and attribute basis with the highest scoring tenderer also having the lowest price in this case.

[26] Two options are presented as shown in Figure 1 below.

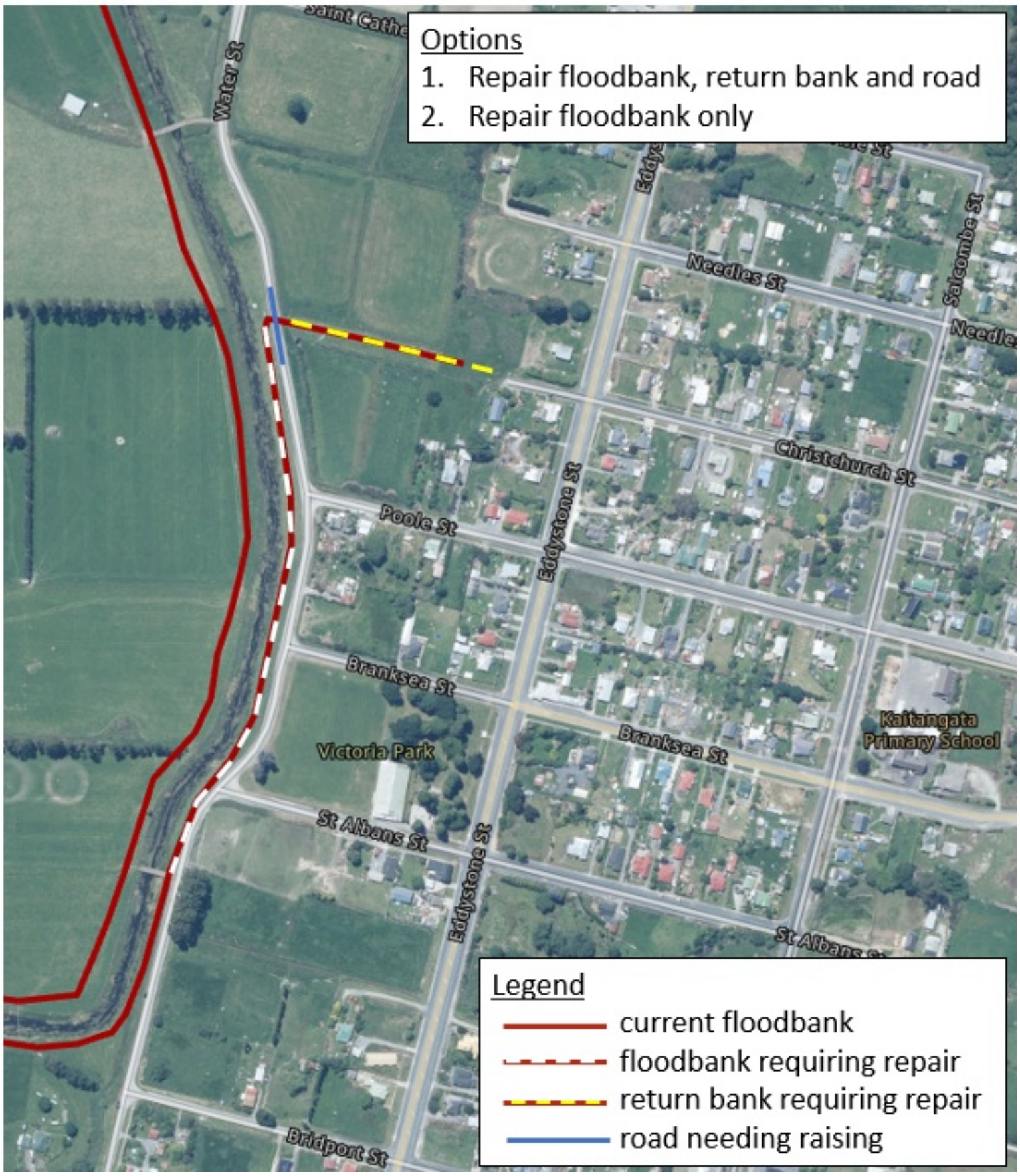


Figure 1. Kaitangata floodbank repair options.

[27] Option 1 includes the full repair as proposed including, repairing the floodbank, repairing the return bank and raising the road. This is the staff preferred and recommended option as it returns the flood defence to a condition that provides the originally designed intended protection to the western side of Kaitangata township with uniform design height. The current construction estimate is $649,462 from the highest scoring tenderer. If this option is selected, Council is asked to approve expenditure of up to $700,000 to accommodate possible minor variations.

[28] Option 2 includes repairing the floodbank only at this stage, with works to repair the return bank and raise the road to be included in future Annual Plan budgets and to be undertaken at a later stage. This option is cheaper at a construction cost of $486,000 which is closer to the original estimate for flood damage repair. This option is not

recommended because Kaitangata township will remain at increased flood risk until the return bank and road are completed. Procuring the return bank and road work separately in future is likely to have a higher cost due to re-mobilisation of equipment, site re-establishment and price increases through inflation by the time the works are undertaken. This option also represents a reputational risk through the public perception of inefficient delivery of the works and delay in providing the design level of flood protection to the Kaitangata township. If this option is selected, Council is asked to approve expenditure of up to $530,000 to accommodate possible minor variations.

[29] The financial implications, presented hereafter, use the staff preferred and recommended value of $649,462 (for Option 1) for the Kaitangata flood damage repairs. If Option 2 is selected, the financial impact will be less.

[30] As flood repairs are unbudgeted, this work is funded by scheme reserves. This work has been included in ORC's application to the RIF Tranche 2 programme. The 2022 flood recovery programme did not reach the threshold for NEMA funding. The works at the Kaitangata floodbank are not eligible for contribution from Contact Energy.

2023 FLOOD DAMAGE REPAIRS

[31] 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 currently underway and works are expected to be completed by the end of the 2024/25 financial year.

FINANCIAL IMPLICATIONS

[32] 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. These costs were updated in a summary table presented in the report to Council on 4 December 2024. This table has been updated below (Table 4) and the revised 2024 flood damage costs included. The 2022 flood damage costs have been increased following receipt of tenders on the 2022 Kaitangata floodbank repairs.

[33] The overall cost for the 2020 to 2024 flood damage is expected to be $8.4 million. Costs incurred to date are $5.1 million with contributions to date from others of $1.1 million. $3.3 million remains to be spent.

[34] Of the remaining $3.3 million, approximately $1.2 million is for the remaining 2020-2023 flood damage. The majority of the 2020-2023 flood damage works are expected to be completed in the 2024/25 financial year. Part of the 2024 flood damage costs of $2.4 million will be spent in 2024/25 and the remainder in 2025/26 financial years.

Table 4: Summary of ORC Flood Repair Costs from 2020, 2022, 2023 and 2024 events.

Weather event	Est. cost of repairs as reported 10/08/23	Cost to ORC Schemes & Rivers at 31/01/2025	Contributions from others at 31/10/24		Forecast expenditure to complete	Revised estimated cost at completion
February 2020	$4,500,000	$4,207,323	NEMA[1]	$426,183	$405,543	$4,612,866
			MBIE[2]	$608,000		
			CEL[3]	$14,631		
July to August 2022	$1,855,309	$628,401	CEL[3]	$45,440	$690,000	$1,318,401
July 2023		$31,500			$79,000	$110,500
October 2024		$214,000	CEL[3]	To Be Confirmed[4]	$2,150,500	$2,364,500
Total	**$6,355,309**	**$5,081,224**		**$1,094,254**	**$3,325,043**	**$8,406,267**

[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.

[4] The CEL contribution is yet to be confirmed. ORC is currently in discussion with CEL regarding their contribution.

[35] The flood protection schemes, and river channels damaged by weather outlined in this paper are not insured[1] by the ORC. The flood protection and river management schemes are structured as self-insured funding models.

[36] The flood repair costs, shown above are unbudgeted and will be incurred as deficit to the schemes and/or rivers management reserves[2].

[37] Contact Energy Limited (CEL) through their consents [3] have historically contributed to repairs which have been deemed as reasonable costs to 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 4.

[38] Initial discussions are underway with Contact Energy regarding their contribution to 2024 flood damage repairs. The level of contribution is yet to be determined.

[39] 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. The threshold for the 2020 flood damage was $1.92 million and the estimated NEMA threshold for the 2024 event is $2.83 million.

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

[2] 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.

[3] Resource Consent 2001.394

[40] Costs for flood damage from both the 2022 and 2023 events were below the required threshold to be eligible for NEMA funding. The cost of 2024 flood damage is also below the NEMA threshold at this stage.

[41] Other funding options such as accessing the ORC Emergency Response fund, borrowing against the Flood Protection and Drainage Schemes, or changing the Kuriwao Fund contribution to the Lower Clutha Flood Protection & Drainage Scheme, have been presented in the previous reports to Council.

[42] The scheme reserve balances as of 30 June 2024 are provided in table 5.

Table 5. Scheme reserve balances as of 30 June 2024.

Scheme	Reserve Balance $000s ( ) denotes a deficit
Alexandra Flood Protection Scheme	7
East Taieri Drainage Scheme	(270)
Leith Flood Protection Scheme	(12,998)
Lower Clutha Flood Protection and Drainage Scheme	(838)
Lower Taieri Flood Protection Scheme	4,975
Tokomairiro Drainage Scheme	51
West Taieri Drainage Scheme	(2,417)

OTHER CONSIDERATIONS

Strategic Framework and Policy Considerations

[43] The works presented within this report contribute to ORC's Resilience goals within the Strategic Directions of:

a. Plans are in place to ensure that the region's most vulnerable c*ommunities (geographic and demographic) and ecosystems are resilient in the face of natural hazards.*

And*:*

b. Our infrastructure is designed and built to accommodate variability and uncertainty associated with changing weather patterns and sea level rise.

Significance and Engagement Considerations

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

Legislative and Risk Considerations

[45] 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

[46] 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

[47] Communications have included several community meetings and direct discussion with affected landowners. Staff will continue to engage with the community and affected stakeholders as the works progress.

NEXT STEPS

[48] Complete the two remaining 2022 flood damage repairs by the end of the 2025 Calendar Year.

[49] Complete the four remaining 2023 flood damage repairs by the end of the 2024/25 financial year.

[50] Updated Council again on the October 2024 flood repair programme at the end of 2025. Repairs are expected to be completed by the end of the 2025/26 financial year.

[51] Continue to communicate with Contact Energy on consent contributions for the reinstatement of eligible flood repair works.

ATTACHMENTS

Nil

10.8. Lower Taieri Liaison Group

Prepared for:	Council
Report No.	GOV2511
Activity:	Governance Report
Author:	Kirsten Tebbutt, Engagement Strategy and Planning Lead Kirsten Tebbutt, Principal Strategic Advisor
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	19 March 2025

PURPOSE

[1] To update the Council regarding the formation of the Lower Taieri Liaison Group, present the confirmed Terms of Reference, and to seek the nomination of a Councillor Representative for the Group.

EXECUTIVE SUMMARY

[2] The Lower Taieri Liaison Group has now been established, and its Terms of Reference (ToR) have been confirmed with minor amendments.

[3] It is now appropriate that the Council formally recognises the formation of the Group and nominates a Councillor representative.

RECOMMENDATION

That the Council:

1. ***Notes** this report.*
2. ***Approves** the Terms of Reference for the Lower Taieri Liaison Group.*
3. ***Nominates** Councillor XXX to be a member of the Lower Taieri Liaison Group.*
4. ***Thanks** those community members who have put themselves forward to be members of the Lower Taieri Liaison Group.*

BACKGROUND

[4] During the 2024-2034 Long Term Plan process, the Lower Taieri community strongly advocated for the re-establishment of a liaison group. While more engagement is needed with other Otago communities to assess the desire for liaison groups, the Council requested staff to report back to the Regional Leadership Committee to confirm a process for the re-establishment of Liaison Groups for Flood Protection and Drainage Schemes and a draft Terms of Reference. A draft Terms of Reference (ToR) was presented to the Regional Leadership Committee meeting on 28 August 2024, along with a general outline of the approach to be taken to the formation of the Group. The ToR identified that membership of the Group would comprise:

- Two representatives from East Taieri
- Two representatives from West Taieri
- One representative from Dunedin International Airport Limited
- One representative from the Mosgiel Taieri Community Board
- One Council representative
- Two ‘other’ representatives, intended to be ratepayers or occupiers from within the area
- 1 representative from mana whenua.

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[5] A comprehensive engagement plan was developed and implemented from 15 November 2024. Engagement methods included:

- Flyers circulated to all scheme users and ratepayers across the Taieri (roughly 7,800 households)
- A web page developed with information about the liaison group and the scheme
- Print advertisements in the ODT and Southern Rural Life
- Media release sent out announcing the liaison group was being reformed and seeking nominations
- Development of a digital nomination form
- Emails to various stakeholder groups
- Article published in ORC On Stream (late November edition)
- Q&As and information pack developed for ORC Customer Experience staff
- Social media posts
- Targeted social media advertising.

[6] A meeting was held on 12 December 2024 at the Henley Community Centre. Attendance was reasonable, and ten nominations were recorded from East and West Taieri (five nominations for each area). No nominations were received for the 'other' representatives, and as a result it was determined appropriate to proceed to elect three representatives from each of East and West Taieri. Voting was undertaken on the basis of a show of hands.

[7] The full composition of the Liaison Group is shown below:

East Taieri	Julie Struthers Simon Parks William Kirkland (determined by coin toss)
West Taieri	David Wilson Colin Scurr Matt Kerr
Dunedin International Airport Limited	Nick Rodger
Mosgiel Taieri Community Board	Andrew Simms

[8] Engagement with Aukaha prior to the meeting determined a preference for their involvement to be at a strategic level rather than via formal involvement in the Liaison Group itself. A framework for this strategic level involvement will be developed in partnership with Aukaha in due course.

[9] Attachment A sets out a full summary of the engagement undertaken and the voting process itself.

DISCUSSION

[10] Since the election of members of the Lower Taieri Liaison Group, an inaugural meeting of the elected group has now been held. At the inaugral meeting, staff were introduced, and a provisional chairperson was elected (to be confirmed once the Councillor representative has been confirmed). The provisional chairperson that has been elected

is Simon Parks. The most substantive discussion related to the confirmation of the ToR. This was confirmed and reflects the Draft ToR that was approved via the Regional Leadership Committee meeting of 24 August 2024.

[11] Some minor amendments were made to the Draft ToR, as follows:

- The purpose of the Liaison Groups has been updated to delete reference to 'informal' committee.
- Meeting frequency has been updated to indicate meetings will be held between October and December, and May and June. The former reference was May to July.
- The principles of participation have been updated in accordance with a question raised by the Group. Concerns were expressed that the Draft ToR could suggest that individual group members would not be able to participate in other Council processes (such as the Long Term Plan, Annual Plan, etc). An additional bullet point has been inserted to this section to clarify that individuals are not precluded from lodging their own submissions or feedback.
- Point 13 of the Terms of Reference has been updated to clarify that members have been appointed to the Liaison Group for a three year term.

[12] In all other respects, the ToR are unchanged. Attachment B sets out the agreed ToR.

[13] Looking ahead, Meetings are expected to be late afternoon, mid week, with the next meeting expected to be scheduled for late May 2025.

OPTIONS

[14] The Council approves the Terms of Reference and nominates a Councillor to join the Lower Taieri Liaison Group. The Liaison Group will provide a conduit for discussions and communication with the Taieri community and provides an opportunity for community involvement in work programming and asset management activities. It will provide a robust means to enable community involvement in these processes.

[15] Alternatively, the Council may choose not to approve the Terms of Reference.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[16] The Lower Taieri Liaison Group will serve as a tactical communication plan for achieving the ORC's strategic goals relating to Communities and Resilience, as follows:

- Our communities trust us, and they are satisfied with us and the outcomes that we are delivering
- Our communities are supported and empowered to achieve better environmental outcomes
- Our infrastructure is designed and built to accommodate variability and uncertainty associated with changing weather patterns and sea level rise.

Financial Considerations

[17] The costs associated with the support of the Lower Taieri Liaison Group is expected to be met within existing approved budgets for the Lower Taieri Flood and Drainage Scheme.

[18] In time it will be expected that the financial impacts are minimal as the meetings become a part of annual work programme cycles. Staff time associated with preparing for and attending meetings is not expected to be significant. In the future, as other Liaison groups are established, there may be capacity within the team to develop a Liaison Officer role.

Significance and Engagement

[19] The endorsement of the establishment of the Lower Taieri Liaison Group does not trigger any engagement requirements under Councils Significance and Engagement Policy.

Legislative and Risk Considerations

[20] There are no statutory obligations to be considered in the endorsement of the Lower Taieri Liaison Group by Council.

[21] Infrastructure resilience has been identified as a Strategic Risk for ORC. The establishment of a Lower Taieri Liaison Group supports the communication and awareness of this risk through the group.

Climate Change Considerations

[22] Climate change considerations have been discussed in the Draft Infrastructure Strategy 2024-2054. The development of the Liaison Groups will enable oversight to the management of the effects of future climate change on the ORC's assets in respect of flood risk, land drainage, and river management infrastructure.

Communications Considerations

[23] The information relating to the establishment and operation of Lower Taieri Liaison Group will be made publicly available on ORC's website. Additional communication will be undertaken at the recommendation of the Group.

NEXT STEPS

[24] Confirm Councillor representation on the Group.

[25] Commence preparation for the first meeting cycle.

ATTACHMENTS

1. Attachment A Lower Taieri Flood Protection Scheme Liaison Group Engagement Report [**10.9.1** - 3 pages]
2. Attachment B Confirmed Terms of Reference [**10.9.2** - 4 pages]

Lower Taieri Flood Protection Scheme Liaison Group Engagement Report

Purpose of this report

The below report outlines the process undertaken to engage with the Lower Taieri Community and re-establish the Lower Taieri Flood Protection Scheme Liaison Group.

Background and Context

ORC owns and manages flood protection and drainage schemes in Otago. These include the Lower Taieri Flood Protection Scheme, the West Taieri Drainage Scheme, and the East Taieri Drainage Scheme.

These were initially funded by Central Government, but this investment ceased in 1989, and it was up to local ratepayers to develop and maintain these schemes. Two liaison groups (the Lower Clutha Liaison Group and the West Taieri Drainage Liaison Group) were set up and ran until 2014 to provide ratepayer representation and input into these scheme management. From around 2019, ORC has offered annual drop-in sessions with some success but also limitations providing an opportunity to discuss in detail expenditure and decisions on the schemes.

During the recent Long Term Plan process, there was a strong desire of the Lower Taieri community to re-establish a liaison group. While more engagement is needed with other Otago communities to assess the desire for liaison groups, Council requested staff to report back to the Regional Leadership Committee to confirm a process for the re-establishment of Liaison Groups for Flood Protection and Drainage Schemes and a draft Terms of Reference.

Engineering staff presented to Council at the Regional Leadership Committee Meeting on August 28th 2024 options and a recommendation for the re-establishment of Liaison Groups.

Engagement Approach

ORC was seeking to strengthen the relationship with the community. The establishment of the liaison groups will facilitate a connection between the community and Council to work on management of scheme assets, which enables a collaborative approach on the significant issues related to the scheme.

The purpose of the liaison group is to act as an informal committee who will work alongside ORC to:

- Facilitate effective communication between the scheme ratepayers, key infrastructure providers and ORC.
- Be the ‘eyes and ears’ of the scheme community in relation to scheme performance and stakeholder satisfaction.
- Provide feedback to the ORC through the liaison group on proposed scheme operational and capital programmes.
- Provide feedback on the scheme levels of service.
- Provide feedback on the development of infrastructure strategy, asset management plans and rating/funding proposals as relevant to the schemes.

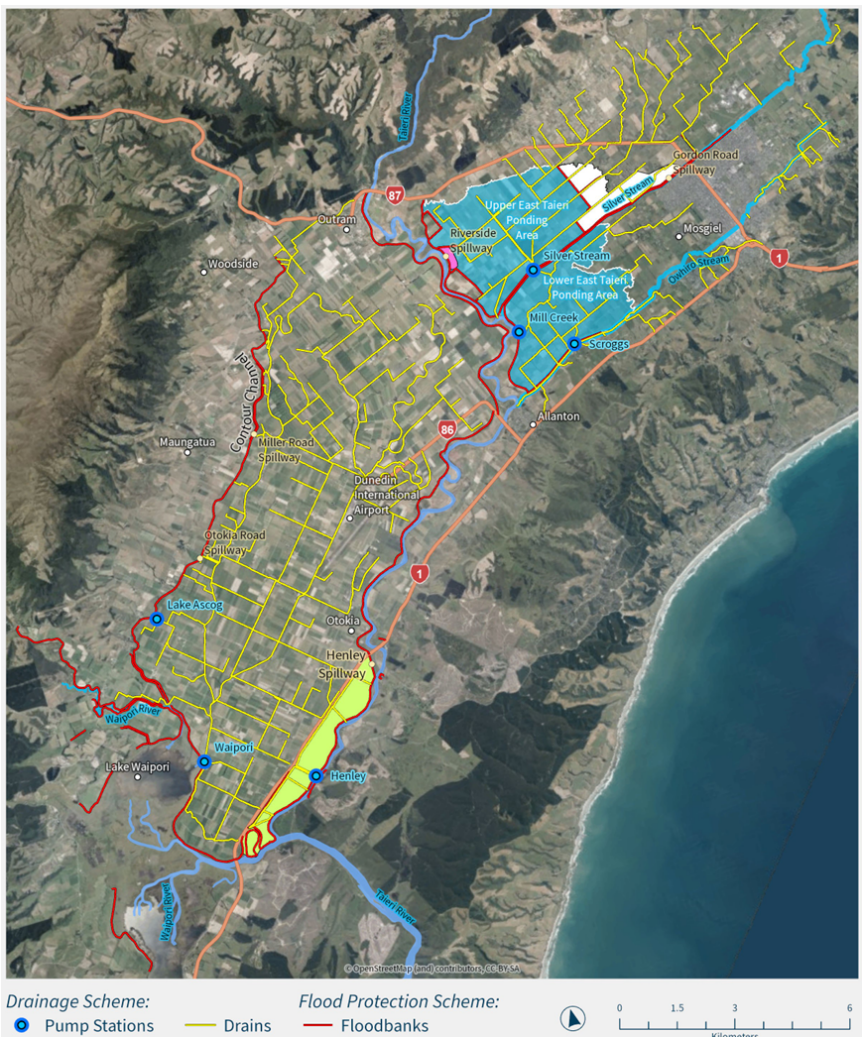
The purpose of engaging with the community and stakeholders was to ensure as many targeted rate payers as possible for the Lower Taieri Flood Protection and Drainage Schemes were made aware of an initial AGM on Dec 12th, and were given every ability to put forth nominations for the new group.

Scope

This engagement process did not constitute a formal consultation, but was an opportunity for users of the LTFPS to be made aware of the formation of the Liaison Group, and be given the chance to nominate members to sit on the group.

GEOGRAPHIC SCOPE

The audience we are looking to engage with are users of the scheme, which is identified on the map below.



Audiences

There were two main audiences we were looking to engage with:

Users of the scheme

being ratepayers and residents who live within the scheme's boundaries and contribute (either directly or indirectly) to the maintenance and upkeep of the scheme through their rates.

This audience was engaged with using a range of Council channels, including:

- Online material available on the ORC website
- A flyer delivered to addresses across the scheme
- Social media posts
- Media advisory
- Adverts in local papers

Stakeholder Groups

Groups with an interest in the area and who help us push messaging out to their members. These are likely to include organisations such as Federated Farmers, Dairy NZ and other rural support groups.

Stakeholder groups were identified by ORC and were be communicated with via an email that was drafted by the comms team.

Engagement

A range of engagement actions were undertaken to get the word out to the community, these are listed below.

Engagement actions (6 Nov – 12 Dec)

- Flyer developed and dropped to all scheme users and ratepayers (Mosgiel and Taieri area, from Wingatui to Outram to Henley – roughly 7,800 households)
- Dedicated web page developed with information about the liaison group and the scheme
- Print ads ran in the ODT and Southern Rural Life
- Media advisory sent to media announcing the liaison group was being reformed and seeking nominations
- Digital nomination form developed
- Emails sent to a range of stakeholder groups
- Article published in ORC On Stream (late November edition)
- Q&As and information pack developed for ORC Customer Experience staff
- Social media posts
- Targeted social media advertising
- Media advisory announcing Liaison Group members (post-meeting)

Results

Ten nominations were received for the six seats on the Liaison Group – five from East Taieri, and five from West Taieri.

Approximately forty community members attended the initial AGM and all nominees spoke to the group and outlined why they would make suitable members of the Liaison Group.

Votes were taken from the floor on the night, with the results of the voting shown in the table below.

7pm, 12 December, 2024	
East Taieri	
Nominees	**Votes**
William Kirkland	13 13 **14**
Simon Parks	21 **19** -
Julie Struthers	**25** - -
Errol Millar	0 0 0
Jimmy Miles	15 15 14
Members elected	1. Julie Struthers 2. Simon Parks 3. William Kirkland (winner of coin toss)
West Taieri	
Nominees	**Votes**
Colin Scurr	20 **21** -
David Wilson	**21** - -
Matt Kerr	14 13 **17**
Braden Young	0 0 0
Scott Young	3 2 2
Members elected	1. David Wilson 2. Colin Scurr 3. Matt Kerr
Dunedin International Airport	Nick Rodger – General Manager Infrastructure and Operations, Dunedin Airport
Mosgiel Taieri Community Board	Andrew Simms – Mosgiel Taieri Community Board Chair
ORC Councillor	To be confirmed

Otago Regional Council

Terms of Reference

Lower Taieri Liaison Group Flood Protection & Drainage Schemes

Purpose of Liaison Groups

Liaison Groups are advisory committees established to:

- facilitate effective communication between the scheme ratepayers, key infrastructure providers and Otago Regional Council (ORC);
- be the 'eyes and ears' of the scheme community in relation to scheme performance and stakeholder satisfaction;
- provide feedback to the ORC through the liaison group on proposed scheme operational and capital programmes;
- provide feedback on the scheme levels of service;
- provide feedback on the development of infrastructure strategy, asset management plans and rating/funding proposals as relevant to the schemes.

Liaison Group Status

The Groups shall be established by ORC and shall operate in accordance with these Terms of Reference. Liaison Groups have no authority to make decisions on behalf of ORC. However, issues or recommendations arising from Liaison Group meetings will either be addressed by the ORC or referred to the ORC's Safety and Resilience Committee or full Council as appropriate.

Meeting Frequency

As agreed by members of the liaison committee, but no less that twice a year, to coincide with the development of draft annual plan budgets and following the receipt of public feedback on proposals prior to Council adoption. This will generally be between October and December and May and June. The time and location of meetings shall be agreed by representatives of the liaison group.

Limits of Power

Members of the Liaison Group are able to submit on draft work programmes and rating proposals in the ORC's Annual Plan or Long-Term Plan. The Liaison Group has no authority to commit the ORC to any investment path or capital and operating expenditure.

The Liaison Group will operate in such a way as to not compromise the ORC's freedom to deliberate and make such decisions as it deems appropriate.

Records
The Liaison Group shall maintain records including notices of meetings, agendas, reports to meetings, notes/minutes of meetings/site inspections; records of nominations, and election of members of the Liaison Group. This will be available online to the public.

Principles of Participation
All members of the Liaison Group agree to participate in the following ways:

- contributions are made without prejudice – i.e. nothing said within the Group may be used in subsequent planning or legal processes except for any recommendations or agreements reached by the group;

- members shall show respect for others views and avoid promoting discord within the Group;

- any public statements by the Group are to be agreed by the Group and made through an agreed spokesperson;

- members of the Group are expected to support decisions and recommendations reached by consensus by the Group in subsequent public discussions; and

- the Chair is responsible for fostering the principles of participation and is expected to be respected as a leader in their role.

- Membership of the Liaison Group shall not be preclude its members from lodging independent submissions or feedback in respect of any Council plan, policy, document etc.

Terms of Reference

1. Each Liaison Group should ideally consist of not less than five and not more than ten members and should provide a broad representation of ratepayers and land uses within the scheme area; geographical extent of the scheme; and major infrastructure providers. Additional or fewer members may be appointed according to the needs of a particular scheme, at the ORC's discretion.

2. It is desirable that there may be regular introduction of new members to ensure that new ideas are brought to the table and that there is some growth of scheme operational knowledge within the community.

3. Key infrastructure owners and lifeline utilities may also seek representation[1].

4. ORC shall appoint a Councillor to be a formal representative on the Liaison Group. Other constituent Councillors from the area in which the scheme is located are entitled to attend Liaison Group meetings.

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[1] Infrastructure providers that may seek to participate in the Group may include Dunedin International Airport Limited, Aurora, KiwiRail and NZ Transport Agency Waka Kotahi. In addition, Civil Defence and Emergency Management may also seek participation from time to time.

5. Other members will usually be confirmed or nominated by ratepayers at the Annual Scheme Ratepayers' meetings. Group membership will then be confirmed in writing by the ORC's Manager Engineering within a month following the meeting.

6. The ORC staff will arrange meetings of the Liaison Groups in consultation with the respective Group Chairs. Groups will meet at least twice per year and on other occasions as scheme issues dictate. In addition, a public annual general meeting will be held for each scheme and shall be chaired by the Chair of the Liaison Group.

7. Agendas will be advertised and circulated which will allow for the community to express and interest in speaking at the Liaison Group.

8. Minutes shall be kept of all Group meetings and should record discussion points and agreed actions.

9. The Liaison Group Chair, or in their absence their nominated substitute, will be invited to attend an annual meeting of all Liaison Group Chairs organised by the Chairperson of the ORC's Safety and Resilience Committee, where relevant.

10. Attendance by the Public will not have speaking rights, unless requested through the Liaison Group Chair. When the Agenda is set and advertised the matters to be considered must adhere to the timings set for inclusion.

11. The line of communication between Liaison Group members and the ORC will generally be through the ORC's appointed liaison officer.

12. A quorum for the Liaison Group will be 60% of current members.

13. The term for membership of the Liaison Group will be 3 years until the next triennial election.

Otago Regional Council

Attachment A: Table of proposed future minimum representation

Party	Minimum Representation across Parties	Comments
East Taieri	2	
West Taieri	2	
Dunedin International Airport	1	
Mosgiel Taieri Community Board	1	
ORC Councillor	1	
Other representatives	2	
Mana whenua	1	
Total	10	

10.9. ORC Review of Committee Structure, Terms of Reference, Delegations

Prepared for:	Council
Report No.	GOV2521
Activity:	Governance Report
Author:	Amanda Vercoe, General Manager Strategy and Customer
Endorsed by:	Richard Saunders, Chief Executive
Date:	19 March 2025

PURPOSE

[1] To consider next steps for reviewing Council's committee structure, terms of reference and delegations.

EXECUTIVE SUMMARY

[2] Council adopted its current committee structure in November 2022, and terms of reference and delegations for those committees in December 2022. At the time Council foreshadowed a review during the triennium to check that the committee arrangements remained fit for purpose.

[3] Since then, Council has refreshed its Strategic Directions and adopted a new Long-term Plan, undertaken a Te Tiriti Audit which made recommendations around considering delegations and committee structure, and the Chief Executive restructured the Executive Leadership Team portfolios. These changes have helped inform the review.

[4] As a starting point, a workshop was held on 4 February 2025 facilitated by Doug Craig, Director, RDC Group. Councillors worked through a discussion on committee structure and delegations. A discussion also took place at Mana to Mana (a governance level meeting between councillors and mana whenua).

[5] This paper presents options for councillors to consider, stemming from the above discussions. These options include:

a. Consider and adopt a new committee structure and terms of reference (as attached, with or without changes) as a trial, ahead of the 2025 elections. This would enable clear recommendations to be shared with the incoming Council on how it has worked, in consultation with mana whenua. This would require discussions with the current iwi representatives about which committees they would best align with for the remainder of the triennium.

b. Consider a new committee structure and terms of reference, and recommend this to the incoming Council to adopt for the 2025-2028 triennium. This would enable discussions with iwi over the next 6 months as to how they would be best represented in any new structure and a co-design process for the structure through Mana to Mana.

c. Ask Co-Chairs and Senior Officers to consider delegations to committees and what kind of downstream committee decisions could potentially be delegated over the next six months. Any changes could be considered either ahead of the next triennium, or could be recommended to the incoming Council for the 2025-2028 triennium.

RECOMMENDATION

That the Council:

1. ***Notes** this report.*

2. *Either*

   a) ***Adopts** the proposed new committee structure and terms of reference (attached) as a trial, with or without changes, to be implemented ahead of the end of May committee meetings until the end of the triennium.*

   b) ***Directs** the Chair and Chief Executive to discuss the changes with mana whenua, and iwi appointees to committees to determine the best alignment for iwi appointees to the new committees, and seek input on the revised structure and terms of reference ahead of the 2025 triennial elections*

   c) ***Requests** a report back to Council in September 2025 with views from Co-Chairs, Senior Officers, mana whenua and iwi representatives about the committee structure and terms of reference, in order to make a recommendation to the incoming Council.*

   Or

   d) ***Agrees** to retain the current committee structure and terms of reference and continue discussions with Co-Chairs, Senior Officers, mana whenua and iwi representatives about a revised structure and directs this to be brought back for consideration by Council in September 2025, where a recommendation could be made to the incoming Council to consider.*

3. ***Considers** the discussion on delegations for committees and:*

   a) ***Directs** Co-Chairs and Senior Officers to consider downstream decisions for their respective committees over the next six months and where these would be best taken, to inform a further report to Council in September 2025 that makes recommendations to the incoming Council.*

   b) ***Directs** the Chair and Chief Executive to discuss delegations in further detail with mana whenua and iwi appointees, to inform a further report to Council in September 2025, that makes recommendations to the incoming Council.*

BACKGROUND

[6] The Local Government Act 2002 (the LGA) gives local authorities the power to appoint committees, subcommittees, and other subordinate decision-making bodies that it considers appropriate (Section 30, Schedule 7). Local Authorities are also able to appoint non-elected members to those committee (Section 31(3), Schedule 7, LGA).

[7] The LGA (Section 32, Schedule 7) also gives Council the ability to delegate any of its responsibilities, powers or duties. Some decisions cannot be delegated, these include:

a. the power to make a rate
b. the power to make a bylaw (although local boards have the right to recommend these for their local areas)
c. the power to borrow money, or purchase or dispose of assets, other than in accordance with the long-term council community plan
d. the power to adopt a long term plan, annual plan, or annual report
e. the power to appoint a chief executive.

[8] ORC's current committee structure and terms of reference and delegations were adopted after the 2022 elections. It includes the following committees established under the LGA, each with two Co-Chairs.

- Council
- Finance Committee
- Audit and Risk Sub-committee (1x appointed member)
- Environmental Science and Policy Committee (2x appointed iwi representatives)
- Environmental Implementation Committee
- Regional Leadership Committee (1x iwi representative)
- Public and Active Transport Committee
- Safety and Resilience Committee

[9] It also includes the long-standing Otago Regional Transport Committee (established under the Land Transport Act, including New Zealand Transport Agency and Otago Territorial Authority representatives) and Civil Defence Emergency Management Group Committee (established under the Civil Defence Emergency Management Act and includes Otago Territorial Authority representatives).

[10] Most of the committees have no delegations, with all decisions made by committees having to go to Council for approval. The exceptions to this are the Finance Committee, which has authority to approve contracts and tenders up to $2million and the Regional Leadership Committee, which has the ability to consider and make decisions concerning the Future Development Strategies (FDS) work with the Dunedin City Council.

[11] At the time the committee structure was adopted, it reflected the priorities of the ORC and more or less matched the way the ORC was organised internally, enabling each committee to have a General Manager supporting the Co-Chairs to run the committee.

[12] A review was discussed when the decision-making framework was being considered in 2022.

[13] Since then, a refreshed Strategic Directions was created and a new Long-Term Plan developed and adopted in mid-2024. There was also an Executive Leadership Team restructure in mid-2024 that resulted in changes to the way the ORC's functions were grouped together.

[14] ORC also had a Te Tiriti Audit undertaken in 2024. This review, received by the Regional Leadership Committee in November 2024, considered the ability of iwi to contribute to decision making. It flagged consideration of delegated decision making to committees with mana whenua representation and co-designing relevant committee terms of reference with mana whenua as potential issues to give consideration to.

[15] An initial discussion on a review took place at a workshop on 4 February 2025 and is reported below. Discussion with Mana Whenua also took place at Mana to Mana on 4 March 2025. Mana Whenua signalled they would need time to consider a revised structure and terms of reference, and management of iwi representatives ahead of the new triennium.

DISCUSSION

Committee Structure and Terms of Reference

[16] During the workshop, Council considered the changes that had taken place since the committee structure was adopted and how these impacted the current committees, and delegations to those committees.

[17] Councillors noted that some of the committees were fit for purpose and working well as currently constituted, with clear lines of reporting from the organisation and good relationships at a Co-Chair to General Manager level. This included the committees below, and no changes were proposed.

a. Council (Senior Officer – Chief Executive)
b. Finance (Senior Officer – General Manager Finance)
c. Audit and Risk (Senior Officer – General Manager Finance)
d. Public and Active Transport (Senior Officer – General Manager Regional Planning and Transport)
e. Regional Transport Committee (Senior Officer – General Manager Regional Planning and Transport)
f. Civil Defence and Emergency Management (Senior Officer – Chief Executive)

[18] The key opportunities for streamlining the structure were identified to be the Environmental Science and Policy Committee, Regional Leadership Committee, Safety and Resilience Committee and the Environmental Implementation Committee. These committees as currently constructed didn't necessarily align to the refreshed Strategic Directions, and had multiple issues being reported from different General Managers. A revised structure was discussed, with the following committees suggested.

a. Partnerships and Community Committee
b. Strategy and Policy Committee
c. Science and Resilience Committee
d. Environmental Delivery Committee.

[19] The proposed committees are discussed in more detail in the attached draft Terms of Reference, but at a high level the proposed purpose of each of these committees is outlined below.

Proposed Partnerships and Community Committee

[20] To be the guardian of the development and implementation of Otago Regional Council's Strategic Directions, which includes vision, community outcome areas and goals, and Council's partnership with mana whenua. To connect the overarching strategic directions with the community through governance, engagement, communications and customer functions and activities.

[21] The proposed Senior Officer for this committee would be General Manager Strategy and Customer.

Proposed Environmental Strategy and Policy Committee

[22] To provide advice and guidance to Council on the development of Otago's environmental (water, land, air, biodiversity and biosecurity) plans, policies and strategies. To ensure the Council partnership with Kāi Tahu is reflected in the above processes.

[23] The proposed Senior Officer for this committee would be General Manager Regional Planning and Transport.

Proposed Science and Resilience Committee

[24] To consider and set the direction for programmes of work and provide advice to Council on matters that affect our communities' ability to be informed about issues that impact resilience across Otago and the work ORC does to support this. Includes issues that are included in the Resilience activity of the ORC's Long-term Plan 2024-34, including natural hazards, science, environmental monitoring, flood and drainage schemes and civil defence responsibilities.

[25] The proposed Senior Officer for this committee would be General Manager Science and Resilience.

Proposed Environmental Delivery Committee

[26] To monitor and provide advice to Council on ORC's delivery of environmental outcomes, projects, and environmental funding, and how we work with the community to achieve these environmental outcomes as set out in the Long-term Plan 2024-34. Also to monitor ORC's regulatory functions and how these are delivered through receiving quarterly reporting.

[27] The proposed Senior Officer for this committee would be General Manager Environmental Delivery.

Delegations

[28] ORC's committees have had wider delegations in previous triennia, although they have never had full delegations. Some of the challenges that have been experienced with the very limited delegations this triennium include timing delays between a committee agreeing something and the Council meeting to endorse it, which presents a risk to work plans and actions being progressed in a timely manner. It also meant that committees generally only received noting papers, as decision issues went directly to Council, instead of going through committee. Benefits of committees having delegations included efficiency and effectiveness of decision making, allows Co-Chairs to build knowledge on specific issues and also facilitates community engagement.

[29] There were mixed views at the Council workshop on the benefits of considering delegating powers, decisions and duties to committees. Some councillors felt that it was appropriate that Council retained the decision-making powers, as this was what the community had elected Council representatives to do. Others felt that with most of Council's committees being committees of the whole (all councillors were members), the risk of delegation was limited as all councillors would be around the table when making those delegated decisions.

[30] It was suggested that more information was needed and it would be useful for Co-Chairs and General Managers to monitor the decisions coming to Council and committees that could potentially have been made by a committee with delegated decision making powers.

[31] To help consideration of this matter, the kinds of things that could be considered for delegating are listed below. Most Council's when giving committees delegations note that the delegation only applies to give effect to matters and issues consistent with the Council's adopted Long-term Plan, Annual Plan and strategic direction, policies and previous decisions. Anything that was inconsistent, new or a change, or was unbudgeted would need to be endorsed by Council. Adopting this approach, the types of decisions that might be delegated could include;

a. Approve draft plans, policies and strategies for consultation
b. Determine the design and format of consultation and engagement for issues within the scope of the committee
c. Conduct all consultation and hearings with the public concerning matters within the scope of the committee
d. Approve submissions to agencies on issues which fall within the scope of activity of the committee. Where timing constraints apply, the Chairperson of Council in consultation with the co-chairs of the committee (or in the case of an absence, the Deputy Chairperson) has the authority to lodge submissions and seek retrospective approval of the committee
e. Make decisions on matters with a financial impact only where the related costs are budgeted for within a current, adopted Long Term Plan or Annual Plan, otherwise the matter must be referred to the Council for decision.

OPTIONS

[32] **Option 1:** Consider and adopt a new committee structure (as attached, with or without changes) as a trial, ahead of the 2025 elections. This would enable clear recommendations to be shared with the incoming Council on how the structure has worked. This would require discussions with mana whenua, to share the revised structure and terms of reference and seek feedback ahead of the next triennium. It would also require discussions with the current iwi representatives about which committees they would best align with for the remainder of the triennium. This option would also require a relook at the Council calendar for the remainder of the year, to ensure that the right timings for the new committees had been allocated.

[33] **Option 2:** Status-quo – Retain the current committee structure and recommend a new structure to the incoming Council to adopt for the 2025-2028 triennium. This would enable discussions with iwi over the next 6 months about the structure, terms of reference, and how they would be best represented in any new structure through Mana to Mana.

[34] **Delegations:** Ask Co-Chairs and Senior Officers to consider delegations to committees and what kind of committee decisions could potentially be delegated over the next six months. Also engage in a discussion with mana whenua about delegations and seek input into a Council report before the end of the triennium with advice. Any proposed changes could be recommended to the incoming Council for the 2025-2028 triennium.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[35] The ORC's strategic directions were a key consideration in reviewing the committee structure and alignment with the key outcome areas was a driver for the proposed new structure.

Financial Considerations

[36] There are no financial implications related to this review.

Significance and Engagement

[37] The Te Tiriti Audit recommended Council engage with Mana Whenua on committee structure, terms of reference and delegations.

Legislative and Risk Considerations

[38] The proposed committee structure meets the Council's legislative and risk obligations

Climate Change Considerations

[39] Not applicable, this is an administrative decision.

Communications Considerations

[40] To be confirmed depending on Council's decision.

NEXT STEPS

[41] To be confirmed depending on Council's decision.

ATTACHMENTS

1. 2022 2025 Committee Terms of Reference and Delegations 2025 03 10 REVIEW COP (3) [**10.10.1** - 23 pages]

Committee Structure, Membership and Terms of Reference

2022 - 2025 Triennium

REVIEW VERSION

Adopted:

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Otago Regional Council Committee Memberships

Finance Committee	EnvironmentalStrategy and Planning Committee	Environmental Delivery Committee
Co-Chairs: Kevin Malcolm, Tim Mepham Committee of the Whole	Co-Chairs: Lloyd McCall, Iwi Representative Edward Ellison* Committee of the Whole Iwi representative Karen Coutts*	Co-Chairs: Kate Wilson, Lloyd McCall Committee of the Whole

Public and Active Transport Committee	Community and Partnerships Committee	Science and Resilience Committee
Co-Chairs: Alexa Forbes, Andrew Noone Committee of the Whole	Co-Chairs: Elliot Weir, Michael Laws Committee of the Whole Iwi representative Hoani Langsbury*	Co-Chairs: Gary Kelliher, Alan Somerville Committee of the Whole

Audit and Risk Subcommittee	Civil Defence and Emergency Management Joint Committee	Regional Transport Committee *(established by the Land Transport Management Act)*
Co-Chairs: Tim Mepham, Independent Member Andrew Douglas Alexa Forbes Gary Kelliher Kevin Malcolm Gretchen Robertson Kate Wilson	ORC Chair Otago Mayors	Kate Wilson (ORC), Chair Alexa Forbes (ORC), Deputy Chair Cr Jim O'Malley (DCC) Cr Bruce Graham (CDC) Cr Stuart Duncan (CODC) Cr Quentin Smith (QLDC) Cr Jim Thomson (WDC) Mr James Caygill (NZTA) Alternates: Cr Kevin Gilbert (DCC) Cr Guy Percival (WDC)

*to be confirmed following discussions

Community and Partnerships Committee

Co-Chairs	Elliot Weir, Michael Laws
Members	All councillors Iwi Representative Hoani Langsbury
Quorum	Seven (7)
Meeting frequency	Quarterly
Senior Officer	General Manager Strategy and Customer

Purpose:

To be the guardian of the development and implementation of Otago Regional Council's Strategic Directions, which includes vision, community outcome areas and goals, and Council's partnership with mana whenua. To connect the overarching strategic directions with the community through governance, engagement, communications and customer functions and activities.

.

Areas of responsibility

- Develop, and monitor implementation of Council's Strategic Directions
- Be the guardians of the Council's partnership with Kāi Tahu, engagement with Māori, and upholding the Treaty of Waitangi in the work of Council
- Consider and develop community engagement plans, including how to reach new/all communities
- Develop and oversee ORC's Communications and Marketing Strategy
- Monitor and oversee ORC's biennial community survey and follow-up action plan
- Provide oversight of ORC's Climate Change Strategy, implementation and effectiveness.
- Consider Council meeting schedules, remuneration, and governance matters.

Delegations

The Committee has no general decision-making or financial delegations. It can:

1. Receive information for noting.
2. Make recommendations to Council on the matters within its responsibility.
3. Appoint working parties as appropriate provided they are limited to a time duration consistent with performance of their specified tasks and receive reporting from them.
4. Carry out any other function or duty delegated to it by the Council.

Finance Committee

Co-Chairs	Kevin Malcolm, Tim Mepham
Members	All Councillors
Quorum	Six (6)
Meeting frequency	Quarterly
Senior Officer	General Manager Finance

Purpose: To guide, monitor and provide advice to Council on the Council's financial, commercial, and administrative affairs, including the Port shareholding and operational performance, Long-term Plan, Annual Plans, and implementation of the Local Government Act 2002.

Areas of Responsibility

- Review and monitor quarterly activity reporting against the agreed levels of service and target measures outlined in the Long-term and Annual Plans
- Review and monitor quarterly and annual financial statements including the statement of comprehensive income, balance sheet and treasury report
- Lead Long-term and Annual Plan process including consultation and hearings and make recommendations to Council for adoption
- Oversee and make recommendations to Council on financial policies including the Financial Strategy and Revenue and Financing Policy
- Oversee and make recommendations to Council on Rates, fees, charges, royalties and rentals policies and strategies
- Manage affairs with Port Otago Ltd (including Statement of Corporate Intent and receive the six month and annual reports)
- Review and monitor commercial activities, trading activities or investments held by the Council
- Review and monitor Council's assets, leases, and financial reserves

Delegations

- Receive information for noting.
- To award or approve contracts and tenders in excess of staff delegations and to a maximum of $2million.
- To consider and make recommendations to Council matters of financial impact other than as provided for in the Annual Plan.
- The Finance Committee shall carry out any other function or duty delegated to it by the Council.
- The Finance Committee may appoint subcommittees or working parties as appropriate provided they are limited to a time duration consistent with performance of their specified tasks.

Audit and Risk Subcommittee

Co-Chairs	Tim Mepham, Andrew Douglas
Members	Alexa Forbes Gary Kelliher Kevin Malcolm Gretchen Robertson (Ex Officio member) Kate Wilson Other councillors are encouraged to attend meetings of the Subcommittee, but do not have voting rights.
Quorum	Four (4)
Meeting frequency	Quarterly
Senior Officer	General Manager Finance

Purpose: To provide advice about governance, risk management, and internal control matters, external reporting and audit matters. The Subcommittee can make recommendations to the Council and/or the chief executive, and request information and advice through the chief executive when necessary.

Areas of Responsibility

- Council's risks and management of those risks,
- Strategic risk register and management of risks on the register
- Insurance renewals and notifications
- Annual audit process, including audit plan, management letter, and management response, and reviewing the draft annual report before it goes to Council
- Internal audit and control process
- People and Safety reporting
- Investment management, including managed fund, performance of Council's investment manager including compliance of the managed fund with the Statement of Investment Policies and Objectives (SIPO), and appointment of fund manager.
- Legal compliance
- The Co-Chairs will report to Council annually on the activities of the Subcommittee.

Delegations

The Subcommittee has no general decision-making or financial delegations. It can:

- Receive information for noting.
- Receive the external audit engagement letters and letters of undertaking for audit functions and additional services provided by the external auditor.
- Review matters within its areas of responsibility and make recommendations to Council on those matters.
- Seek information it requires from the Chief Executive. The Chief Executive is required to cooperate with any requests unless excused by the Chair of the Otago Regional Council.

- Request access to outside legal or independent professional advice should it consider this necessary.

Environmental Strategy and Planning Committee

Co-Chairs	Lloyd McCall, Iwi Representative Edward Ellison
Members	All Councillors Iwi representative Karen Coutts
Quorum	Seven (7)
Meeting frequency	As needed
Senior Officer	General Manager Regional Planning and Transport

Purpose To provide advice and guidance to Council on the development of Otago's environmental (water, land, air, biodiversity and biosecurity) plans, policies and strategies. .. To ensure the Council partnership with Kāi Tahu is reflected in the above processes.

Areas of Responsibility

Strategy:

- Strategy development related to the environment (water, air, land, coast, biodiversity and biosecurity)
- Oversight of environmental strategies' implementation and effectiveness

Policy/Planning:

- Land and Water Regional Plan development, including policy, science, economics inputs
- Coast plan review, including the policy and science inputs
- Air Plan review, including the policy and science inputs
- Regional Policy Statement – appeals, reviews, amendments
- Regional Pest Management Plan, including the policy and science inputs
- Creation of Biodiversity plans, including the policy and science inputs
- Oversight of plan effectiveness
- Develop and review Council positions and submissions, and advocacy on behalf of the Otago region on national and regional plans, policies and legislation
- Monitor implementation of ORC's Regional Policy Statement
- Participate in joint urban development policy development and consideration alongside Territorial Authorities, and other obligations set out by the National Policy Statement Urban Development Provide regional leadership in urban development policy direction, including by engaging with Territorial Authorities and by taking a regional approach to urban growth and development

Delegations

1. Receive information for noting.
2. Receive reporting from the Land and Water Regional Plan Governance Group.
3. Make recommendations to Council on the matters within its responsibility.

4. Consider and make decisions concerning the Future Development Strategy work with the Dunedin City Council.
5. Appoint working parties as appropriate provided they are limited to a time duration consistent with performance of their specified tasks.
6. Carry out any other function or duty delegated to it by the Council.

Environmental Delivery Committee

Co-Chairs	Kate Wilson, Lloyd McCall
Members	All Councillors
Quorum	Six (6)
Meeting frequency	Quarterly
Senior Officer	General Manager Environmental Delivery

Purpose To monitor and provide advice to Council on ORC's delivery of environmental outcomes, projects, and environmental funding, and how we work with the community to achieve these environmental outcomes as set out in the Long-term Plan 2024-34. Also to monitor ORC's regulatory functions and how these are delivered through receiving quarterly reporting.

Areas of Responsibility

- Monitor implementation of activities related to (but not limited to):
    - ORC work with catchment groups and Otago Catchment Community
    - Biodiversity project delivery
    - Biosecurity plan delivery
    - Air project delivery
- Oversight of ORC delivered environmental projects
- Oversight of Wilding Conifer and Wallaby national funded programmes
- Development and implementation of the Integrated Catchment Management programme
- Development of annual Biosecurity Operational Plan.
- Oversee the ECO Fund
- Receive biosecurity outcomes/compliance reporting
- Reporting from community about environmental activities

Regulatory

- Receive and review quarterly reporting from the Regulatory Group (including Harbourmaster)

Delegations

The Committee has no general decision-making or financial delegations. It can:

1. Receive information for noting.
2. Make recommendations to Council when decisions are needed.
3. Appoint working parties as appropriate provided they are limited to a time duration consistent with performance of their specified tasks.
4. Carry out any other function or duty delegated to it by the Council.

Science and Resilience Committee

Co-Chairs	Gary Kelliher, Alan Somerville
Members	All Councillors
Quorum	Six (6)
Meeting frequency	Quarterly
Senior Officer	General Manager Science and Resilience

Purpose

To consider and set the direction for programmes of work and provide advice to Council on matters that affect our communities' ability to be informed about issues that impact resilience across Otago and the work ORC does to support this. Includes issues that are included in the Resilience activity of the ORC's Long-term Plan 2024-34, including natural hazards, science, environmental monitoring, flood and drainage schemes and civil defence responsibilities.

Areas of Responsibility

- Review and advise Council on ORC's programme of work on climate change adaptation
- Oversee the Otago Climate Change Risk Assessment
- Monitoring natural hazards risks and programmes to manage those risks
- Oversee and monitor waterway management, flood control and land drainage
- Oversee and monitor the condition and performance of council's river management, flood control and land drainage schemes and service delivery risks
- Natural hazards monitoring and warning systems and processes
- Monitor delivery of ORC's Civil Defence and Emergency Management responsibilities

Science

- Receive and review science inputs as part of the policy, strategy and plan making process
- Review of State of the Environment monitoring, analysis and reporting
- Reporting on science communication activities

Delegations

The Committee has no general decision-making or financial delegations. It can:

1. Receive information for noting.
2. Make recommendations to Council when decisions are needed.
3. Appoint working parties as appropriate provided they are limited to a time duration consistent with performance of their specified tasks.
4. Recommending formation of liaison groups to Council.
5. Carry out any other function or duty delegated to it by the Council.

Public and Active Transport Committee

Co-Chairs	Andrew Noone, Alexa Forbes
Members	All Councillors
Quorum	Six (6)
Meeting frequency	Quarterly (or as needed)
Senior Officer	General Manager Regional Planning and Transport

Purpose To set the strategic and operational direction for approved Regional Council public transport policy and strategy, and monitor its implementation.

Areas of Responsibility

- Prepare and review the Otago Regional Public Transport Plan.
- Implement, monitor and review operational public transport policy and plans.
- Advocate for public transport with Waka Kotahi NZTA, territorial authorities, and Central Government.
- Set and monitor targets for public transport in the region.
- Oversee Public Transport Dunedin provision of service, routes, data, contracts, complaints, and communications
- Oversee Public Transport Queenstown provision of service, routes, data, contracts, complaints, and communications
- Regional Total Mobility Service
- In coordination with the work programme of the Regional Transport Committee, guide and review the public transport components of the Regional Land Transport Plan (RLTP) and make recommendations to Regional Transport Committee for incorporation into the RLTP.
- Receive reporting from the Regional Transport Committee
- Receive reporting from any working groups set up under this Committee
- Understanding of school transport changes

Delegations

The Committee has no general decision-making or financial delegations. It can:

1. Receive information for noting.
2. Make recommendations to Council when decisions are needed.
3. Appoint working groups with representatives from territorial authorities and other agencies as appropriate provided they are limited to a time duration consistent with performance of their specified tasks and receive reporting from those working groups.
4. Carry out any other function or duty delegated to it by the Council.

Otago Civil Defence Emergency Management Group (Joint Committee)

Chairperson	Gretchen Robertson, Chair of Otago Regional Council
Members	• Central Otago District Council • Clutha District Council • Dunedin City Council • Otago Regional Council • Queenstown Lakes District Council • Waitaki District Council Each member is represented on the joint committee by the Mayor/ Chairperson, or by an elected person from that authority who has delegated authority to act for the member.
Quorum	Three (3)
Meeting frequency	Quarterly
Senior Officer	Chief Executive

Constitution

Pursuant to section 12 of the Civil Defence Emergency Management Act 2002, the Otago Civil Defence Emergency Management Group is constituted as a joint standing committee under section 114S of the Local Government Act 1974 (a joint committee under section 30 of Schedule 7 of the Local Government Act 2002) by resolutions adopted by:

- Central Otago District Council
- Clutha District Council
- Dunedin City Council
- Otago Regional Council
- Queenstown Lakes District Council
- Waitaki District Council

Chairperson

The Otago Civil Defence Emergency Management Group shall appoint one of the representatives of its members as chairperson, and one of its members as deputy chairperson. Each will hold office for such period as agreed by the Group, but only so long as those persons remain a representative of a member of the Group.

Purpose

The Otago Civil Defence Emergency Management Group has the purpose and all of the functions, powers and obligations of a civil defence emergency management group as defined by the Civil Defence Emergency Management Act 2002 and subsequent amendments. Section 17 of the Civil Defence Emergency Management Act 2002 defines the function of a group and each of its members that, in

summary, require it to:

- Identify, assess and manage relevant hazards and risks;
- Ensure provision of trained and competent personnel, an appropriate organisational structure and the necessary services and resources for effective civil defence emergency management in its area;
- Respond to and manage the adverse effects of emergencies;
- Carry out recovery activities;
- Assist other civil defence emergency management groups when requested;
- Promote public awareness of and compliance with the Civil Defence Emergency Management Act and legislative provisions relevant to the purpose of the Act;
- Develop, approve, implement, monitor and review a civil defence emergency management group plan;
- Participate in the development of the national civil defence emergency management strategy and the national civil defence emergency management plan.
- Promote civil defence emergency management in its area that is consistent with the purpose of the Civil Defence Emergency Management Act 2002.

Delegations

The Otago Civil Defence Emergency Management Group shall have all the delegated authorities that may be given by each member Council, including authority to fulfil the powers, obligations and functions of the Group as specified in the Civil Defence Emergency Management Act 2002, authority to appoint subcommittees, and authority to sub-delegate any authority able by law to be delegated.

Subcommittee

A subcommittee of all members of the Otago Civil Defence Emergency Management Group may be formed and given full delegated authority to carry out the functions, obligations and powers of the Group under the Civil Defence Emergency Management Act 2002 pursuant to section 114P(2) of the Local Government Act 1974 and section 30(2) schedule 7 of the Local Government Act 2002. Any meeting will transact routine business and not commit members to any major financial expenditure.

Standing Orders

The current Standing Orders of the Otago Regional Council shall govern the conduct of the meetings, except that order papers and agenda papers shall be sent to every member no less than five working days before the meeting. Notwithstanding anything in the Civil Defence Emergency Management Act or Standing Orders, adequate notice shall be given of all matters to be discussed at a meeting of the Group. Where a matter of significance is to be considered, where practicable, prior written notice of the background to that matter must be given in sufficient time to allow for consultation with each member.

Administering Authority

The Otago Regional Council as the administering authority shall provide administrative and leadership of the Group.

Reporting

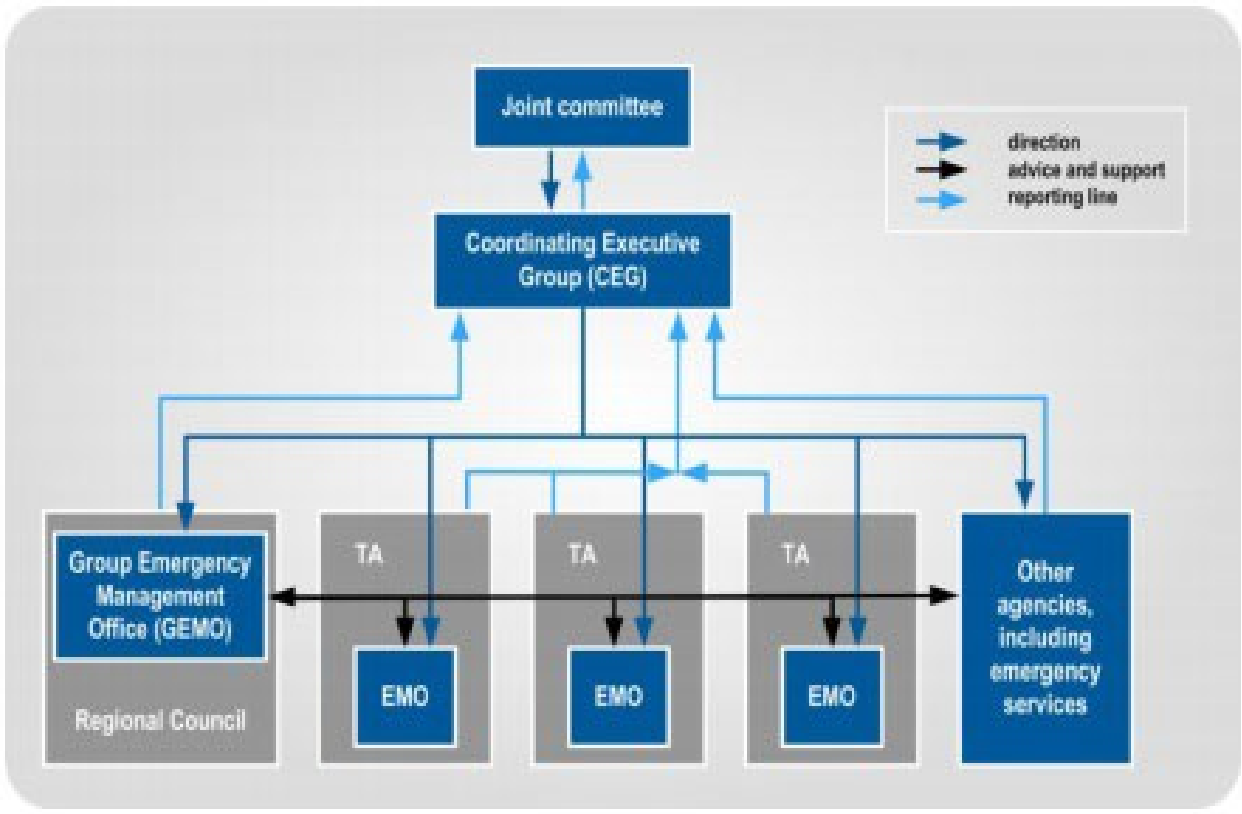
The Group will report to each member.

Continuance of Joint Standing Committee

The Otago Civil Defence Emergency Management Group shall not be discharged by a triennial election

but appointments of representatives of members shall be confirmed or new appointments made by each council following each election.

Otago CDEM Group Governance Structure



The **Otago CDEM Group Joint Committee**, made up of all the mayors from the five districts and the chairperson of the Regional Council, has overall governance responsibility for CDEM in the Otago area. The Chair is Mayor Jules Radich, Dunedin City Council and the Deputy Chair is Councillor Andrew Noone, Chairperson, Otago Regional Council.

Operational management is supported by the **Coordinating Executive Group (CEG)**, made up of the Chief Executives of the six councils (or persons acting on their behalf), plus senior representatives from the NZ Police, Fire and Emergency NZ, St John, Southern District Health Board, Ngāi Tahu and the Ministry of Social Development. The CEG provides advice to the JC and ensures its decisions are implemented. The Chair is the Chief Executive of the Otago Regional Council.

Otago CDEM Group Management Office is a shared service across all six local authorities of Otago. Otago Regional Council is the Administering Authority for the CDEM Group. It:

- Employs all staff of Otago CDEM Group and is responsible for all employment-related matters including health and safety, wellbeing, welfare, operational policies, and conduct.
- Provides administrative and related services to the Group, such as preparing agendas, arranging meetings, and taking and disseminating minutes from meetings.
- Provides financial management for the CDEM Group, including budgeting and reporting.

In addition to the funding collected by the Regional Council through the targeted rate to resource the Otago CDEM Group and its activities.

Each **local authority member** of the Group is operationally and financially responsible for its **own local arrangements**. Each council also contributes skills, expertise and mutual support to the Group on an ‘as available’ basis.

For more information please see: https://www.otagocdem.govt.nz/media/1417/otago-cdem-group-plan-2018-28-print-version.pdf

Otago Regional Transport Committee

Chairperson	Kate Wilson, Otago Regional Council
Deputy Chairperson	Alexa Forbes, Otago Regional Council
Members Total membership of the Otago committee equals eight. This is dictated by Section 105 of the Land Transport Management Act 2003 (LTMA). Representatives are appointed by the Regional Council on the nomination of NZ Transport Agency and each of the territorial local authorities.	Two regional council representatives (Chair and Deputy Chair): One representative from the Waka Kotahi NZ Transport Agency One district council representative from each of the: • Central Otago District Council • Clutha District Council • Dunedin City Council • Queenstown Lakes District Council • Waitaki District Council Alternates: • Central Otago District Council • Clutha District Council • Dunedin City Council • Queenstown Lakes District Council • Waitaki District Council
Quorum / Voting	An Otago RTC meeting cannot proceed unless five committee members are present, at least one of whom must be representative of the regional council and no more than one to be an alternate representative. No voting will occur unless there is a quorum of committee members from those organisations allowed to vote on these matters. The Chairperson has a deliberative vote and in the case of an equality of votes does not have a casting vote. Clause 24 of the 7th Schedule of the Local Government Act otherwise applies to voting. The purpose of encouraging each

	organisation to have alternates is to ensure that each of the organisations involved in the RTC (the TAs, Waka Kotahi NZ Transport Agency and the regional council) is able to bring their organisation's view to the table and to report back the outcome to their organisation. Each organisation (i.e., the regional council, Waka Kotahi NZ Transport Agency and each district/city council) is therefore encouraged to have alternative representatives to act as a replacement should the appointed representative be absent from a meeting. Alternates will count towards a quorum but do not have voting rights.
Meeting frequency	The RTC normally meets at least three times a year but may meet more regularly depending on the work to be undertaken or the issues to be addressed. Where possible, members will be advised, in advance, of the meeting schedule for the year. Typically, the Otago RTC meets alongside the Southland RTC.
Senior Officer	General Manager Regional Planning and Transport

Purpose

To undertake the functions as prescribed by the *Land Transport Management Act 2003 and subsequent amendments.*

Role and Functions

The role and functions of the Otago Regional Transport Committee are as follows:

1. To undertake the statutory requirements of the *Land Transport Management Act 2003*;

2. To prepare the Regional Land Transport Plan (RTLP) in co-operation with the Southland Regional Transport Committee, to prepare any applications to vary the RLTP and to process any applications to vary the RLTP (*LTMA Section 106(1)(a)*);

3. To prepare and adopt a policy that determines significance in respect of:

    a) any variations made to the RLTP;
    b) activities included in the RLTP (*LTMA Section 106(2)*).

4. To provide any advice and assistance the regional council may request on its transport responsibilities generally (*LTMA Section 106(1)(b)*);

5. To undertake monitoring to assess implementation of the Regional Land Transport Plan including monitoring of the performance of activities (*LTMA Section 16(3)(f) and 16(6)(e)*), in co-operation with the Southland Regional Transport Committee;

6. To consult on a draft RLTP for the region in accordance with the consultation principles specified in Section 18 and 18A of the *Land Transport Management Act 2003,* in co-operation with the Otago Regional Transport Committee;

7. To complete a review of the RLTP during the six-month period immediately before the expiry of the third year of the Plan (*LTMA Section 18CA*) in co-operation with the Otago Regional Transport Committee;

8. To advise the Council on any significant legislative changes, programmes, plans or reports relating to the region's transport system;

9. To prepare and implement regional transportation planning studies, or pan-regional studies with the Otago Regional Transport Committee, when necessary;

10. To represent and advocate for transport interests of regional and/or pan-regional Otago Southland concern;

11. To consider and submit on transport-related policies, plans and consultation documents issued by the Ministry of Transport, Waka Kotahi NZ Transport Agency, regional/district councils, and other relevant organisations as considered appropriate, including submitting jointly with the Otago Regional Transport Committee, when appropriate;

12. To liaise with the Ministry of Transport, Waka Kotahi NZ Transport Agency, Commissioner of Police, regional/district councils, KiwiRail, the Department of Conservation and other interested parties on transport matters, and advise the Council on any appropriate new initiatives as considered appropriate;

13. To operate in a collaborate manner in the combined meetings of the Otago and Southland regional transport committees and to engage with other regional transport committees and working parties, which from time-to-time may be established;

14. To consider advice and recommendations from the Otago Southland Regional Technical Advisory Group.

Members' responsibilities for reporting back to the organisation they represent

Each member of the Regional Transport Committee is expected to report back to their own organisations following each Regional Transport Committee meeting or workshop on matters discussed at those Committee meetings, and with particular reference to the RLTP. A briefing paper will be produced by the Regional Council for distribution to stakeholders and to assist members with their report back responsibilities.

Terms of Membership

Should a vacancy occur in the membership of the RTC, the Committee Secretary shall report this to the next meeting of the Council, which shall then invite the nominating organisation to nominate a

replacement.

Delegated Authority – Power to Act

The Regional Transport Committee:

1. Does have the ability to appoint a panel to hear RLTP, submissions, working parties, advisory groups and, where there is urgency or special circumstances, a sub-committee to deal with any matters of responsibility within the Committee's Terms of Reference and areas of responsibility, and to make recommendations to the Committee on such matters, provided that a sub-committee does not have power to act other than by a resolution of the committee with specific limitations;
2. Does have the ability to make decisions in accordance with the Terms of Reference and the *Land Transport Management Act 2003*.

Power to Act (for the information of Council)

The Regional Transport Committee has the power to:

1. Monitor any transport activities of the regional council, territorial authorities and New Zealand Transport Agency in order to report on progress on the Regional Land Transport Plan;
2. Prepare and recommend variations to the Regional Land Transport Plan that trigger the RTC's significance policy;
3. Consider and recommend transportation planning studies and associated outcomes;
4. Provide recommendations to relevant government agencies on transport priorities for the region and the allocation of national or regional transport funds.

Council Established Working Groups

Meetings to be as required

ORC Chairperson is Ex Officio member of all working groups

Port Otago Liaison Working Group *Established by Council, 2016* *Reports to Council*	Chair, Cr Kevin Malcolm Council Chair – Cr Gretchen Robertson Finance Co- Chair – Cr Tim Mepham Council Deputy Chair - Cr Lloyd McCall CE
ECO Fund Decision Panel Chair *Established by Council in 2019* *Reports to Environmental Implementation Committee and Council*	Cr Alan Somerville
Land and Water Regional Plan Governance Group *Established by Council, May 2020* *Reports to Environmental Science and Policy Committee*	Council Chair - Cr Gretchen Robertson Cr Andrew Noone
ORC Whare Rūnaka Internal Steering Group *Established by Council, October 2021* *Reports to Council*	Council Chair – Gretchen Robertson Cr Kevin Malcolm Cr Andrew Noone
Otago Integrated Catchment Management (ICM) Working Group *Established by Council, September 2022* *Reports to Environmental Implementation Committee*	Chair: Cr Lloyd McCall Deputy Chair: Cr Kate Wilson (FMU Catlins Councillor)
Submissions Working Group *Established by Council, December 2022* *Purpose:* • To receive draft submissions and provide input and review feedback, ahead of submissions going to Council for approval, to help with timeliness and direction. • To seek support from councillors for submission positions ahead of them going to council for approval. *Reports to Regional Leadership Committee*	Members: • Cr Lloyd McCall (Chair) • Cr Andrew Noone • Cr Kate Wilson • Cr Elliot Weir

Resource Management Reform Working Group *Established by Council, December 2022* *Purpose:* • Monitor and review resource management reform and its impacts on the ORC • Provide updates to Council about developments • Provide inputs to submissions on the reforms *Reports to Regional Leadership Committee*	Members: • Cr Andrew Noone (Chair) • Cr Kate Wilson • Cr Lloyd McCall • Cr Elliot Weir

Appointments as Representatives of Council

Mana to Mana	All councillors
Te Rōpū Taiao Southland	Chair – Cr Gretchen Robertson Deputy Chair – Cr Lloyd McCall
LGNZ Zone 6	Chair – Cr Gretchen Robertson Deputy Chair – Cr Lloyd McCall Attendance shared between Councillors
Regional Sector Group (RSG)	Chair/CE
Mayoral Forum	Chair/CE
CDEM Joint Committee	Chair/CE
Connecting Dunedin (transport related)	Cr Andrew Noone Cr Kate Wilson Cr Elliot Weir
Way to Go (Whakatipu) (transport related)	Cr Andrew Noone Cr Alexa Forbes Cr Kate Wilson
Dunedin Tracks Network Trust (DnTNT)	Cr Kate Wilson
Dunedin Hospital Liaison Group	Cr Gretchen Robertson
Tertiary Precinct Planning Group	Cr Elliot Weir
Lower Waitaki River Scheme Liaison	Cr Kevin Malcolm
Otago Catchment Community (OCC) Governance Group	Cr Lloyd McCall Cr Kate Wilson (alternate)
Manuherekia Exemplar Catchment Programme Governance Group (MfE)	Cr Kevin Malcolm Cr Michael Laws and Cr Lloyd McCall (alternate) CE
Regional Co-ordination Group for Wilding Conifer Management	Cr Alexa Forbes Cr Kate Wilson (alternate)
Regional Co-ordination Group for Wallaby Management	Cr Kevin Malcolm Cr Gary Kelliher (alternate)
Otago South River Care Group Governance Group	Cr Kate Wilson Cr Tim Mepham (alternate)
Grow Well Whaiora Partnership Governance Group (Queenstown Future Development Strategy Group) *note a separate paper will come on the DCC Future Development Strategy Group, as the governance arrangements for this are still to be considered	Cr Andrew Noone Cr Alexa Forbes

10.10. South Dunedin Future – Risk Assessment and Potential Adaptation Futures

Prepared for:	Council
Report No.	GOV2531
Activity:	Governance Report
Author:	Jonathan Rowe, Programme Manager
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	19 March 2025

PURPOSE

[1] The purpose of the paper is to present the attached technical reports relating to the South Dunedin Risk Assessment and Potential Adaptation Futures for South Dunedin, and to seek Council endorsement to engage with affected communities and other stakeholders.

EXECUTIVE SUMMARY

[2] The South Dunedin Future (SDF) programme is a joint initiative between the Dunedin City Council (DCC) and Otago Regional Council (ORC) to develop a climate change adaptation plan for South Dunedin. The programme vision is "a safer and better South Dunedin, where sustainable urban regeneration leads to improved community resilience and wellbeing". The programme remains on track to deliver the final climate adaptation plan by the end of 2026.

[3] The attached technical reports represent a major milestone for the SDF programme and a significant step in the process of developing a climate adaptation plan for South Dunedin. The risk assessment essentially seeks to define the challenges facing South Dunedin and the adaptation futures reports respond by outlining a range of potential solutions. Read together, the reports present an initial picture of the potential future – or futures – for South Dunedin.

[4] The risk assessment identifies, classifies, and prioritises risk across South Dunedin by assessing hazard likelihood, exposure, and vulnerability, before assigning corresponding risk scores. The impacts of these risks, should they be realised, are also described.

[5] The risk assessment shows that South Dunedin has high exposure to natural hazards and a correspondingly high risk profile at present day. Anticipated changes in climate, and associated increases in exposure to natural hazards, are expected to materially increase risk to South Dunedin's buildings, infrastructure, and communities over coming decades. Adverse consequences are expected to increase to a point where much of the key infrastructure, functions, and services experience declining functionality, loss of service, or complete failure. These risks will have significant adverse effects on the South Dunedin community, wider Dunedin city, and the economy unless suitable risk mitigation is employed. This presents a compelling case for change, based on the adverse impacts described, and their misalignment with the vision, purpose, and objectives of the SDF programme.

[6] A mana whenua risk assessment has been undertaken for the SDF programme, which has identified and rated risks through a Kāi Tahu lens. This assessment has shown that, from a Kāi Tahu perspective, there is substantial risk resulting from a 'keep doing what we are doing' scenario, if there are no additional interventions to address the issues facing South Dunedin. Risk to the values identified in Te Taki Haruru (DCC's Māori Strategic Framework) is generally significant, ranging from high risk (mana, whakapapa, tapu & noa) to extreme risk (mauri).

[7] The adaptation futures report responds to the risk assessment by outlining the options available for managing and mitigating the risks faced by South Dunedin. Various adaptation options and approaches are combined into seven potential adaptation futures, a status quo and six further futures each of which sits on a spectrum of 'fight and flight', with an emphasis on infrastructure at one end and land use change (including managed retreat) at the other. The report describes the key characteristics of each potential future, explores the pros and cons, and provides high-level costs and visualisations of what South Dunedin could look like in 75 years' time (in 2100).

[8] The adaptation futures report shows that there is no single future for South Dunedin where all problems are solved cheaply or easily, rather many viable futures, each with unique characteristics and trade-offs. Of the seven futures presented, the status quo is likely to lead to the worst outcomes, with high costs relative to very limited benefits, the largest number of properties affected, and highest residual risk. The other six potential futures represent improved outcomes, but with different cost-benefit ratios, and varying numbers of affected properties, ease of implementation, and residual risk. The report essentially illustrates that creating a safer and better future for South Dunedin will come down to a balance of trade-offs, and include choices about the scale and rate of change, the affordability of different options, and the acceptable level of ongoing risk.

[9] This stage of the SDF programme is intended to illustrate those choices and to explore the trade-offs with affected communities and other stakeholders. Subsequent stages of the programme will combine that feedback with further technical and economic analysis, refine potential adaptation futures to a preferred future and pathway, before presenting this in a final adaptation plan for South Dunedin by December 2026.

[10] At present, Councils have committed to completing the SDF programme, including remaining technical work, economic analysis, and community engagement. Councils have not, at this time, committed to supporting any particular course of action that might be recommended by the SDF programme – including those relating to strategic land use planning or infrastructure investment. Such decisions, and the roles and responsibilities of respective Councils in implementing them, would be subject to further Council consideration, including in the context of strategic and financial decisions associated with long term plan processes.

RECOMMENDATION

That the Council:

1. ***Notes** the background of the South Dunedin Future programme and work undertaken since the previous update report to Council on 25 September 2024.*

Risk Assessment

2. ***Notes*** *the contents of the South Dunedin Risk Assessment report, which identifies, classifies, and prioritises risk across the area by assessing exposure to natural hazards, vulnerability to those hazards, and likelihood of occurring, before assigning corresponding risk scores. The impacts of these risks, should they be realised, are also described.*
3. ***Notes*** *a mana whenua risk assessment has been undertaken for South Dunedin, which has identified and rated risks through a Kāi Tahu lens, based on an analysis of cultural values.*
4. ***Notes*** *the South Dunedin Risk Assessment has undergone technical peer review, and where technical issues remain outstanding, these are acknowledged in the report or will be addressed in subsequent stages of the SDF programme.*
5. ***Endorses*** *the attached South Dunedin Risk Assessment report for the purposes of community engagement.*

Adaptation planning

6. ***Notes*** *the contents the 7 Potential Adaptation Futures for South Dunedin and Context Summary reports, which respond to the risk assessment by outlining the options available for managing and mitigating the risks faced by South Dunedin, including the key characteristics, costs, benefits, and trade-offs involved.*
7. ***Notes*** *the 7 Potential Adaptation Futures for South Dunedin and Context Summary reports have undergone technical peer review, and where technical issues remain outstanding, these are acknowledged in the reports or will be addressed in subsequent stages of the SDF programme.*
8. ***Endorses*** *the attached 7 Potential Adaptation Futures for South Dunedin and Context Summary reports for the purposes of community engagement.*
9. ***Notes*** *that there are two further stages of adaptation planning under the South Dunedin Future programme, through which further technical and economic analysis will support development of a shortlist of potential adaptation futures and then the preferred adaptation future and pathway for South Dunedin. This work will be presented as a final adaptation plan for South Dunedin.*

Community engagement

10. ***Notes*** *the next stage of the South Dunedin Future programme involves engaging with the community on the findings and implications of the South Dunedin Risk Assessment and the key characteristics of the 7 Potential Adaptation Futures for South Dunedin.*
11. ***Approves*** *the SDF programme team undertaking engagement with partners, stakeholders and affected communities on the basis of the South Dunedin Risk Assessment, 7 Potential Adaptation Futures of South Dunedin and Context Summary reports.*

BACKGROUND

[11] The South Dunedin Future (SDF) programme is a joint initiative between the Dunedin City Council (DCC) and Otago Regional Council (ORC) to develop a climate change adaptation plan for South Dunedin. A programme plan, which outlined the high-level approach for delivering the SDF programme was approved by DCC and ORC Council Committees in July 2022 (refer report OPS2223, Strategy and Planning Committee, 13 July 2022).

[12] The SDF programme vision is “a safer and better South Dunedin, where sustainable urban regeneration leads to improved community resilience and wellbeing”. The

purpose of the programme is to enable South Dunedin to prepare for, and adapt to, the impacts of climate change, while also realising the opportunities that come with change. Broader strategic objectives of the programme relate to just transition, community safety, environmental and cultural restoration, social and economic resilience, and sustainable urban development (refer HAZ2302, ORC Council Meeting, 22 November 2023).

[13] The SDF programme has been broken into five phases, five workstreams, and a number of programme actions. The workstreams include: (i) natural hazards; (ii) strategy and programme management; (iii) communications and community engagement; (iv) risk assessment; and (v) adaptation planning. This breakdown has been explained more fully in previous Council papers and workshops, but is also illustrated in the A3 SDF Programme Overview (Attachment 1).

External technical assistance

[14] The SDF programme involves detailed technical work, economic analysis, and extensive community engagement over multiple years. External technical assistance has been sourced to support delivery of the SDF programme. In July 2023, following an open tender process, DCC contracted a consultant group comprising engineering, planning, and environmental services firms WSP, BECA and Tonkin & Taylor (collectively known as 'Kia Rōpine'), to support delivery of the SDF programme over the next three years (2023/24 to 2025/26).

[15] In August 2023, DCC also contracted a second consultant group comprising engineering, planning and environmental services firms Jacobs New Zealand Ltd, Royal HaskoningDHV and Bell Adapt Ltd, to undertake technical peer review of the risk assessment and adaptation planning workstreams.

Recent SDF programme activities

[16] The following key activities have been undertaken by or in support of the SDF Programme since the most recent update report to Councils (refer GOV2430, Council Meeting, 25 September 2024):

a. Filling of information gaps and data limitations required for the South Dunedin Risk Assessment, including floor level information for South Dunedin properties and development of a new 3 Waters flood model.
b. Supporting the response, recovery, and analysis of the 3-4 October 2024 heavy rainfall and flooding event that affected much of South Dunedin.
c. Working to finalise the technical reports attached to this council paper, including the South Dunedin Risk Assessment, 7 Potential Adaptation Futures for South Dunedin and supporting Context Summary Report.
d. Engaging with a wide range of SDF programme partners, stakeholders, and affected communities, including (but not limited to): central government agencies, other councils, banks, insurers, community groups, and mana whenua representatives.
e. Completing an initial analysis of the potential property implications associated with the various adaptation options being explored under the SDF programme, and in particular the implications of managed relocation or retreat.

DISCUSSION

[17] The two key outputs from this stage of the SDF programme are the South Dunedin Risk Assessment and 7 Potential Adaptation Futures reports. The risk assessment essentially seeks to define the challenges facing South Dunedin and the adaptation futures report responds by outlining a range of potential solutions. Read together, the reports present an initial picture of the potential future – or futures – for South Dunedin.

Risk Assessment

[18] The risk assessment has been delivered in three stages: (i) risk identification, (ii) risk assessment methodology; and (iii) undertaking detailed risk assessment against "do nothing" scenarios at present and in future. The approach aligns with guidance from the Ministry for the Environment (MfE) and Intergovernmental Panel on Climate Change (IPCC), and where appropriate draws on the ORC's Regional Policy Statement (RPS) methodology for aggregated risk.

[19] Principles for the risk assessment included making best use of available data, ensuring effort is proportional to outcome, and identifying risks and opportunities that may require or justify further inquiry. There are inherent limitations and sources of uncertainty regarding the risk assessment, due to the scope, scale, and complexity of what it needs to cover. Additionally, data gaps relating to exposure, hazard, and vulnerability introduce limitations and sources of uncertainty. These limitations are noted in the report.

[20] Importantly, the risk assessment is intended to support suburb-level adaptation planning undertaken by the SDF programme, including dialogue with affected stakeholders about the options for mitigating and adapting to identified risks. The risk assessment is not intended to provide a detailed property-level assessment of risk and using the report in this way could lead to false or misleading conclusions (e.g. high-risk areas may include low-risk properties, or the reverse).

South Dunedin Risk Assessment

[21] The South Dunedin Risk Assessment (Attachment 2) identifies, classifies, and prioritises risk across the area by assessing exposure to natural hazards, vulnerability to those hazards, and likelihood of occurring, before assigning corresponding risk scores. The impacts of these risks, should they be realised, are also described.

[22] The purpose of the Risk Assessment is to "assess the potential for elements at risk (people, places, assets) to be negatively affected by pluvial flooding, coastal (inundation and erosion), groundwater, landslide, and liquefaction natural hazards in South Dunedin. To support this purpose, the two primary aims of the risk assessment are to:

a. outline the "case for change" in response to current and increasing natural hazard risks, by providing an overview of risk and developing a risk baseline to illustrate the implications of a "status quo" or "do nothing" scenario; and
b. support spatial adaptation planning, including by identifying which key features are most at risk, where and when adaptation may be required to reduce risk, and by establishing a baseline against which potential risk mitigations (i.e. adaptation options) can be assessed.

[23] A mana whenua risk assessment has been undertaken for the SDF programme, which has identified and rated risks through a Kāi Tahu lens. Based on an analysis of cultural values, it takes a broad approach to risk. As well as risks to specific places and features important for the cultural associations to mana whenua, it considers risks to Kāi Tahu perspectives and values relating to wider environmental, social, and economic factors in South Dunedin. This mahi was facilitated by Aukaha with guidance and validation from a panel of Kāi Tahu mana whenua representatives.

Key findings

[24] The risk assessment shows that South Dunedin has high exposure to natural hazards , including chronic and gradual onset hazards like sea level rise and shallow groundwater, as well as event-based hazards such as pluvial flooding and liquefaction. South Dunedin has a correspondingly high risk profile at present day. Anticipated changes in climate, and associated increases in exposure to natural hazards, are expected to materially increase risk to South Dunedin's buildings, infrastructure, and communities over coming decades.

[25] Adverse consequences are expected to increase to a point where much of the key infrastructure, functions, and services experience declining functionality, loss of service, or complete failure. These risks will have significant adverse effects on the South Dunedin community, wider Dunedin city, and the economy unless suitable risk mitigation is employed. This presents a compelling case for change, based on the adverse effects described, and the misalignment with the SDF programme vision, purpose, and objectives noted above.

[26] The mana whenua risk assessment has shown that, from a Kāi Tahu perspective, there is substantial risk resulting from a 'keep doing what we are doing' scenario, where there are no additional interventions to address the issues facing South Dunedin. Risk to the values identified in Te Taki Haruru (DCC's Māori Strategic Framework) is generally significant, ranging from high risk (mana, whakapapa, tapu & noa) to extreme risk (mauri). In the view of mana whenua, these results support the case for change in response to the natural hazards and climate risks described in the broader risk assessment.

Technical peer review

[27] The risk assessment has been developed by Tonkin & Taylor (supported by WSP and BECA) and has undergone technical peer review by Jacobs (supported by Royal HaskoningDHV). The peer review process has been robust, extensive, and has led to many refinements to the report. However, not all outstanding technical issues have been resolved, and remaining issues are: (i) acknowledged as data gaps, assumptions, limitations, or with disclaimers; (ii) matters that will be addressed in subsequent stages of the technical work; or (iii) subject to difference of professional opinion (i.e. the experts have agreed to disagree).

Risk assessment – next steps

[28] The next steps with the South Dunedin Risk Assessment include engaging the community on the key findings and associated implications to promote a broad

understanding and support more informed discussions about potential risk mitigations (i.e. potential adaptation futures).

[29] The risk assessment sets a baseline using existing information and 'business as usual' risk mitigations (i.e. current mitigations continue, with no step-change in approach). Subsequent stages of the SDF programme will assess the effectiveness of various adaptation futures, options, and projects in terms of their impact on reducing risk in different areas over time. This may result in revisions to the risk baseline for South Dunedin.

Adaptation Planning

[30] The primary output from the SDF programme is a climate adaptation plan for South Dunedin. Developing options for adapting to the locked-in and anticipated impacts of climate change and the associated natural hazards on South Dunedin, and weaving these together into potential futures and a consolidated adaptation plan, is a complex and iterative process.

[31] The SDF programme adaptation planning workstream is delivered in five stages: (i) domestic and international good practice review; (ii) longlist of generic adaptation approaches; (iii) longlist of seven potential adaptation futures; (iv) shortlist of potential adaptation futures and pathways; (v) preferred adaptation future and pathway.

- Stage 1 – Domestic and international good practice review (completed, December 2023): Included researching and showcasing a selection of relevant and innovative adaptation approaches of relevance to South Dunedin, both in New Zealand an internationally.
- Stage 2 – Longlist of generic adaptation approaches (completed, December 2023): Included identifying a list of 16 generic adaptation approaches that could reasonably be expected to mitigate the impacts of natural hazard and climate risks in South Dunedin.
- Stage 3 – Potential adaptation futures for South Dunedin (Longlist): Combines the adaptation approaches in different ways to form seven potential adaptation futures for South Dunedin, describing key characteristics, costs, benefits, and visualisations at 2100.
- Stage 4 – Potential adaptation futures and pathways for South Dunedin (Shortlist): Refines the seven potential adaptation futures to a shortlist of 3-4 futures, adding more technical and economic detail, and determining pathways to get there including key changes at 25-year intervals out to 2100 and beyond.
- Stage 5 – Preferred adaptation future and pathway: Further refines the shortlisted futures and pathways, adding more technical and economic detail, and determining a preferred adaptation future and pathway. This would form the basis of the final climate adaptation plan for South Dunedin.

[32] The focus of this paper is Stage 3, which includes the 7 Potential adaptation futures for South Dunedin (Attachment 3) and supporting Context Summary Report (Attachment 4).

7 Potential Adaptation Futures and Context Summary Report

[33] The adaptation futures report responds to the risk assessment by outlining the options available for managing and mitigating the risks faced by South Dunedin. Various adaptation options and approaches are combined into 7 Potential Adaptation Futures, each of which sits on a spectrum of 'fight and flight', with an emphasis on infrastructure at one end and land use change (including managed retreat) at the other. The report describes the key characteristics of each potential future, explores the pros and cons, and provides visualisations of what South Dunedin could look like in 75 years' time (in 2100). The futures proposed are a product of extensive technical work and community engagement and the methodology used to develop them is described in the attached Context Summary Report.

[34] This stage of the adaptation planning workstream has focused on the viability of potential adaptation options, assessing which options could be combined in different ways to reduce risk in South Dunedin. Planning and analysis is still high-level, with a range of assumptions and remaining uncertainties, which are described in the reports. Subsequent stages of the SDF programme will undertake more detailed analysis to explore the efficacy of selected adaptation options, assessing how well they work, and what size, location, and duration would be required to best reduce risk.

[35] The reports provide high-level cost estimations for each of the seven potential adaptation futures. The costing estimates follow established good practice methodologies adopted for Better Business Case processes in New Zealand and are calculated against available rates for similar projects. The costs do however include a range of assumptions and are provided primarily to enable comparison between the futures and to benchmark the potential costs against DCC's current capital programme of around $200 million per annum. Potential benefits of each future are also described with similar estimates for their economic value, enabling a cost-benefit ratio to also be calculated. Finally, costs represent the estimated total cost of implementing the corresponding future, and depending on specifics, would be spread across a range of stakeholders (i.e. figures do not represent costs only to councils). This economic analysis will be further refined in subsequent stages of the SDF programme.

[36] Each of the seven potential adaptation futures includes a visualisation of what South Dunedin could look like in 75 years' time (2100). These are intended for illustrative purposes, and show the types of changes anticipated, in the general areas of South Dunedin they are expected to occur, based on available information and current analysis. The actual scope and location of infrastructure investments and land use changes that might result from the SDF programme are yet to be determined. These would be subject to more detailed adaptation planning in subsequent stages of the programme and any resulting processes to implement the adaptation plan for South Dunedin (e.g. design of infrastructure projects, changes to the District Plan, etc.).

Key findings

[37] The potential adaptation futures report presents seven futures for South Dunedin, which include a status quo future, where current approaches are continued, and six other futures spanning a spectrum of 'fight and flight', with an emphasis on infrastructure at one end and land use change (including managed retreat) at the other. The seven futures are listed in the table below:

#	Potential Adaptation Future
1	Status quo – largely individual property actions
2	Keep land dry – pipes and pumps
3	Keep and dry – raised land and pumping water
4	Space for water – waterways and wetlands
5	Space for water – waterways and raised land
6	Let water in – relocation to raised land
7	Let water in – large scale retreat

[38] The status quo future is likely to lead to the worst outcomes, with high costs relative to very limited benefits, the largest number of properties affected, and highest residual risk. The status quo approach is not well aligned to the objectives of the SDF programme and relies primarily on individual property interventions, so costs may also fall mostly to individuals or represent loses resulting from floods and other events.

[39] Of the remaining six potential adaptation futures, the report shows that there is no single future for South Dunedin where all problems are solved cheaply and easily, rather there are many viable futures, each with unique characteristics and trade-offs. Potential futures two through seven all represent improved outcomes over the status quo, but with different cost-benefit ratios, and varying numbers of affected properties, ease of implementation, and residual risk. The futures have varying alignment with the objectives of the SDF programme, and these are described in the quantitative and qualitative assessments that accompany each future.

[40] The report essentially illustrates that creating a safer and better future for South Dunedin will come down to a balance of trade-offs, and include choices about the scale and rate of change, the size of investment we can afford, and the level of risk we are prepared to live with. These are questions that will be explored tduring community engagement work and interrogated through more detailed technical and economic analysis in subsequent stages of the SDF programme.

Technical peer review

[41] The adaptation futures reports have been developed by BECA (supported by WSP and Tonkin & Taylor) and have undergone technical peer review by Jacobs (supported by Bell Adapt Ltd). The peer review process has been robust, extensive, and has led to many refinements to the reports. However, not all outstanding technical issues have been resolved, and remaining issues are: (i) acknowledged as data gaps, assumptions, limitations, or with disclaimers; (ii) matters that will be addressed in subsequent stages of the technical work; or (iii) subject to difference of professional opinion (i.e. the experts have agreed to disagree).

Adaptation planning – next steps

[42] The next steps with the seven Potential Adaptation Futures include engaging the community on the key characteristics and associated implications of each future, in order to support a broad understanding, enable more informed discussion, and collect

data on community views – particularly in relation to the choices and trade-offs associated with each future.

[43] Stage 4 of the adaptation planning work will then seek to combine community feedback with additional technical and economic analysis, to refine the potential adaptation futures to a shortlist and determine pathways to get there. This work would lead into subsequent stages of the SDF programme, which are described above and illustrated in Attachment 1.

Communications and community engagement

[44] A communications and community engagement plan has been developed to support effective council interactions with partners, stakeholders, and affected communities in relation to the risk assessment and adaptation planning work described above. This includes briefings and co-development of key messaging with selected central government agencies, local institutions, community groups, mana whenua, and other interested parties – such as banks and insurers – whose views and responses are likely to be of interest to affected communities. Advanced briefing of media has also been undertaken. The intent of this work is to promote clear and consistent messaging, support informed dialogue, and to reduce uncertainty and speculation.

OPTIONS

[45] The SDF Programme Plan provides for various stage gates at the conclusion of each stage of technical work, where Council approval is sought to proceed to community engagement. Two options are outlined below which involve either proceeding with the SDF programme as scheduled, or delaying the programme to undertake additional work as may be directed by Council. The respective advantages and disadvantages of each option are described.

Option 1 – Proceed to community engagement (recommended option)

[46] This option includes proceeding as outlined in the SDF programme plan and according to the high-level scheduled in Attachment 1. It would involve Council noting the South Dunedin Risk Assessment, 7 Potential Adaptation Futures and Context Summary Reports, then endorsing the reports for the purpose of community engagement, and approving the SDF programme team undertaking engagement with partners, stakeholders, and affected communities on the basis of these reports.

Advantages

- Enables the SDF programme to remain on schedule and budget.
- Fulfils commitment to partners, stakeholders, and affected communities to complete risk assessment and current stage adaptation planning work for South Dunedin within agreed timeframes.
- Enables councils to actively facilitate a dialogue with partners, stakeholders, and affected communities on the risks facing the area and potential adaptation options.
- Enables staff and consultant teams to direct effort to subsequent stages of the SDF programme, including more detailed technical and economic analysis.

Disadvantages

- Requires proceeding with imperfect information and despite a range of information gaps, assumptions, and uncertainties, each of which carries a degree of risk.

Option 2 - Undertake further technical and economic analysis

[47] This option would involve Council requesting further technical or economic work on the risk assessment or potential adaptation futures, before seeking Council approval to undertake planned engagement with partners, stakeholders, and affected communities.

Advantages

- Undertaking additional work could enable filling some existing information gaps and resolving some outstanding technical issues or remaining uncertainties, increasing confidence levels and potentially helping to mitigate risks to the SDF programme at a later stage.

Disadvantages

- Additional delays would disrupt the SDF Programme schedule, may require additional budget, and could generate criticism from partners, stakeholders, and affected communities who may prefer earlier release of the risk assessment and adaptation planning work.
- Undertaking more detailed technical and economic analysis at this stage of the programme could be perceived as 'skipping' community engagement and moving straight to the next stage of technical work.
- While further technical or economic work may fill information gaps and resolve some remaining technical issues or uncertainties, the nature and complexity of the subject matter is such that there will always be gaps and uncertainties.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[48] These are described in the paper and attachments, which build on previous advice on strategy and policy considerations, provided in the following reports:

- HAZ2109, ORC Council, 24 November 2021
- OPS2215, ORC Strategy and Planning Committee, 13 April 2022
- OPS2223, ORC Strategy and Planning Committee, 13 July 2022
- HAZ2302, ORC Safety and Resilience Committee, 10 August 2023
- HAZ2302, ORC Council, 22 November 2023
- GOV2343, ORC Council, 6 December 2023
- GOV2419, ORC Council, 24 July 2024
- GOV2430, ORC Council, 25 September 2024

Financial Considerations

[49] Funding of the South Dunedin Future programme is provided for in ORC's 2024/25 Annual Plan. The SDF programme is also co-funded by the Dunedin City Council. As noted in the paper, no decisions have been made about funding for potential adaptation work that may arise from the programme.

Significance and Engagement

[50] Extensive external engagement has been undertaken with a range of partners, stakeholders, and affected communities on the topics covered in this paper. Further planned engagement is described in the report.

Legislative and Risk Considerations

[51] These are described in ORC paper HAZ2302 presented to Council on 22 November 2023.

Climate Change Considerations

[52] The South Dunedin Future Programme is enabling adaptation to the effects of future climate change.

Communications Considerations

[53] These are described in the report and include extensive communications and community engagement activities over coming months.

NEXT STEPS

[54] Subject to Council decisions, next steps include:

a. Commencing communications and community engagement activities relating to the South Dunedin Risk Assessment and 7 Potential Adaptation Futures for South Dunedin. These activities are planned to commence in late-March and extend through to mid-May, and will involve a mix of in-person and online engagement with stakeholder groups and the general public, as well as web-, print-, and social media-based communications.
b. Designing and commencing Stage 4 of the adaptation planning work, including developing the shortlist of potential adaptation futures and pathways for South Dunedin. This will include analysis of community feedback on the longlist of potential futures, and more detailed technical and economic work, to refine this list down to 3-4 futures. This work is expected to be undertaken between May-October 2025, with a view to presenting to Council in late-2025 or early-2026.

[55] Subsequent stages of the SDF programme will repeat the cycle of community engagement and technical and economic analysis, refining potential adaptation futures to a preferred future and pathway, before presenting this in a final adaptation plan for South Dunedin by December 2026.

[56] At present, Councils have committed to completing the SDF programme, including remaining technical work, economic analysis, and community engagement. Councils have not, at this time, committed to supporting any particular course of action that might be recommended by the SDF programme – including those relating to strategic land use planning and infrastructure investment. Such decisions, and the roles and responsibilities of respective Councils in implementing them, would be subject to further Council consideration, including in the context of strategic and financial decisions associated with long term plan processes.

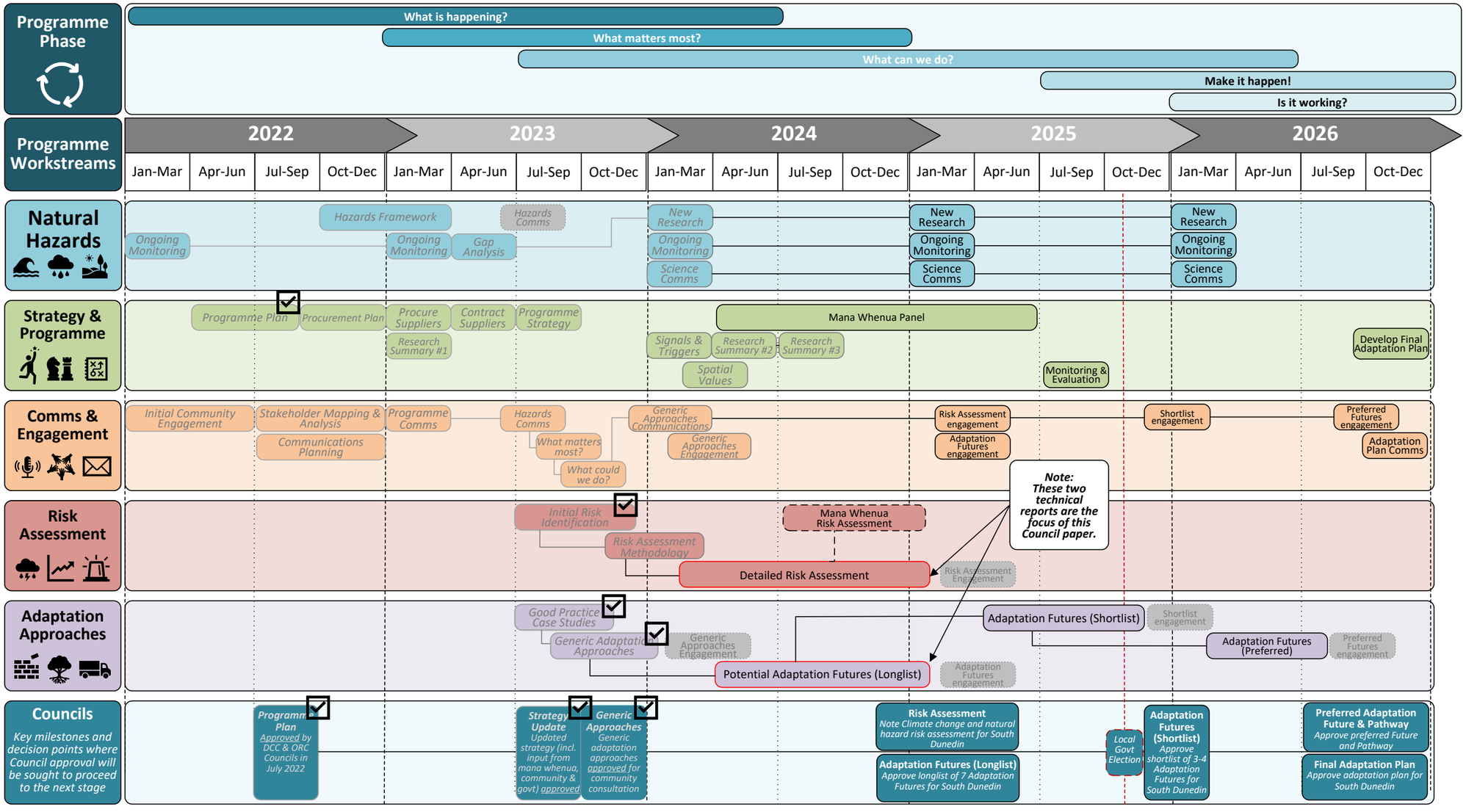
ATTACHMENTS

1. SDF Programme - Summary One-Pager (A3) [**10.10.1** - 1 page]
2. South Dunedin Risk Assessment [**10.10.2** - 198 pages]
3. 7 Potential Adaptation Futures for South Dunedin [**10.10.3** - 21 pages]

4. Potential Adaptation Futures for South Dunedin - Context Summary Report [**10.10.4** - 72 pages]

South Dunedin Future Programme

- South Dunedin Future is a **joint programme** between Dunedin City Council and Otago Regional Council to find ways to respond to climate change and flooding problems in South Dunedin.
- We need to **adapt South Dunedin's infrastructure and environment** in a way that creates more room for increasing levels of rain, sea and groundwater, while protecting space for people and the things that matter.
- We are **making a plan** with the South Dunedin community, mana whenua and stakeholders to work out what's most important and to find the right balance between people, water and space.
- This will involve **lots of technical work and community engagement** over a number of years. Some key pieces of this work are mapped out below.



SOUTH DUNEDIN FUTURE

WORKSTREAM 3: RISK ASSESSMENT

RISK ASSESSMENT REPORT

6 March 2025

SOUTH DUNEDIN FUTURE

RISK ASSESSMENT REPORT: REV 1 DRAFT

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REV	DATE	DETAILS
Revision 0	24 September 2024	
Revision 1 DRAFT	20 December 2024	Updated pluvial flood hazard results
Revision 1.1 DRAFT	18 February 2025	Updates following DCC, ORC and peer review.
Revision 2 Final	28 February 2025	Final
Revision 3 Final	6 March 2025	Updates following Transpower review

	NAME	DATE	SIGNATURE
Prepared By	Katherine Cowper-Heays	6 March 2025	
Reviewed by	Jon Rix	6 March 2025	
Approved by	Kevin Wood	6 March 2025	

28 February 2025

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GLOSSARY

Component	Definitions
Baseline risk assessment	Refers to the assessment of the 'business as usual', 'status quo' or 'do nothing' option of risk to South Dunedin at present day*, mid-century (2060-2070) and late-century (2100-2110) climate scenarios. The baseline risk assessment assumes that risk is not mitigated, which is part of a separate piece of work. *see Present day entry in glossary.
Element at risk	People, places, assets within South Dunedin that are potentially vulnerable to hazards. People and communities are a fundamental consideration in this risk assessment. Risks to people are considered in relation to the elements identified below, either the physical risk of harm to people living, working, and using the buildings of South Dunedin, or through impacts arising from damage or loss to the other elements. Risk elements are adapted from those presented in the Risk Identification Report (Kia Ropine, 2023) as: (1) Buildings (2) Parks and sports fields (3) Ecological areas (4) Roads and associated infrastructure (5) Rail infrastructure (6) Water supply infrastructure (7) Wastewater infrastructure (8) Stormwater infrastructure (9) Contaminated land (10) Telecommunication infrastructure (11) Energy infrastructure Risks relating to mana whenua are acknowledged as an important component of the South Dunedin Future Programme. A separate piece of work is underway to define and incorporate these risks into the programme.
Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC, 2021). E.g. Buildings located in an area where flooding occurs either now or in the future.
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. E.g. Pluvial flooding.
Impacts	The consequences of realized risks on natural and human systems. Where risks result from the interactions of hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure (IPCC, 2021). E.g. The social, cultural, economic, and environmental consequences and cascading risks resulting from risks to buildings.

Component	Definitions
Key feature	Feature within an 'element at risk' that will be assessed as part of the South Dunedin risk assessment. E.g. Element at risk: Buildings; Key Feature: Residential buildings. Key features are elements or parts of an element that are required to inform the adaptation plan and will indicate relative value/consequence/criticality within an element. Some key features may have sub-categories within them. Key features are identified through: • Risk identification report. • Agreement with Workstream 4 – Adaptation Planning. This workstream will develop an adaptation plan for South Dunedin, which shall be informed by the findings of the risk assessment. • Stakeholder engagement.
Present day	Hazard data assessments used to inform this study were carried out using varied 'present day' timeframes for pluvial flood modelling, groundwater, and coastal hazard assessments (2024, 2023, and 2005 sea levels respectively).
Risk outside hazard extent	Physical risk classification for assets that are located outside the modelled hazard extent. The probability of exposure is expected to be lower than locations within modelled hazard extents.
Risk	The potential for adverse consequences for human or ecological systems (IPCC, 2021). Risk includes the following related concepts and terms: **Physical risk:** Risks that result from dynamic interactions between hazards with the exposure and vulnerability of the affected human or ecological system to the hazards (IPCC, 2021). In this project context, these are also called 'direct risks', and are those that may result from physical contact with the hazard. When realised, results in impacts. e.g. The risk to buildings due to flooding, and the risk to residents due to flooding of buildings. **Risk rating:** Physical risks are rated as **high**, **medium**, or **low,** or are classified as being ***not exposed to the scenarios assessed***. These ratings are a product of exposure and vulnerability scores with this relationship shown in Table 3-11. **High risks** are typically those that are associated with exposure up to a 1% AEP event and an extreme vulnerability rating of a place or asset, or those associated with extreme exposure (i.e. to a 10% AEP event) and a high vulnerability rating of a place or asset. **Medium risks** are typically those that are associated with moderate exposure (i.e. up to a 1% AEP event) and a moderate or high vulnerability rating, or extreme exposure (i.e. to a 10% AEP event) with a low or moderate vulnerability rating, or those that are exposed to extremely low probability hazards (i.e. to a >1% AEP event) but are extremely vulnerable. **Low risks** are typically those that are associate with exposure to extremely low probability hazards (unless they are extremely vulnerable) or exposed to hazards but with low or very low vulnerability.
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC, 2021). E.g. Floor level, building materials, or other attributes that influence whether the building is adversely affected by flooding.

EXECUTIVE SUMMARY

RISK ASSESSMENT CONTEXT

South Dunedin is a vibrant and important part of Dunedin city which is home to more than 13,000 people, several hundred businesses, and an array of critical infrastructure. South Dunedin is also exposed to a range of natural hazards, many of which are expected to increase in frequency and severity with the effects of climate change.

The purpose of the South Dunedin Future (SDF) programme is to enable South Dunedin to prepare for, and adapt to, the impacts of climate change, while also realising the opportunities that come with change. This includes investigating, monitoring and predicting the impacts of a changing climate, including natural hazards; working with the community to assess the risks posed to the South Dunedin by these hazards; and exploring a range of options for mitigating these risks and realising associated opportunities.

Purpose of the risk assessment

Within the wider programme context, the **purpose** of *the South Dunedin Risk Assessment* is to "*assess the potential for elements at risk (people, places, assets) to be negatively affected by pluvial flooding, coastal inundation, coastal erosion, groundwater, landslide and liquefaction natural hazards in South Dunedin*"[1]. This is required to support two aims:

1. Outline the case for change - The baseline risk profile illustrates the consequences of a 'status quo' or 'do nothing' scenario.
2. Spatial adaptation planning - Spatial risk quantification helps identify locations *where* adaptation measures are more likely required to reduce risk. The changing risk profiles over time helps inform *when* adaptation may be required. The risk profile for South Dunedin provides a baseline against which the merits of potential risk mitigations (e.g. adaptation options) can be assessed.

Importantly, the risk assessment is intended to support suburb-level adaptation planning, including dialogue with affected stakeholders about the options for mitigating and adapting to identified risks. **The risk assessment is not intended to provide a detailed property-level assessment of risk** and using the report in this way could lead to false or misleading conclusions (e.g. high risk areas may include low risk properties, or the reverse).

The risk assessment seeks to identify, classify, and prioritise risks across South Dunedin by assessing exposure to hazards, vulnerability of elements, and assigning corresponding risk scores. The associated impacts of these risks, should they be realised, are also described. The risk assessment does not however seek to prioritise areas for adaptation, which could be influenced by a range factors, including planning, budget, asset management, and other considerations. These factors could be unique to each of the potential futures explored for South Dunedin and will be considered as part of a separate but related workstream on adaptation options.

Establishing a risk baseline for South Dunedin: This report documents the findings of the risk assessment, establishing a baseline risk profile for South Dunedin if the identified risks are not mitigated further. This is informed by natural-hazard, exposure and vulnerability information

[1] This purpose was adopted for the earlier Risk Identification Report, noting that the terminology 'things of value' is changed to 'elements at risk'. Terminology relating to hazards has changed from "rainfall, coastal, groundwater and seismic natural hazards" to "pluvial flooding, coastal inundation, coastal erosion, groundwater, landslide and liquefaction".

regarding “key features” within twelve “elements at risk” that have been used to characterise the physical places and assets of South Dunedin. The direct physical risks are assessed alongside the associated impacts to people, and the resultant social, economic, and environmental impacts.

Risks relating to mana whenua are acknowledged as an important component of the South Dunedin Future Programme. Risks relating to mana whenua are assessed in a separate piece of work by Aukaha, which is in the final stages of completion (expected early to mid-2025). A short summary of the approach and findings is included in this assessment and the ongoing collaboration with mana whenua will work to integrate the full results into subsequent stages of the programme thereafter.

While the risk assessment establishes a risk baseline for South Dunedin, the assessment uses the best available (but imperfect) information, and represents a snapshot in time. As the SDF programme progresses, new information will become available, which may enable refinements and updates to this baseline. Moreover, the purpose of the adaptation options workstream is to test potential adaptation options, exploring how effective and efficient each could be at mitigating risks, and assessing the extent to which they might improve the risk baseline in South Dunedin.

The assessment presents findings representative of the present-day timeframe (i.e. 2024[2]), medium term timeframe (2060-2070) and long-term timeframe (2100) using best available information. For the medium-term and long-term scenarios, two greenhouse gas emissions scenarios were used representing mid-range (SSP2-4.5) and high end (SSP5-8.5) projections.

The results of the spatial risk assessment have been compiled into a geospatial database which has been provided to DCC alongside this report (and will be made publicly available by DCC).

SUMMARY OF RISK ASSESSMENT FINDINGS

South Dunedin is subject to a range of natural hazards, including shallow groundwater, pluvial flooding, coastal inundation, coastal erosion, liquefaction and landslide. Figure E-1 shows that the majority of South Dunedin will be exposed to four hazards at late century under a high-end climate scenario. These hazards present a range of risks to the elements assessed in this report – such as buildings, utilities, and parks – which if realised could have a range of largely negative impacts. Element level risk is communicated based on the exposure of elements at risk to these hazards and their unique vulnerability to that hazard.

As with all risk assessment of the scale and complexity of South Dunedin, the assessed risk ratings presented in this assessment are subject to limitations regarding data availability and confidence. To minimise risk, the outputs of the risk assessment have been shared with local subject matter experts to test the results. It is noted that there is uncertainty regarding the coastal erosion risk assessment in some localised areas, particularly around engineered coastal erosion structures (e.g. sea walls). This is due to the risk assessment reliance on a regional coastal erosion hazard screening study and new hazard information is likely later in 2025. The complete list of limitations is identified in Section 2.5 and the relevant hazard and risk figures identify the localised limitation extents for coastal erosion.

The risk assessment findings can be summarised through a range of different lenses. This section presents an overview of risk, and summaries by element at risk, timeframe, and impact.

[2] Hazard data assessments used to inform this study were carried out using varied ‘present day’ baseline timeframes for pluvial flood modelling, groundwater, and coastal hazard assessments (2024, 2023, and 2005 sea levels respectively)

OVERVIEW OF RISK

A spatial summary of risk to South Dunedin is presented in Figure E-2. The figure shows the locations where buildings[3], roads and parks are at high or medium risk due to one or more hazards. These elements at risk extend across the entire land coverage of South Dunedin and the risk to other elements is provided in the main report (e.g. three waters, telecommunications and energy infrastructure. The maps illustrate that some parts of South Dunedin are currently at high or medium risk due to three hazards, which increases in extent over time, particularly in The Flat[4]. This map series is intended to provide a spatial overview of risk to South Dunedin, where detailed, element specific risks can be explored in the main report.

SUMMARY OF DIRECT PHYSICAL RISK FINDINGS BY ELEMENT AT RISK

Table E-1 summarises the percentage of all elements at risk that were rated high risk[5] across South Dunedin. Many of these risks correspond to complete loss of functionality. Table E-2 provides the same information for high or medium risk[6] where functionality is likely to be compromised or lost. Risks to each element at risk are summarised:

- Buildings: The buildings within South Dunedin generally face high and widespread risk from a range of existing hazards. Notably, 23% of buildings are rated as high risk to pluvial flooding at present day, and 84% of buildings are rated as high risk from groundwater by late-century. These risks, if realised, would negatively impact building performance and functionality, making some buildings uninhabitable. This would have a range of adverse impacts on residents, including to physical health and wellbeing and wider economic and societal impacts.
- Parks: The 56 parks in South Dunedin generally face medium risk from various existing hazards, with only 5% at high risk, mainly those with playgrounds vulnerable to waterlogging due to groundwater. Currently, 95% of parks are at medium risk from groundwater and 57% from pluvial flooding. By late century, medium risk due to coastal inundation and erosion will rise to 29% and 30%, respectively.
- Sports fields: Many of the sports fields within South Dunedin currently face medium risk due to a range of hazards. Groundwater and coastal erosion are the two main drivers of high risk to Sports fields. Groundwater impacts the sports fields due to chronic saturation of the playing turf and grass root zones which causes die-off, and coastal erosion causes a loss of sport field area. At present 17% of fields are at high risk due to groundwater, which

[3] Building risk has not been aggregated to SA1 areas in this map
[4] 'The Flat' is the low-lying flat area to the south of Dunedin's CBD which is built on a former tidal wetland.

[5] High risks are typically those that are associated with exposure up to a 1% AEP event and an extreme vulnerability rating of a place or asset, or those associated with extreme exposure (i.e. to a 10% AEP event) and a high vulnerability rating of a place or asset. Refer Section 3.4 for further information.

[6] Medium risks are typically those that are associated with moderate exposure (i.e. up to a 1% AEP event) and a moderate or high vulnerability rating, or extreme exposure (i.e. to a 10% AEP event) with a low or moderate vulnerability rating, or those that are exposed to extremely low probability hazards (i.e. to a >1% AEP event) but are extremely vulnerable. Refer Section 3.4 for further information.

increases at mid century to 46%. Coastal erosion[7] poses a high risk to parks at mid-(20%) and late century (29%) timeframes, and typically those fields that are at lower risk from groundwater are more impacted by coastal erosion. Consequentially 75% of all fields are at high risk by late century due to either coastal erosion or high groundwater. Loss of sports fields would have widespread impacts on the wide city, as South Dunedin provides for 45% of the Dunedin City playing field area.

- Roads: South Dunedin's 90 km of roads are increasingly at risk due to high groundwater levels and coastal erosion. Currently, 35% of roads are at high risk from groundwater, rising to 76% by 2100, while coastal erosion threatens 2% of roads, increasing to 9% by the end of the century. These conditions will lead to severe road damage, challenging maintenance efforts, and potential road collapses, impacting local and regional transport routes, especially the 3 km of critical routes.
- 3 Waters: Of the 71 km of stormwater pipes in South Dunedin, 22% are currently at high risk from groundwater, increasing to 28% by late century. Medium risk from pluvial flooding affects 28% of pipes today, rising to 38% by mid-century, while coastal inundation will impact 76% by late century. These risks, if realised, will erode the level of service of the stormwater system, resulting in increased flooding.

  Of the 79 km of wastewater pipes in South Dunedin, 50% are currently at high risk from groundwater, increasing to 58% by the end of the century. Pluvial flooding poses a high risk to 51% of pipes today, rising to 72% by century's end. Coastal inundation risks are lower except in the late-century high-range scenario, where 80% of the network is at high risk. These risks threaten the wastewater system's service, potentially causing widespread contamination and public health issues.

  In general, natural hazard risks to the water supply network in South Dunedin is low.
- Contaminated sites: The 236 contaminated sites in South Dunedin are primarily at risk from groundwater, with 7% currently at high risk, rising to 80% by late century. These high-risk sites have the potential for contaminants to be transported, resulting in spread of contamination. Additionally, coastal erosion poses a high risk to 1% of sites, which increases to 4% at late century with further potential for increased spread of contamination.
- Telecommunications: The telecommunications exchange site in South Dunedin is currently at medium risk from groundwater, increasing to high risk by late century. It also faces medium to high risk from coastal erosion by late century. Risks to the wider network haven't been fully assessed, although their dependency on road access and power supply is identified.
- Energy: Risk to energy assets in South Dunedin varies by type. The energy distribution network, with more assets than the transmission network, faces higher risks. Currently, 16% of overhead distribution lines are at high risk from groundwater, increasing to 84% by late century. Pluvial flooding and coastal inundation pose medium risk to most lines by late century (89% and 83%, respectively). The St Kilda Zone Substation and Transpower South Dunedin Substation both become high risk at mid-century[8].

[7] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.
[8] Risk to specific key features (e.g. Wastewater Treatment Plant, Pump stations, Substations, and other features) is shown in Section 5.

Table E-1 Percentage of elements at risk across South Dunedin rated at high risk[1,2]

	Coastal erosion			Pluvial flooding					Coastal inundation					Groundwater					Lique-faction	Land-slide
	Present Day	2060	2100	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Buildings	1%	1%	2%	23%	31%	39%	37%	47%	0%	0%	0%	1%	83%	3%	9%	32%	49%	78%	0%	2%
Sports fields	0%	20%	29%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	46%	47%	47%	48%	0%	0%
Parks	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	5%	0%	0%
Roads	2%	5%	9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	35%	63%	68%	70%	76%	0%	2%
Water supply	1%	1%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Wastewater	0%	0%	0%	51%	59%	67%	66%	72%	1%	1%	2%	2%	80%	50%	51%	52%	54%	58%	0%	0%
Stormwater	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	22%	25%	26%	26%	28%	0%	0%
Contaminated land	1%	1%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	31%	57%	64%	80%	0%	0%
Telecommunications	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	100%	100%	0%	0%
Energy distribution	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	16%	70%	79%	81%	84%	0%	2%

Table E-2 Percentage of elements at risk across South Dunedin rated at high or medium risk[1,2]

	Coastal erosion			Pluvial flooding					Coastal inundation					Groundwater					Lique-faction	Land-slide
	Present Day	2060	2100	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Buildings	1%	1%	2%	49%	57%	63%	61%	69%	0%	0%	1%	81%	84%	32%	71%	78%	80%	84%	0%	2%
Sports fields	0%	20%	29%	76%	76%	77%	76%	77%	11%	13%	13%	69%	75%	100%	100%	100%	100%	100%	0%	13%
Parks	21%	25%	30%	57%	61%	63%	63%	66%	13%	14%	14%	16%	29%	100%	100%	100%	100%	100%	0%	7%
Roads	2%	5%	9%	43%	47%	52%	50%	55%	2%	4%	4%	5%	72%	100%	100%	100%	100%	100%	0%	2%
Water supply	1%	1%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
Wastewater	2%	2%	3%	71%	76%	79%	78%	79%	1%	1%	2%	76%	80%	67%	69%	70%	72%	80%	66%	2%
Stormwater	1%	1%	2%	60%	68%	75%	75%	80%	1%	1%	2%	2%	86%	78%	84%	85%	87%	91%	0%	2%
Contaminated land	1%	1%	4%	65%	72%	80%	81%	87%	3%	5%	7%	7%	92%	19%	36%	60%	67%	80%	0%	3%
Telecommunications	0%	0%	0%	100%	100%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	0%	0%
Energy distribution	0%	0%	0%	85%	85%	88%	87%	89%	0%	0%	1%	78%	83%	100%	100%	100%	100%	100%	0%	2%

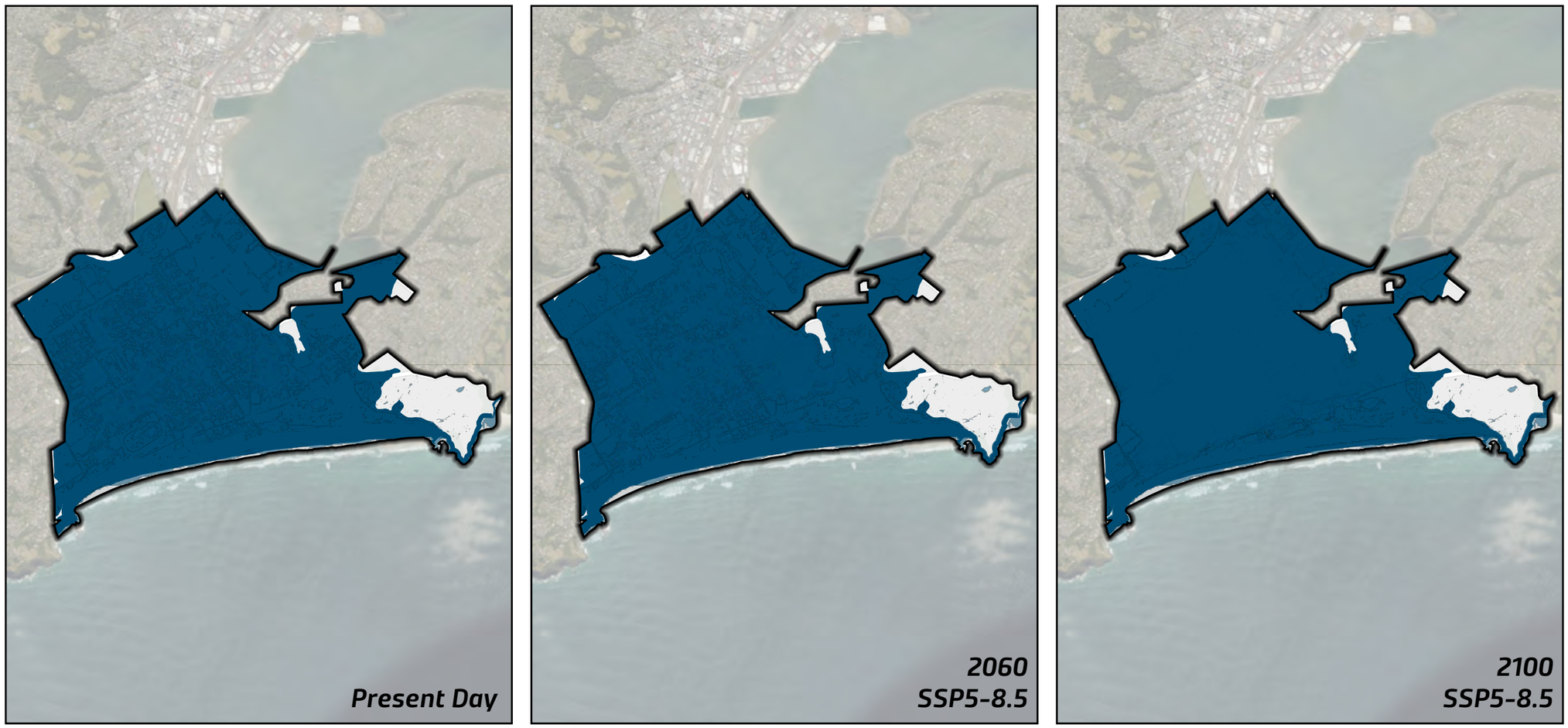
Risk score	Aggregated risk criteria
Very high	≥50% of affected assets within hazard zone have asset level risk rated to be medium or high.
High	21-50% of affected assets within hazard zone have asset level risk rated to be medium or high.
Moderate	11-20% of affected assets within hazard zone have asset level risk rated to be medium or high.
Low	1-10% of affected assets within hazard zone have asset level risk rated to be medium or high.
Not exposed to scenarios assessed	No assets are at risk (due to not being exposed), or <1% of affected assets within hazard zone have asset level risk rated to be medium or high.

[1] Percentages for each element show: buildings: % number of building footprints., sports fields, parks, contaminated land: % number of sites, roads, 3 waters assets and energy: % length of asset.

[2]Risk to specific key features (e.g. Wastewater Treatment Plant, Pump stations, Substations, and other features) is shown in Section 5.

Figure E-1 Exposure of South Dunedin to hazards

Coastal Erosion, Coastal Inundation, Emergent Groundwater, Landslide, Liquefaction & Pluvial Flooding



South Dunedin Future Boundary

One Hazard
Two Hazards
Three Hazards
Four Hazards

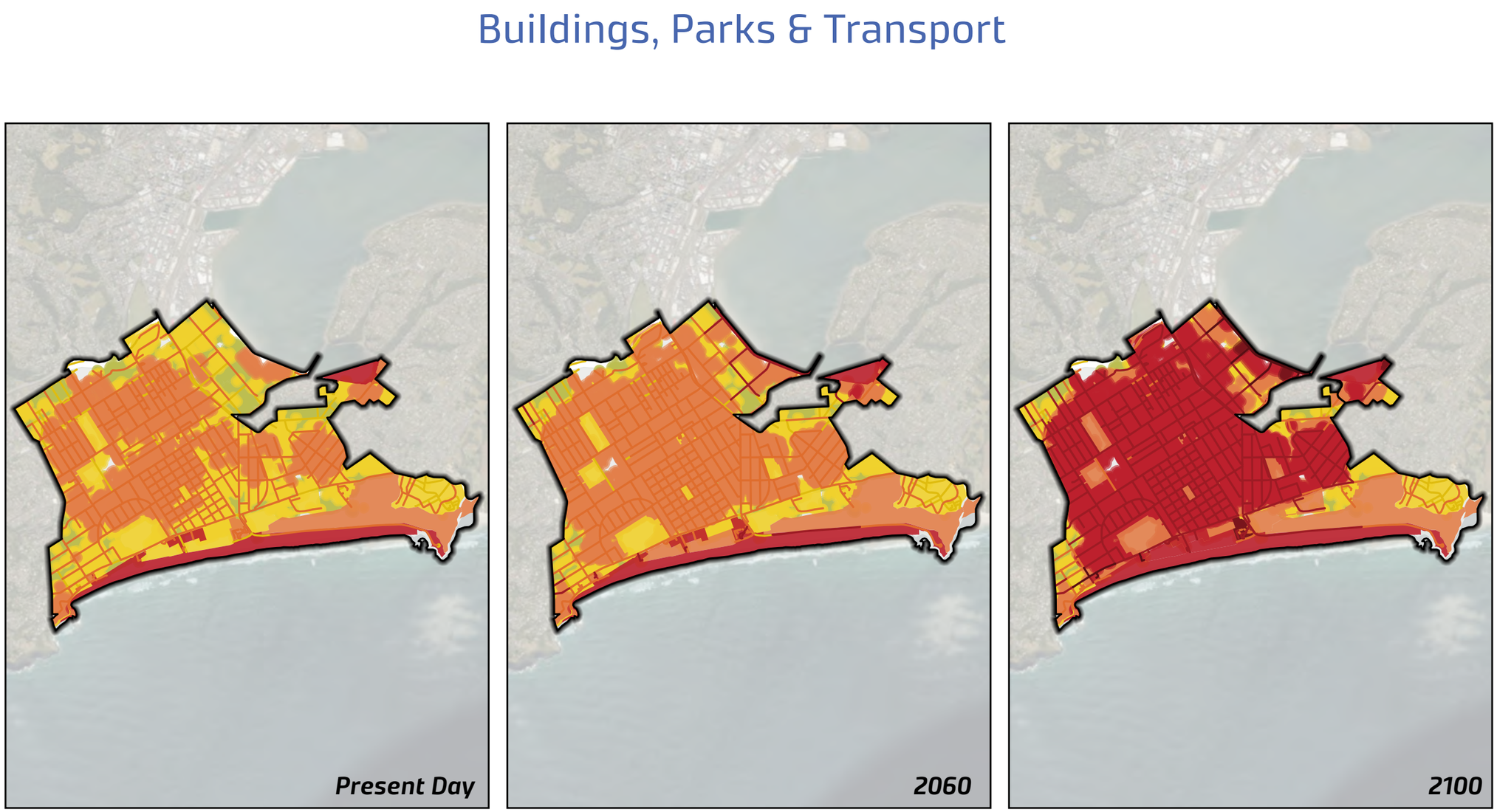
0 0.4 0.8 1.2 1.6 2 (km)

Council Meeting - 19 March 2025

Hazard and data sources:
Pluvial flooding: Scenario: 1% AEP, Source: DCC ICMP Flood Model (Beca, WSP, 2024)
Coastal inundation: Scenario: 1% AEP, Source: Paulik, 2023
Emergent groundwater: Scenario: Median emergent, Source: Cox, et al., 2023
Coastal erosion: Source: WSP, 2024
Liquefaction: Source: Barrell, 2014
Landslide: Source: DCC Hazard database data provided for South Dunedin Future programme.

Explainer: These maps show the hazard extents for coastal erosion, coastal inundation, emergent groundwater, landslide, liquefaction, and pluvial flooding, over three timeframes and under one climate change scenario (SSP 5-8.5). Areas shaded in a darker blue indicate those areas that are exposed to more hazards. The map indicates that at the present day around half of South Dunedin is exposed to two or more hazards, particularly in The Flat. At mid-century areas that are exposed to three or more hazard are more dispersed throughout the study area, while at end of century the majority of South Dunedin will be exposed to four hazards.
Note: Liquefaction and landslide hazards showing in future timeframes do not account for the influence of climate change.

Figure E-2 Hotspot summary of risks to South Dunedin: Buildings, parks and transport



Explainer: These hotspot maps show locations in South Dunedin where buildings, roads, and parks are at high or medium risk due to one or more hazards. They show that many areas of South Dunedin are already subject to such risk from two or more hazards, which increases to three or more hazards over time, particularly on The Flat. Note: Illustrating an 'overall picture' of risk can be problematic in a South Dunedin context, given the large number of hazards assessed (6) and elements at risk (11) (i.e. 66 different risk layers would be needed, resulting in a convoluted image). Using a subset of selected risks can help illustrate a clearer overview. For example, buildings, roads, and parks are three elements at risk that collectively represent 100% of the geographical area in South Dunedin, so they offer a useful overview and can act as a proxy for identifying risk hotpots. Disclaimer: These hotspot maps are intended to provide a visual overview of risk in South Dunedin but are not intended to be an accurate property-level assessment of risk, which requires much more detailed information and analysis. Using these hotspot maps in this way could lead to false or misleading conclusions about property-level risk (e.g. high risk areas may include many low risk properties, or the reverse).

SUMMARY OF DIRECT PHYSICAL RISK BY TIMEFRAME

Baseline risk profile

These summaries show that South Dunedin has high exposure to a wide range of natural hazards. This high exposure, when combined with the high vulnerability of some of the elements, results in a correspondingly high baseline risk profile (despite existing risk mitigations). The scale of this risk increases over time in response to increases in hazards due to climate change. By late century the majority of the places and assets of South Dunedin are at high or medium risk to at least three hazards. The location of these risks is concentrated within the flat areas of South Dunedin.

Present day risk

Present day risk across South Dunedin is driven largely by groundwater and pluvial flooding. Approximately 60% of buildings within South Dunedin are rated medium to high risk due to at least one of the assessed hazards but < 1% are at medium to high risk to 3 or more hazards. At the coastal edge, erosion poses a medium to high risk to parks. More broadly, the roads and wastewater assets have the highest proportion of assets rated at high risk (Table E-1). 35% of roads are subject to groundwater levels requiring unsustainable maintenance. 50% of wastewater pipes are leaky and past their useable life, resulting in reduced level of service.

Many of these risks are realised day-to-day across South Dunedin, such as shallow groundwater reducing the liveability of residential properties and negatively affecting the level of service of roads, stormwater, and wastewater. They are also occurring periodically, such as the heavy rainfall events in June 2015 and October 2024, which caused widespread pluvial flooding and damaged buildings and infrastructure across South Dunedin. There are a range of cascading risks and impacts that result from these direct physical risks, many of which are observable at present day. For example, flood damage negatively impacts housing quality, insurability, and market value, and costs of flood repairs can increase cost of living, affect mental health, and increase inequality.

Mid-century risk (2060)

Mid-century (2060) climate change projections indicate that 0.3 - 0.5 m of sea-level rise will occur under mid-range (SSP2-4.5) and high-range (SSP5-8.5) climate change scenarios. This will drive rising groundwater, coastal erosion, and increasing coastal inundation extents. A warmer climate will also drive more frequent and severe rainfall events. These changes are expected to increase exposure to natural hazards, particularly high groundwater, pluvial flooding, and coastal erosion. In both mid- and high-range emissions scenarios, many of the risks identified at present day increase incrementally at mid-century. Additionally, significant increases in medium to high risk arise in sports fields due to coastal erosion (increase from 0% at present day to 20% at mid-century), buildings due to groundwater (increase from 23% at present day to 71%-78% at mid-century) and contaminated land due to groundwater (19% at present day to 36%-60% at mid-century).

At mid-century, approximately 20% of South Dunedin buildings are rated medium or high risk arising from a single hazard, 60% from at least two hazards, but < 1% are at medium to high risk to 3 or more hazards. The chronic effects of high groundwater will cause increasingly widespread decline in building condition, stability, and healthiness, sports fields, and roads, as well as reduction in level of service of stormwater and wastewater systems. Increased spread of contaminants is likely as a result of these risks as well as due to the effect of high groundwater on large number of contaminated sites. Increased event-based impacts will result in damage to increased numbers of buildings. These increasing risks carry cascading impacts, including health risks, environmental

damage, significant reduction in sports field area, decline in building performance and increased road maintenance.

Late century risk (2100)

Late century (2100) climate change projections indicate that 0.6 – 1.1 m of sea-level rise will occur under mid-range and high-range climate change scenarios. In combination with a warmer atmosphere, this will further drive rising groundwater, coastal erosion, increased coastal inundation extents and more frequent intense rainfall events. These changes are expected to further increase exposure to natural hazards, particularly high groundwater, pluvial flooding, and coastal erosion, as well as bringing a significant increase in exposure to coastal inundation. Correspondingly, these changes will increase the exposure of people, places and assets to the hazards. The largest increases in exposure are most likely from the groundwater and coastal inundation hazards.

In high-range emissions scenarios, the late-century risk arising from groundwater coastal inundation and pluvial flooding is widespread, with 69-84% of all buildings at high risk to these hazards (refer Table E-1). Additionally, most other elements at risk have a high percentage of assets that are at high or medium risk to these hazards.

At late-century, approximately 90% of South Dunedin buildings are rated at medium or high risk due to one or more hazards. In the case of groundwater, 80-84% of buildings will be subject to medium or high risk, where widespread emergent groundwater could cause instability to foundations, increase dampness and mould, and reduce level of service of stormwater, wastewater, and other utilities servicing these properties. As the number and severity of risks increase, the functionality or level of service of the places and assets within South Dunedin will decline. This will bring complex and interrelated cascading impacts on the social, economic, and environmental systems in South Dunedin. Many of these impacts will affect broader Dunedin City and wider region, given the interconnected nature of activities, services, and infrastructure in South Dunedin (e.g. the majority of Dunedin's wastewater is treated in South Dunedin).

SUMMARY OF IMPACTS, RISKS TO MANA WHENUA, AND CONCLUSIONS

Direct and cascading risk

The direct physical risks arising from natural hazards and climate change also have cascading risks (i.e. impact) for the community, economy, and environment in South Dunedin (and wider Dunedin city). A high-level summary of the relationships between impacts identified through this assessment and gathered through literature (Harrison, et al., 2022) are presented in Figure E-3. The diagram shows the impact pathways that extend across social, environmental, and economic domains from the physical risk. Some of these impacts are compounding, and many have further complex dynamics that are not fully evaluated and quantified within the scope of this report.

Mana whenua risk assessment

A mana whenua risk assessment has been undertaken for the South Dunedin Future programme, which has identified and rated risks through a Kāi Tahu lens. Based on an analysis of cultural values, it takes a broad approach to risk. As well as risks to specific places and features important for the cultural associations to mana whenua, it considers risks to Kāi Tahu perspectives and values relating to wider environmental, social and economic factors in South Dunedin. This mahi was facilitated by Aukaha with guidance and validation from a panel of Kāi Tahu mana whenua representatives.

The mana whenua risk assessment has shown that, from a Kāi Tahu perspective, there is substantial risk resulting from a 'keep doing what we are doing' scenario, where there are no additional interventions to address the issues facing South Dunedin. Risk to the key Te Taki Haruru values is generally significant, ranging from high (mana, whakapapa, tapu & noa) to extreme (mauri) levels of risk. These results outline the case for change in response to the modelled natural hazards and climate risks.

A more detailed summary of the mana whenua risk assessment inputs, methodology, and findings is included in Annex D of this report. The companion workstream on adaptation options also utilised the four key Te Taki Haruru values as a framework to integrate a mana whenua perspective into the assessment criteria, aligning the analysis with that of the risk assessment. This enabled continuity for assessing how well each proposed option mitigates the risks identified in this report.

Conclusion

Analysis in the risk assessment shows that South Dunedin has high exposure to natural hazards and a correspondingly high baseline risk profile. Anticipated changes in climate and associated increases in exposure to natural hazards are expected to materially increase risk across all elements assessed in the risk assessment. As this exposure and direct physical risk increases, the adverse consequences for South Dunedin's buildings, infrastructure, and communities also increase to a point where much of the key infrastructure, functions, and services experience declining functionality, loss of service, or complete failure. These risks will have significant adverse effects on the South Dunedin community, Dunedin city, and the economy unless appropriate risk mitigation is employed.

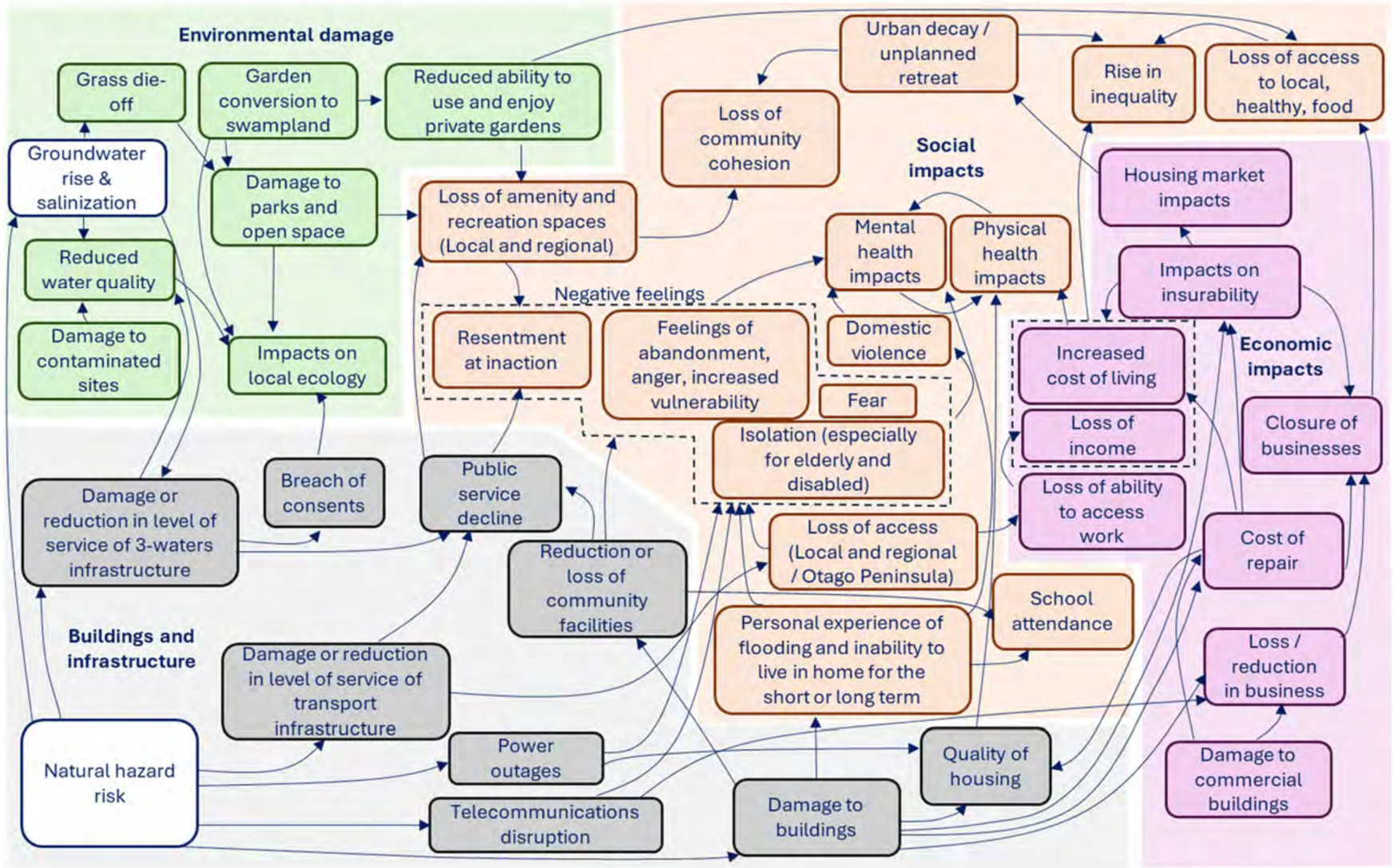


Figure E-3. Overview of cascading risk arising from natural hazard and climate change risk to South Dunedin (colour scheme: grey = buildings and infrastructure damage and impacts, orange = social impacts, purple = economic impacts, green=environmental damage)

1 INTRODUCTION

South Dunedin is exposed to a range of hazards, many of which are expected to increase with the effects of climate change. South Dunedin is also home to more than 13,000 people and it is a vibrant and important part of Dunedin City.

The South Dunedin Future (SDF) programme is underway to enable South Dunedin to prepare for, and adapt to, the impacts of climate change, while also realising the opportunities that come with change. The strategic objectives are presented in Section 1.1. The programme includes the suburbs of South Dunedin, St Kilda North and St Kilda South, parts of St Clair, Caversham, Tainui, and Musselburgh, shown in Figure 1.1[9].

South Dunedin comprises a large area of flat land close to the city centre. In particular, it is centred around the low-lying flat area to the south of Dunedin's CBD which is built on a former tidal wetland, termed 'The Flat'[10]. The physical characteristics of South Dunedin include its flat, low-lying topography, poorly consolidated underlying sediments, proximity to the ocean and harbour, and shallow groundwater. Land-use is primarily residential, commercial and industrial. The area contains key transport networks and a range of important city services and amenities. As such, it plays a key role in the functioning of the wider city, and it will feature prominently in considerations of Dunedin's future growth and development.

This document presents the findings of the South Dunedin Climate Change and Natural Hazard Risk Assessment at the present day, mid-term (2060-2070) and long term (2100) timeframes under mid-end climate change scenarios (SSP2-4.5) and high-end climate change scenarios (SSP5-8.5).

A parallel Mana Whenua Risk Assessment within the SDF programme has explored their risks to people, places, and assets due to climate change. This parallel assessment provides a key contribution to the overall programme to allow for adaptation responses to be made in partnership with mana whenua. This is important because mana whenua are generally considered more likely to be disproportionately affected by climate change (Ministry for the Environment, 2020). The summary findings from the Mana Whenua Risk Assessment are noted in various sections of this report and are included in Appendix D. Further work will be undertaken to integrate findings from the Mana Whenua Risk Assessment into adaptation planning for South Dunedin. .

This risk assessment focused only on South Dunedin; discussion of regional risks is covered in the Otago Regional Climate Change Risk Assessment (Tonkin and Taylor, 2021), and discussion of national scale and international risks is covered in the National Climate Change Risk Assessment (Ministry for the Environment, 2020).

[9] Note that the time of writing this report, the South Dunedin Future adaptation options are being developed for South Dunedin Programme area excluding the St Clair to St Kilda Coastal area.
[10] https://www.orc.govt.nz/get-involved/projects-in-your-area/south-dunedin/a-reclaimed-history/

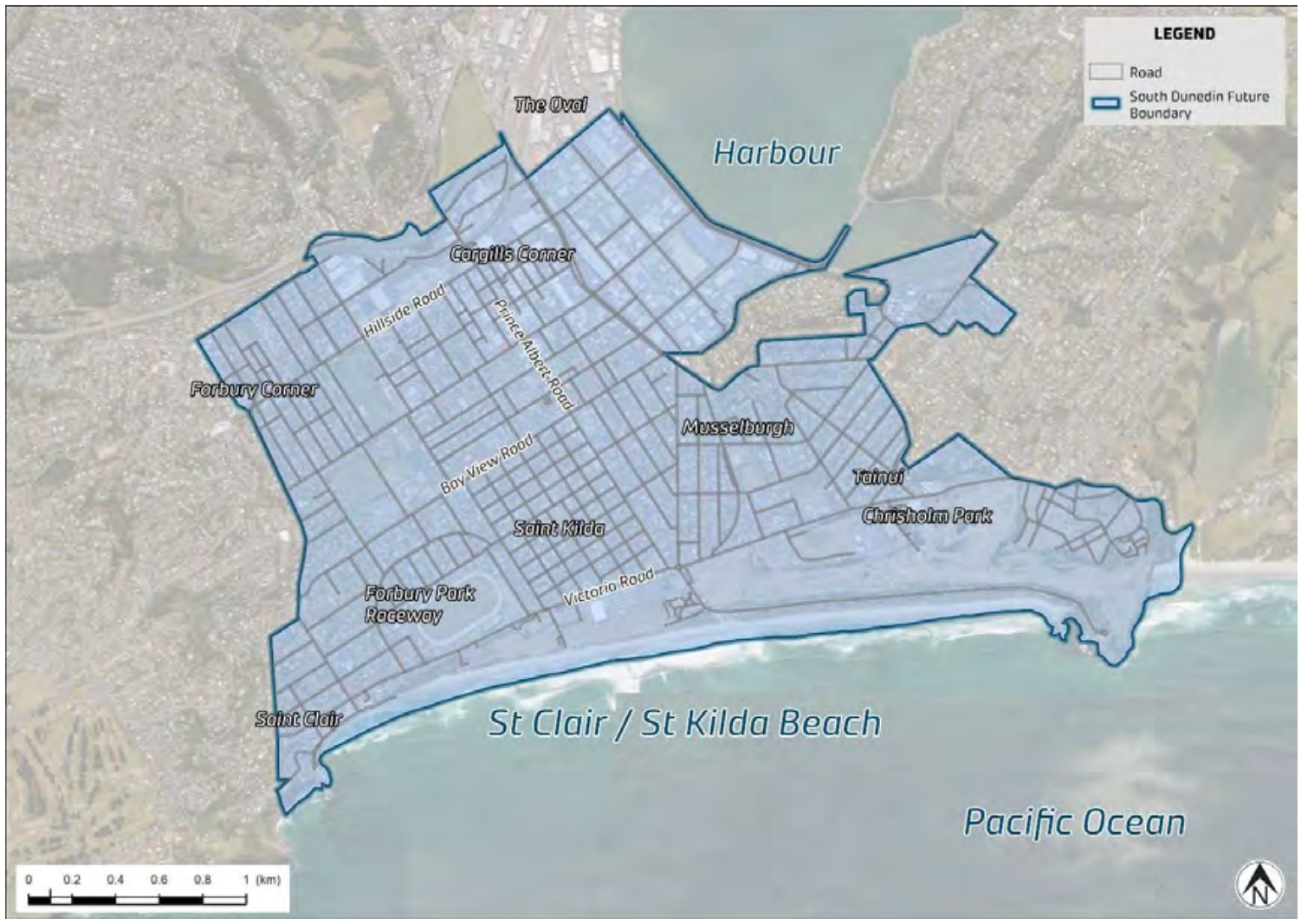


Figure 1.1. South Dunedin Future programme focus area

1.1 STRATEGIC OBJECTIVES OF THE SOUTH DUNEDIN FUTURE PROGRAMME

The Strategic Operational Objectives of the South Dunedin Future (SDF) Programme are displayed in (Figure 1.2) and include the Vision, Purpose and specific objectives related to outcomes that are sought for South Dunedin (programme focus area shown in Figure 1.1). The SDF Strategic Objectives guide the risk assessment.

Strategic Objectives					
	<u>Vision:</u> A safer and better South Dunedin, where sustainable urban regeneration leads to improved community resilience and wellbeing.				
	<u>Purpose:</u> To enable South Dunedin to prepare for, and adapt to, the impacts of climate change, while also realising the opportunities that come with change.				
	Just transition Respond to climate change in ways that empower communities and promote fairness and equity.	**Community safety** Promote community safety in South Dunedin by reducing flood and other risks, despite increasing natural hazards	**Environmental & cultural restoration** Restore and regenerate natural environments, renew urban spaces, and re-energise cultural connections to place.	**Social & economic resilience** Strengthen communities and businesses so they are well-prepared for floods and other hazards, better able to cope and recover.	**Sustainable urban development** Urban development accounts for the changing environment, providing better spaces for people, water and wildlife.

Figure 1.2. SDF Strategic Objectives

2 REPORT CONTEXT

This section of the report provides a summary of important contextual information for the risk assessment. It includes identification of the assessment purpose, aims and output requirements. It also identifies who the report is intended for (i.e. the audience), and some principles that were established to support progress whilst recognising important uncertainties and limitations, particularly regarding input data.

Some additional background information, not included in the summarised version of this section, is provided in Appendix A.

2.1 PURPOSE & AIMS OF THE RISK ASSESSMENT

The **purpose** of the Risk Assessment is to "*assess the potential for elements at risk (people, places, assets) to be negatively affected by pluvial flood, coastal (inundation and erosion), groundwater, landslide and liquefaction natural hazards in South Dunedin*".[11] This is an important component for achieving the SDF Strategic Operational Objectives because it identifies what may happen if nothing is done. It also provides a framework for the future efficacy assessment of adaptation options.

In order to meet this purpose, there are two **aims** for the risk assessment component of the SDF programme:

1 Outline the "case for change" in response to current and increasing natural hazard risks
The risk assessment outlines the "case for change" by providing an overview of natural hazard risks drawing together the results and conclusions from the spatial risk assessment. The risk baseline can be used to illustrate the implications of a 'status quo' or 'do nothing new' option. It also identifies and discusses non-spatial risks and their potential impacts. These impacts relate strongly to the Strategic Objectives of the SDF programme, particularly posing risks to social and economic resilience, and environmental and cultural restoration. This will identify what may occur if South Dunedin does not adapt, which is a critical component of the case for change.

2 Support spatial adaptation planning
The risk assessment supports spatial adaptation planning aim by providing a spatial representation of risk to twelve *elements at risk* for a range of timeframes and climate scenarios[12]. This helps to:

- Inform *where* adaptation is required to reduce risk.
- Identify how risk profiles change over time, which informs *when* adaptation may be required.
- Identify *key features* as these are the features that are most likely to influence *what type* of adaptation options are most appropriate for different areas (e.g. residential buildings are a key feature and their location in some areas will influence the choice of adaptation option).
- Establish a risk baseline against which potential risk mitigations can be assessed through the adaptation planning workstream.

[11] This purpose is stated in the RFP and has been adopted in the Risk Identification Report, noting that the terminology 'things of value' is changed to 'elements at risk'.
[12] Timeframes and climate scenarios are discussed in Section 3.2.6.

2.2 RISK ASSESSMENT STAKEHOLDERS

The primary stakeholder for risk-related information to support spatial adaptation planning are those involved in developing the adaptation response (i.e. SDF programme Workstream 4). Therefore, the risk assessment methodology, and information outputs were primarily guided by the needs of SDF Workstream 4.

It is also acknowledged that the case for change has a wide range of stakeholders who can draw on the risk assessment results for general adaptation and development decision-making purposes. These stakeholders include Councillors, asset owners and the broader 'community'.

Additional information regarding the programme stakeholders and partners can be found in the South Dunedin Future Communications and Engagement Strategy (Kia Ropine, 2024).

2.3 RISK ASSESSMENT OUTPUTS

The risk assessment outputs have been identified through a three-stage process which is shown in Figure 2.1 (i.e. this report is the culmination of Stage 3).

In collaboration with the adaptation response workstream, the following outputs have been identified by the process:

- Identification of key features within each element at risk.
- Assessment of exposure to the hazards for each 'element at risk'.
- Assessment of vulnerability of each 'element at risk' to the hazards.
- Assessment of risk based on the exposure and vulnerability assessments.
- Presentation of spatial mapping of risk, where outputs are presented by hazard and by element.
- Documentation to support the spatial data which identifies the impacts arising from risks to key features.
- Description of the impacts and presentation of relevant supporting spatial data where available.

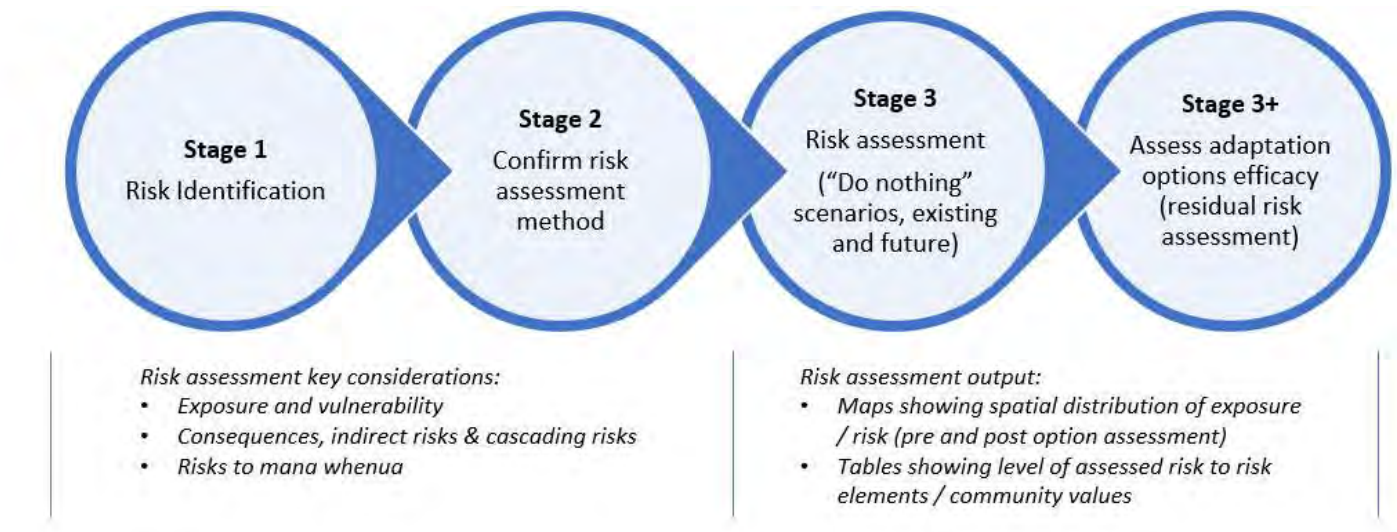


Figure 2.1 Risk assessment stages, considerations and high level outputs

Further information regarding the Stage 1 and Stage 2 aspects of the risk assessment process can be found in Appendix A. This report supersedes previous reports.

Stage 3+ provides an assessment of efficacy of adaptation options against the baseline risk assessment documented in this report. Stage 3+ is not covered in this report.

2.3.1 GEOSPATIAL DATABASE

The results of the spatial risk assessment have been compiled into a geospatial database which has been provided to DCC and ORC alongside this report. The database holds spatial files relating to each element at risk with metadata holding risk ratings and some supporting information (e.g. identification of key features) (Refer to Appendix E for a summary of geospatial files). Some of the geospatial information is reproduced in figures contained within this report, and it has been used to analyse and interpret the risk assessment results.

2.4 PRINCIPLES

Risk assessments are inherently carried out in an imperfect environment, where limitations of data availability, data quality, budget and timeframes influence the outcomes of the risk assessment. To support decision making for the risk assessment, the following principles are adopted, and are particularly important because they have underpinned progress for the risk assessment:

- Make best use of available data.
- Ensure effort is proportionate to outcome.
- Identify risks and opportunities arising from the above including recommendations for additional studies where necessary.

2.5 UNCERTAINTY AND LIMITATIONS

There are inherent limitations and sources of uncertainty regarding the risk assessment, due to the scope, scale, and complexity of what it needs to cover. Additionally, data gaps relating to exposure, hazard and element/asset vulnerability introduce limitations and sources of uncertainty. This report is intended to transparently document what has been done. It is beyond the scope of this report to record all the limitations, uncertainties and project risk management decisions which have been discussed and agreed with the project sponsors (DCC and ORC) and wider project stakeholder group. As appropriate, attention is drawn throughout this document to key limitations or assumptions, particularly where the outcomes of the programme could be affected. There is also additional information provided through the Appendices that help support some of the summarised text throughout the main body of this report.

Importantly, the risk assessment is intended to support suburb-level adaptation planning, including dialogue with affected stakeholders about the options for mitigating and adapting to identified risks. The risk assessment is not intended to provide a detailed property-level assessment of risk and using the report in this way could lead to false or misleading conclusions (e.g. high risk areas may include low risk properties, or the reverse).

This risk assessment involved incorporating current spatial hazard and asset data, knowledge and research available at the time, augmented by stakeholders and subject matter experts with knowledge of South Dunedin using the principles of the assessment (Section 2). This baseline risk assessment does not consider:

- Socio-economic projections: i.e. present day social demographic and economic profile is considered when evaluating risk under all scenarios.

- New adaptation measures (also referred to as mitigation measures or risk treatment). However, the risk assessment does assume that business as usual maintenance and renewals programmes continue.
- Transition risks: i.e. risks associated with societal and economic shifts toward a low-carbon future.

Changes in our future climate are dependent on atmospheric greenhouse gas concentrations. These concentrations are dependent on global efforts as well as local efforts to reduce greenhouse gas emissions, all of which are subject to socio-political influence. Potential greenhouse gas concentrations and the associated uncertainty is captured through the development of future emissions scenarios (detailed in Section 3.2.6). Between these scenarios, there is a comparatively narrow range of uncertainty in the near term, where the range in projected greenhouse gas concentrations is relatively small between scenarios. However, uncertainty increases for longer-term planning horizons, where the range in projected greenhouse gas concentrations increases significantly between scenarios over time.

There is a wide range of limitations and uncertainties for each of the asset classes, hazard types and vulnerability classifications. The limitations and assumptions applied in this assessment could lead to the under- or over-estimation of risk presented in this report. The reader is referred to the respective reports for a full understanding of the key input data and limitations. A number of key limitations are identified below:

- Many of the inputs used to inform this study are of a high-level nature and have a number of limitations associated with them. Notably the findings of this risk assessment should not be used for detailed, property and infrastructure specific risk.
- Risk to assets is assigned at the parcel scale (i.e. land parcel, road section, pipe section). This means that if any part of the parcel is exposed to a hazard, risk is assigned to the whole parcel. In some cases, particularly for larger parcels, this means that large areas are assessed as being at risk despite a relatively small proportion of the parcel actually being exposed.
- Coastal inundation modelling is based on a 'bathtub' approach that assumes inundation of all areas lower than the calculated extreme sea level (while also assuming no connectivity/permeability of the raised land/dune systems within the proximity of the coast). This may be conservative (i.e. result in higher risk) as it does not account for the time varying nature of a storm event (i.e. when modelled to represent the time limited nature of a storm event, the level may be lower). It also does not account for any potential influence of permeability of the dunes or connectivity of the raised land around Andersons Bay Road area and therefore may underestimate the inundation potential. Further investigations would be required to determine a higher degree of confidence in coastal inundation extent and / or depths (refer Appendix B1 for further information).
- The coastal erosion assessment is based on a district scale screening assessment and therefore may not be fully reflective of localised coastal environments, particularly where there have been engineering interventions (e.g. seawalls). Accordingly, the Coastal Erosion risk assessment at this stage of the South Dunedin Future Programme is not being used to inform adaptation planning along St Clair-St Kilda. More detailed South Dunedin specific coastal erosion modelling of the St –lair - St Kilda coastline is underway as part of the St Clair-St Kilda Coastal Plan, (refer Appendix B1). This will be completed in late-2025, after which coastal erosion risk ratings will be reviewed.

- The landslide hazard assessments do not currently allow for climate change influences of groundwater level rising or increased rainfall intensity (refer Appendix B1 for further information). The landslide extent is based on known landslide areas and does not account for other potential sources of landslide nor represent the extent of the area of deposition/runout. It also does not account for future changes in landuse or human activity that could trigger landslides.
- Liquefaction potential mapping does not reflect the known high level of variability across the area (Hornblow, 2020), for which a suitable spatially mapped dataset is not available. The liquefaction hazard assessment has not considered the influence of raised groundwater levels as a result of climate change (refer Appendix B1 for further information).
- Spatial vulnerability data for all elements at risk is generally unavailable, with a few exceptions (this exception relates to three waters infrastructure which uses physical characteristics of the pipe network to establish asset vulnerability to some hazards). Therefore, vulnerability information has been gathered through elicitation with relevant subject matter experts (refer Appendix C for further information).
- Building floor level information is sourced from observation-based estimates carried out by DCC in late 2024. Refer Appendix C1 for further information.

3 RISK ASSESSMENT APPROACH

3.1 CONCEPTUAL RISK FRAMEWORK

The conceptual risk framework selected for the South Dunedin risk assessment considers risk arising from three components:

- Hazards (which can be physical events or trends, such as sea-level rise or seasonal climate changes).
- The degree to which *elements at risk* are exposed to the hazard. This includes peoples' interactions with the elements at risk, whether they are living, working or visiting South Dunedin
- Elements at risk and their vulnerability to the effects of hazards, including effects on people.

The framework is presented in Figure 3.1 and definitions and interpretations of the terms are provided in the glossary for the purposes of this risk assessment.

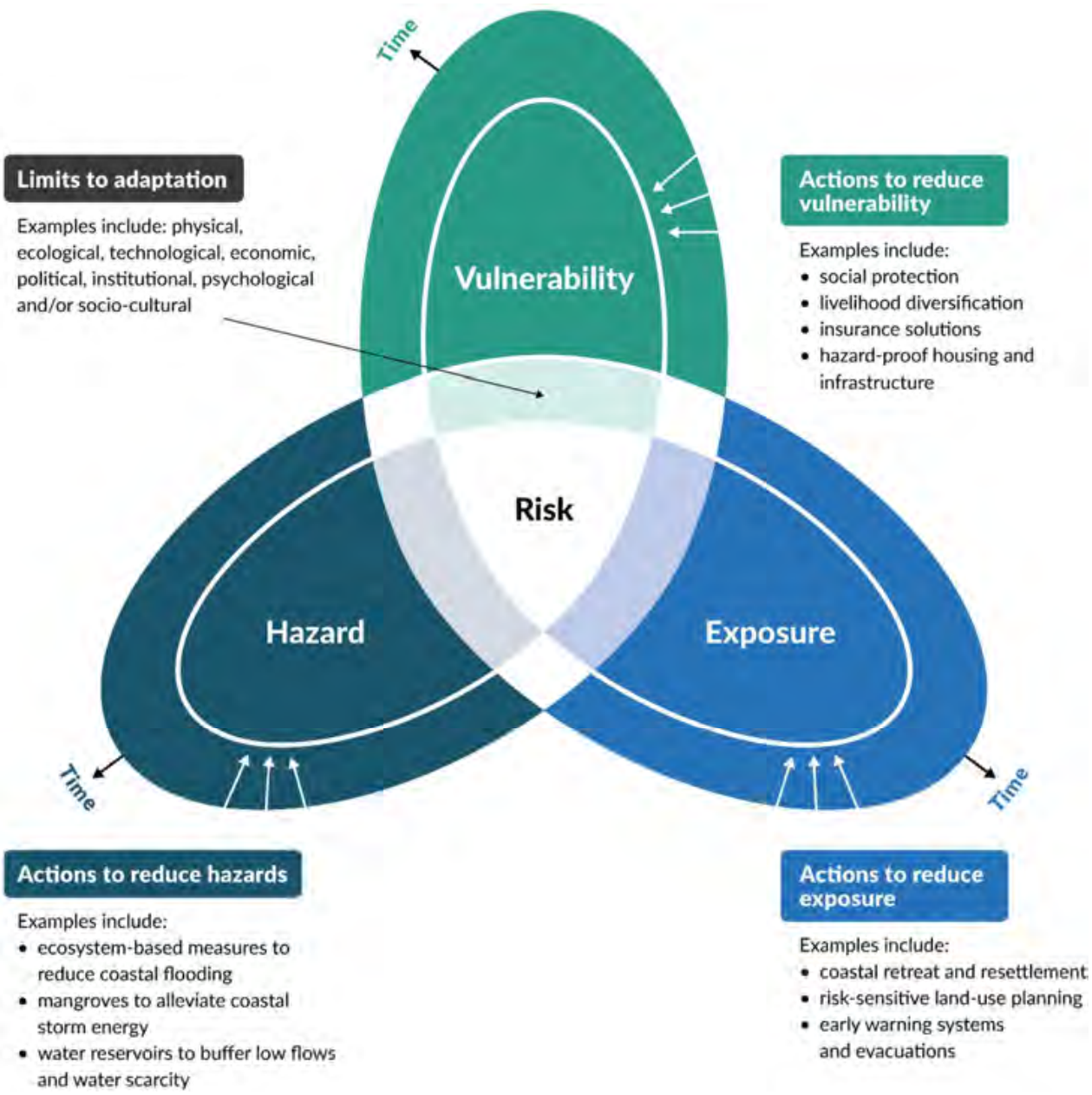


Figure 3.1 Conceptual risk framework used for this assessment (reproduced from MfE (2024)[13])

[13] Adapted from Garschagen et al 2019 https://doi.org/10.1016/j.crm.2021.100357.

Note: actions to reduce the hazards, exposure and vulnerability are not included in this risk assessment report.

Importantly, there are many social, economic, environmental and cultural impacts which are not directly caused by the hazard. For this reason, the risk assessment approach considers:

- Physical risk (also termed 'direct risks') i.e. through contact with the hazard/s.
- Impacts (also termed 'consequences, indirect risks, and cascading risks') i.e. an upstream or downstream consequence of the hazard/s.

The framework aligns with MfE (Ministry for the Environment, 2024) and IPCC guidance (Reisinger, et. al, 2020). This approach was chosen as it is tailored to address the unique and complex nature of climate risks while also being well suited to assess the influence of adaptation actions on risk. It is also aligned with the principles of the approach described in APP6 of the proposed Otago Regional Policy Statement (pORPS) (i.e. a risk assessment based on consideration of event likelihood and consequences) (Otago Regional Council, 2022) although adjustments were required to reflect the needs of the risk assessment for the South Dunedin Future programme. The pORPS methodology has been modified to allow specific assessments for the different elements at risk whereas the scale in the consequence classification of the RPS is designed to be applied over broad areas and is not directly applicable to specific assets. The adjustments are related to the definitions of likelihood, to the description of the consequences and to the risk rating scale. These adjustments are detailed in the following sections where relevant.

3.2 HAZARDS, SCENARIOS AND TIMEFRAMES

The following information provides a description of the key hazards (i.e. one of the three components of the risk framework), the availability of hazard data and spatial mapping of the hazard data.

Additional information regarding the hazards, exposure and vulnerability is provided in Appendix B (e.g. includes data availability, materiality/assumptions, data gaps, data sources, exposure criteria, Spatial definition). It is important to understand that hazard data used in the risk assessment is based on modelled results and are subject to limitations as discussed further in Section 2.5.

3.2.1 KEY HAZARDS

An overview of the key hazards facing South Dunedin included in SDF programme are described in Table 3-1. Further detail regarding hazards is included in the Risk Identification Report (Kia Ropine, 2023), which includes references to the numerous detailed hazard assessments which have been carried out in the South Dunedin area.

Table 3-1 Key hazards facing South Dunedin

Hazard	Description of hazard
Pluvial flooding	South Dunedin is prone to rainfall induced flooding. The area has no major watercourses or natural connection to the coast. All stormwater is piped and discharged into the harbour via the Portobello Stormwater Pump Station (Otago Regional Council, 2016). The South Dunedin Future Programme Area comprises the stormwater catchment of South Dunedin, with parts of St Clair, and Portsmouth Drive. Stormwater runoff from the wider St Clair catchment discharges into South Dunedin (DCC, 2011).

Hazard	Description of hazard
	South Dunedin has experienced severe flooding on numerous occasions (1923, 1929, 1960, 2015, 2018, and 2024). With climate change, extreme rainfall events are projected to become more severe. The hydrodynamic flood model of South Dunedin has recently been updated (Beca, 2024). Amongst the updates is additional consideration regarding the influence of groundwater on pluvial flooding for existing and future scenarios. Results show modelled flooding extents throughout much of South Dunedin Figure 3.5. This broadly aligns with experiences of the recent October 2024 flood event that caused widespread flooding and damage to buildings within South Dunedin. Preliminary review (led by DCC) of this event shows broad alignment between the modelled results and actual flood extents, however further investigation is underway. In parts of South Dunedin, rising sea levels will drive an increase in the ordinarily very shallow groundwater table. Areas with emergent groundwater (levels permanently at the surface) may begin to emerge in the near future and become more defined and widespread over time. This is likely to be problematic in itself, but is also likely to exacerbate the extent and severity of pluvial flooding. Modelling of future scenarios shows the extent and frequency of pluvial flooding will increase in response to climate change and associated increases in sea level, groundwater, and rainfall intensity Figure 3.5.
Coastal inundation (includes sea level rise)	South Dunedin is positioned between two major water bodies: The Otago Harbour (to the north), and the Pacific Ocean (St Clair and St Kilda beaches) to the south. This position means South Dunedin is potentially exposed to hazards from two coastal sources. Sea level rise (SLR) is projected to occur as a result of increased atmospheric and oceanic warming, the rate of this increase is uncertain (discussed further in Section 2.5). The influence of vertical land movement (VLM) at the coast is accounted for by representing sea level rise relative to land movement. Relative sea level (RSLR) rise is considered in this assessment by inclusion of vertical land movement estimates taken from NZ SeaRise (NZ SeaRise, 2022). Previous work has modelled the potential coastal inundation extent of South Dunedin under a range of return events and sea level rise increments (Paulik, et al., 2023). Under these scenarios coastal inundation of South Dunedin occurs via inundation from the Harbour once sea level rise drives storm surge to overtop the reclaimed land along on the Otago Harbour backshore (occurs with approximately 0.6 m RSLR in the 1% annual exceedance probability (AEP) event, as shown in Figure 3.3). These models have a number of limitations discussed in Section 2.5. Under these scenarios, the St Clair and St Kilda dune system continues to provide protection from inundation of South Dunedin arising from the Pacific Ocean. Inundation of South Dunedin arising from the Pacific Ocean would require a breach of the St Clair/St Kilda dunes. The conditions required for this are currently unknown. However, this work is planned for 2025. Modelling of associated coastal inundation arising from a dune breach is not currently procured. Sea level rise will drive corresponding increases in mean high water springs (MHWS). Modelling of MHWS (WSP, 2024) shows parts of inland South Dunedin are lower than MWHS at present day. The potential for tidal inundation of inland South Dunedin as a result of SLR is dependent on hydraulic connectivity (e.g. through the stormwater network). DCC is in the process of installing flap gates on all outfalls, which is thought to effectively prevent sea water from being conveyed within the stormwater network. The extent of tidal inundation is limited to localised areas around Portsmouth Drive

Hazard	Description of hazard
	with 0.6 m RSLR. Beyond this, a direct overland connection between the coast and inland South Dunedin occurs with 1.5 m RSLR, after which point the South Dunedin area may become permanently tidal or inundated if flood water is not prevented from entering, drained or pumped.
Coastal erosion	The coastal erosion potential of Dunedin has been evaluated as part of the District Coastal Hazards Screening (WSP, 2024). This study is of a high-level nature and has a number of limitations associated with it, notably it should not be used for the assessment of the erosion hazard for individual properties and infrastructure (refer Section 2.5 for further details). Accordingly, the Coastal Erosion risk assessment at this stage the South Dunedin Future Programme is not being used to inform adaptation planning along St Clair-St Kilda. This indicates that coastal erosion risk is relatively low along the Otago Harbour coastline but higher along the St Kilda to St Clair dune system (Figure 3.2). Previous storm events have had significant erosion effects on coastal dunes and beaches and future events may continue to do so. Should the St Clair to St Kilda dune system diminish, its ability to provide a buffer against the coastal hazards will also reduce therefore increasing the likely exposure of people and property in South Dunedin to coastal hazards (Otago Regional Council, 2014). More detailed coastal hazard assessments are underway as part of the St Clair-St Kilda Coastal Plan, these will be completed in late-2025, after which coastal erosion risk ratings will be reviewed.
Groundwater	The groundwater table is usually very shallow within South Dunedin. In some areas groundwater levels are tidally influenced, where the tidal signal increases with proximity to the Pacific Ocean and Otago Harbour. Groundwater fluctuations are also dominated by short term rainfall variability. Increasing levels of salinity in groundwater approaching the coastal edge are detected, reflecting direct mixing of groundwater with inland flow from the ocean (Cox, et al., 2020). Groundwater has been found to be contaminated in some locations due to the former Dunedin Gasworks in the area (DCC, 2011). Present day groundwater and the influence of sea level rise on groundwater levels within South Dunedin has been assessed as part of previous work (Cox, et al., 2023). This shows that areas with chronic emergent groundwater (levels permanently at the surface) may begin to emerge in the next few decades and become more defined with approximately 0.5 m RSLR (Figure 3.4). These areas of chronic emergent groundwater are broadly constrained to three areas roughly skirting the perimeter of The Flat, with smaller increments of sea level rise but become increasingly widespread and connected over time (Cox, et al., 2023).
Landslide	Landslides are not a common issue in South Dunedin due to the flat topography although neighbouring hills are prone to shallow landslides after heavy rainfall. Landslide mapping shows potential land instability areas are generally confined to the hillsides at the edges of South Dunedin, with notable locations near Forbury Corner and Saint Clair (Figure 3.2 source: DCC Hazard database data provided for South Dunedin Future programme)[14]. Increased rainfall intensity associated with climate change is expected to result in increased landslide occurrence. The specific impact of climate change on landslides in South Dunedin has not yet been assessed.
Liquefaction	There are numerous potential earthquake sources that could cause shaking within South Dunedin. The Kaikorai Fault which runs through South Dunedin is potentially active and has an estimated average recurrence interval (ARI) of 22,000 years. Other

[14] DCC Hazard database data provided for South Dunedin Future programme.

Hazard	Description of hazard
	active faults in proximity to South Dunedin include Akatore Fault classified as a "definite active fault" with an estimated ARI of 1,700 years, and the Titri Fault classified as a "potentially active fault" with an estimated ARI of 19,000 years (Barrell, 2021). These faults have the potential to generate ground shaking of sufficient strength to cause surface rupture, liquefaction, and lateral spreading in susceptible soils. Hornblow (2020) conducted a site-specific assessment in South Dunedin which revealed considerable variability in liquefaction potential across the examined locations. For a 100-year return period design level of ground shaking, Liquefaction Severity Numbers (LSNs) were generally below 10, corresponding to indicative settlements of only a few centimetres (typically less than 40 mm). In contrast, a 2500-year return period design level of ground shaking produced LSNs generally below 25. This level of severity indicates predominantly minor liquefaction effects, with occasional sand boils and, in some cases, localised moderate to severe liquefaction that could result in settlements sufficient to cause structural damage. Spatial representation of the most recent site specific assessment of South Dunedin (Hornblow, 2020) is not available. Therefore, desktop assessment of liquefaction susceptibility data has been used (Barrell, 2014). This shows that liquefaction potential across South Dunedin is classified as moderate to high in areas classified as 'Domain C' (Figure 3.2). This reflects the geomorphic history of the area (shallow marine/estuarine with some reclaimed land) which entails a high likelihood of fine-grained soils and a shallow groundwater across the area (Barrell, 2014). This regional scale assessment may not be suitable to identify exposure at the local scale of South Dunedin. The influence of rising groundwater (associated with climate change induced sea level rise) on liquefaction potential has been assessed. The assessment showed that generally across the South Dunedin area an increase in groundwater level does not translate to a material increase in liquefaction risk. Minor to moderate sensitivity may exist at specific sites due to localised near-surface soil conditions (e.g. local surface fill or infilled channels), however it would not be practical to undertake a sufficient density of ground investigation across South Dunedin to be able to confidently delineate areas of higher sensitivity. Refer to T+T Report[15] for more information on the influence of groundwater on the liquefaction hazard in South Dunedin.

3.2.2 HAZARD DATA AND AVAILABILITY

The available data to support the spatial risk assessment is discussed in Appendix B. It includes a visual comparison of the spatial data availability for different timeframes and climate scenarios.

3.2.3 MAPPED HAZARDS

Spatial hazard extents of the key hazards used in the risk assessment are presented in the following figures:

- Figure 3.2 Coastal erosion extents (source: WSP (2024)), land instability (source: DCC Hazard database data provided for South Dunedin Future programme) and liquefaction (source: (Barrell, 2014)). There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures).

[15] Tonkin & Taylor Ltd (2025). South Dunedin Liquefaction Hazard. Data review and high-level groundwater sensitivity assessment.

More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

- Figure 3.3 Modelled coastal inundation extents within South Dunedin (Source: (Paulik, et al., 2023)
- Figure 3.4 Modelled emergent groundwater (groundwater level is at the surface) extents within South Dunedin under the following scenarios: median (50th percentile), mean high water springs (MHWS), extreme sea level (ESL), 95th percentile (source Cox, et al., (2023))
- Figure 3.5 Modelled pluvial flood extents within South Dunedin (source: Beca (2024))

Other Hazards

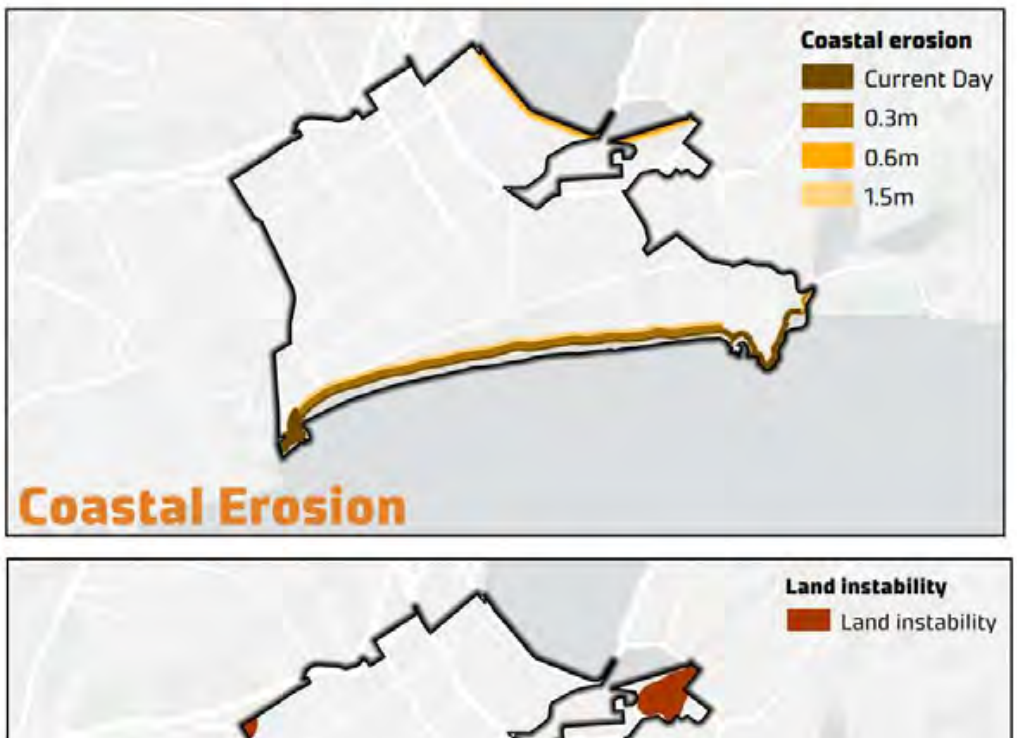


Figure 3.2 Coastal erosion extents (source: (WSP, 2024)), land instability (source: DCC Hazard database data provided for South Dunedin Future programme) and liquefaction (source: (Barrell, 2014)[16]

[16] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

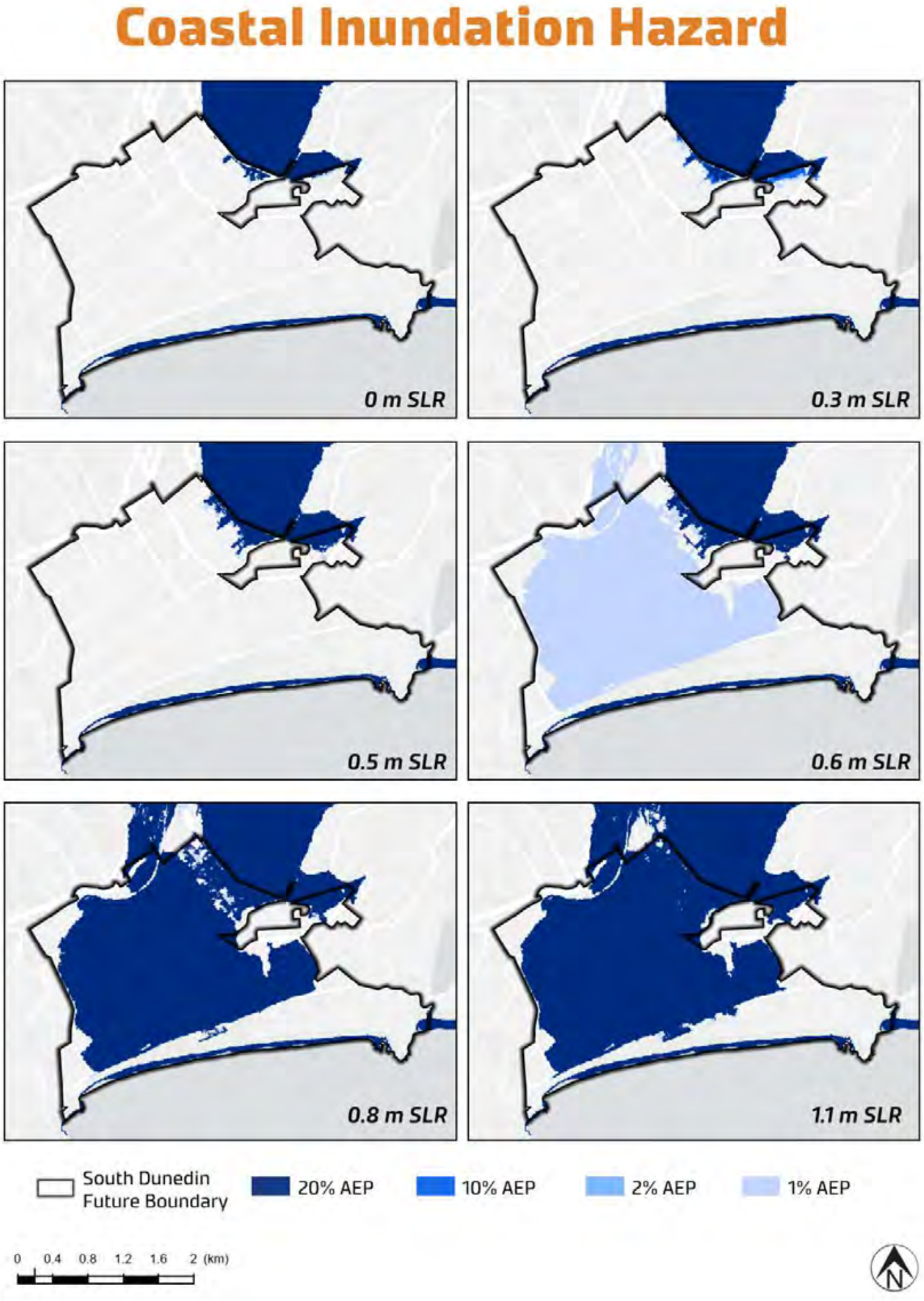


Figure 3.3 Modelled coastal inundation extents within South Dunedin (Paulik, et al., 2023)

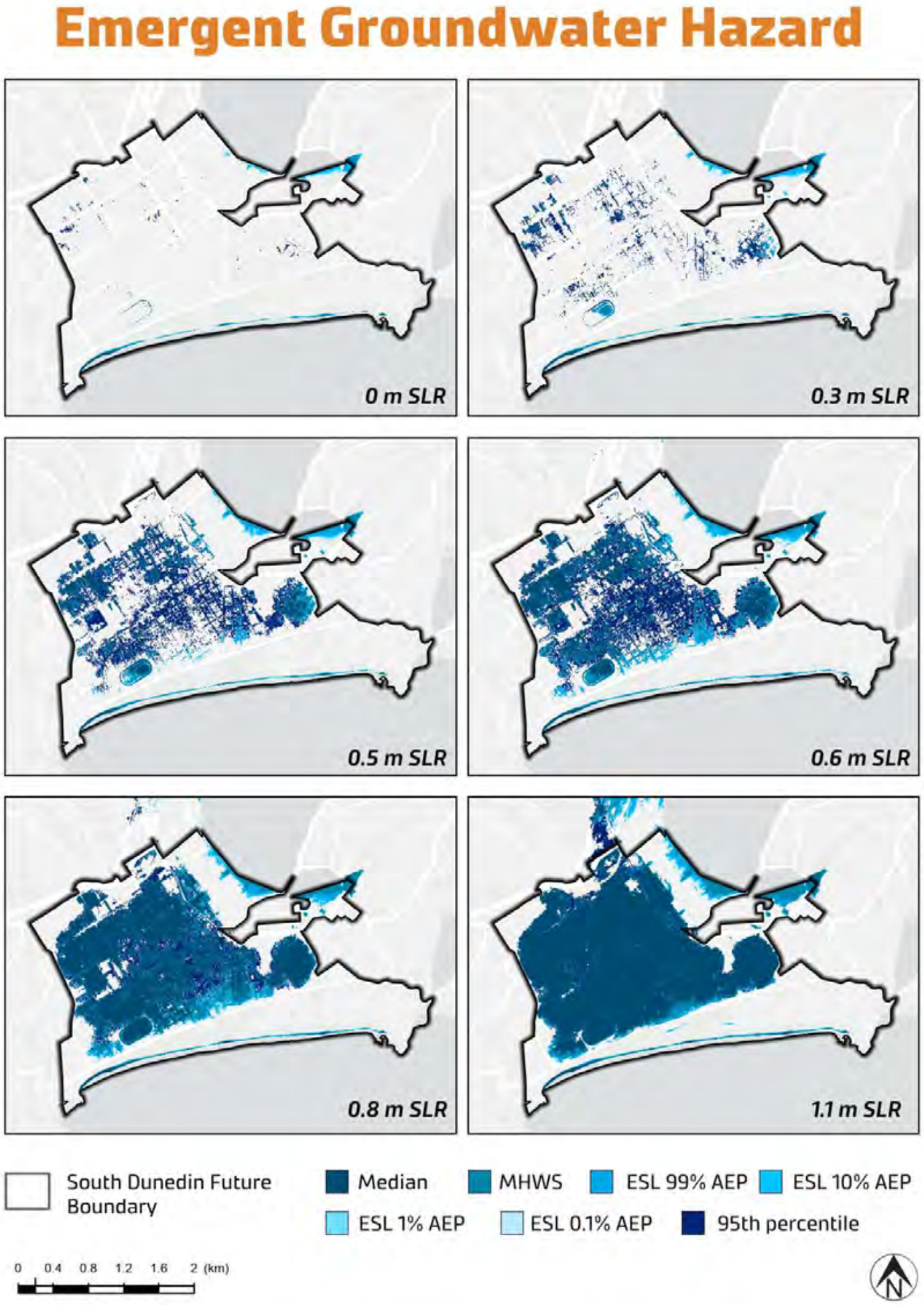


Figure 3.4 Modelled emergent groundwater (groundwater level is at the surface) extents within South Dunedin under the following scenarios: median (50th percentile), mean high water springs (MHWS), extreme sea level (ESL), 95th percentile (Cox, et al., 2023)

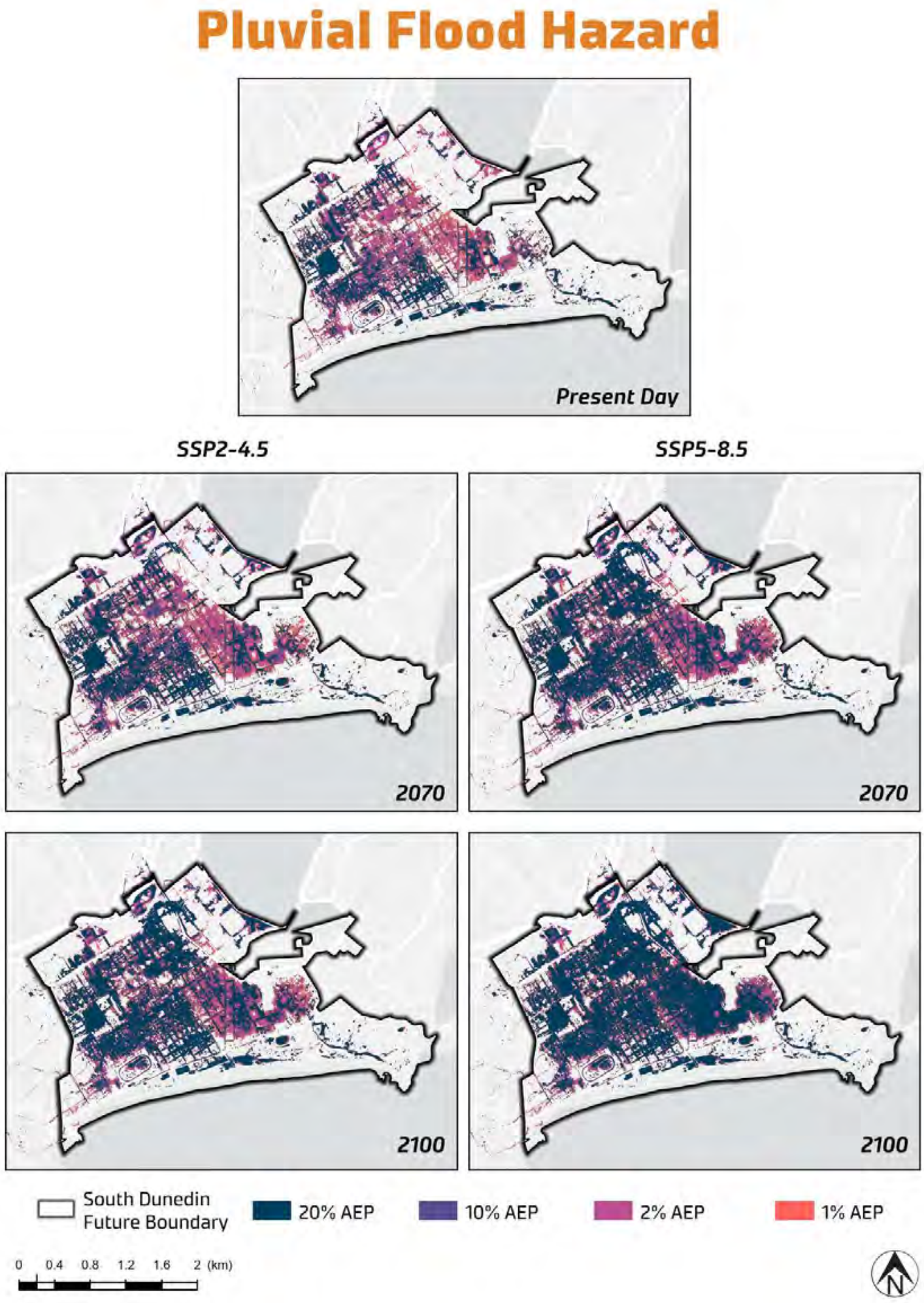


Figure 3.5 Modelled pluvial flood extents within South Dunedin (Beca, 2024)

3.2.4 COMPOUNDING HAZARDS AND INCLUSION OF THE EFFECTS OF CLIMATE CHANGE

Compounding hazards occur when a combination of hazards occur at the same time; for example, there is potential for coastal inundation and erosion, higher groundwater levels, and intense rainfall impacts to occur simultaneously. Where these hazards occur independently, joint probability analysis is required to determine the likelihood and scale of the compounding hazards. This is not generally available for all hazards within South Dunedin but in some instances compounding hazard information is available, as follows:

- Pluvial flood hazard modelling includes the influence of groundwater rise, increased rainfall intensity and Sea Level Rise due to climate change.
- Coastal inundation modelling includes Relative Sea Level Rise.
- Groundwater modelling includes Relative Sea Level Rise and pluvial flooding.

Where information is available it has been incorporated into the risk assessment. The following identified gaps relate to compounding hazards that will occur simultaneously (opposed to those that occur independently and are therefore subject to joint probability analysis such as pluvial flooding and coastal inundation). These identified compounding hazards have the potential to significantly increase the hazards facing South Dunedin:

- Coastal inundation modelling has no information regarding the likelihood of dune breach (erosion), or the influence of groundwater rise.
- Landslide does not include the effects of climate change (e.g. to identify whether these is increased landside potential associated with increasing rainfall intensity and rising groundwater).
- The liquefaction assessment does not include the effects of increased groundwater levels as a result of climate change.

3.2.5 HAZARDS NOT INCLUDED IN THE RISK ASSESSMENT

The following hazards have been excluded from the risk assessment:

- Temperature: out of scope of South Dunedin Future Programme.
- Tsunami: Not included on the grounds that available hazard extents associated with 1% AEP tsunami (NIWA, 2007) are smaller than those associated with a 1% AEP coastal inundation storm event. Therefore, no further benefit is expected from assessing Tsunami separately.
- Earthquake hazard (other than liquefaction): Not included on the grounds that earthquake risk is unlikely to drive adaptation options as the level of risk is similar across the wider Dunedin area. Risk mitigation measures to be included in all adaptation options where appropriate.

3.2.5.1 GROUND BEARING CAPACITY AND LAND SUBSIDENCE

Site specific ground stability and land subsidence have not been considered as part of the risk assessment. Noting that larger scale vertical land movement is included in this assessment through incorporation into relative sea level rise (Section 3.2.1). An awareness of site specific ground stability and land subsidence issues in South Dunedin is important for adaptation planning as these issues may strongly influence construction cost or engineering feasibility.

Much of the soils encountered in the Hornblow (2020) assessment of South Dunedin were plastic (i.e. moderately plastic silts or clays). These soils are soft and compressible and therefore only provide low bearing capacities with associated high rates of settlement for shallow foundations. This may pose a significant geotechnical challenge for development. Hornblow (2020) note significant areas in South Dunedin do not meet the definition of 'good ground' as per NZS3604:2011.

In addition to low bearing capacity, there are a number of areas within South Dunedin that are likely prone to land subsidence (Figure 3.6) This potential land subsidence is primarily related to the placement of fill and land reclamation.

Figure 3.6 Land subsidence and landslide (land movement) in South Dunedin (source: DCC Hazard database data provided for South Dunedin Future programme)

3.2.6 TIMEFRAMES AND CLIMATE SCENARIOS

Present day and future timeframes (also referred to as Planning Horizons) and their associated uncertain climate scenarios are used to represent the future hazardscape to inform the risk assessment and subsequent adaptation planning. Scenarios used in this risk assessment are in line with the recommended minimum shared socio-economic pathway (SSP) scenarios for risk assessments[17]:

- The 'Middle of the road' scenario, SSP2-4.5, assumes that the world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns. It assumes that warming reaches 2.7 ˚C by 2100 (Ministry for the Environment, 2024)

[17] Recommended scenarios as described in Table 9 from Coastal Hazards and Climate Change Guidance (Ministry for the Environment, 2024)

- The 'Fossil-fuelled development' scenario, SSP5-8.5, represents the high end of the range of future scenarios. It assumes that the world places increasing faith in competitive markets, innovation, and participatory societies to produce rapid technological progress and development of human capital as the path to sustainable development, with warming of more than 4˚C by 2100 (Ministry for the Environment, 2024).

The timeframes, climate scenarios and projected sea level rise increments used in this risk assessment are presented in Table 3-2. These values are based on projections and vertical land movement (VLM) estimates available at the time of assessment (January 2024, NZ SeaRise (2022)). Selection of the timeframes and climate scenarios were strongly influenced by available spatial hazard data and an aim to use consistent scenarios across all hazards.

Further information on the available spatial hazard data is presented in Appendix B.

Refer to Section 3.2.6.1 for specific discussion regarding coastal hazard scenarios and recent MfE guidance. Furthermore, additional information regarding uncertainty and limitations (including climate uncertainty) is provided in Section 2.5.

Table 3-2 Timeframes and climate scenarios

Timeframe	Date range[1]	Increment of sea level rise (m)[2]	
		Mid-range: SSP2-4.5	High end: SSP5-8.5 H+
Present day	2005-2023	0	0
Mid-term	2060-2070	0.3	0.5
Long term	2100	0.6	1.1

[1] Date ranges are presented as a range to reflect differences in 'present day' timeframes used in pluvial flood modelling, groundwater, and coastal hazard assessments (2024, 2023, and 2005 sea levels respectively) [18].

[2] H+ is the top of the likely range for the SSP5-8.5 scenario (83rd percentile), representing widening future deep uncertainties associated with SLR

3.2.6.1 COASTAL HAZARDS GUIDANCE DISCUSSION

Specific coastal hazard guidance released earlier this year (Ministry for the Environment, 2024) recommends consideration of hazards to 2150, using medium confidence climate scenarios. This includes consideration of high-end emissions scenario SSP5-8.5 H+ (the 83rd percentile) to provide an upper-bound of the likely range.

In the South Dunedin context, this scenario equates to Relative SLR of 2.31 m (NZ SeaRise, 2024) to 2150. This is 1.2 m higher than the high-end scenario that has been currently adopted to 2100. Coastal inundation levels are available up to 2.0 m for South Dunedin if a coastal-specific assessment needs to be carried out, however there is no other information available for other hazards for this timeframe and scenario (i.e. the intent to be consistent across the hazards for all timeframes/climate scenarios would not be possible).

[18] Sea level rise increments are presented as relative sea level rise at Kitchener Street (VLM of -0.44 mm/ year) from a baseline of approximately 2005 (1994-2014) as used widely in national projections (NZ SeaRise, 2022) and supported by coastal inundation extents (Paulik, et al., 2023).

Currently the risk assessment has not considered 2.31 m Relative SLR and it is recommended that further consideration of this scenario is given for stress testing adaptation pathways. This approach is in line with the MfE (2024) guidance:

"Scenarios are not 'predictions' but rather a description (narrative) of how different futures might unfold, and they can be used to stress-test adaptation options, dynamic adaptive pathways, plans or strategies. They can help inform the development of objectives and policies and inform the effectiveness (or otherwise) of risk management strategies, including any lock-in dependencies relying on a single type of option."

In addition, we highlight a major sea level rise 'tipping point' in South Dunedin with approximately 0.6 m RSLR, when widespread emergent groundwater is likely across South Dunedin and coastal inundation of inland South Dunedin is modelled to occur during the 1% AEP storm event.

3.2.7 HAZARD EXPOSURE WITHIN SOUTH DUNEDIN

South Dunedin is exposed to all of the key hazards to varying degrees, some of which change in extent over time. The extent of hazard exposure is an important factor in determining the risk to the people, places and assets in South Dunedin. Figure 3.7 shows the percentage of South Dunedin Future land area exposed to hazards, and how this changes over time under different climate change scenarios. This figure shows that the dominant hazard at present is pluvial flooding due to the 1% AEP event. Coastal inundation associated with the 1% AEP event exposes a significant proportion of South Dunedin with 0.6 m RSLR. At a similar timeframe, the extent of emergent groundwater under the median scenario also begins to increase. Pluvial flooding, emergent groundwater, and coastal inundation are modelled to cover extensive proportions of South Dunedin with 1.1 m RSLR. No future climate scenario information is available for landslide or liquefaction. Groundwater modelling scenarios are not available for RSLR increments greater than 1.1 m (adjusted to 2005 baseline timeframe). Figure 3.8 shows similar information by mapping the hazard extents for coastal erosion, coastal inundation, emergent groundwater, landslide, liquefaction, and pluvial flooding, over three timeframes and under one climate change scenario (SSP 5-8.5). Areas shaded in a darker blue indicate those areas that are exposed to more hazards. The map indicates that at the present day around half of South Dunedin is exposed to two or more hazards, particularly in The Flat. At mid-century areas that are exposed to three or more hazard are more dispersed throughout the study area, while at end of century the majority of South Dunedin will be exposed to four hazards.

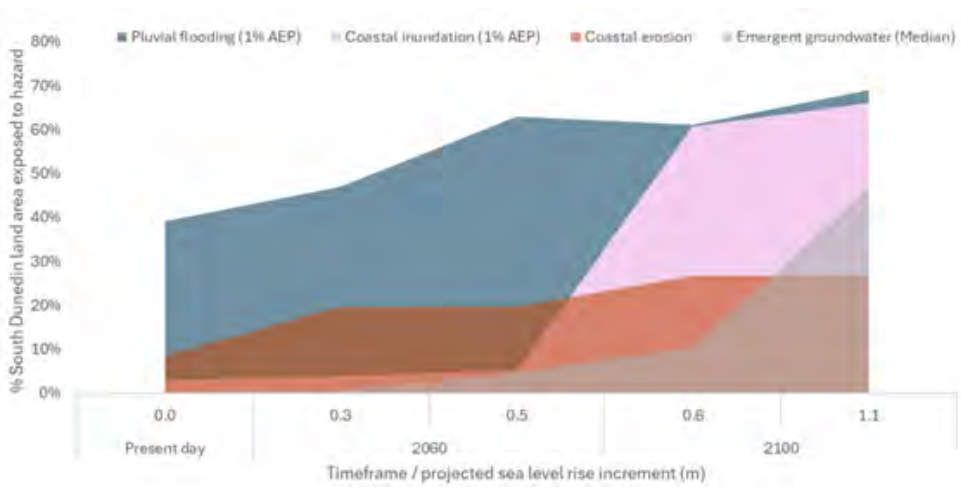


Figure 3.7 Percentage of South Dunedin Future land area exposed to hazards showing change over time under climate change scenarios (landslide and liquefaction hazards are excluded due to a lack of information regarding future timeframes).

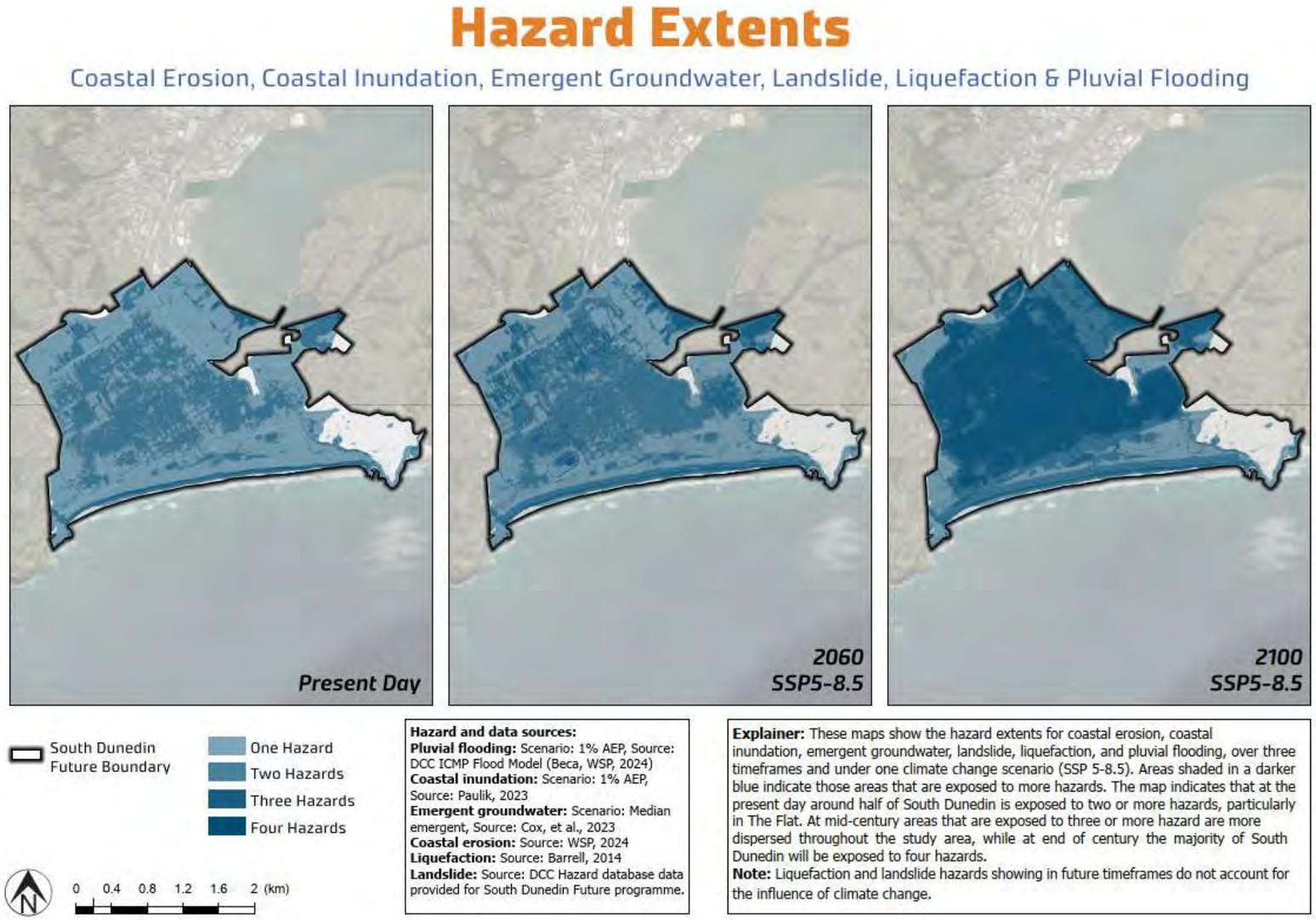


Figure 3.8 Exposure of South Dunedin Future area to coastal erosion, coastal inundation, emergent groundwater, landslide, liquefaction, and pluvial flooding hazards, over three timeframes under SSP 5-8.5 climate change scenario

3.3 EXPOSURE AND VULNERABILITY

The following information provides a description of the exposure and vulnerability components of the risk framework. They have been reported together because they both require an understanding of the 'elements at risk' in terms of how they are characterised. The exposure requires understanding of where the elements at risk are located (relative to the hazards), and the vulnerability indicates their propensity to be adversely affected.

3.3.1 ELEMENTS AT RISK

Through the 3-stage risk assessment process (refer Appendix A) the following 'elements at risk' have been identified in South Dunedin:

(1) Buildings.
(2) Parks and sports fields.
(3) Ecological areas.
(4) Roads and associated infrastructure.
(5) Rail infrastructure.
(6) Water supply infrastructure.
(7) Wastewater infrastructure.
(8) Stormwater infrastructure.
(9) Contaminated land.
(10) Telecommunication infrastructure.
(11) Energy infrastructure.
(12) Risks to mana whenua – part of a separate mana whenua risk assessment (key findings noted in this report).

Within each of the elements at risk, there are an array of key features (Table 3-3) which are typically the places or assets that characterise the element at risk and are also most likely to influence the adaptation planning pathway. Further details on element data used in the assessment is contained in Appendix B. Further discussion on the elements at risk and key features is provided in the risk assessment results (Section 5).

Risks to people are considered in relation to how they interact with the elements at risk identified above. This can arise through direct harm (physical or mental) to people living, working or visiting South Dunedin, or through impacts arising from damage or loss to the other elements.

Table 3-3 Elements at risk and associated key features

Element at risk	Key features
Buildings	• Residents and community members. • Residential buildings. • Non-residential buildings (inc. commercial, schools, churches, heritage buildings, rugby clubs and sports facilities). • Important or essential buildings (as identified by the community, also covering those identified in the pORPS (Otago Regional Council, 2022)).
Parks and sports fields	• St Clair - St Kilda beach.

Element at risk	Key features
	• Tahuna Park. • Marlow Park (especially the Dinosaur Playground). • Other parks & playgrounds. • Sports grounds (Bathgate Park, Tonga Park, West Kettle Park, Culling Park). • Caledonian gym and sporting facilities.
Ecological areas	No spatial data (i.e. no areas identified in the spatial plan). Qualitative discussion included.
Roads and associated infrastructure	• Identified by their criticality rating (vital to local). • Cycle lanes.
Rail	• Rail corridor. • Rail transport buildings.
Water	• Somerville Street Water Pumping Station. • Somerville Distribution mains (from treatment plant that feeds Somerville). • High criticality pipes.
Wastewater	• Musselburgh WW pump station. • Tahuna WWTP. • Marne St Pump station (overflow pump station which pumps to Musselburgh). • All flap gates. • High criticality pipes.
Stormwater	• Tainui SW pump station. • Portobello stormwater pump station. • Portobello Road Screens. • All flap gates. • High criticality pipes.
Contaminated land	• HAIL sites within industrial areas. • HAIL sites within residential areas. • Kettle Park (Ocean Beach Domain Landfills). • Gas Works.
Tele-communications infrastructure	• Exchange site.
Energy	• Transpower South Dunedin Substation. • Transpower: Transmission line.

Element at risk	Key features
	• Aurora Substations: Andersons Bay, Carisbrook, St Kilda. • Aurora 33kV Buried lines. • Aurora Overhead lines. • Genesis bulk LPG Facility.
Mana whenua	Assessed separately (refer Section 4)

3.3.2 EXPOSURE

Evaluation of exposure is carried out through a spatial assessment of asset locations relative to hazard extents, where those within a hazard extent are exposed. The exposure rating criteria used in the risk assessment is shown in the following tables: groundwater (Table 3-4), pluvial flooding (Table 3-5), coastal inundation (Table 3-6), coastal erosion (Table 3-7), landslide (Table 3-8), and liquefaction (Table 3-9). For most hazards, exposure rating thresholds are related to the likelihood of a hazard event occurring. These thresholds have been adapted from pORPS Risk Assessment Hazard likelihood scale[19]. Exposure is assessed under the present day, medium, and long-term timeframes, and mid-range and high-end climate change scenarios where hazards information is available to support this assessment. A single rating is applied to each land parcel or asset length. Additional information regarding the percentage of area or length exposed is recorded and has been used for some interpretation of data. Hazard extents and data sources are discussed in Section 3.2. Locations of assets are shown indicating asset specific risk rating in Section 3.4.3.

Table 3-4 Hazard exposure: groundwater

Exposure	Present day 0 m SLR	Medium-term 0.3, 0.5 m SLR	Long-term 0.6, 1.1 m SLR
Extreme	Median groundwater level: • All non-buried assets have extreme exposure to the median groundwater level as a default rating. Depth thresholds that determine the level of risk are recorded in the vulnerability rating. • All buried assets (three waters) have extreme exposure to the median groundwater level if their invert levels intersect with the groundwater level.		
Not exposed	Assets located outside the modelled hazard extent		

Table 3-5 Hazard exposure: pluvial flooding

Exposure	Present day	Medium-term	Long-term
Extreme	10% AEP current	10% AEP future (2060-2070)	10% AEP future (2100)
High	2% AEP current	2% AEP future (2060-2070)	2% AEP future (2100)
Moderate	1% AEP current	1% AEP future (2060-2070)	1% AEP future (2100)
No rating	Assets located outside the modelled hazard extent of the scenarios assessed		

[19] ORC (2021) Proposed Regional Policy Statement APP6 Methodology for natural hazard risk assessment Hazard likelihood (Table 6). This table has been adapted by adding a new class 'up to once every 10 years', and combining the 100-1000 and 1000-2500 year classes.

Table 3-6 Hazard exposure: coastal inundation

Exposure	Present day 0 m SLR	Medium-term 0.3, 0.5 m SLR	Long-term 0.6, 1.1 m SLR
Extreme	10% AEP current	10% AEP + SLR	10% AEP + SLR
High	2% AEP current	2% AEP + SLR	2% AEP + SLR
Moderate	1% AEP	1% AEP + SLR	1% AEP + SLR
No rating	Assets located outside the modelled hazard extent of the scenarios assessed		

Table 3-7 Hazard exposure: coastal erosion

Exposure	Present day 0 m SLR	Medium-term 0.3, 0.6 m SLR	Long-term 0.6, 1.5 m SLR
Extreme	Exposed	Exposed	Exposed
No rating	Assets located outside the modelled hazard extent	Assets located outside the modelled hazard extent	Assets located outside the modelled hazard extent

Table 3-8 Hazard exposure: landslide

Exposure	Present day	Medium-term	Long-term
Moderate	Exposed	No data therefore not assessed	No data therefore not assessed
No rating	Assets located outside the modelled hazard extent	No data therefore not assessed	No data therefore not assessed

Table 3-9 Hazard exposure: liquefaction

Exposure	Present day	Medium-term	Long-term
Low	Exposed	No data therefore not assessed	No data therefore not assessed
No rating	Assets located outside the assessed hazard extent	No data therefore not assessed	No data therefore not assessed

3.3.3 VULNERABILITY

The physical risk assessment is informed by people, place, or asset specific (i.e. elements at risk) vulnerability information, such as design, condition, and age. The availability and materiality of this information was tested with owners, managers and those responsible for the elements at risk. Vulnerability was rated qualitatively where necessary using input from with owners, managers and those responsible for the elements at risk and the rating guidance shown in Table 3-10 (discussed further in Appendix B5). Vulnerability ratings and supporting background information for each element at risk is documented in Appendix C.

Table 3-10. Example vulnerability attributes by hazard

Vulnerability	Description
Extreme	Sudden collapse or failure likely, causing potential risk to life. For example house/culvert collapse putting people's lives at risk.
High	High damage likely. Loss of service with lengthy time to restore to operation (months).
Moderate	Moderate damage likely or possible. Short to medium time to restore to operation (less than one month).
Low	Minor damage sustained although it does not impact the operation of the asset.
Very low	No damage or loss of service.

3.3.3.1 RISK TO RESIDENTS OF SOUTH DUNEDIN

The physical risk of harm to the residents of South Dunedin is presented through the relationship between risk to buildings and the social demographics of South Dunedin. Spatial data regarding people working and visiting South Dunedin was not available, however impacts on these people are discussed in Section 6.

3.3.3.1.1 Background

The population of South Dunedin is roughly 13,500[20], living within approximately 6,000 households in the area (Statistics NZ, 2018). The South Dunedin community is approximately 84% New Zealand European, 12% Māori, 7% Asian, 6% Pacific peoples, and 1% other. 4% of the population report a lot of difficulty walking and 1% cannot walk at all (Figure 3.9). Relative to Dunedin, the population is slightly older, with approximately 21% of the population over 65 year-olds (relative to 16% in Dunedin) but similar proportion of over 30-65 years of age (approximately 43%). In the younger age groups, South Dunedin has approximately 19% of the population within the ages of 15-29 years (relative to 26% in Dunedin) with around 17% of the population under 15 years age group (similar to Dunedin) (Figure 3.10).

The New Zealand Index of Social Deprivation provides one example of a measure of social vulnerability across communities. The Index rank's locations on a scale of decile 1 (least deprived) to decile 10 (most deprived) based on prescribed criteria by Statistical Area 1 using averaged data (Statistics NZ, 2018). Figure 3.11 shows that a large proportion of South Dunedin is classified as 'most deprived'. However, it is worth noting that there are also portions of South Dunedin that are decile 1 and 2 (richest 20% of New Zealand), particularly focused around the St Clair area. The median income for people in South Dunedin is $26,000 which is slightly higher when compared to the wider Dunedin area ($25,500). However, when considering those with an income of greater than $70,000, South Dunedin has a lower percentage with 9%, compared to the rest of Dunedin (14%).

[20] Population and demographic information is based on 2018 Census data as this was available at the time of analysis (June – December 2024).

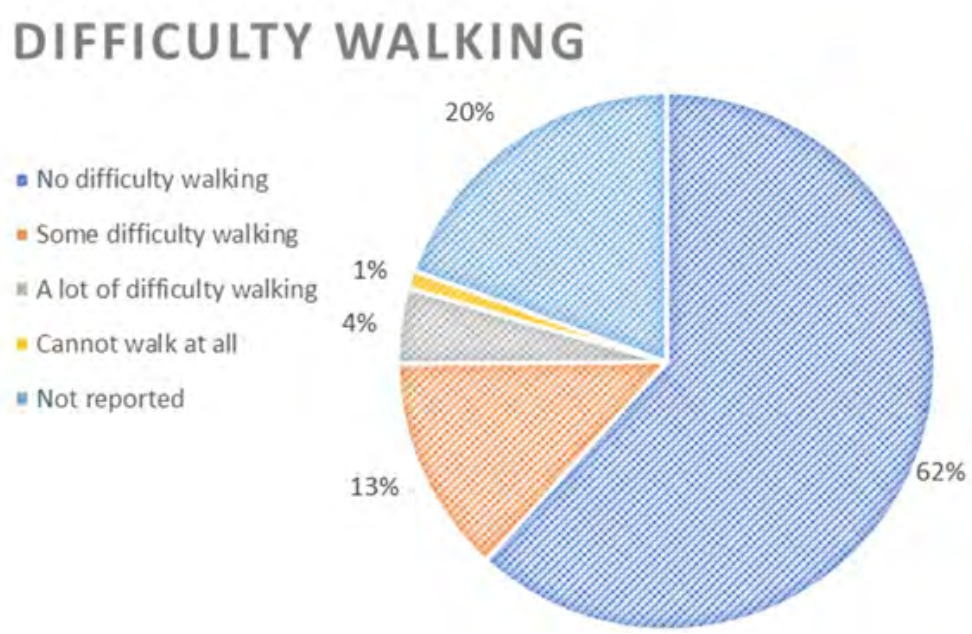


Figure 3.9 Proportion of population with a disability within South Dunedin (Statistics NZ, 2018)

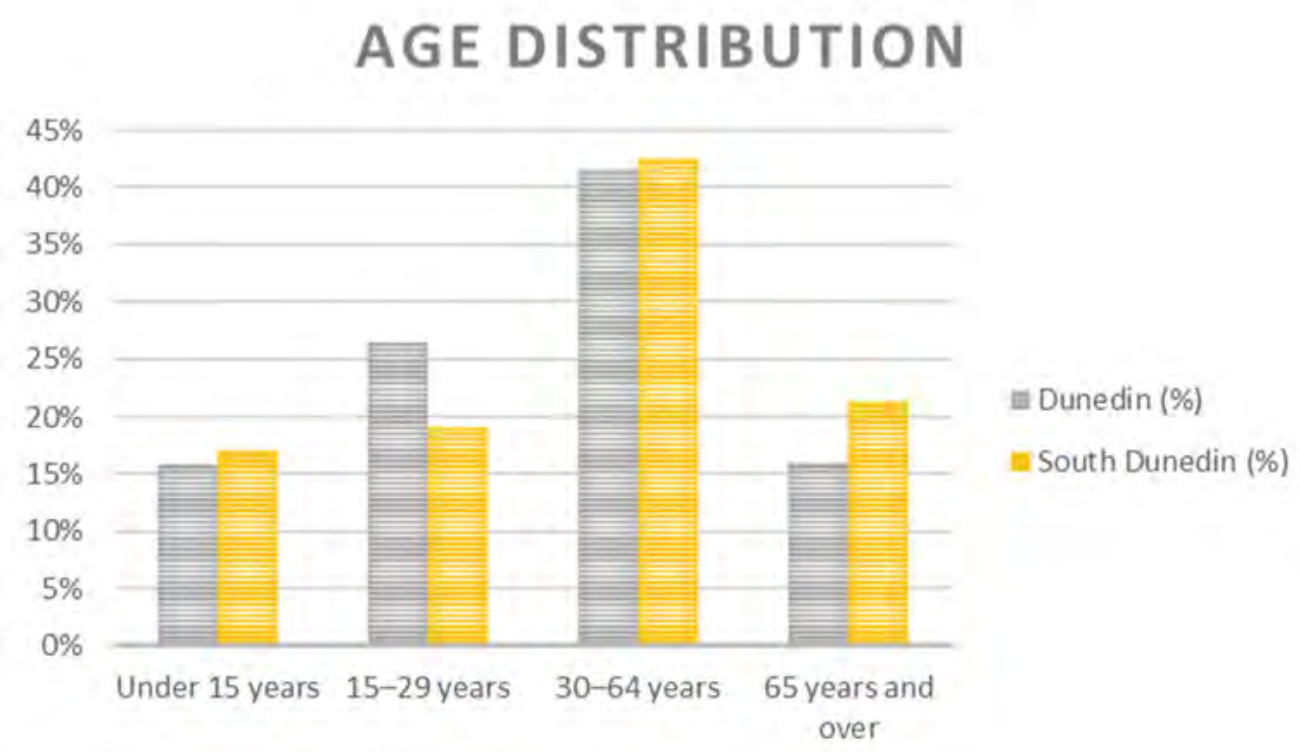


Figure 3.10 Age distribution of population within South Dunedin (Statistics NZ, 2018)

3.3.3.1.2 Vulnerable groups within social demographics

South Dunedin has a higher population of vulnerable groups than the wider Dunedin area. For the purpose of this assessment, these groups are considered to be those with disabilities, in rental accommodation, over 65 years old, or classified as having higher Social Deprivation Index. The population distribution across South Dunedin of these groups is shown in Figure 3.11 based on Census data (2018) statistical areas (SA1) within the approximate SDF project extent where:

- Social Deprivation provides one example of a measure of social vulnerability across communities. The Index ranks locations on a scale of decile 1 (least deprived) to decile 10 (most deprived) based on prescribed criteria by Statistical Area 1 using averaged data.

- The number of households in South Dunedin living in rental accommodation is roughly 2450, this represents 42% of the South Dunedin households. This group is determined as those who do not own or partly own the home they reside in.
- The population of South Dunedin who experience difficulty communicating is 198, this represents 1.5% of the South Dunedin population. This group is determined by those who have a lot of difficulty or cannot communicate.
- The population of South Dunedin who experience difficulty walking is roughly 770, this represents 6% of the South Dunedin population. This group is determined by those who have a lot of difficulty or cannot walk.
- The population of South Dunedin who are aged over 65 is 2853, this represents 21% of the South Dunedin population.

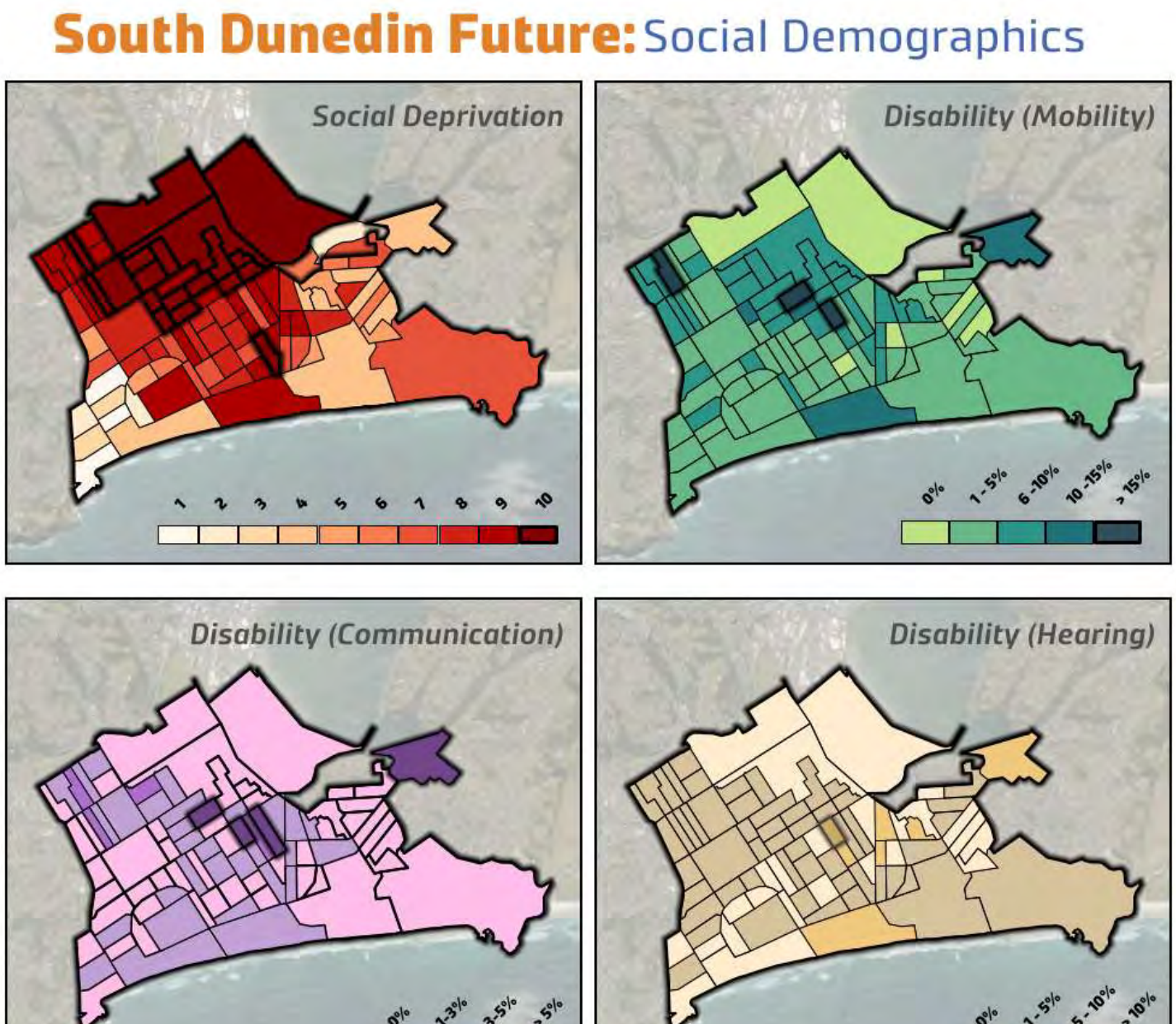


Figure 3.11 Social demographics of South Dunedin showing SA1 unit boundaries (Statistics NZ, 2018).

3.4 ASSESSMENT OF RISK

Risk ratings are presented in two different ways to reflect the two scales at which risk is reported. The two methods are discussed in the following two sub-sections.

3.4.1 ELEMENT LEVEL RISK ASSESSMENT

The direct physical risk is assessed for each element at risk. It is presented using a rating established by assessing exposure and vulnerability for each hazard. The risk categories have been adapted[21] from pORPS (Otago Regional Council, 2022), and are based on the three class matrix shown in Table 3-11. Assets that are not exposed were not processed in the risk assessment and were therefore rated as 'not at risk'.

Element level risk is communicated based on the exposure of elements at risk to a hazard and their unique vulnerability to that hazard. High risks are typically those that are associated with exposure up to a 1% AEP event and an extreme vulnerability rating of a place or asset, or those associated with extreme exposure (i.e. to a 10% AEP event) and a high vulnerability rating of a place or asset.

Medium risks are typically those that are associated with moderate exposure (i.e. up to a 1% AEP event) and a moderate or high vulnerability rating, or extreme exposure (i.e. to a 10% AEP event) with a low or moderate vulnerability rating, or those that are exposed to extremely low probability hazards (i.e. to a >1% AEP event) but are extremely vulnerable.

Low risks are typically those that are associate with exposure to extremely low probability hazards (unless they are extremely vulnerable) or exposed to hazards but with low or very low vulnerability.

Table 3-11. Element level physical risk matrix

Exposure	Vulnerability				
	Very low	Low	Moderate	High	Extreme
Extreme					
High					
Moderate					
Low					
Very low					

Green = low risk Yellow = medium risk Red = high risk

3.4.2 AGGREGATION OF RISK RATINGS

In order to support broader risk reporting needs, an aggregation of risk scores is sometimes required within a larger defined spatial area.

Aggregation of risk ratings has been applied for two spatial extents:

- Risk to Buildings: Aggregated to Statistical Area 1.
- Risk to all elements at risk: aggregated to South Dunedin Future area for summary statistics.

Categories for the aggregated risk reporting were aligned with thresholds used to establish 'severity of impact' in the proposed Otago Regional Policy Statement[22] (RPS) (Otago Regional

[21] Terminology has been changed 'consequence' is now 'vulnerability', 'likelihood' is now 'exposure'
[22] based on Table 7 from the pORPS.

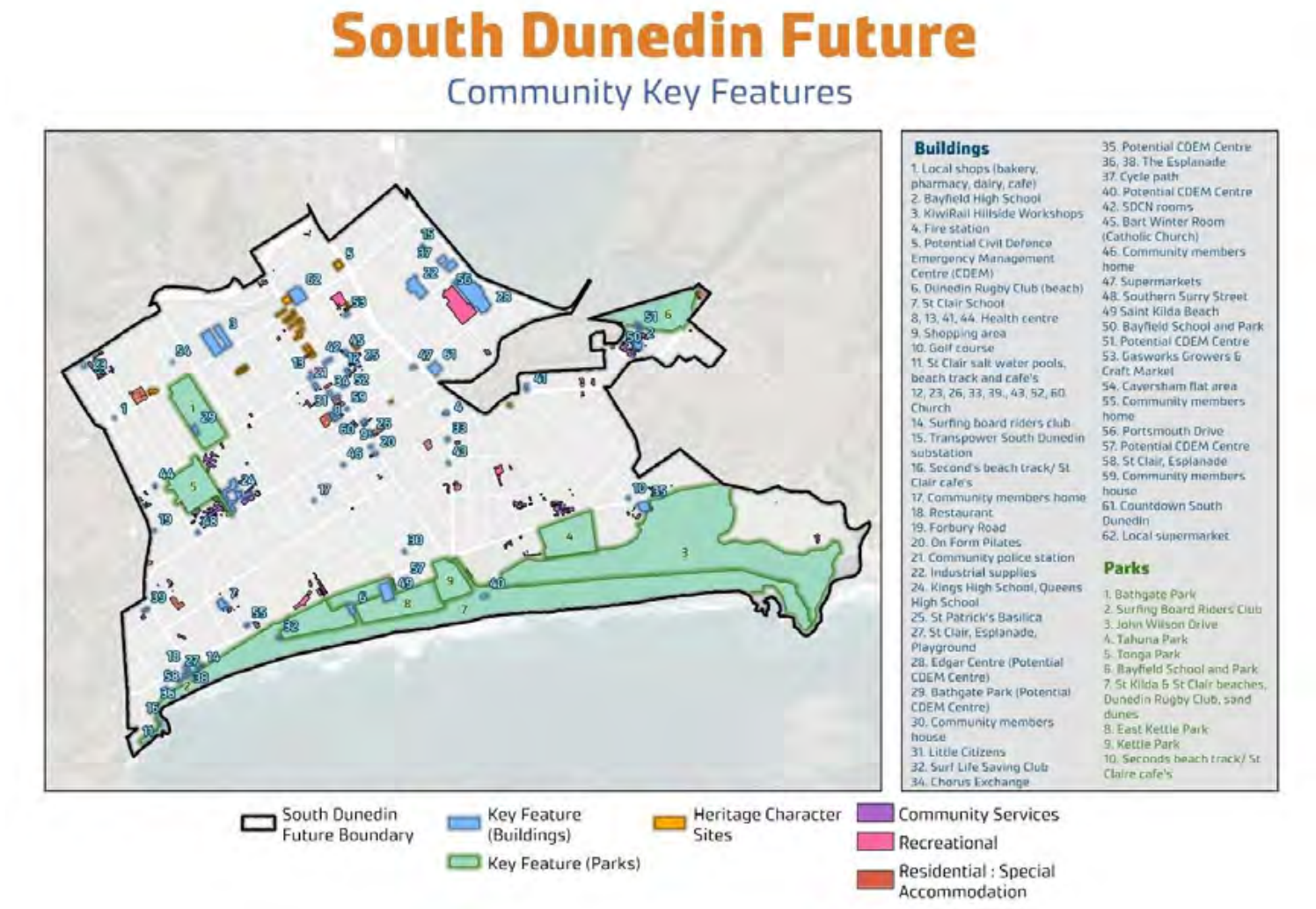
Council, 2022). Within the RPS, these thresholds are used to define the proportion of 'assets that have functionality compromised' and have been interpreted to relate to 'medium' and 'high' risk categories within this risk assessment. The categories, thresholds and colour schemes used to communicate risk are presented in Table 3-12.

Table 3-12 Risk aggregation thresholds

Risk score	Aggregated risk criteria
Very high	≥50% of affected assets within hazard zone have asset level risk rated to be medium or high.
High	21-50% of affected assets within hazard zone have asset level risk rated to be medium or high.
Moderate	11-20% of affected assets within hazard zone have asset level risk rated to be medium or high.
Low	1-10% of affected assets within hazard zone have asset level risk rated to be medium or high.
Not exposed to scenarios assessed	No assets are at risk (due to not being exposed), or <1% of affected assets within hazard zone have asset level risk rated to be medium or high.

3.4.3 HOTSPOT MAPPING OF RISK

Illustrating all risks to all elements in a single graphic can be problematic. In the context of this risk assessment, such a graphic will need to show 66 different yet often overlapping risks (one for each of



. underground utilities generally follow the same transport corridor as roads), so they offer a useful overview and can act as a proxy for identifying risk hotpots.

Hotspot maps have been developed to demonstrate an overview of spatial physical risk to South Dunedin. Risk to buildings, roads and parks have been included in the map.

To evaluate the hotspot score, the risk arising from all hazards to each asset (building, road, or park) has been reviewed. The hotspot score is a tally of the number of hazards that have resulted in a high or medium risk rating to the asset (Table 3-13). In each map, risk to the asset is included in the count if it is rated high or medium at any scenario within each timeframe. Hotspot maps have been developed for three timeframes.

Table 3-13 Hotspot risk criteria

Hotspot score	Hotspot risk criteria
4 hazards	An asset (building, road, or park) is rated at medium or high risk due to 4 hazards*.
3 hazards	An asset (building, road, or park) is rated at medium or high risk due to 3 hazards*
2 hazards	An asset (building, road, or park) is rated at medium or high risk due to 2 hazards*
1 hazard	An asset (building, road, or park) is rated at medium or high risk due to 1 hazards*
0 hazards	An asset (building, road, or park) is not rated at medium or high risk to any hazards*

*Risk is due to any of the following hazards: coastal inundation, coastal erosion, groundwater, landslide, liquefaction, pluvial flooding)

3.5 IDENTIFICATION OF IMPACTS

Cascading impacts arising from risks to South Dunedin have been identified through community engagement and discussion with subject matter experts (Refer to Appendix B7 for details). Many of the issues identified align with the findings of previous in-depth research into the cascading impacts of flooding on the South Dunedin community (Harrison, et al., 2022). Findings of this previous study have been incorporated into the discussion of cascading impacts of climate risk on South Dunedin. Findings are presented through a description of impacts, casual maps, and where available, relevant supporting data is presented spatially.

Refer to the South Dunedin Future Engagement Report: Risk and Long List of Adaptation Approaches for details of the engagement activities.

4 MANA WHENUA RISK ASSESSMENT

A mana whenua risk assessment has been undertaken for the South Dunedin Future programme, which has identified and rated risks through a Kāi Tahu lens. Based on an analysis of cultural values, it takes a broad approach to risk. As well as risks to specific places and features important for the cultural associations to mana whenua, it considers risks to Kāi Tahu perspectives and values relating to wider environmental, social and economic factors in South Dunedin. This mahi was facilitated by Aukaha with guidance and validation from a panel of Kāi Tahu mana whenua representatives.

The mana whenua risk assessment has shown that, there is substantial risk resulting from a 'keep doing what we are doing' scenario, where there are no additional interventions to address the issues facing South Dunedin. Risk to the key Te Taki Haruru values is generally significant, ranging from high (mana, whakapapa, tapu & noa) to extreme (mauri) levels of risk. These results outline the case for change in response to the modelled natural hazards and climate risks.

A more detailed summary of the mana whenua risk assessment inputs, methodology, and findings is included in Appendix D of this report. A similar exercise has been undertaken within the companion workstream on adaptation options, where mana whenua values are also integrated into the criteria for assessing potential options for mitigating the risks identified in this report.

5 DIRECT PHYSICAL RISK ASSESSMENT RESULTS

This section of the report presents the direct physical risks to eleven of the twelve *elements at risk* in South Dunedin arising from coastal inundation, coastal erosion, pluvial flooding, groundwater, landslide and liquefaction. Risks to Mana Whenua (the twelfth *element at risk*) are discussed in Section 4. The subsequent section (Section 6) discusses the impacts resulting from the direct physical risk.

5.1 RISK TO BUILDINGS AND RESIDENTS

There are 4796 property parcels across the South Dunedin Future area of interest. Within these, there are 9091 buildings located on the properties, and 7990 buildings are located on land zoned for residential land use. Many properties have one or more buildings on them, and the maximum number of buildings on a single property is 52. All buildings are assessed, which also include non-habitable buildings (e.g. sheds, garages).

Key features used to understand 'building' assets include:

- Residents and community members.
- Residential buildings.
- Non-residential buildings:
  - Commercial.
  - Schools and other educational facilities.
  - Church.
  - Built Heritage (heritage zoning).
  - Sports clubs (members tend to be very attached to home turf, could move fields but could not relocate clubs).
  - Sport facilities.
- Important or essential buildings (as identified by the community).

Risk is assessed and analysed through the following lenses:

- Risk to all buildings aggregated to Statistical Area 1.
- Risk to buildings presented by building use.
- Risk to important or essential buildings of South Dunedin.
- Risk to residents of South Dunedin presented by considering building risk alongside the social demographics of Statistical Areas.
- Property values of buildings at risk.

Further discussion on impacts and interconnections between these is contained in Section 5.8. Further detail regarding building vulnerability is contained in Appendix C.

5.1.1 RISK TO BUILDINGS

Figure 5.1 shows the percentage of buildings at risk within South Dunedin, and how this changes over time with each hazard. Spatial representation of risk to buildings is shown in Figure 5.19, Figure 5.21, Figure 5.22, and Figure 5.23.

Of the 9091 buildings in South Dunedin pluvial flooding poses the highest rated risk at the present day and steadily increases over time. At the present day, pluvial flooding poses a high risk to 23% (2070 buildings) of buildings. At the late century under a high end climate scenario pluvial flooding, groundwater and coastal inundation pose a high risk to large proportion of the building stock (47% (4250) buildings, 78% (7110) buildings, and 83% (7562) buildings respectively).

Buildings at high and moderate risk due to groundwater may not be habitable over the long term. These buildings will be exposed to extremely high (shallower than 0.3 m below ground level) or emergent groundwater which can cause instability in building foundations, lead to issues of dampness and mould in housing, and may cause various environmental problems such as pollution and salinity stress in properties.

A small proportion of buildings are rated high risk due to coastal erosion[23] and landslide at present day. At late century 2% (151) buildings are rated to be at high risk due to coastal erosion. Landslide poses a risk to 2% (161) of buildings.

Buildings at high or medium risk to pluvial flooding and coastal inundation are those that have floor levels exposed to flooding during 10% AEP (high risk) and 10%-1% AEP (medium risk) events. These buildings are expected to sustain damages resulting in the building being uninhabitable for longer than one month following an event. Flooding above building floor levels can cause the need for extensive repairs and can lead to complete loss or damage to buildings. South Dunedin has a high proportion of ageing and poor condition buildings, which are particularly sensitive to flood damage and the chronic effects of high groundwater.

Modelled flood depths associated with the 1% AEP coastal and pluvial flood events at building footprint locations are summarised in Figure 5.2 and Figure 5.3 respectively. This shows the number of buildings exposed to each flood depth band at present day and under available climate change scenarios. At present day, buildings are exposed to a range of pluvial flood depths during a 1% AEP event. These depths reach over 0.55 m in places, with most flood depths ranging between 0.05 m and 0.3 m. At late century under a high end climate scenario these depths increase in range with more buildings exposed to deeper flood depths. At late century under a high end climate scenario the majority of buildings exposed during a 1% coastal inundation scenario are modelled to experience flood depths greater than 0.5 m, with a small number at greater than 2 m depth[24].

[23] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.
[24] This is potentially a conservative depth. The limitations of the coastal inundation modelling are discussed in Section 2.5.

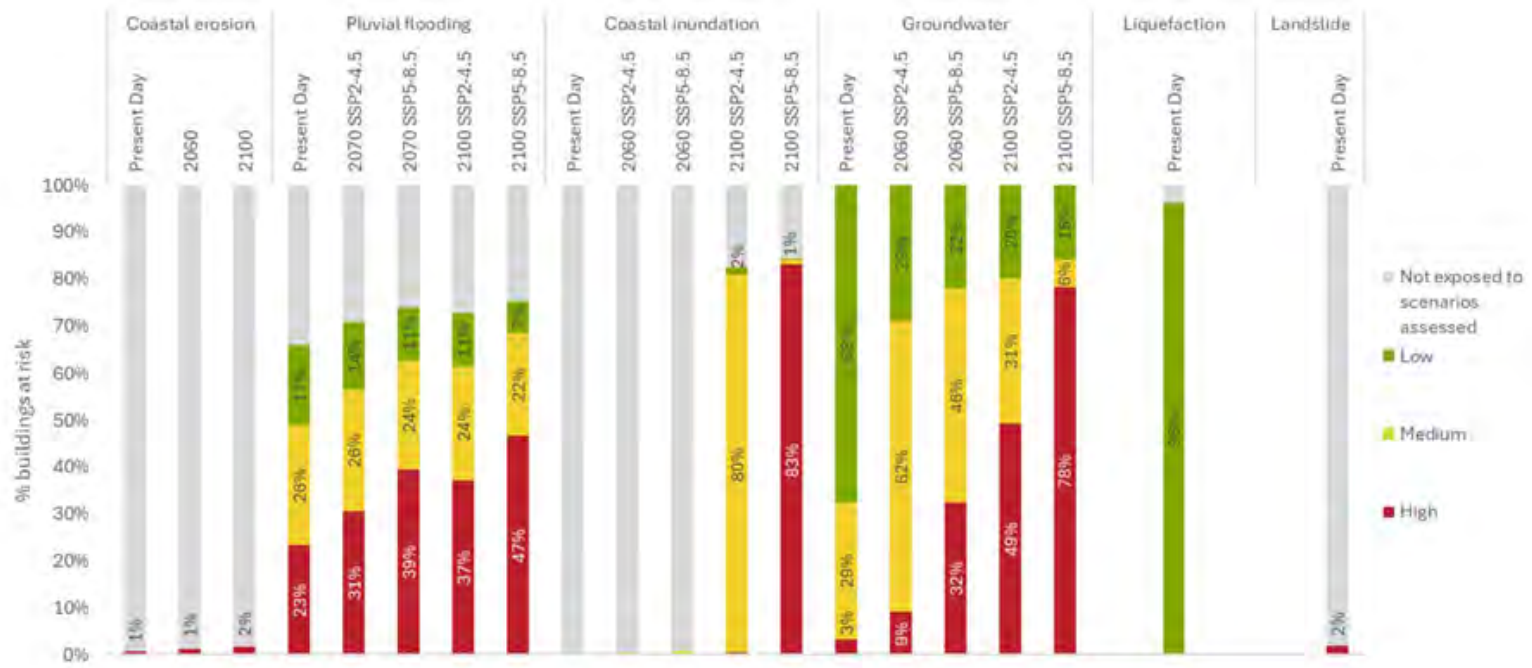


Figure 5.1 Risk to all buildings within South Dunedin presented as percentage of buildings (by number) at each risk rating[25]

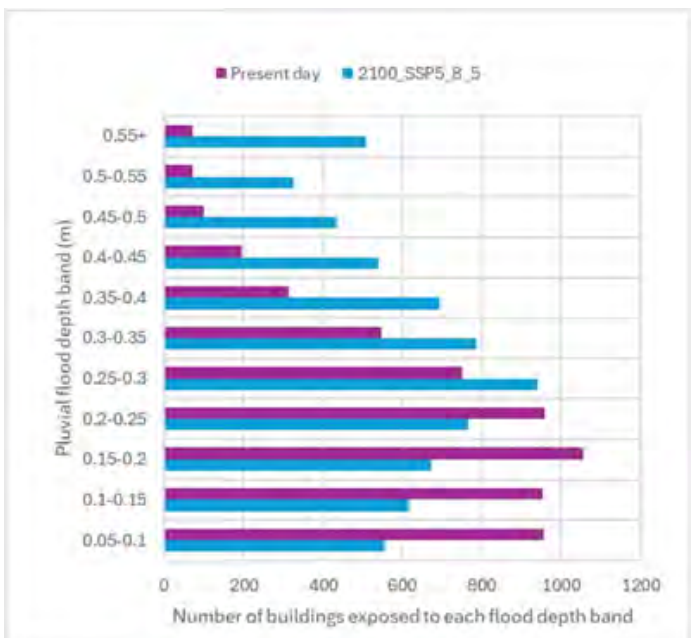


Figure 5.2 Number of buildings exposed to flood depth bands for pluvial flooding. Zero flood depth excluded

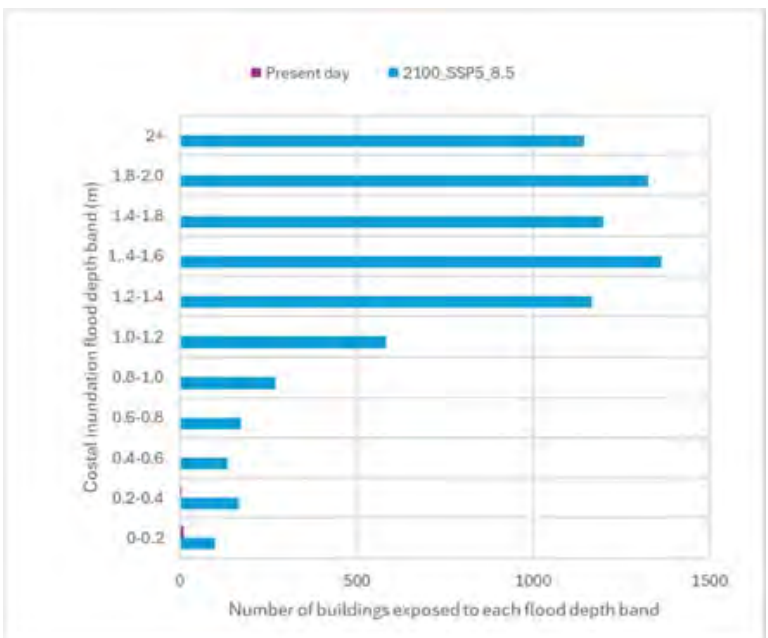


Figure 5.3 Number of buildings exposed to flood depth bands for coastal inundation. Zero flood depth excluded

5.1.1.1 RISK TO IMPORTANT OR ESSENTIAL BUILDINGS

South Dunedin is home to a range of important community buildings including churches, community halls, medical centres, rest homes, parks, recreational grounds, heritage structures and social housing (Figure 5.5). 65 specific buildings were identified through community and subject matter expert engagement, with a further 340 buildings included on account of having

[25] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

heritage classification, being a community facility, or an aged care facility (use category: 'special accommodation'). Risk to key features follows similar trends to the wider building stock..

The combined high and medium risk to important buildings is shown for present day and at late century scenarios under high-end climate projections (Figure 5.4). The number of buildings in each building use category is summarised in Table 5-1. This figure shows that by late century, most important buildings are rated at high or medium risk due to pluvial flooding, coastal inundation and groundwater rise regardless of their use.

High or medium risk to important buildings indicates they are likely to be uninhabitable in the long term due to the effects of groundwater, and/or may be uninhabitable for extended periods following increasingly frequent pluvial flooding and coastal inundation events. The short and long term loss of these important buildings is likely to have wide ranging impacts on the community. These are discussed further in Section 6.

Table 5-1 Categories of important buildings within South Dunedin and associated risk at 2100

Building use category	Number of buildings within each category[1]	Percentage at high or medium risk by late century		
		Pluvial flooding	Groundwater	Coastal inundation
Church	32	94%	97%	94%
Commercial	968	66%	73%	82%
Residential	7972	69%	86%	84%
Residential Institution (e.g. rest homes)	18	67%	78%	83%
School	97	45%	63%	74%

[1] summary excludes 4 null values

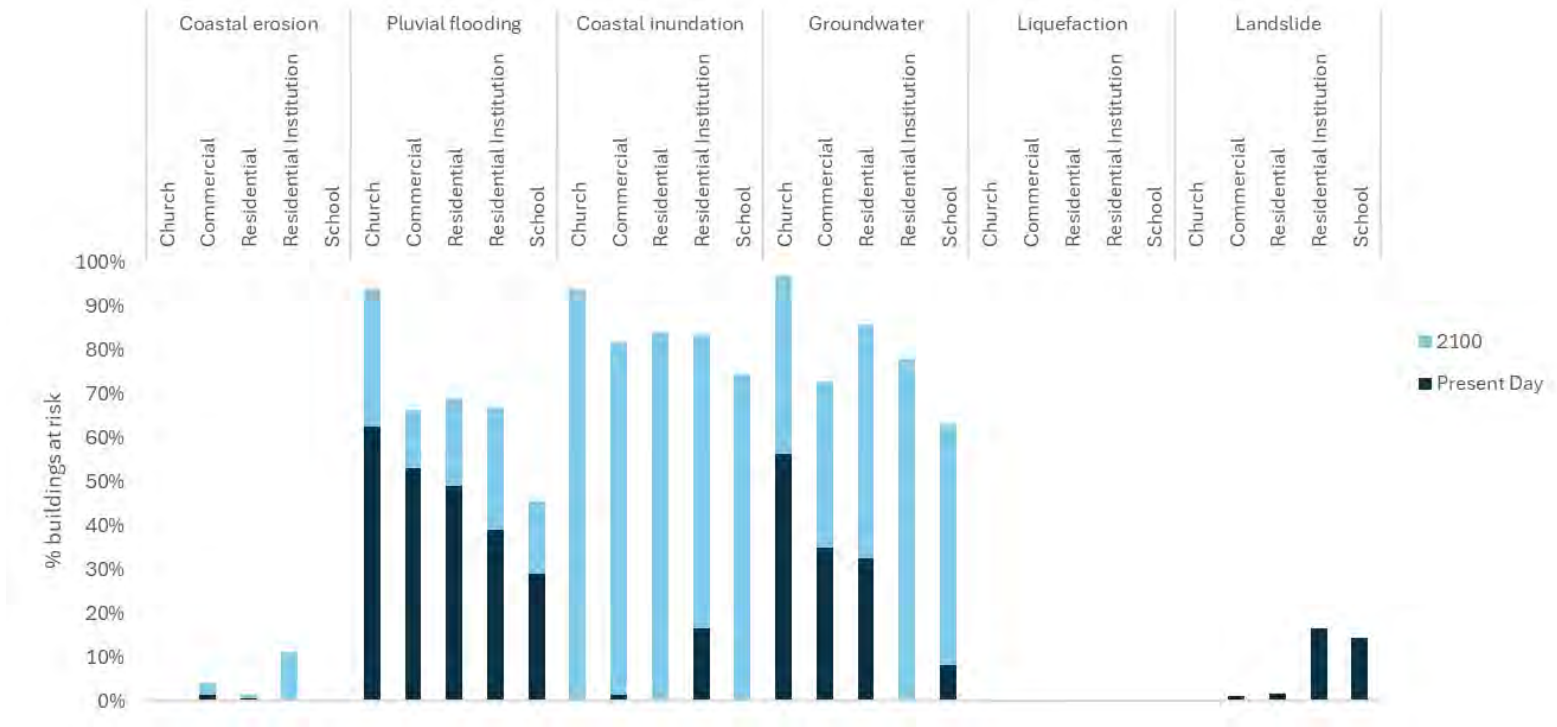
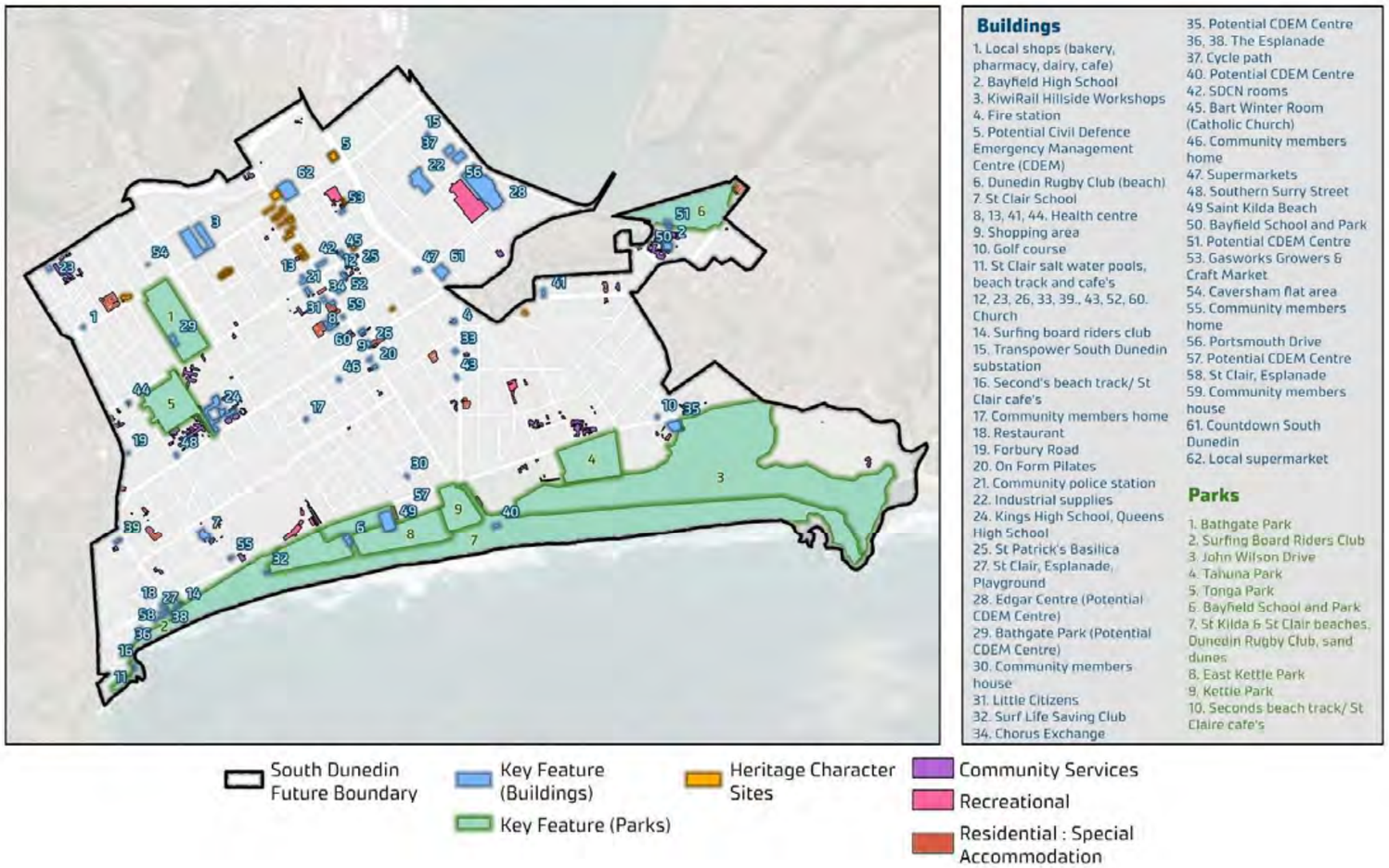


Figure 5.4 Risk to buildings showing percentage of important buildings in each building use category at either medium or high risk at present day and 2100 (note that no future timeframe information is available to evaluate liquefaction and landslide risk)

South Dunedin Future

Community Key Features



Buildings

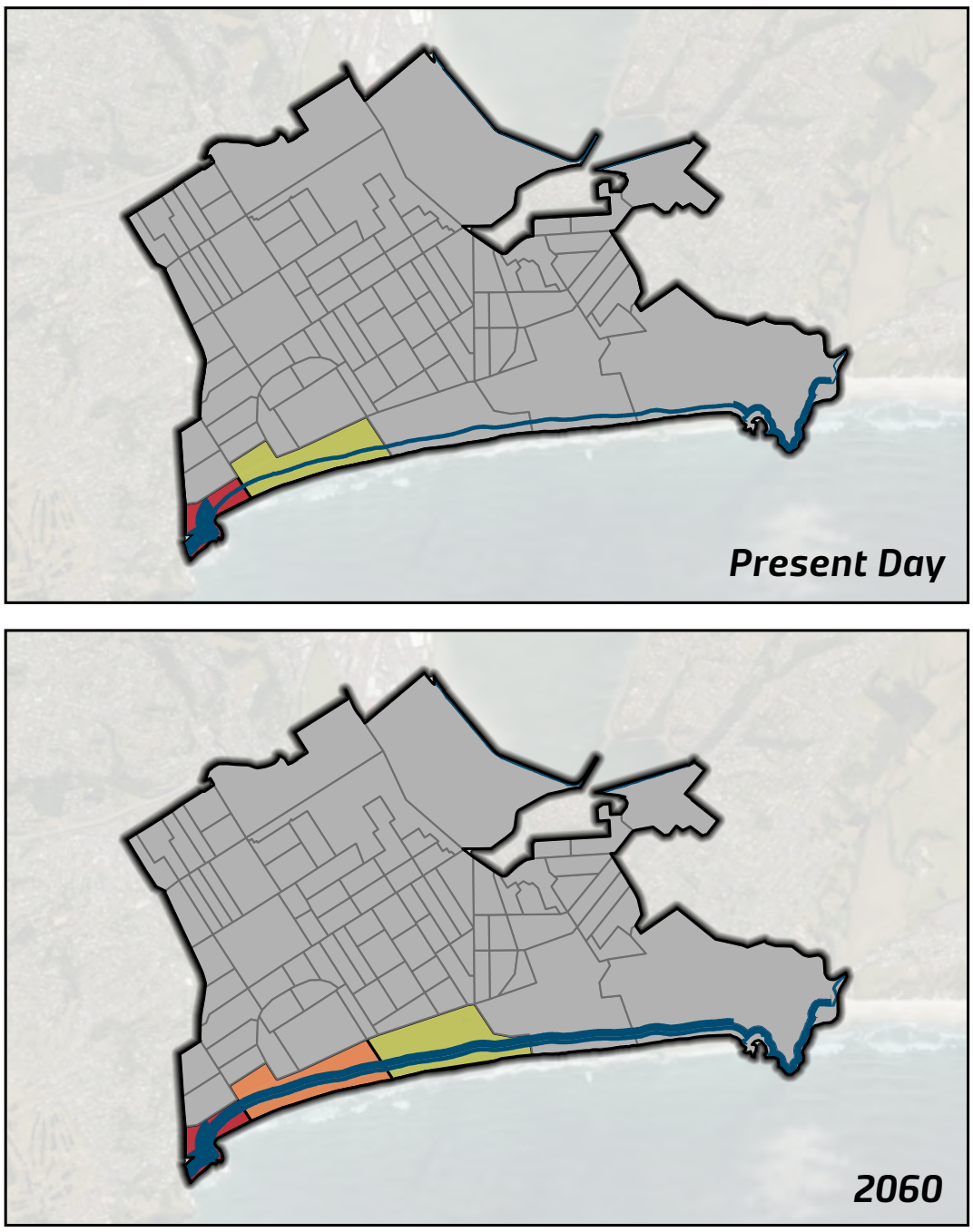
1. Local shops (bakery, pharmacy, dairy, cafe)
2. Bayfield High School
3. KiwiRail Hillside Workshops
4. Fire station
5. Potential Civil Defence Emergency Management Centre (CDEM)
6. Dunedin Rugby Club (beach)
7. St Clair School
8, 13, 41, 44. Health centre
9. Shopping area
10. Golf course
11. St Clair salt water pools, beach track and cafe's
12, 23, 26, 33, 39., 43, 52, 60. Church
14. Surfing board riders club
15. Transpower South Dunedin substation
16. Second's beach track/ St Clair cafe's
17. Community members home
18. Restaurant
19. Forbury Road
20. On Form Pilates
21. Community police station
22. Industrial supplies
24. Kings High School, Queens High School
25. St Patrick's Basilica
27. St Clair, Esplanade, Playground
28. Edgar Centre (Potential CDEM Centre)
29. Bathgate Park (Potential CDEM Centre)
30. Community members house
31. Little Citizens
32. Surf Life Saving Club
34. Chorus Exchange
35. Potential CDEM Centre
36, 38. The Esplanade
37. Cycle path
40. Potential CDEM Centre
42. SDCN rooms
45. Bart Winter Room (Catholic Church)
46. Community members home
47. Supermarkets
48. Southern Surry Street
49 Saint Kilda Beach
50. Bayfield School and Park
51. Potential CDEM Centre
53. Gasworks Growers & Craft Market
54. Caversham flat area
55. Community members home
56. Portsmouth Drive
57. Potential CDEM Centre
58. St Clair, Esplanade
59. Community members house
61. Countdown South Dunedin
62. Local supermarket

Parks

1. Bathgate Park
2. Surfing Board Riders Club
3. John Wilson Drive
4. Tahuna Park
5. Tonga Park
6. Bayfield School and Park
7. St Kilda & St Clair beaches, Dunedin Rugby Club, sand dunes
8. East Kettle Park
9. Kettle Park
10. Seconds beach track/ St Claire cafe's

Figure 5.5 Key features and important buildings within South Dunedin

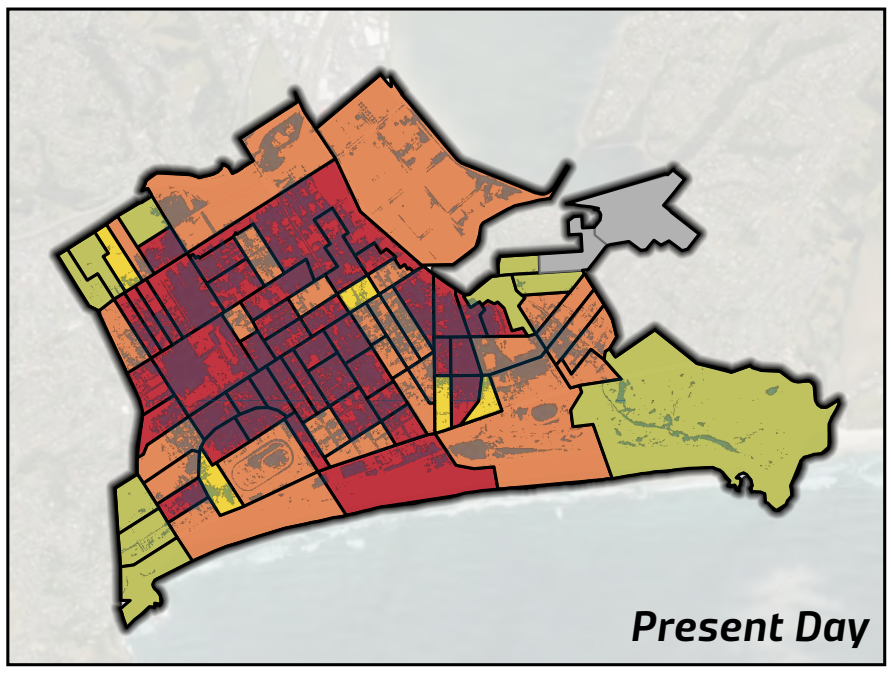
Figure 5.6 Building risk due to coastal erosion aggregated to SA1 units



Explainer: These maps show the risk to buildings due to coastal erosion (blue shading), where risk ratings for individual buildings have been aggregated up to SA1 area level, to reflect available information and confidence levels. The maps indicate that coastal erosion risk to buildings is confined to the St Clair-St Kilda coastline at present day and mid-century, with higher risk of erosion at the St Clair end of the beach. There is a high level of uncertainty regarding coastal erosion risk due to data limitations at present e.g. scale of screening study and accounting for the impact of engineered structures). More detailed coastal hazard assessments are underway as part of the St Clair-St Kilda Coastal Plan, these will be completed in late-2025, after which the coastal erosion risk ratings will be reviewed.
Disclaimer: The aggregation or site specific risk supports the purposes of the South Dunedin Risk Assessment, including by enabling adaptation planning at a suburb-level, however it is not intended to assess risk at an individual building level – which requires more detailed hazard data and consideration of a range of building-specific factors (e.g. foundation type).
Hazard data source: WSP, 2024

Building (SA1 Boundary) Risk					
Risk Description	Very High	High	Moderate	Low	Not Exposed
Percentage of buildings in SA1 area located within a coastal erosion zone (high risk).	**≥ 50%**	**21% - 49%**	**11% - 20%**	**1% - 10%**	**< 1%**

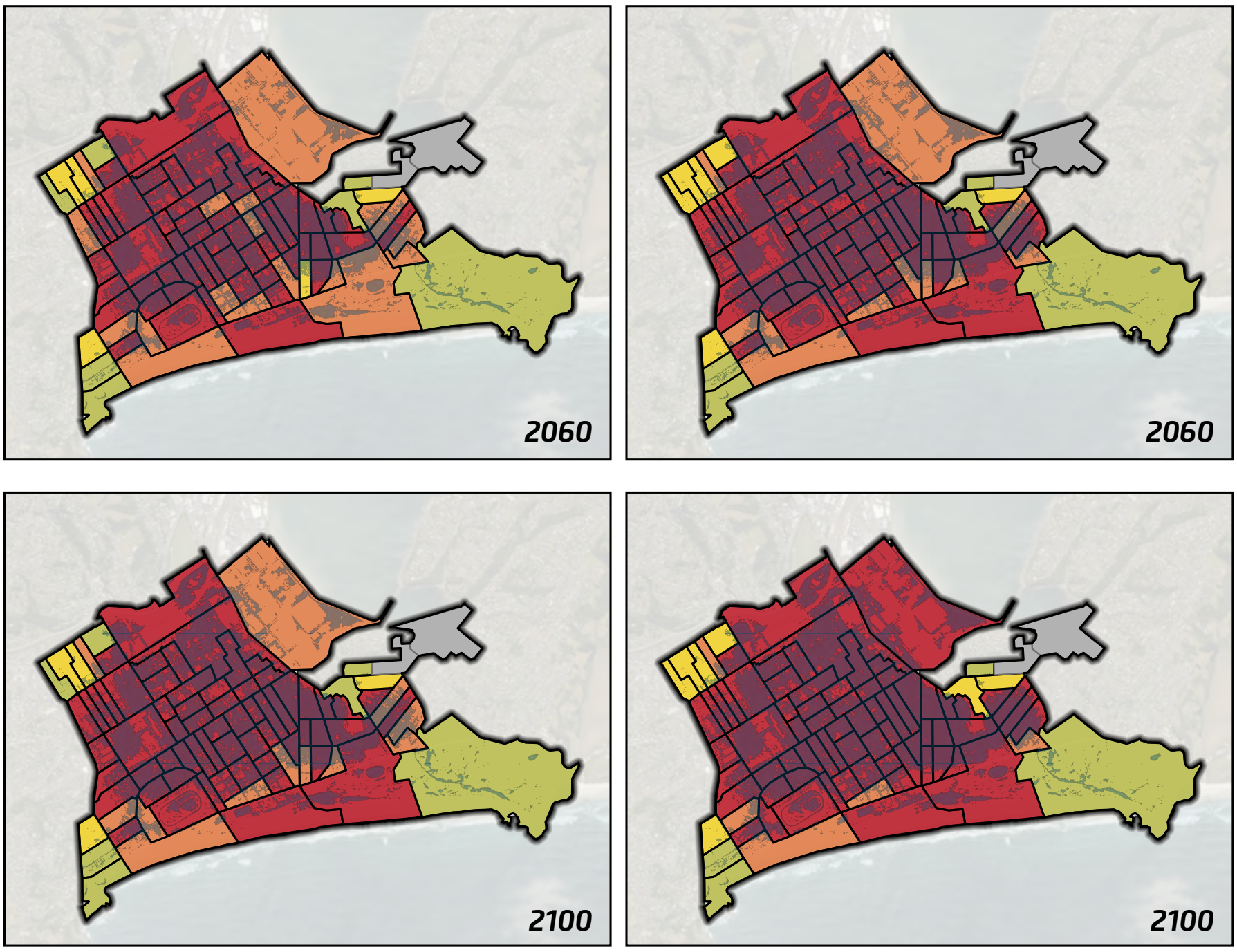
Figure 5.7 Building risk due to pluvial flooding aggregated to SA1 units



Explainer: These maps show the risk to buildings due to pluvial flooding (blue shading), where risk ratings for individual buildings have been aggregated up to SA1 area level, to reflect available information and confidence levels. The maps illustrate pluvial flood risk is already medium or high for most SA1 areas in South Dunedin, expanding to nearly all SA1 areas by 2100, particularly on The Flat. Flooding above floor level can result in significant damage to affected buildings, rendering them temporarily uninhabitable and in need of extensive and costly repairs. Flood damage can negatively impact building quality, value, and insurability, among other impacts (as outlined in Figure 6.1).

Disclaimer: The aggregation of site specific building risk to SA1 areas supports the purposes of the South Dunedin Risk Assessment, including by enabling adaptation planning at a suburb-level. However, it is not intended to assess risk at an individual building level – which requires consideration of a range of building-specific factors (e.g. floor level, construction material, building age, adjacent property, etc).

Hazard data source: DCC ICMP Flood Model (Beca, WSP, 2024)



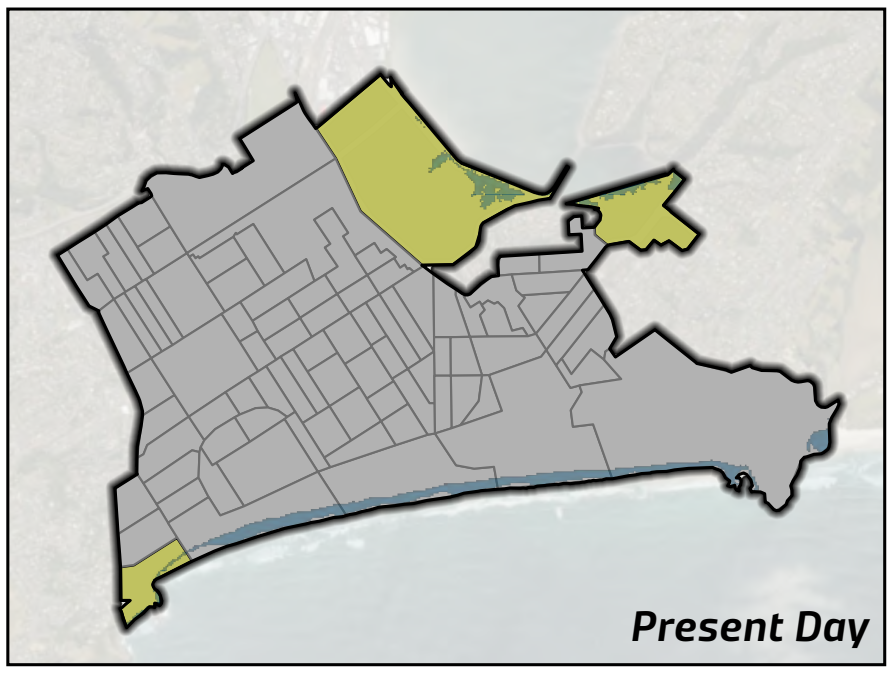
South Dunedin Future Boundary

1% AEP pluvial flood extent

0 0.4 0.8 1.2 1.6 2 (km)

Building (SA1 Boundary) Risk					
Risk Description	Very High	High	Moderate	Low	Not Exposed
Percentage of buildings in SA1 area rated high or medium risk for flooding above floor level in 10% AEP event (high) and 10-1% AEP event (medium)	**≥ 50%**	**21% - 49%**	**11% - 20%**	**1% - 10%**	**< 1%**

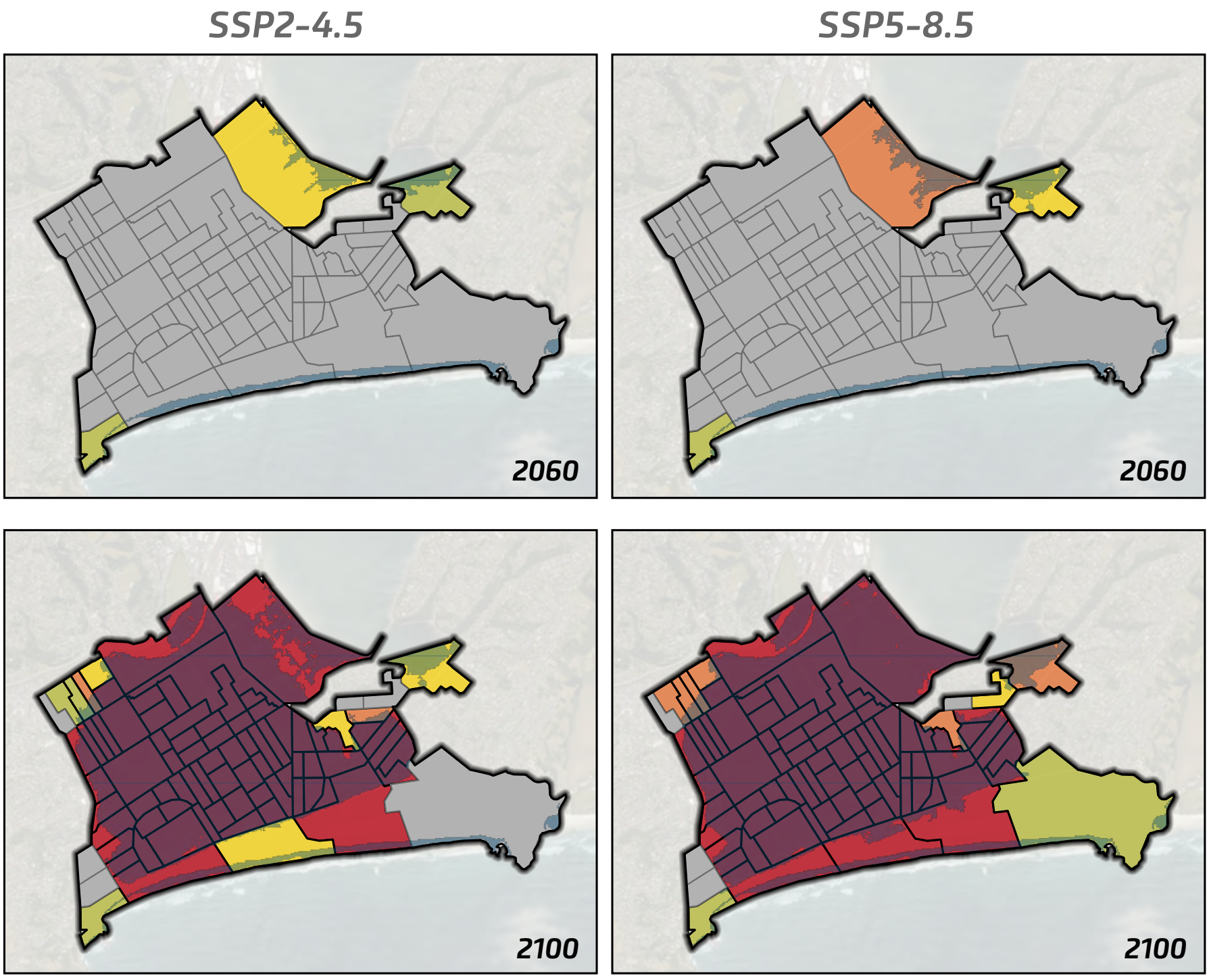
Figure 5.8 Building risk due to coastal inundation aggregated to SA1 units



Explainer: These maps show the risk to buildings due to coastal inundation (blue shading), where risk ratings for individual buildings have been aggregated up to SA1 area level, to reflect available information and confidence levels. The maps illustrate a small area of low coastal inundation risk near the Portsmouth Drive and St Clair coastal edge at present day, with risk around Portsmouth Drive increasing to moderate and high at mid-century. At late century, coastal inundation rises to very high across the majority of South Dunedin due to potential overtopping at Portsmouth Drive flowing into The Flat. Flooding by salt water can result in significant damage to affected buildings, rendering them temporarily uninhabitable and in need of extensive and costly repairs. Flood damage can negatively impact building quality, value, and insurability, among other impacts (as outlined in Figure 6.1).

Disclaimer: The aggregation of site specific building risk to SA1 areas supports the purposes of the South Dunedin Risk Assessment, including by enabling adaptation planning at a suburb-level. However, it is not intended to assess risk at an individual building level – which requires consideration of a range of building-specific factors (e.g. floor level, construction material, building age, etc).

Hazard da**ta source:** Paulik, et al., 2023



South Dunedin Future Boundary

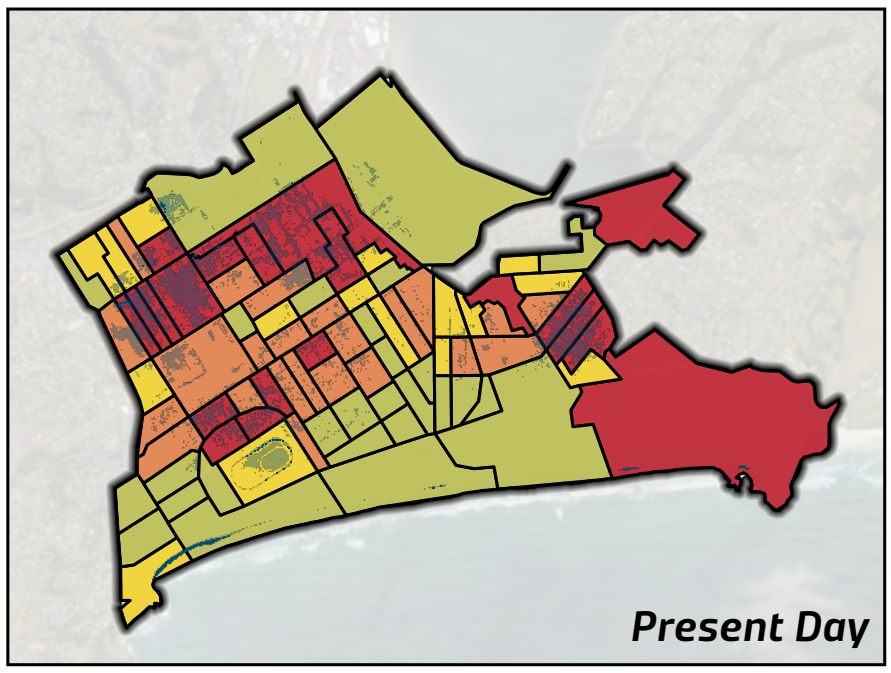
1% AEP coastal inundation extent

N

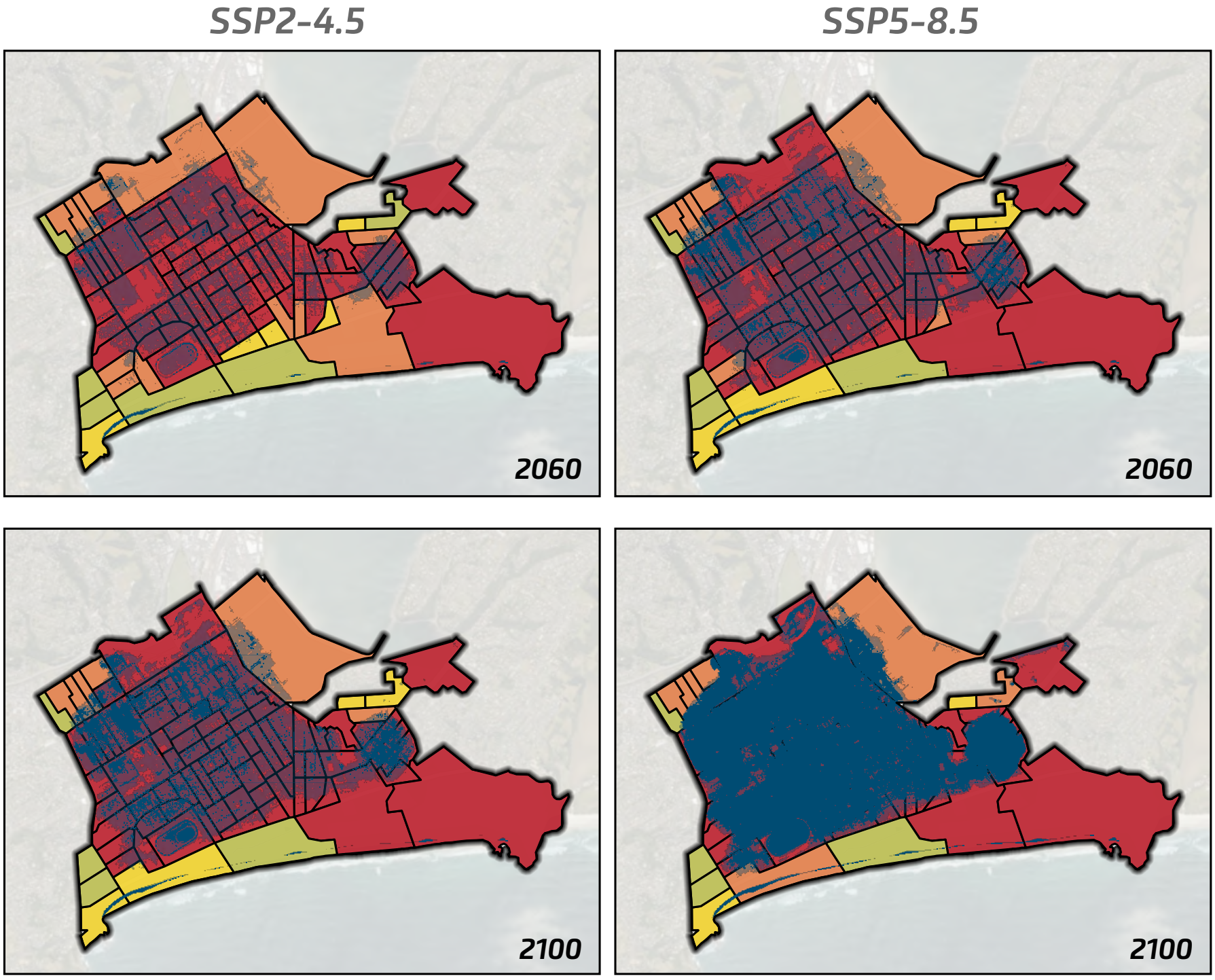
0 0.4 0.8 1.2 1.6 2 (km)

Building (SA1 Boundary) Risk					
Risk Description	Very High	High	Moderate	Low	Not Exposed
Percentage of buildings in SA1 area rated high or medium risk for flooding above floor level in 10% AEP event (high) and 10-1% AEP event (medium)	**≥ 50%**	**21% - 49%**	**11% - 20%**	**1% - 10%**	**< 1%**

Figure 5.9 Building risk due to groundwater aggregated to SA1 units



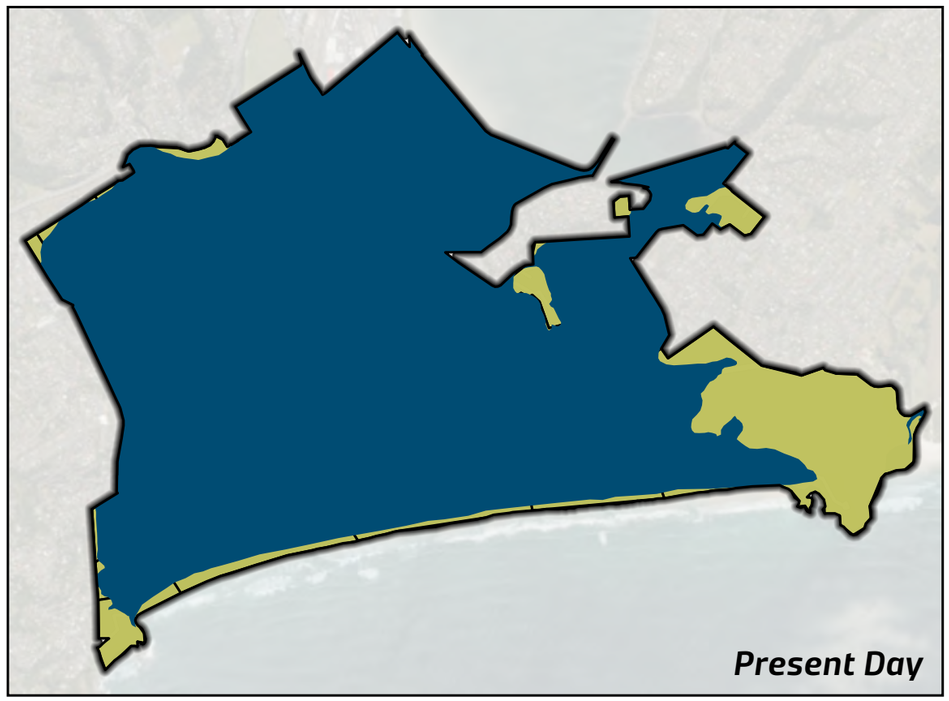
Explainer: These maps show the risk to buildings due to groundwater hazard (blue shading), where risk ratings for individual buildings have been aggregated up to SA1 area level, to reflect available information and confidence levels. The maps illustrate groundwater risk is already medium or high for many SA1 areas in South Dunedin, expanding to nearly all SA1 areas by 2100, particularly on The Flat. High risk to buildings is driven by exposure to emergent groundwater (dark blue shading), which can cause instability in building foundations, lead to issues of dampness and mould in housing, and may cause various environmental problems such as pollution and salinity stress in properties. Where groundwater is high but not yet emergent (light blue shading), groundwater is unlikely to damage building condition, but will impact the liveability of homes. These issues can negatively impact building quality, value, and insurability, among other impacts (as outlined in Figure 6.1).
Disclaimer: The aggregation of site specific building risk to SA1 areas supports the purposes of the South Dunedin Risk Assessment, including by enabling adaptation planning at a suburb-level. However, it is not intended to assess risk at an individual building level – which requires consideration of a range of building-specific factors (e.g. floor level, moisture barriers, etc).
Hazard data source: Cox, et al., 2023



Building (SA1 Boundary) Risk					
Risk Description	Very High	High	Moderate	Low	Not Exposed
Percentage of buildings in SA1 area rated high or medium risk for emergent groundwater (high), groundwater within 0.5 m of surface (medium).	**≥ 50%**	**21% - 49%**	**11% - 20%**	**1% - 10%**	**< 1%**

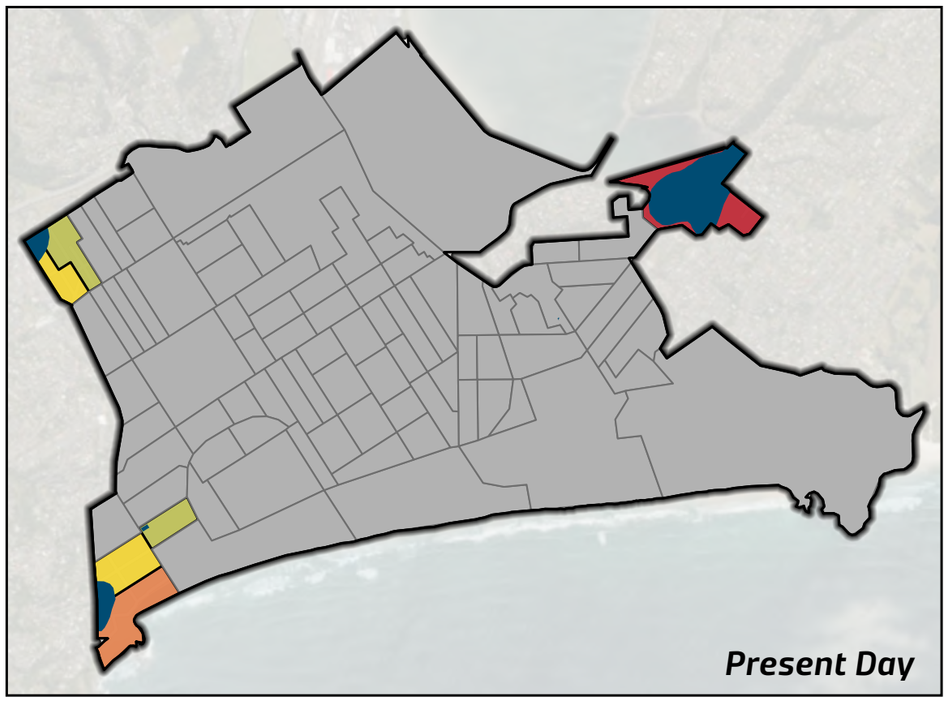
Figure 5.10 Building risk due to landslide and liquefaction aggregated to SA1 units

Liquefaction



Explainer: These maps show the risk to buildings due to liquefaction (blue shading), where risk ratings for individual buildings have been aggregated up to SA1 area level, to reflect available information and confidence levels. The maps illustrate liquefaction risk is low across South Dunedin at the present day. Liquefaction risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of sea level rise on liquefaction potential. If it were to occur, liquefaction can cause differential settlement and lateral spreading that distorts structures, reduces foundation-bearing capacity, and damages pile supports and service connections. Liquefaction damage can negatively impact building quality, value, and insurability, among other impacts (as outlined in Figure 6.1).
Disclaimer: The aggregation of site specific building risk to SA1 areas supports the purposes of the South Dunedin Risk Assessment, including by enabling adaptation planning at a suburb-level. However, it is not intended to assess risk at an individual building level – which requires consideration of a range of building-specific factors (e.g. foundation design, construction material, building age, etc). Liquefaction hazard information is based on a high level desktop review, where subsequent site specific assessment (Hornblow, 2020) has found that liquefaction potential is highly variable across sites analysed.
Hazard data source: Hornblow, 2020

Landslide



Explainer: These maps show the risk to buildings due to landslide, where risk ratings for individual buildings have been aggregated up to SA1 area level, to reflect available information and confidence levels. The maps illustrate that this type of landslide risk is confined to areas around the South Dunedin boundary. Landslides can severely damage buildings resulting in sudden collapse or failure and posing a potential risk to life. Landslide damage can negatively impact building quality, value, and insurability, among other impacts (as outlined in Figure 6.1). Landslide risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of climate change (groundwater level rising or increased rainfall intensity) on landslide.
Disclaimer: The aggregation of site specific building risk to SA1 areas supports the purposes of the South Dunedin Risk Assessment, including by enabling adaptation planning at a suburb-level. However, it is not intended to assess risk at an individual building level – which requires consideration of a range of building-specific factors (e.g. foundation design, construction material, building age, etc). The landslide extent is based on known landslide areas and does not account for other potential sources of landslide nor represent the extent of the area of deposition/runout.
Hazard data source: DCC Hazard database data provided for South Dunedin Future programme

South Dunedin Future Boundary

Land instability

Liquefaction (Domain C: moderate liquefaction potential)

0 0.4 0.8 1.2 1.6 2 (km)

Building (SA1 Boundary) Risk

Risk Description	Very High	High	Moderate	Low	Not Exposed
Percentage of buildings in SA1 area rated high or medium risk for landslide and liquefaction	**≥ 50%**	**21% - 49%**	**11% - 20%**	**1% - 10%**	**< 1%**

5.1.2 PHYSICAL RISKS TO PEOPLE

The hazards facing South Dunedin have potential to cause direct physical injury as well as causing a range of impacts and cascading risks as discussed in Section 6. Exposure to hazards may cause health impacts such as:

- Damp indoor living and working environments due to high groundwater or flooding. These can cause higher incidence of respiratory diseases such as asthma, hypersensitivity pneumonitis, rhinosinusitis, bronchitis, and respiratory infections.
- Exposure to unsafe and contaminated water (due to wastewater overflows or mobilised contaminants).
- Loss of life or injury due to structural failure of buildings (primarily landslide, coastal erosion, liquefaction).
- Drowning during flooding.
- Risk of injury due to electrocution (primarily due to flooding, landslide, liquefaction.
- Loss of life or injury resulting from mobilised debris or landslides caused by heavy rainfall.
- Injuries from fires started in an event (flooding, landslide, liquefaction).

Risk to people arising from flood hazard are related to flood velocity and depth (Australian Institute for Disaster Resilience, 2014). Very low flood water velocities (typically <0.3 m/s) across South Dunedin due to the flat terrain within South Dunedin. Modelled pluvial flood depths are generally shallower than 0.25 m, with the exception of a few localised areas of greater flood depth. Direct loss of life in low velocity environments (<2 m/s) is unlikely at depths below 0.3 m, Inundation depths indicated in coastal inundation modelling reach 2.5 m in places. Even in a low velocity environment this depth of water would be unsafe for all people exposed (Australian Institute for Disaster Resilience, 2014).

Increasing direct physical risk to the elements at risk of South Dunedin is likely to lead to increased physical harm to people living, working, and using the buildings of South Dunedin. Figure 5.11 shows the proportion of the population living in areas at risk. These values mirror the risk to buildings and show that a large proportion of the usually resident population of South Dunedin live in areas where over 50% of the buildings are rated to have medium or high risk due to groundwater rise and/or coastal inundation by late century.

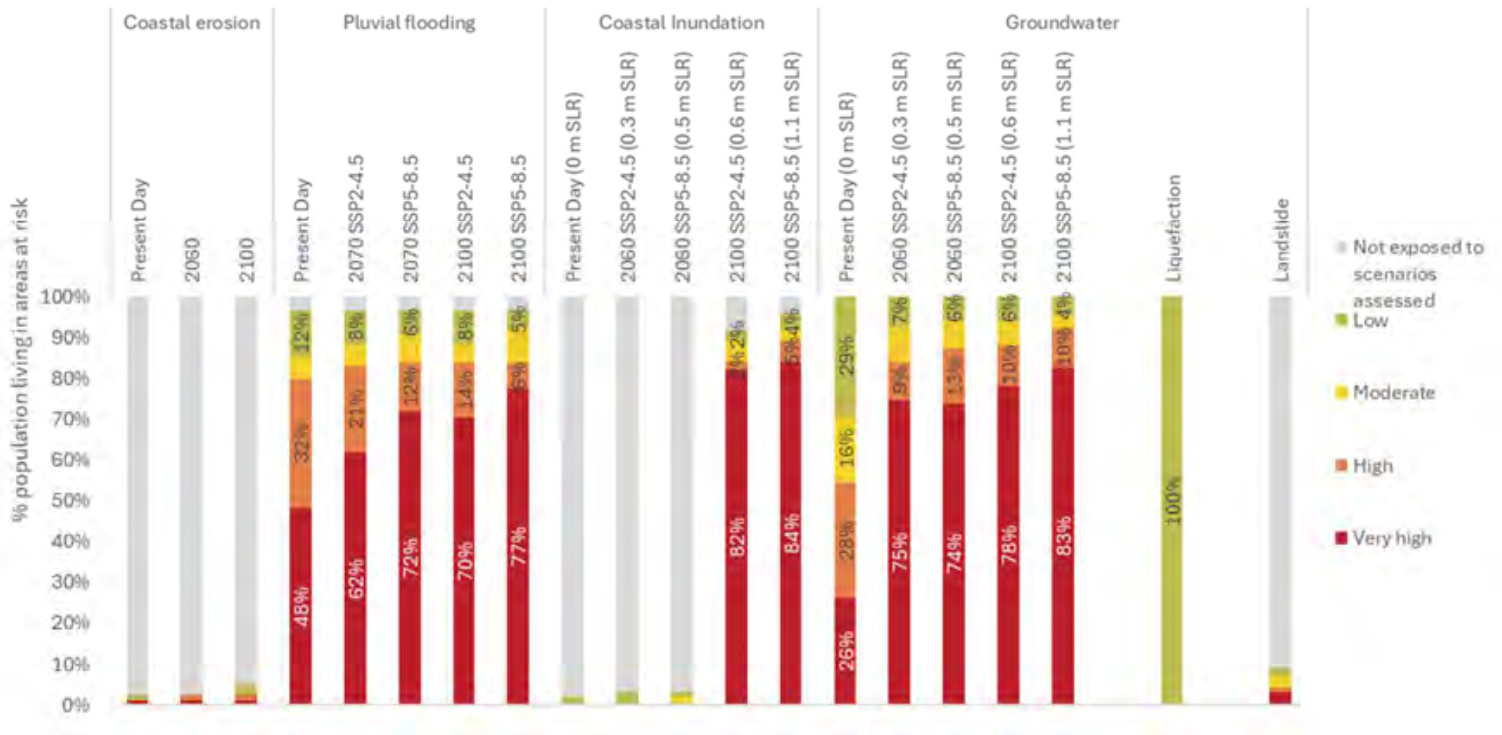


Figure 5.11 Proportion of usually resident population of South Dunedin living in areas at risk (Statistics NZ, 2018)

5.1.2.1 RISK TO VULNERABLE GROUPS

South Dunedin has a relatively high proportion of residents with mobility difficulties, who are over 65, or have other (non-mobility related) disabilities. The proportion of these vulnerable populations living in areas at risk has been analysed. The profile of risk to each group is shown in the series of figures: Figure 5.12 (living in rental accommodation), Figure 5.13 (some difficulty communicating), Figure 5.14 (some difficulty walking), Figure 5.15 (aged over 65).

This analysis shows that a large proportion of the more vulnerable population of South Dunedin live in areas where over 50% of the buildings are rated to have medium or high risk due to groundwater rise and/or coastal inundation by late century. While there are small variations between these subsets of the South Dunedin population, this trend is consistent between all vulnerable groups and with the wider population. The population of more vulnerable groups are distributed widely across South Dunedin (Figure 3.11), and therefore tend to have similar risk profiles to that of the general population.

The people within these groups are likely to be more sensitive to increasing natural hazard risk than the general population. This issue is discussed further in Section 6.2.

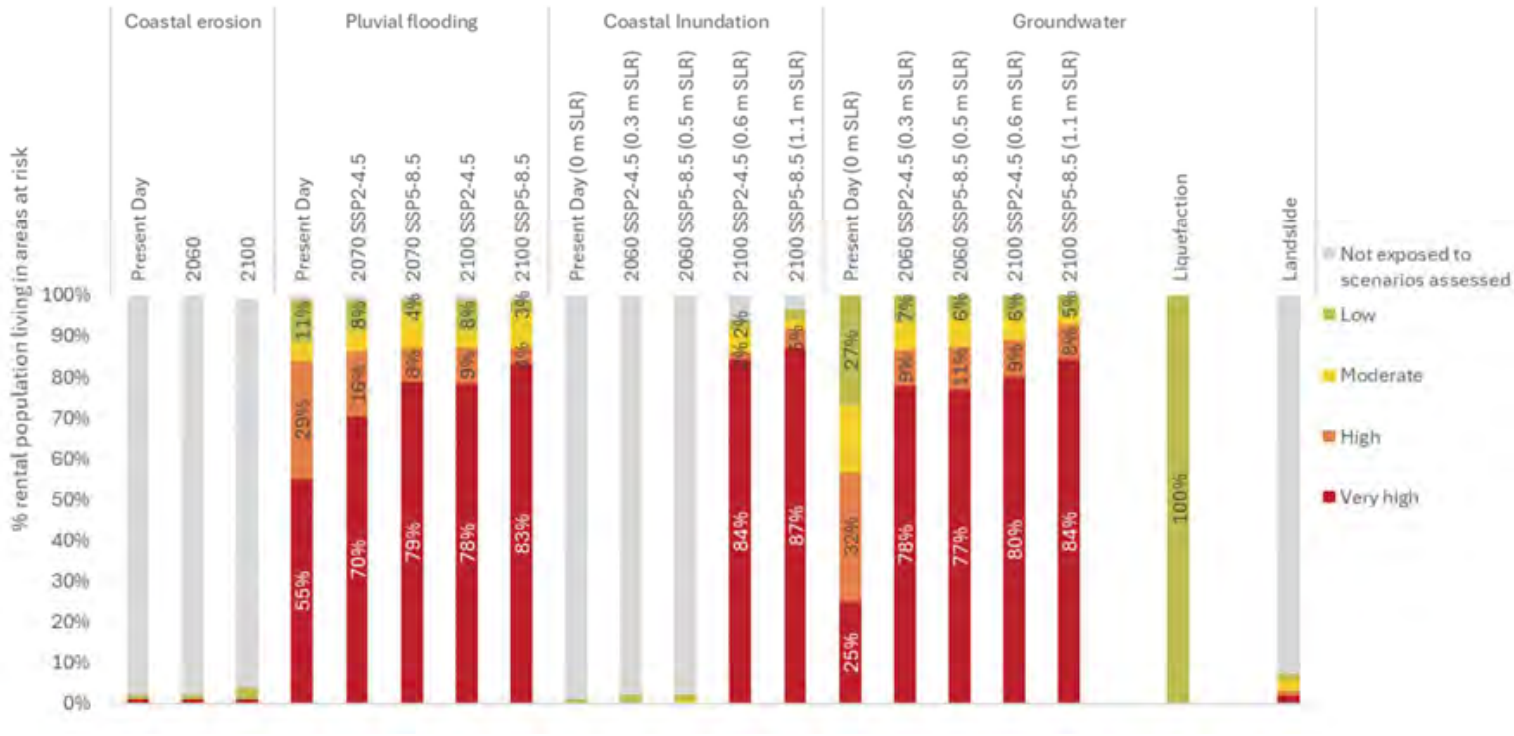


Figure 5.12 Proportion of renters living in areas at risk

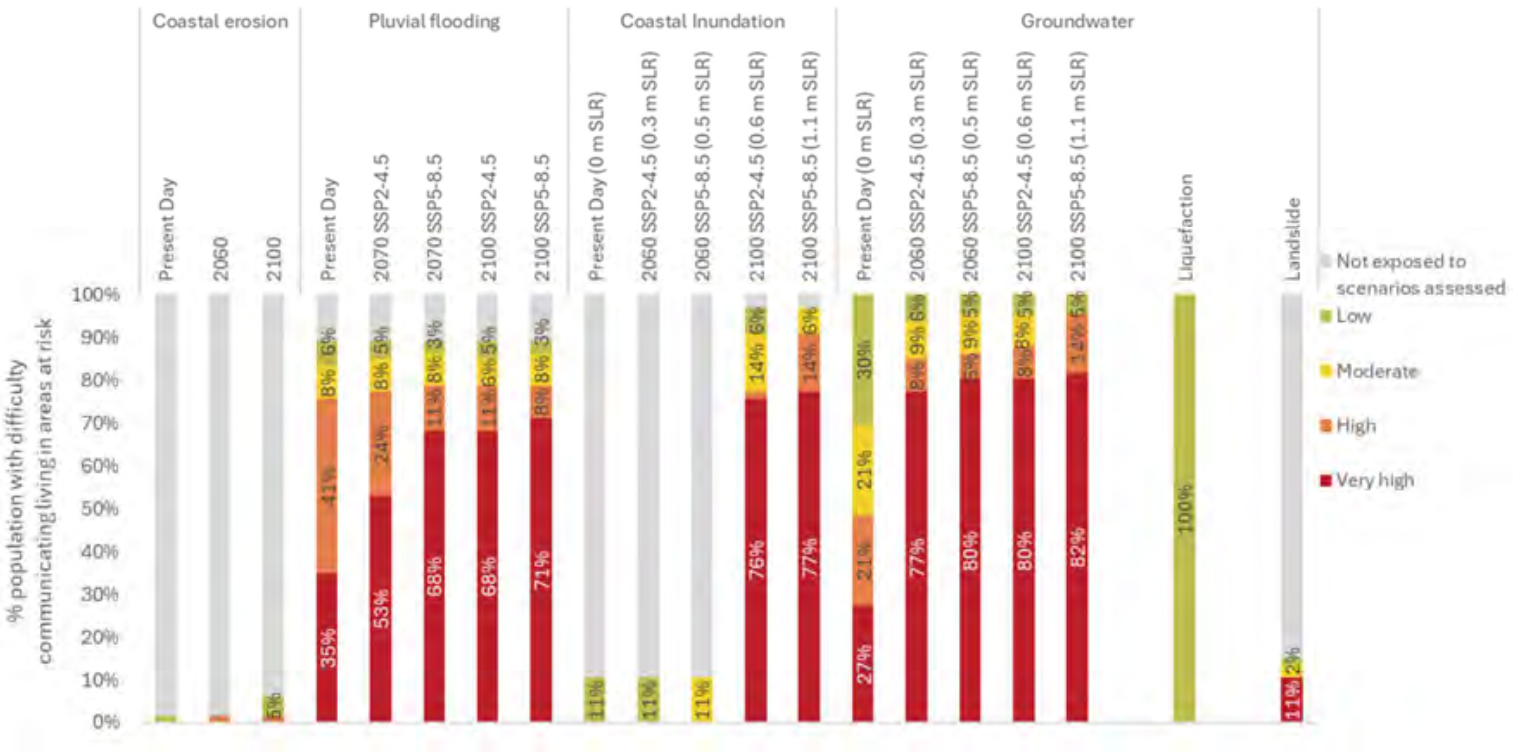


Figure 5.13 Proportion of population with some difficulty communicating living in areas at risk

Figure 5.14 Proportion of population with difficulty walking living in areas at risk

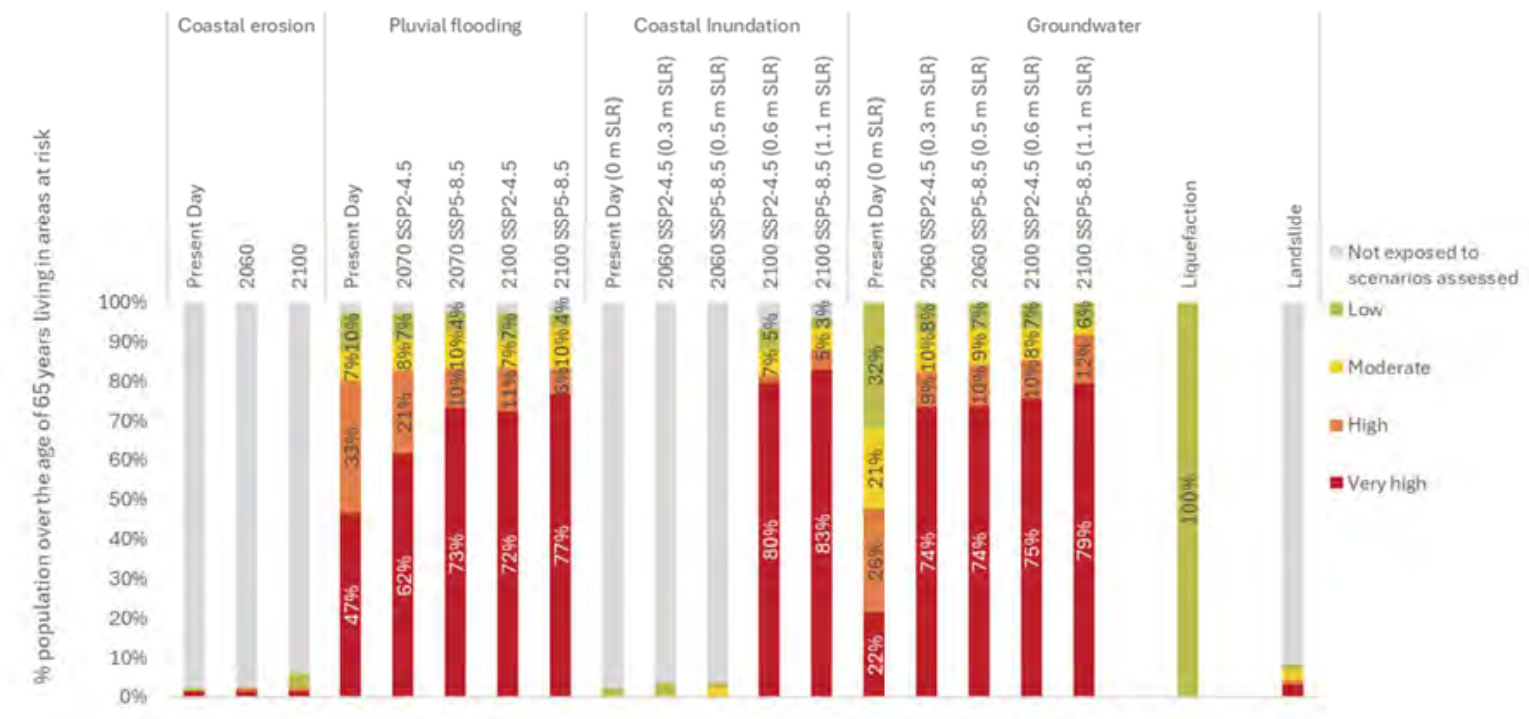


Figure 5.15 Proportion of population aged over 65 living in areas at risk

5.1.3 PROPERTY VALUES

The number of properties in South Dunedin is 4796. Many properties have one or more buildings on them, where the maximum number of buildings on a single property is 52. Of this building stock, the estimated total value is $3.5 billion based on 2023-2024 rateable values.

Figure 5.16 shows the value of properties at risk due to each hazard (values are unadjusted for inflation). These trends are consistent with the proportion of buildings at risk (by number of buildings), as shown in Section 5.1.1.

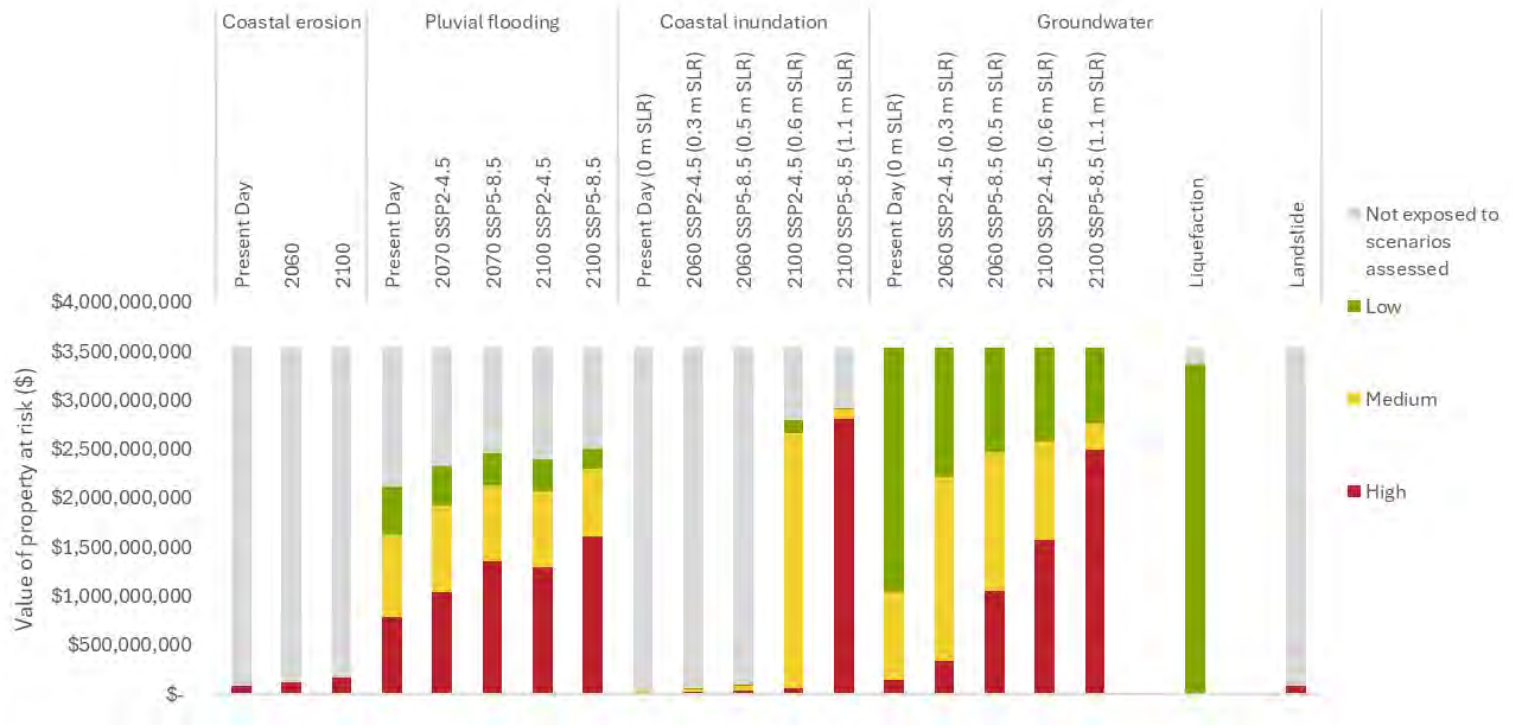


Figure 5.16 Values of properties at risk[26]

5.2 RISK TO PARKS AND SPORTS FIELDS

There are 56 parks and 87 sports fields within South Dunedin (most sports fields are located within parks, and some are overlapping).

The parks and sports fields of South Dunedin were frequently identified as features of high value to the community during in-person engagement sessions. They are also known to provide amenity to the wider Dunedin population because a high proportion of the city's sporting facilities are located within South Dunedin. The total sports field area within the South Dunedin area comprises approximately 230,000 m^2, which is 45% of the entire sports field area of Dunedin (an area of approximately 500,000 m^2). Parks and playing field key features include:

- St Clair - St Kilda beach.
- Tahuna Park.
- Marlow Park (especially the Dinosaur Playground).
- Sports grounds at Bathgate Park, Tonga Park, West Kettle Park, Culling Park.
- Caledonian gym and sporting facilities.

It should be noted that all parks and playgrounds were generically identified as key features of importance through the engagement sessions. Refer Figure 5.5 for locations.

The graphs presented in Figure 5.17 and Figure 5.18 identify how the natural hazard risks to parks and playing fields change over time. Spatial mapping of the risk to parks and playing fields (grouped as 'open space') is shown in Figure 5.19 (risk due to coastal erosion and pluvial flooding), Figure 5.21 (risk due to coastal inundation), Figure 5.22 (risk due to groundwater), and Figure 5.23 (risk due to landslide and liquefaction). Risk ratings are tabulated for the key features in Table 5-2. Further detail regarding parks and sports field vulnerability is contained in Appendix C.

[26] Figures show a count of property values using building footprint risk ratings. No aggregation of risk to SA1 areas has been applied in this calculation

Of the 56 parks within South Dunedin, risk due to groundwater is the only hazard that generates a high rating (Figure 5.17). This high rating occurs at late century under a high end scenario and applies to parks that contain playgrounds (5% of parks).

Of the 87 sports fields[27] within South Dunedin the highest rated risks are due to coastal erosion and groundwater (Figure 5.18)[28]. Groundwater poses a high risk to 15 sports fields at present day, which increases to 40 with a modest increase in sea level rise (0.3 m). Fields that are rated high risk are expected to become permanently unusable. Playing fields that are at high risk are generally those that are within the flat in locations where groundwater is modelled to be above 0.3 m below ground level. When groundwater is permanently this high, it is expected to cause waterlogging of the root zone making the fields unusable. The number of playing fields at high risk due to groundwater stays relatively constant in all future scenarios.

Fields that are rated medium risk due to groundwater at late century are located primarily near the dunes, where groundwater does not become emergent. Fields are moderately sensitive to any rise in groundwater as this is expected to compound the impact of rainfall by making fields more susceptible to waterlogging. The currently high groundwater in South Dunedin means any increase in groundwater or frequency of rainfall is expected to be damaging to fields. Waterlogging of fields is also related to recent rainfall and the frequency of use, where fields can be closed to reduce damage from playing.

Coastal erosion poses a high risk to 17 playing fields under the mid-century scenario which increases to 25 fields in late century[29]. Fields at high risk from coastal erosion may experience direct damage leading to the permanent complete loss of field function. Four of South Dunedin's largest parks; Kettle Park, Tahuna Park, Hancock Park, and Ocean Grove are located along the Coastal Dune area of St Clair, St Kilda and Tomahawk Beaches. Bayfield Park is directly adjacent to the Andersons Bay Harbour Inlet.

Significantly, the fields at risk from coastal erosion are those that are at lower risk due to groundwater. The Ocean Beach Reserve acts as a buffer for the dune system. Parks and playing fields around this area are vulnerable to being buried by shifting dunes, where sand is excavated from these areas at present. The landward migration of the dunes is not included in this assessment (as these areas are not spatially mapped) but may further increase the number of fields at risk.

[27] Some fields are overlapping due to seasonal arrangement of fields. All fields have been included in this assessment.
[28] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.
[29] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

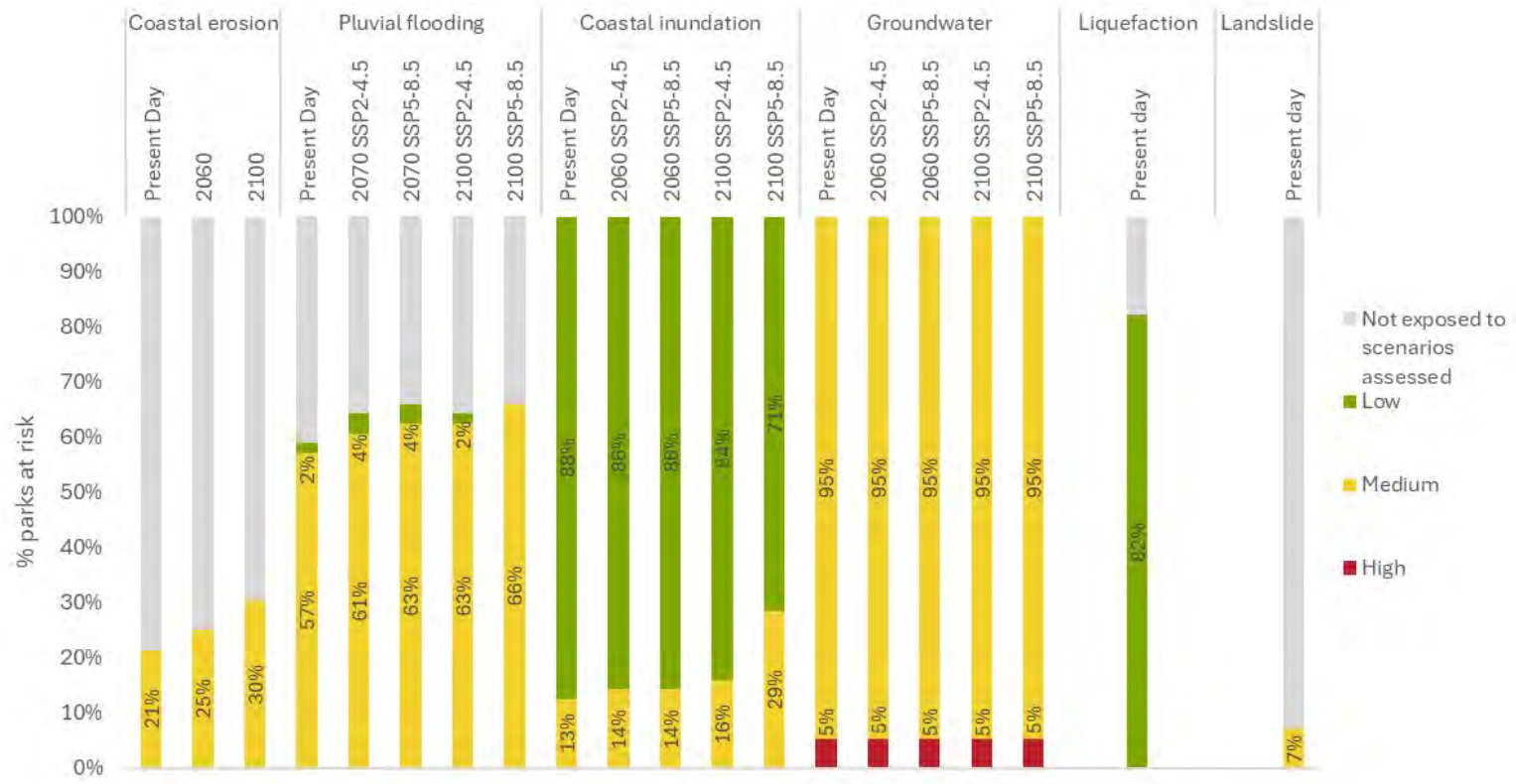


Figure 5.17 Risk to parks presented as percentage of parks (by number) at each risk rating[30].

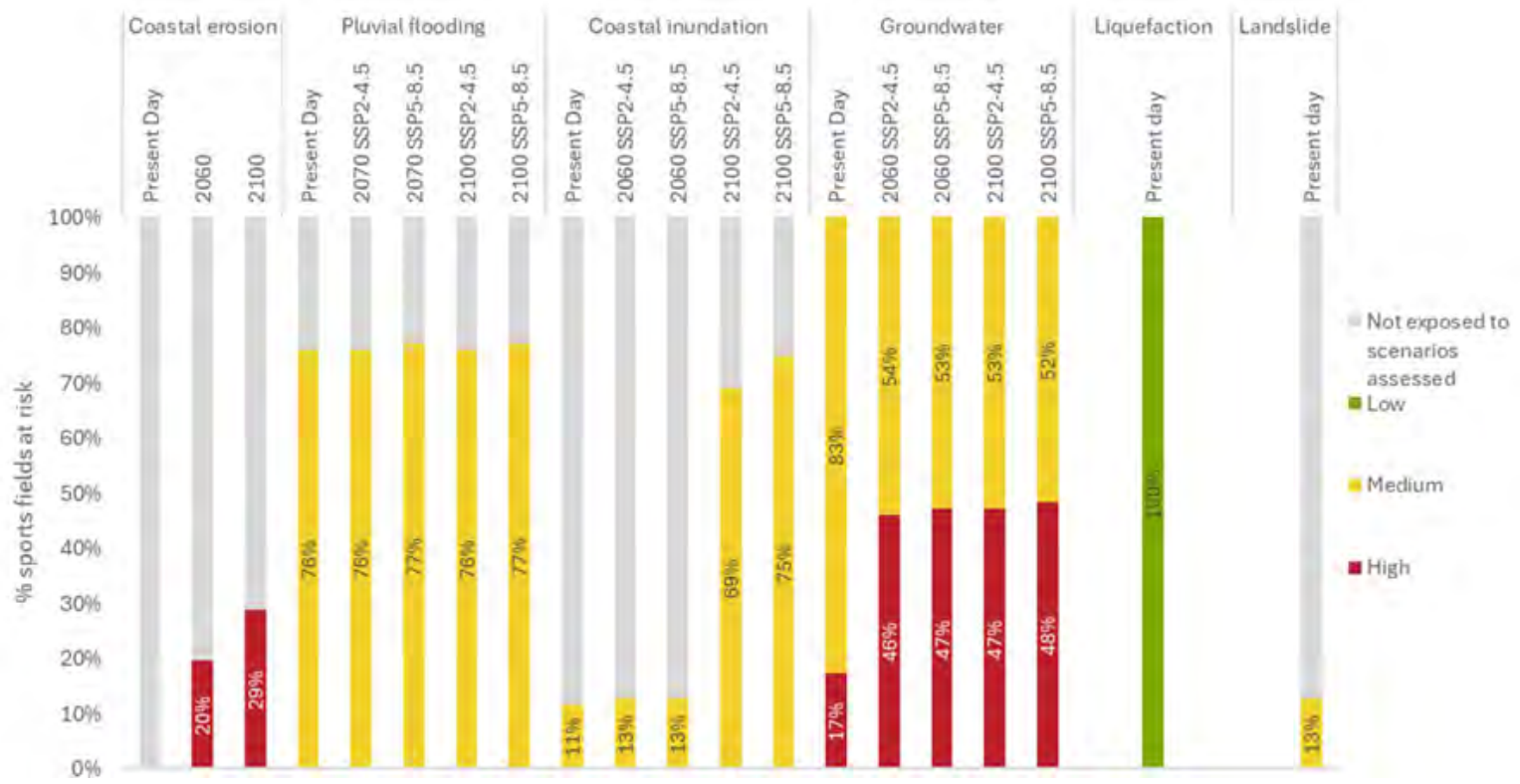


Figure 5.18 Risk to sports fields presented as percentage of fields (by number) at each risk rating[31].

[30] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

[31] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

Table 5-2 Risk to parks and playing field key features[1,2]

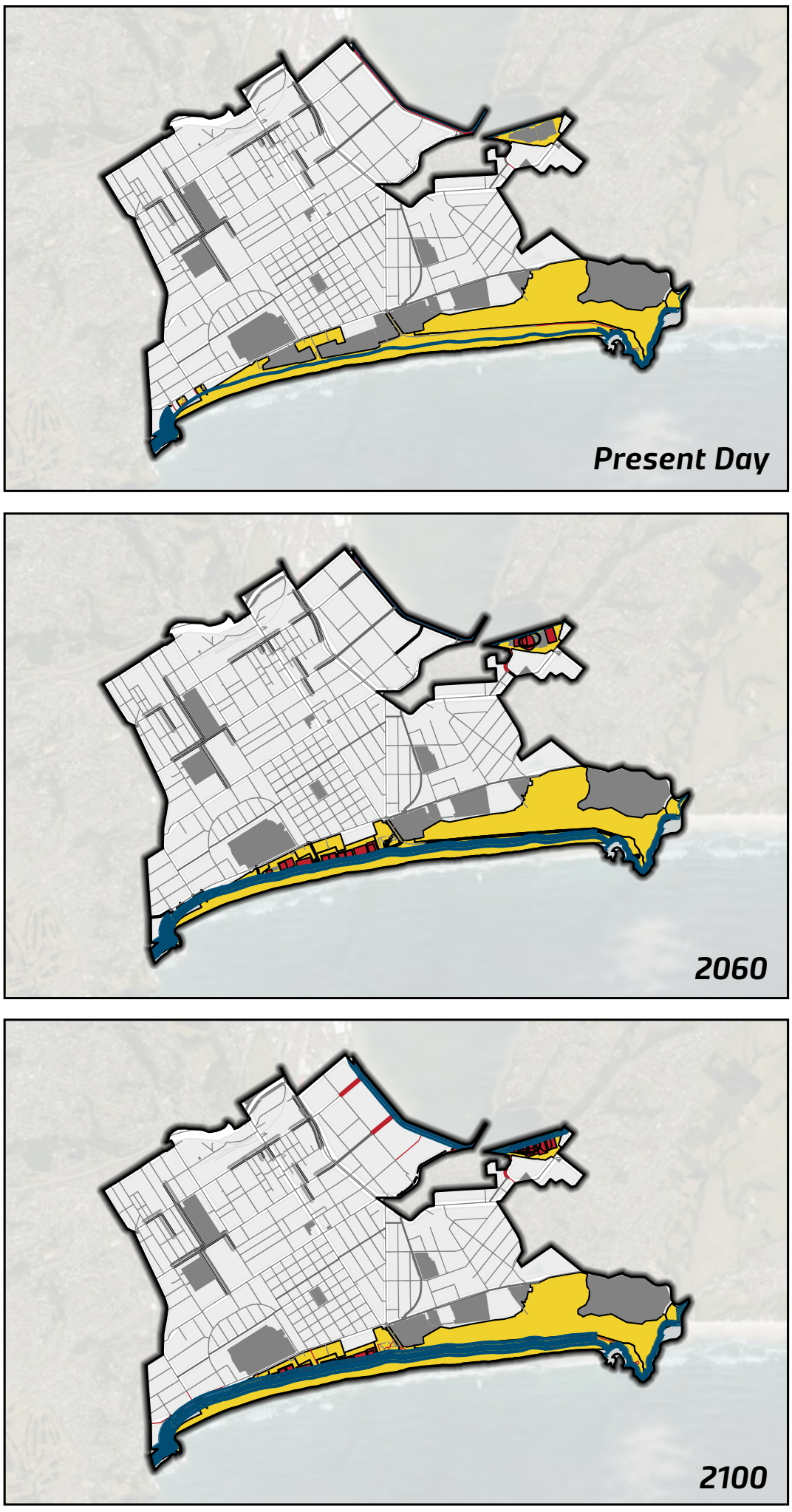
	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Bathgate Park																				
Bayfield Park																				
Culling Park																				
De Carle Park																				
Hancock Park																				
Kettle Park																				
Tahuna																				
Tahuna Park																				
Tonga Park																				
St Clair Playground																				
OB - Chisholm Park Golf Club																				
St Clair Esplanade																				
Ocean Beach Domain																				
OB - Marlow Park Playground																				
St Clair Salt Water Pool																				
Caledonian Gymnasium																				

Low Medium High Not exposed to scenarios assessed

[1]Where parks or playing fields have multiple fields, the highest risk across all fields is presented to show a single risk score for each location

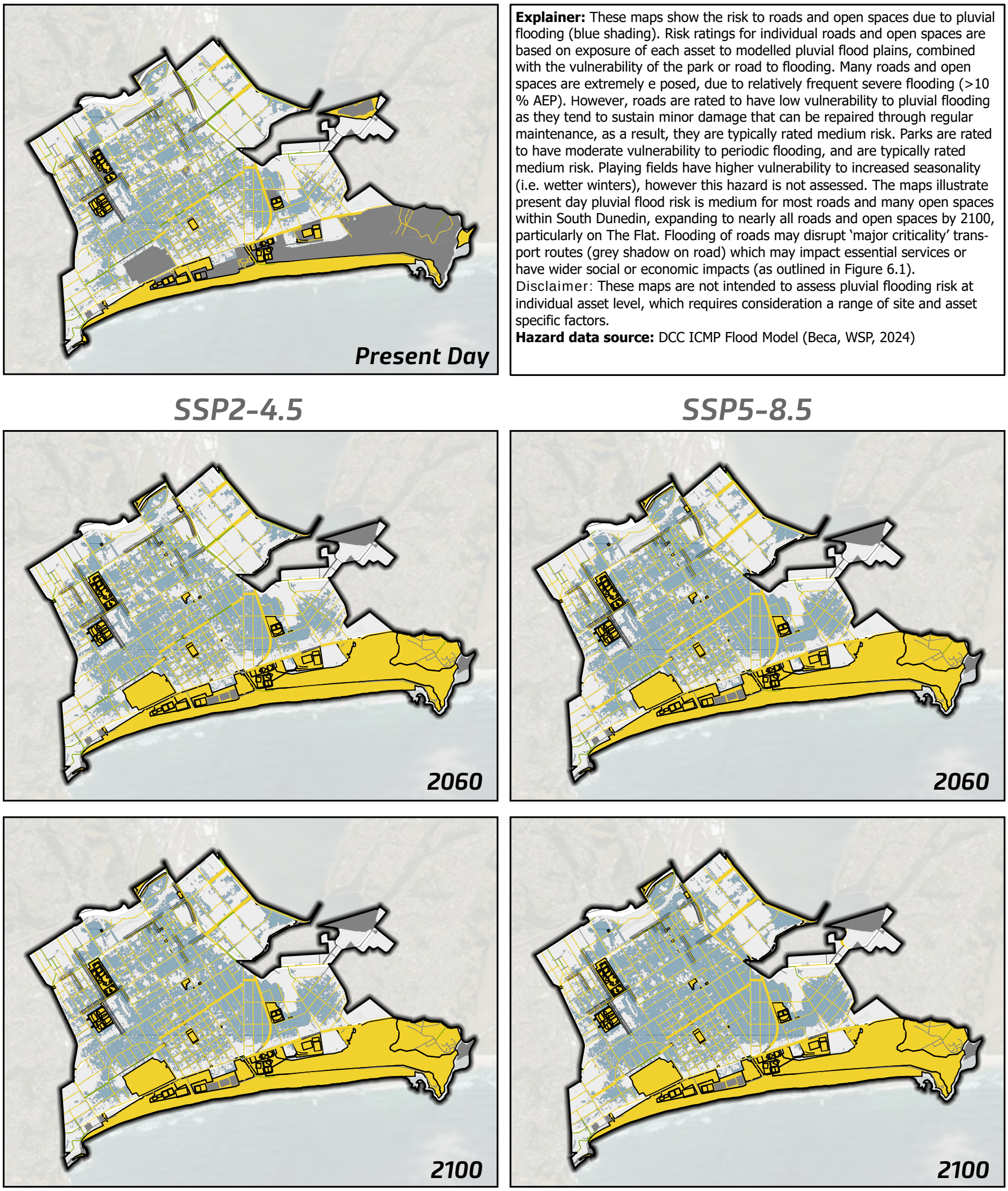
[2]There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

Figure 5.19 Open spaces and roads risk due to coastal erosion



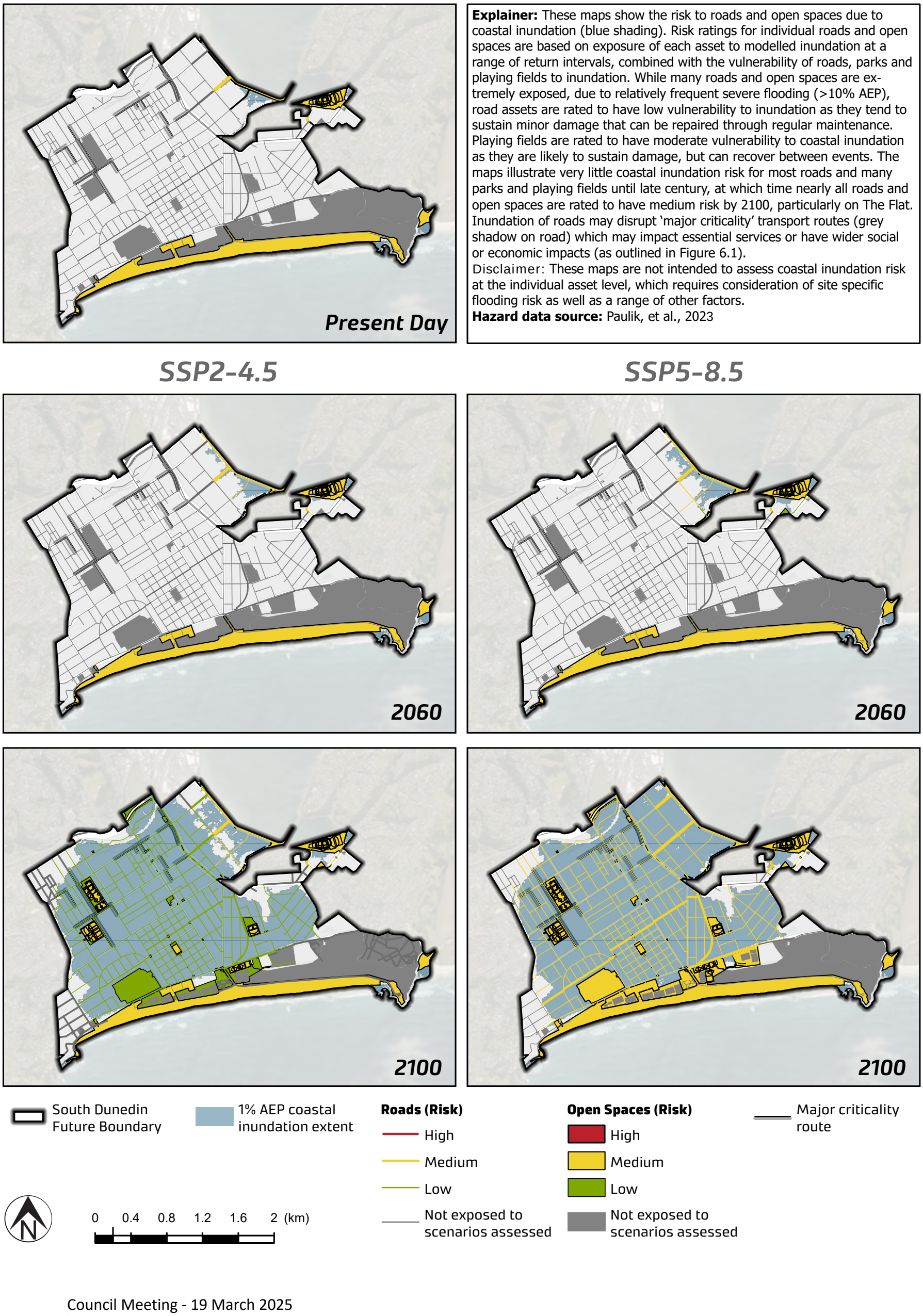
Explainer: These maps show the risk to transport and open spaces due to coastal erosion, noting that there is a high level of uncertainty regarding coastal erosion risk due to data limitations at present (e.g. scale of screening study and accounting for impact of engineered structures). The maps indicate that coastal erosion risk to transport and open spaces is identified at the Otago Harbour coastal edge and the St Clair-St Kilda coastline at present day and mid-century, with high risk to some playing fields emerging at mid century.
Disclaimer: These maps are not intended to assess coastal erosion risk to specific assets, which requires more detailed hazard data and consideration of a range of building specific factors (e.g. foundation type). More detailed coastal hazard assessments are underway as part of the St Clair-St Kilda Coastal Plan, these will be completed in late-2025, after which coastal erosion risk ratings will be reviewed.
Hazard data source: WSP, 2024

Figure 5.20 Open spaces and roads risk due to pluvial flooding



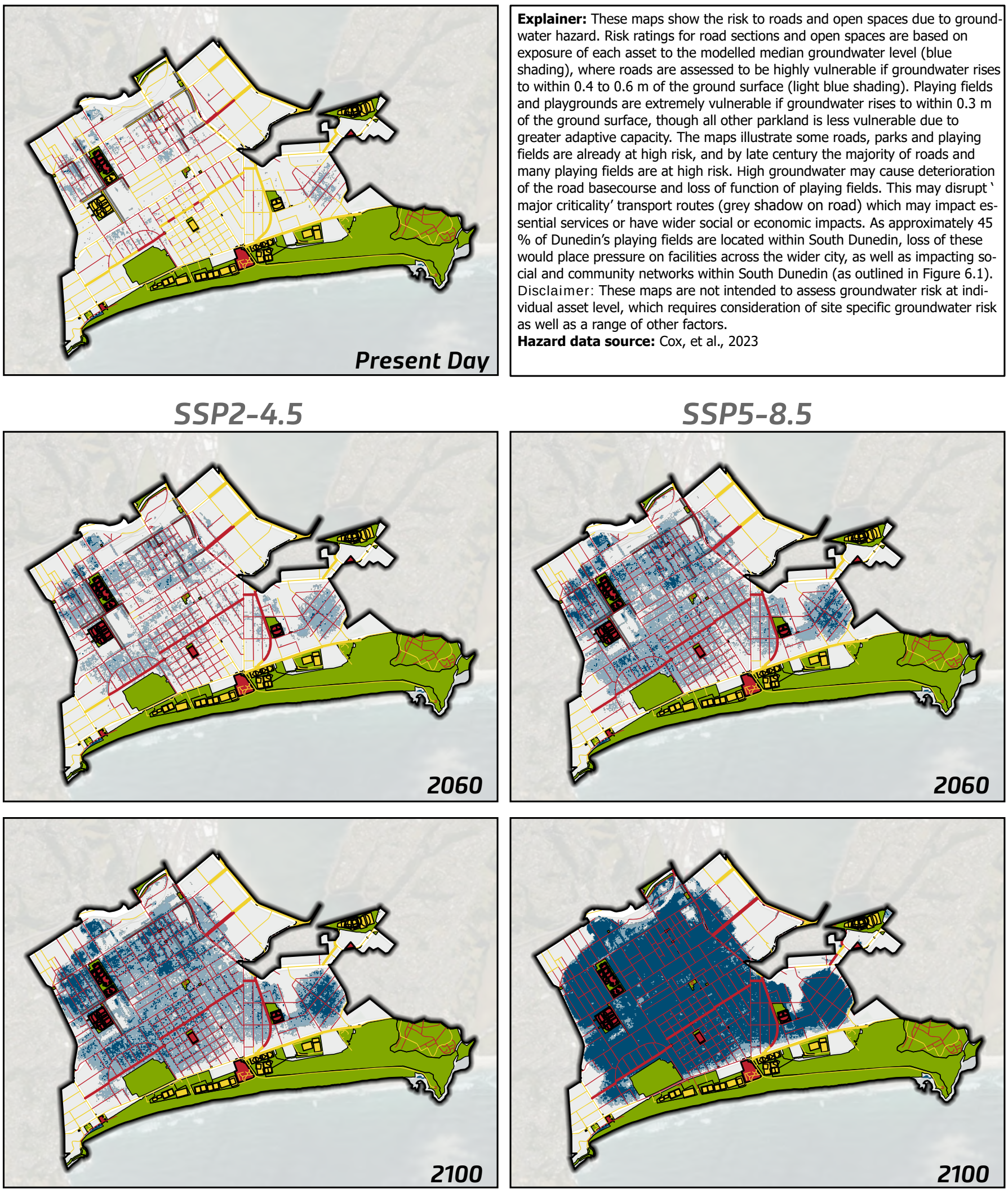
Explainer: These maps show the risk to roads and open spaces due to pluvial flooding (blue shading). Risk ratings for individual roads and open spaces are based on exposure of each asset to modelled pluvial flood plains, combined with the vulnerability of the park or road to flooding. Many roads and open spaces are extremely e posed, due to relatively frequent severe flooding (>10 % AEP). However, roads are rated to have low vulnerability to pluvial flooding as they tend to sustain minor damage that can be repaired through regular maintenance, as a result, they are typically rated medium risk. Parks are rated to have moderate vulnerability to periodic flooding, and are typically rated medium risk. Playing fields have higher vulnerability to increased seasonality (i.e. wetter winters), however this hazard is not assessed. The maps illustrate present day pluvial flood risk is medium for most roads and many open spaces within South Dunedin, expanding to nearly all roads and open spaces by 2100, particularly on The Flat. Flooding of roads may disrupt 'major criticality' transport routes (grey shadow on road) which may impact essential services or have wider social or economic impacts (as outlined in Figure 6.1).
Disclaimer: These maps are not intended to assess pluvial flooding risk at individual asset level, which requires consideration a range of site and asset specific factors.
Hazard data source: DCC ICMP Flood Model (Beca, WSP, 2024)

Figure 5.21 Open spaces and roads risk due to coastal inundation



Explainer: These maps show the risk to roads and open spaces due to coastal inundation (blue shading). Risk ratings for individual roads and open spaces are based on exposure of each asset to modelled inundation at a range of return intervals, combined with the vulnerability of roads, parks and playing fields to inundation. While many roads and open spaces are extremely exposed, due to relatively frequent severe flooding (>10% AEP), road assets are rated to have low vulnerability to inundation as they tend to sustain minor damage that can be repaired through regular maintenance. Playing fields are rated to have moderate vulnerability to coastal inundation as they are likely to sustain damage, but can recover between events. The maps illustrate very little coastal inundation risk for most roads and many parks and playing fields until late century, at which time nearly all roads and open spaces are rated to have medium risk by 2100, particularly on The Flat. Inundation of roads may disrupt 'major criticality' transport routes (grey shadow on road) which may impact essential services or have wider social or economic impacts (as outlined in Figure 6.1).
Disclaimer: These maps are not intended to assess coastal inundation risk at the individual asset level, which requires consideration of site specific flooding risk as well as a range of other factors.
Hazard data source: Paulik, et al., 2023

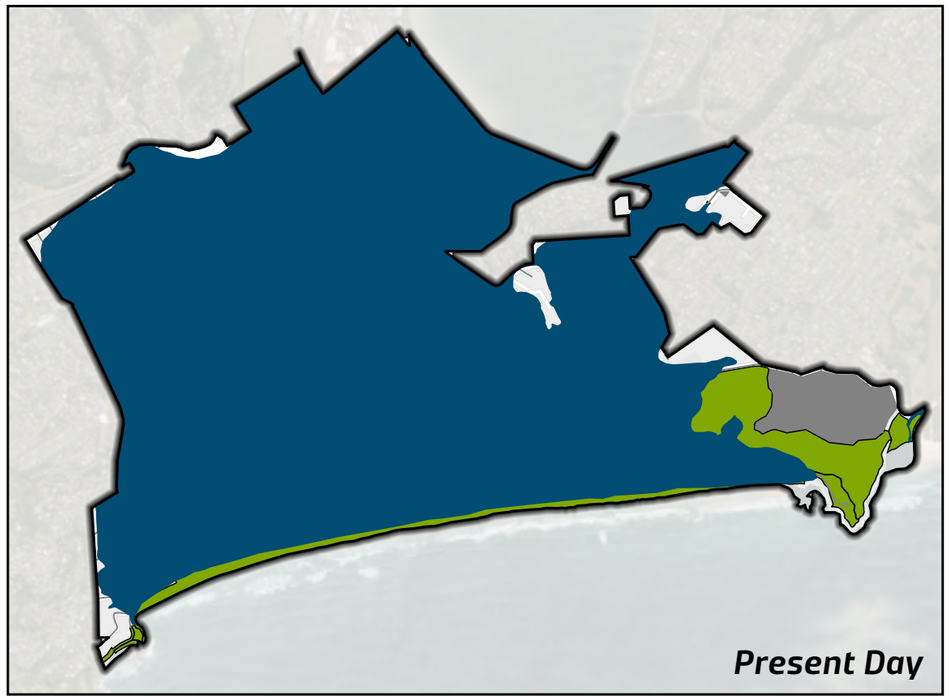
Figure 5.22 Open spaces and roads risk due to groundwater



Explainer: These maps show the risk to roads and open spaces due to groundwater hazard. Risk ratings for road sections and open spaces are based on exposure of each asset to the modelled median groundwater level (blue shading), where roads are assessed to be highly vulnerable if groundwater rises to within 0.4 to 0.6 m of the ground surface (light blue shading). Playing fields and playgrounds are extremely vulnerable if groundwater rises to within 0.3 m of the ground surface, though all other parkland is less vulnerable due to greater adaptive capacity. The maps illustrate some roads, parks and playing fields are already at high risk, and by late century the majority of roads and many playing fields are at high risk. High groundwater may cause deterioration of the road basecourse and loss of function of playing fields. This may disrupt ' major criticality' transport routes (grey shadow on road) which may impact essential services or have wider social or economic impacts. As approximately 45 % of Dunedin's playing fields are located within South Dunedin, loss of these would place pressure on facilities across the wider city, as well as impacting social and community networks within South Dunedin (as outlined in Figure 6.1).
Disclaimer: These maps are not intended to assess groundwater risk at individual asset level, which requires consideration of site specific groundwater risk as well as a range of other factors.
Hazard data source: Cox, et al., 2023

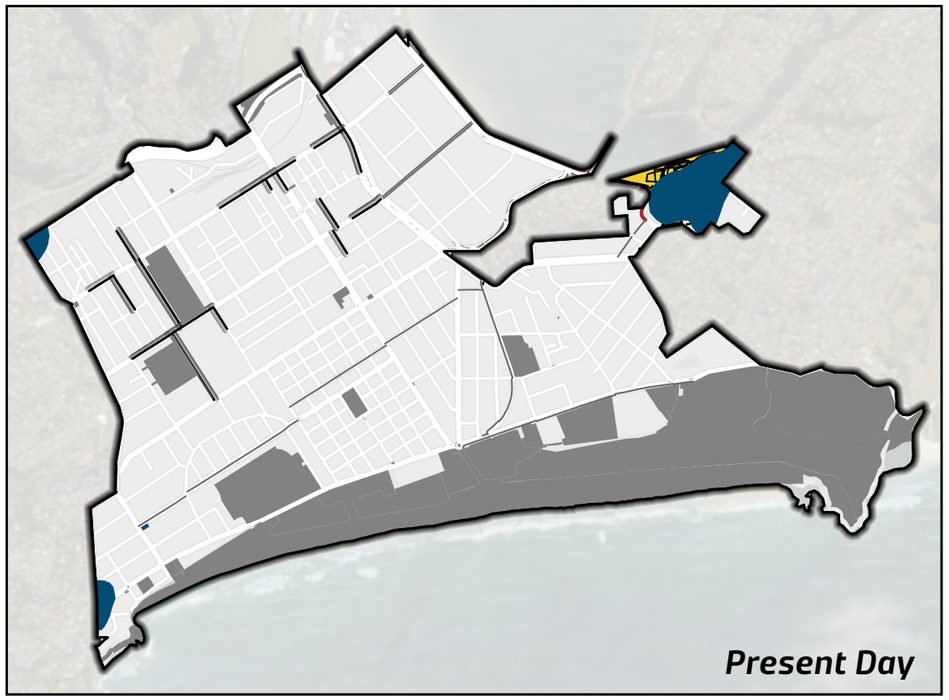
Figure 5.23 Open spaces and roads risk due to landslide and liquefaction

Liquefaction



Explainer: These maps show the risk to roads and open spaces due to liquefaction. Risk ratings for individual roads and open spaces are based on exposure of each asset to liquefaction potential, combined with their vulnerability rating (high). The maps illustrate liquefaction risk is low across South Dunedin at the present day. Liquefaction risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of sea level rise on liquefaction potential. If it were to occur, liquefaction may induce ground settlement and undulation of roads, resulting in uneven surfaces. Sand boils can occur, posing hazards and necessitating cleanup, while lateral spreading near free faces may lead to ground cracking. Liquefaction may induce ground settlement and undulation in parks and sports fields, resulting in uneven surfaces. Sand boils can occur, posing hazards and necessitating cleanup, while lateral spreading near free faces may lead to ground cracking.
Disclaimer: These maps are not intended to assess liquefaction risk at individual asset level, which requires consideration of site specific liquefaction risk as well as more detailed asset information. Liquefaction hazard information is based on a high level desktop review, where subsequent site specific assessment (Hornblow, 2020) has found that liquefaction potential is highly variable across sites analysed.
Hazard data source: Barrell, 2014

Landslide



Explainer: These maps show the risk to roads and open spaces due to landslide. Risk ratings for individual roads and open spaces are based on exposure of each asset to landslides, combined with their vulnerability rating (roads – extreme, open spaces - high). The maps illustrate that this type of landslide risk is confined to areas around the South Dunedin boundary. Landslide risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of climate change (groundwater level rising or increased rainfall intensity) on landslide. Landslides can severely damage transport and open spaces resulting in sudden collapse or failure and posing a potential risk to life. Landslide damage to parks can cause loss of field function, with potentially prohibitively high repair costs.
Disclaimer: These maps are not intended to assess landslide risk at individual asset level, which requires consideration of a site specific landslide risk as well as more detailed asset information. The landslide extent is based on known landslide areas and does not account for other potential sources of landslide nor represent the extent of the area of deposition/runout.
Hazard data source: DCC Hazard database data provided for South Dunedin Future programme

South Dunedin Future Boundary

Land instability

Liquefaction (Domain C: moderate liquefaction potential)

Roads (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

Open Spaces (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

Major criticality route

N

0 0.4 0.8 1.2 1.6 2 (km)

Council Meeting - 19 March 2025

5.2.1 ADAPTIVE CAPACITY – PARKS AND SPORTS FIELDS

The adaptive capacity of parks and sportsfields is important in the consideration and development of adaptation options. The following factors are highlighted and were incorporated into the consideration of asset vulnerability where appropriate:

- Options to improve park performance under increasing flooding and groundwater rise are to change parks to turf or re-lay fields to improve drainage. These measures are limited in their effectiveness when exposed to very high or emergent groundwater levels.
- When considering adaptation of playing fields, parks that are also HAIL sites should be preferentially removed because these need higher maintenance due to re-levelling (land subsidence) and potential increase in contamination with groundwater rise.
- Playgrounds have a 30 year renewal lifespan, and many are comprised of equipment that can be relocated, making them very adaptable if other areas are available to relocate to. Playgrounds can also adapt to reflect their changing environment, for example creating water features where groundwater is high.
- Many of the buildings that are associated with parks are community led, which means they have less funding. These buildings are likely to have lower adaptive capacity compared to private commercial buildings. Loss of these facilities would be a major community loss.
- The Andersons Bay Cemetery is the single main Cultural and Heritage Park in South Dunedin. There are significant cultural and Waahi Tapu implications related to moving this reserve or repurposing it. It is therefore considered an area that is a non-negotiable asset to remain in its current form by the DCC Parks Team. The Cemetery has low exposure to hazards, with groundwater modelled to remain greater than 13 m below the surface at late century and no other hazards modelled to encroach on the grounds.

5.3 RISK TO ECOLOGICAL AREAS

There are no formally classified ecological areas within South Dunedin therefore a spatial risk assessment has not been undertaken. A short discussion regarding ecological areas relevant to South Dunedin based on literature review and the findings of engagement is provided in Appendix C4. The broader environmental impacts caused by the natural hazards are also discussed in Section 6.4.

5.3.1 ADAPTIVE CAPACITY – ECOLOGICAL AREAS

Groundwater rise may present an opportunity to restore some of the historical wetlands or salt marshes within South Dunedin. If opportunities to re-establish wetlands are undertaken within South Dunedin, it may restore ecological resilience, build amenity and strengthen mana whenua values for the benefit of the wider Dunedin area.

Creation of additional ecological areas as part of restoration or blue-green corridors will need to be mindful of the role that South Dunedin currently plays in separating ecological habitats, potentially reducing pathways for invasive pests to access ecologically important areas. For example, the Otago Peninsula and town belt are almost possum free and South Dunedin plays an important role in reducing predator pathways to the Peninsula.

5.4 RISK TO TRANSPORT INFRASTRUCTURE

The South Dunedin transport components that were considered for the risk assessment include roads (and their associated infrastructure), cycle lanes, and rail. The risk to SH1 was not assessed.

The risk assessment results are presented in the following sub-sections.

5.4.1 RISK TO ROADS

There are 90 km of roads in South Dunedin, roading key features include:

- Roads (and associated infrastructure[32]).
- Cycle lanes.
- Critical routes.

Of these, most associated infrastructure and cycle lanes have the same risk profile as the road network, they are generally located within the road corridor (with exception of some cycle ways) and therefore are not presented as separate risk profiles. The associated roading infrastructure that do not have a similar risk profile to roads are:

- Below ground stormwater infrastructure which is expected to have the same risk profile as the local stormwater network. Due to this, roading stormwater infrastructure has not been separately assessed but may be inferred from nearby stormwater risk.

The graph shown in Figure 5.24 identifies the risk to all roads (ex. SH1) within South Dunedin over time for each hazard. Figure 5.25 presents the risk to major criticality roads (~3 km of road length) over time for each hazard.

A spatial representation of risk to roads and associated infrastructure is shown in Figure 5.19, Figure 5.21, Figure 5.22, and Figure 5.23. Further detail regarding road vulnerability is contained in Appendix C.

[32] Associated infrastructure includes, but is not limited to electrical assets (e.g. street lights, signals), stormwater infrastructure (e.g. kerbs, catch pits, cross drainage and culverts), structures (e.g. retaining walls, sea wall, causeway) and footpaths.

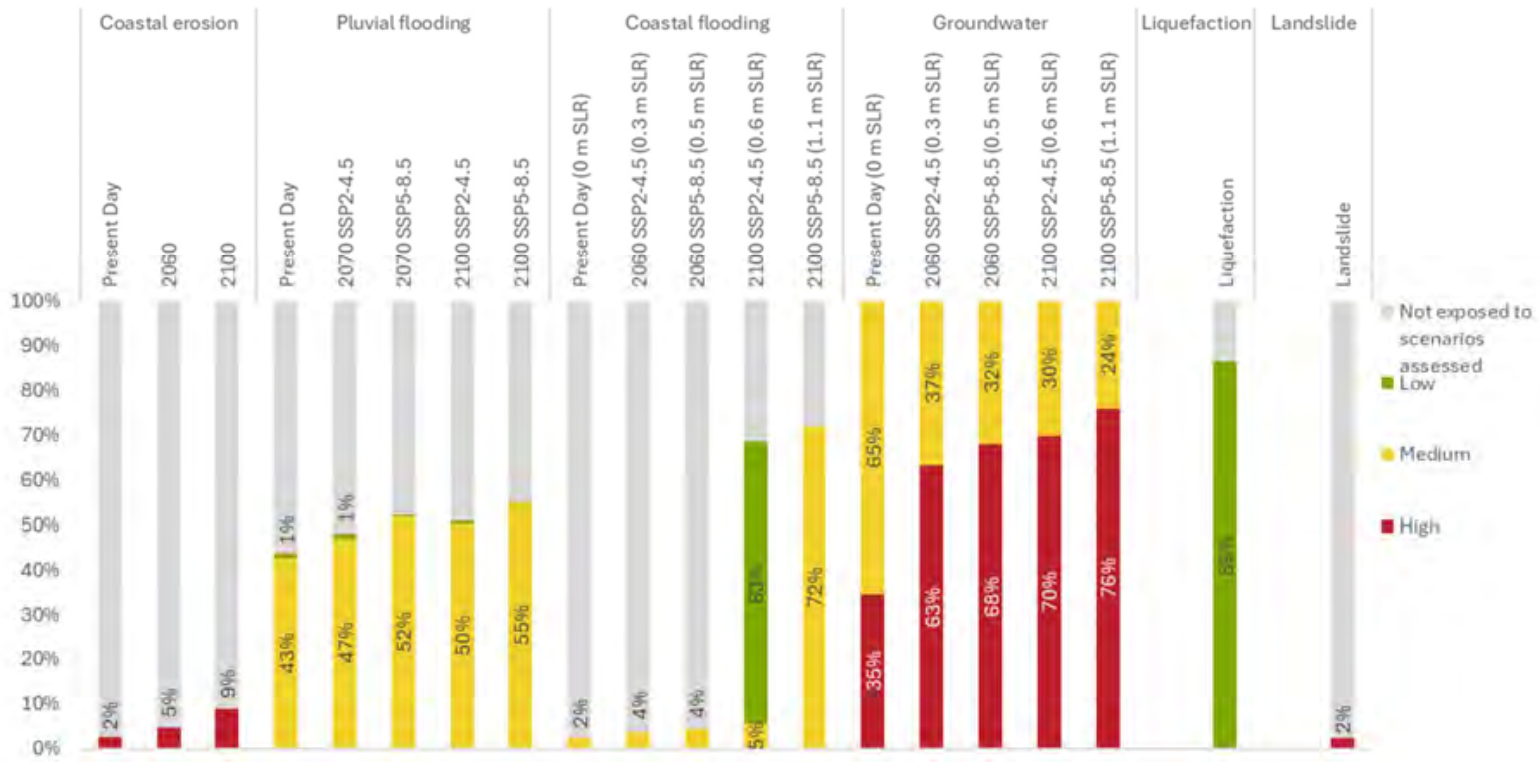


Figure 5.24 Risk to roads presented as percentage of road length at each risk rating[33]

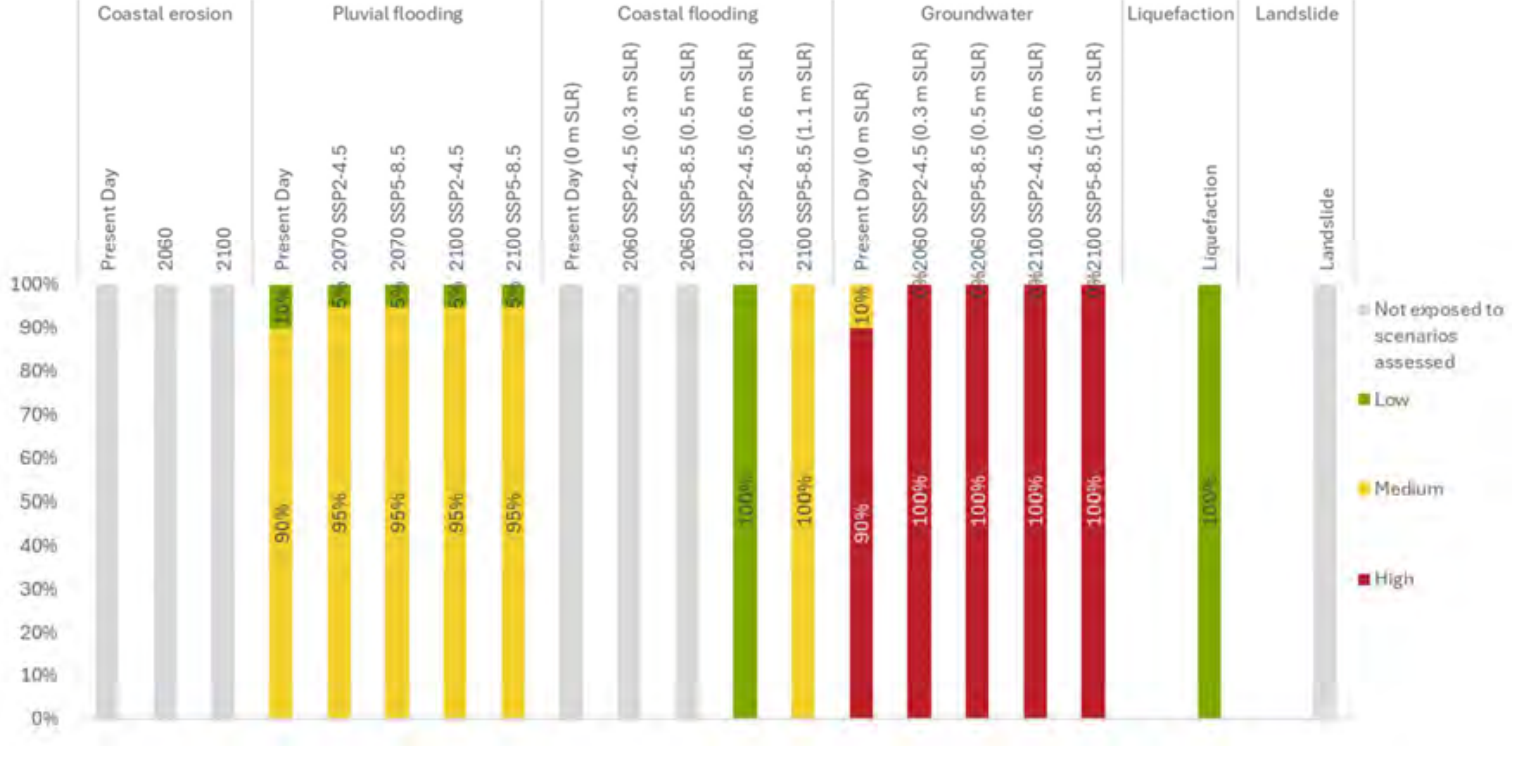


Figure 5.25 Risk to roads with 'major' criticality rating presented as percentage of roads (by number of roads at risk).

Across South Dunedin, risk to roads due to groundwater is the highest rated risk at present (35% roads are at risk) and is projected to increase over time. Groundwater remains the hazard posing the highest risk to roads over all scenarios and time periods. By late century, 76% of roads are rated to be at high risk (Figure 5.24).

Roads that are at high risk due to groundwater are expected to sustain damage to a level where the road is not functional until repairs are made. With a chronic hazard such as groundwater,

[33] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

repairs will become increasingly difficult. Roads and cycle lanes are highly vulnerable to high groundwater, where groundwater within the roading basecourse causes deterioration of the road structure. This drives increased maintenance and can ultimately lead to road failure. Already, in some areas within South Dunedin, high groundwater poses a threat to road condition. Roads with higher traffic loading are sensitive to groundwater earlier in time (median groundwater level above 0.6 m below ground level) to lower traffic loading roads (median groundwater level above 0.4 m below ground level). With only a modest increase in sea level (0.3 m), groundwater levels are modelled to reach the road basecourse depth across extensive parts of South Dunedin.

Roads are also extremely vulnerable to landslide and coastal erosion; roads exposed to these hazards are expected to experience sudden collapse or failure that will cause a potential risk to life. However, the relatively small extent of exposure to these hazards means the length of road at risk to these hazards across South Dunedin is relatively small compared to groundwater risk.

Many roads within South Dunedin are extremely exposed to widespread pluvial flooding at present (43% of roads by length), the extent of which increases with time. At late century, roads are also extremely exposed to widespread coastal inundation (72% of roads exposed by length). Although roads were rated to have low vulnerability to pluvial flooding and coastal inundation, this extreme exposure means many roads are rated to be at moderate risk to pluvial flooding and coastal inundation.

South Dunedin has 20 major criticality routes (shown as grey shading on Figure 5.19 to Figure 5.23 which are defined by their:

- Economic or social significance to more than one region.
- Lifeline significance for providing access or continuity of supply of essential services during an emergency event.

All major criticality routes are at high risk due to groundwater at timeframes beyond present day (Figure 5.25). All major criticality routes are at medium risk due to coastal inundation at late century and 13 are at medium risk at present day and mid-century. None are exposed to coastal erosion or landslide.

The high risk posed by groundwater to the major criticality routes of South Dunedin indicates that these roads will lose functionality in the absence of adaptive measures. Loss of critical transport routes may:

- Have a significant economic or social impact.
- Disrupt access to the Otago Peninsula.
- Disrupt a regionally significant lifeline.
- Interfere with access or continuity of supply of essential services.

Loss or damage of transport routes will have a range of local and regional impacts. These are discussed further in Section 6.2.2.

5.4.2 ADAPTIVE CAPACITY – ROADS

The adaptive capacity of roads is important in the consideration and development of adaptation options. The following factors are highlighted as further considerations for the adaptation planning:

- Measures to adapt roads to high groundwater include raising roads or changing the road material to concrete. However, there are potential adverse effects on others caused by raising roads which will need close consideration (e.g. through changes to overland flowpaths or floodplains). Feedback from roading managers indicated that the use of

concrete to improve road resilience to groundwater was not expected to be effective in South Dunedin.

- Road performance is interdependent with the stormwater network as roading drainage provides stormwater management and connects to the wider stormwater network.
- Road performance is interdependent with parks as these influence stormwater generation, where greater parkland coverage results in comparatively lower stormwater runoff generation (i.e. due to low impervious area).

5.4.3 RAIL INFRASTRUCTURE EXPOSURE ASSESSMENT

Rail infrastructure within South Dunedin comprises the following key features:

- Rail corridor.
- Hillside Workshops.

Rail infrastructure is in important regional asset, however a detailed risk assessment was not carried out because railway adaptation to climate risks is managed through KiwiRail's national resilience planning. It was also considered by project stakeholders and partners that rail adaptation was unlikely to influence the South Dunedin Future adaptation planning.

An exposure assessment of the rail corridor was carried out (i.e. not a risk assessment because there is no consideration of vulnerability). This shows that the rail corridor is exposed to pluvial flooding, coastal inundation, high groundwater and liquefaction.

Risks to the Hillside Workshop buildings were assessed as part of the building risk assessment (Section 5.1), with results summarised in Table 5-3. Risk to most buildings located within Hillside Workshop KiwiRail Facility are rated high due to groundwater and coastal inundation under late century.

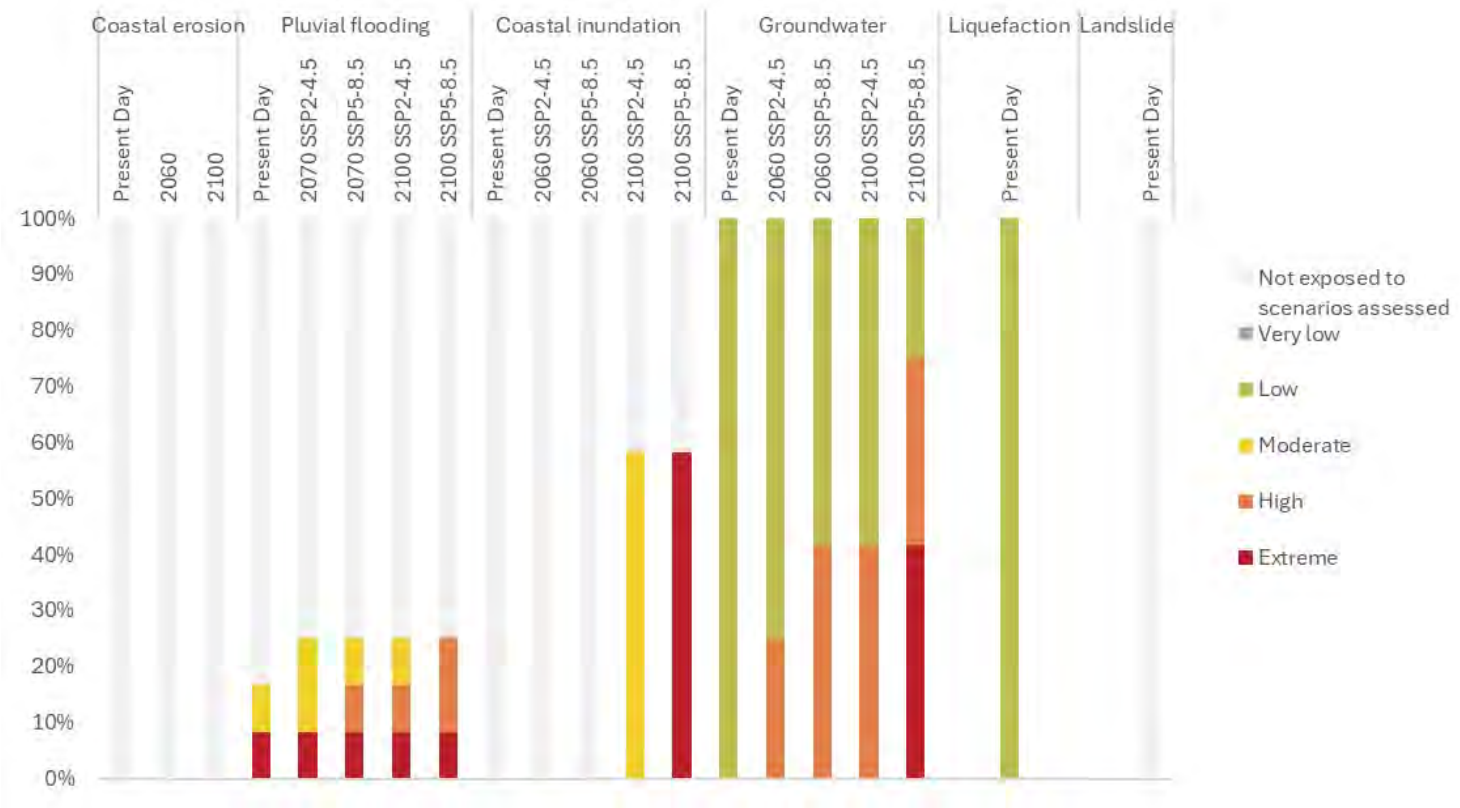


Figure 5.26 Exposure to rail infrastructure presented as percentage of rail corridor exposed

Table 5-3 Risks to buildings located within Hillside Workshop KiwiRail Facility

	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Hillside workshops: Risk rated for 24 buildings located at 13 Strathallan Street Dunedin. Ratings applied based on building risk criteria.																				
Storge yard: Pallet handling (property ID 90119)																				

Low Medium High Not exposed to scenarios assessed

5.5 RISK TO THREE WATERS INFRASTRUCTURE

This section covers the risk assessment to three waters infrastructure, which includes water supply, wastewater and stormwater infrastructure.

5.5.1 RISK TO WATER SUPPLY INFRASTRUCTURE

There are 97 km of water supply pipes in South Dunedin, key features include:

- Somerville Street Water Pumping Station.
- Somerville Distribution mains (from treatment plant that feeds Somerville).

High criticality pipes were discussed, however a review of criticality information identified that there are no high criticality water pipes in South Dunedin.

-The graph shown in Figure 5.27 shows how the risk to water supply infrastructure within South Dunedin changes over time with each hazard. Spatial representation of risk to water supply infrastructure is shown in Figure 5.28, Figure 5.30, and Figure 5.32. Risk ratings for the Somerville

Street Water Pumping Station is shown in Table 5-4. Further detail regarding water supply infrastructure vulnerability is contained in Appendix C.

In general, natural hazard risks to the water supply network in South Dunedin is low due largely to very low vulnerability of all water supply infrastructure within South Dunedin. However, there are some noteworthy observations:

- There is some coastal erosion (high) risk to 0.6 km (0.6%) of the water pipe network, increasing to 2 km (2%) later this century[34].
- Landslide hazard poses a minor risk to water supply infrastructure, with 3 km (3%) of the pipe network at medium risk.
- During floods, access to pump stations may be limited or restricted, thereby increasing operational risks during times of need.

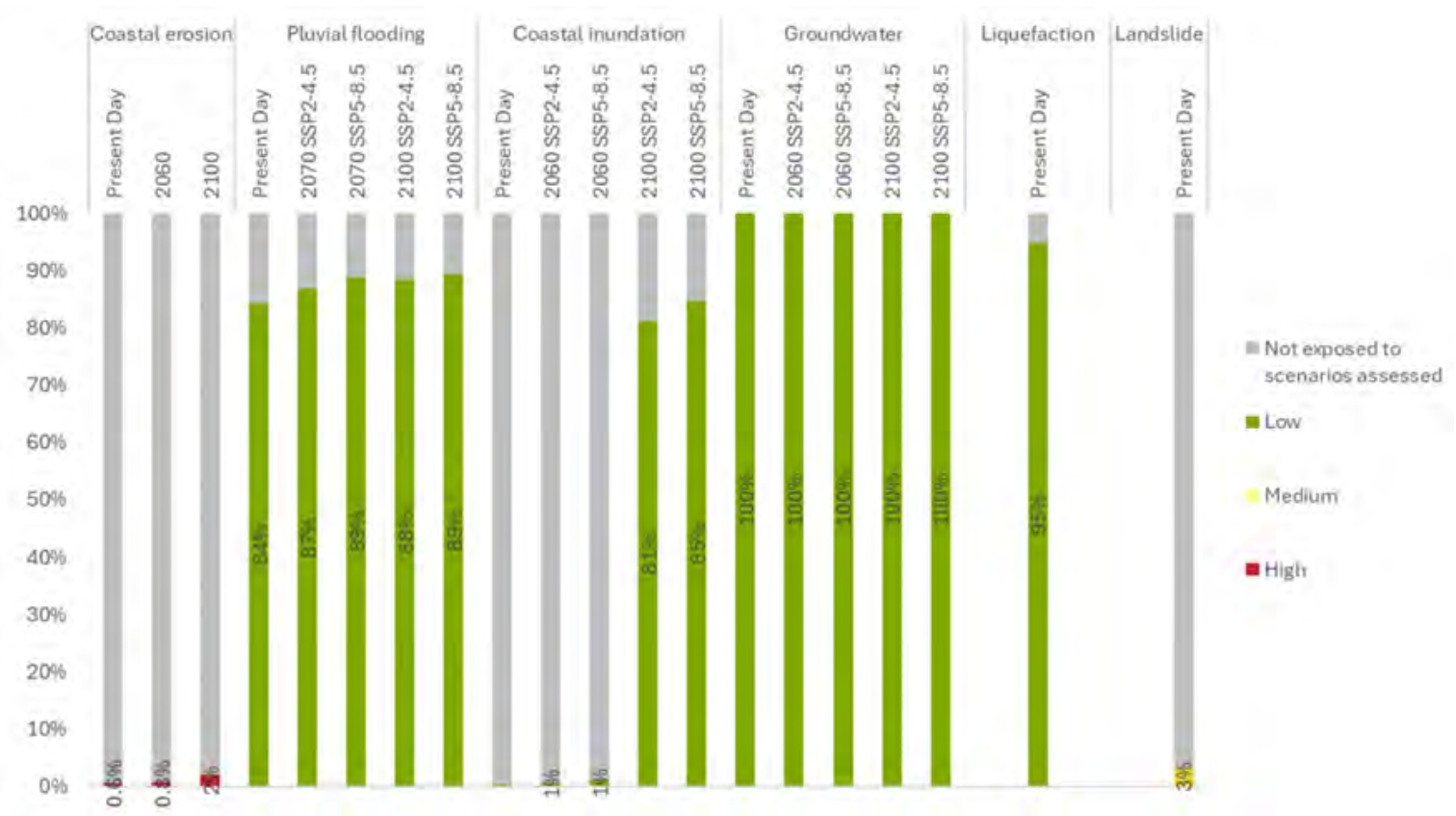


Figure 5.27 Risk to water supply pipes presented as percentage of pipe length at each risk rating[34]

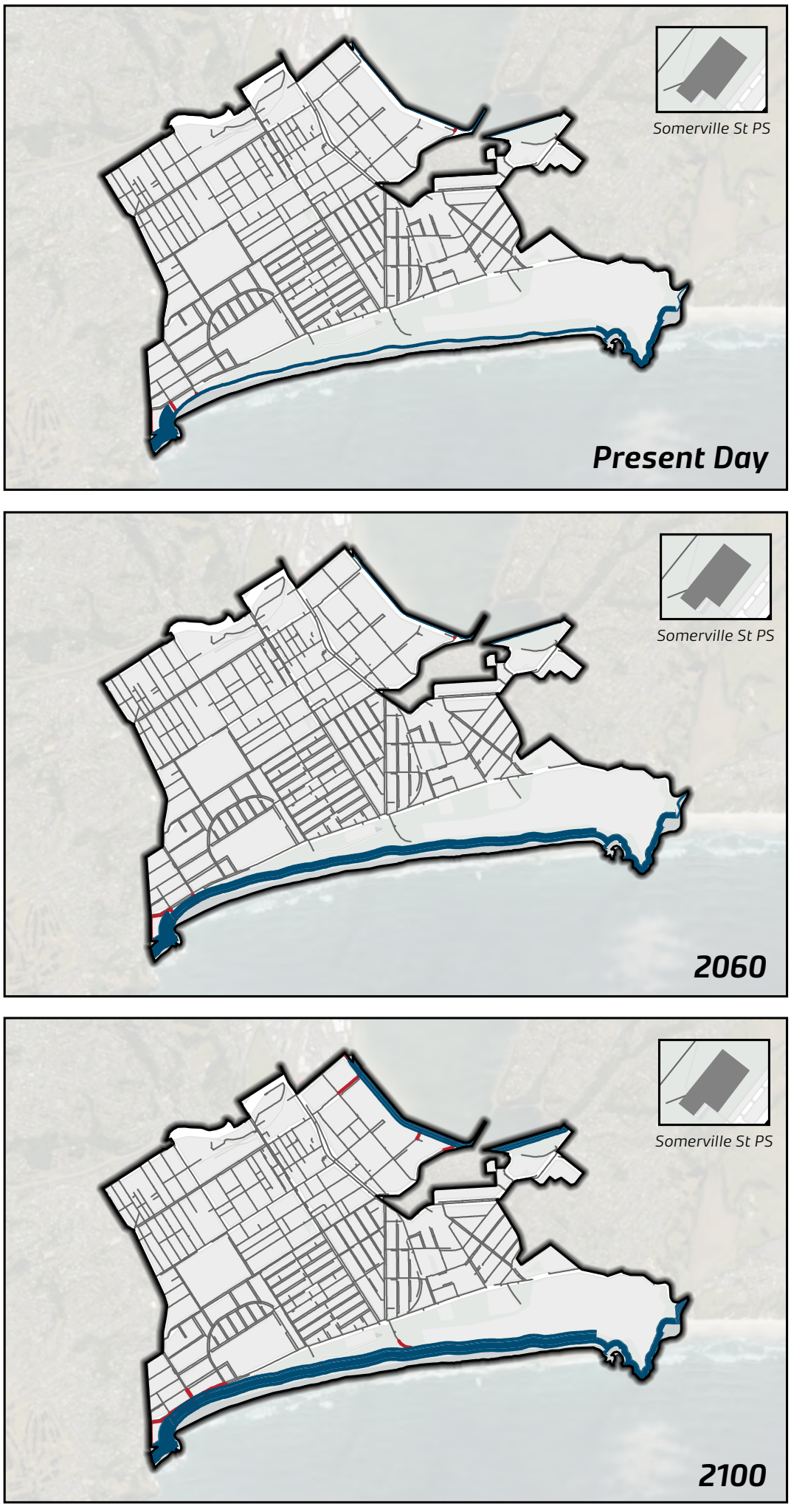
Table 5-4 Risk to Sommerville Street Pump Station

	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Sommerville Street Pumping Station (W)																				

Low Medium High Not exposed to scenarios assessed

[34] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

Figure 5.28 Water supply infrastructure risk due to coastal erosion

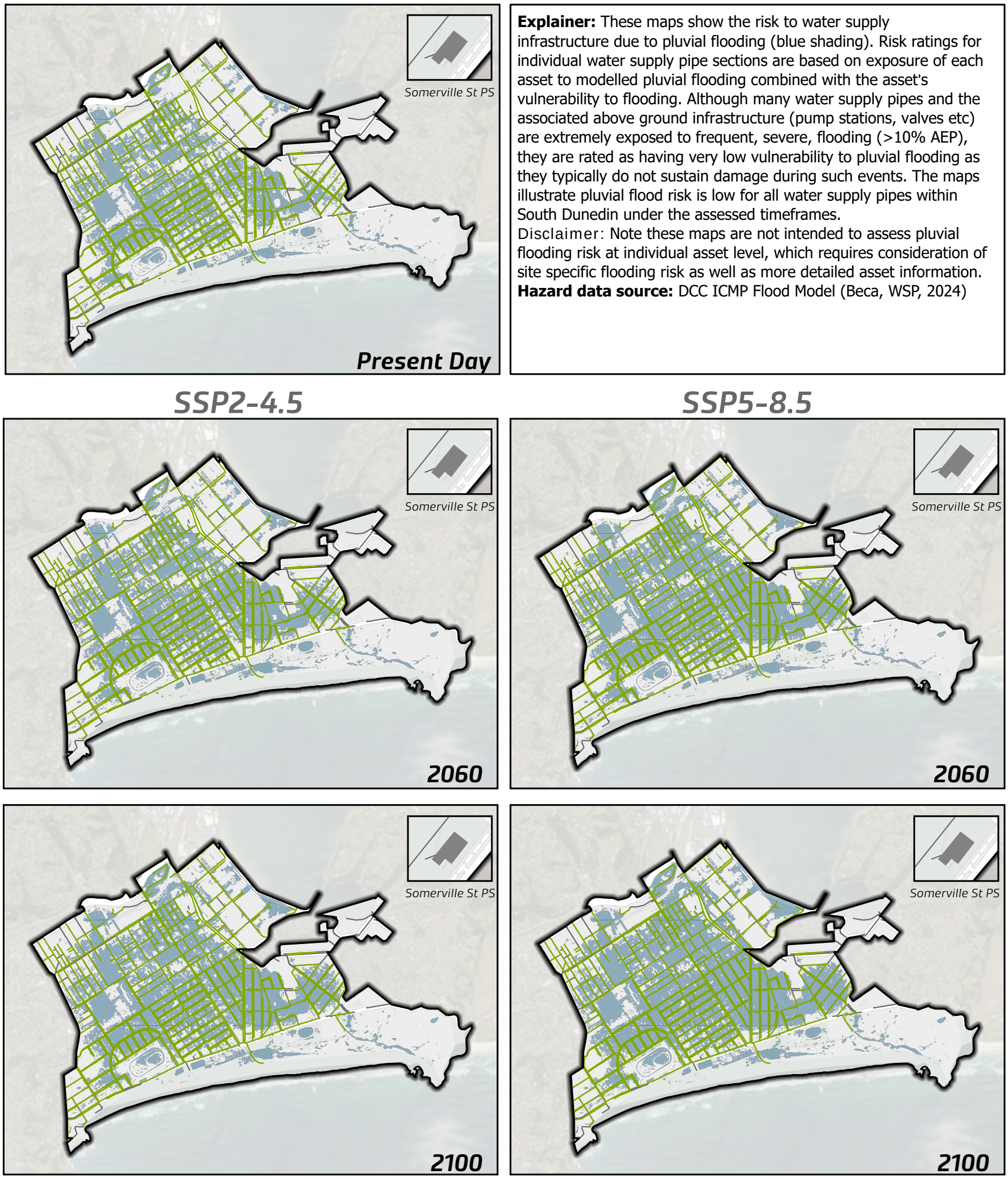


Explainer: These maps show the risk to water supply due to coastal erosion (blue shading), noting that there is a high level of uncertainty regarding coastal erosion risk due to data limitations at present (e.g. scale of screening study and accounting for impact of engineered structures). The maps illustrate that coastal erosion risk to water supply is largely confined to the St Clair-St Kilda coastline at present day with risk to some pipe sections arising from the Otago Harbour at late-century.

Disclaimer: These maps are not intended to assess coastal erosion risk to specific assets, which requires more detailed hazard data and consideration of a range of building specific factors (e.g. foundation type). More detailed coastal hazard assessments are underway as part of the St Clair-St Kilda Coastal Plan, these will be completed in late-2025, after which coastal erosion risk ratings will be reviewed.

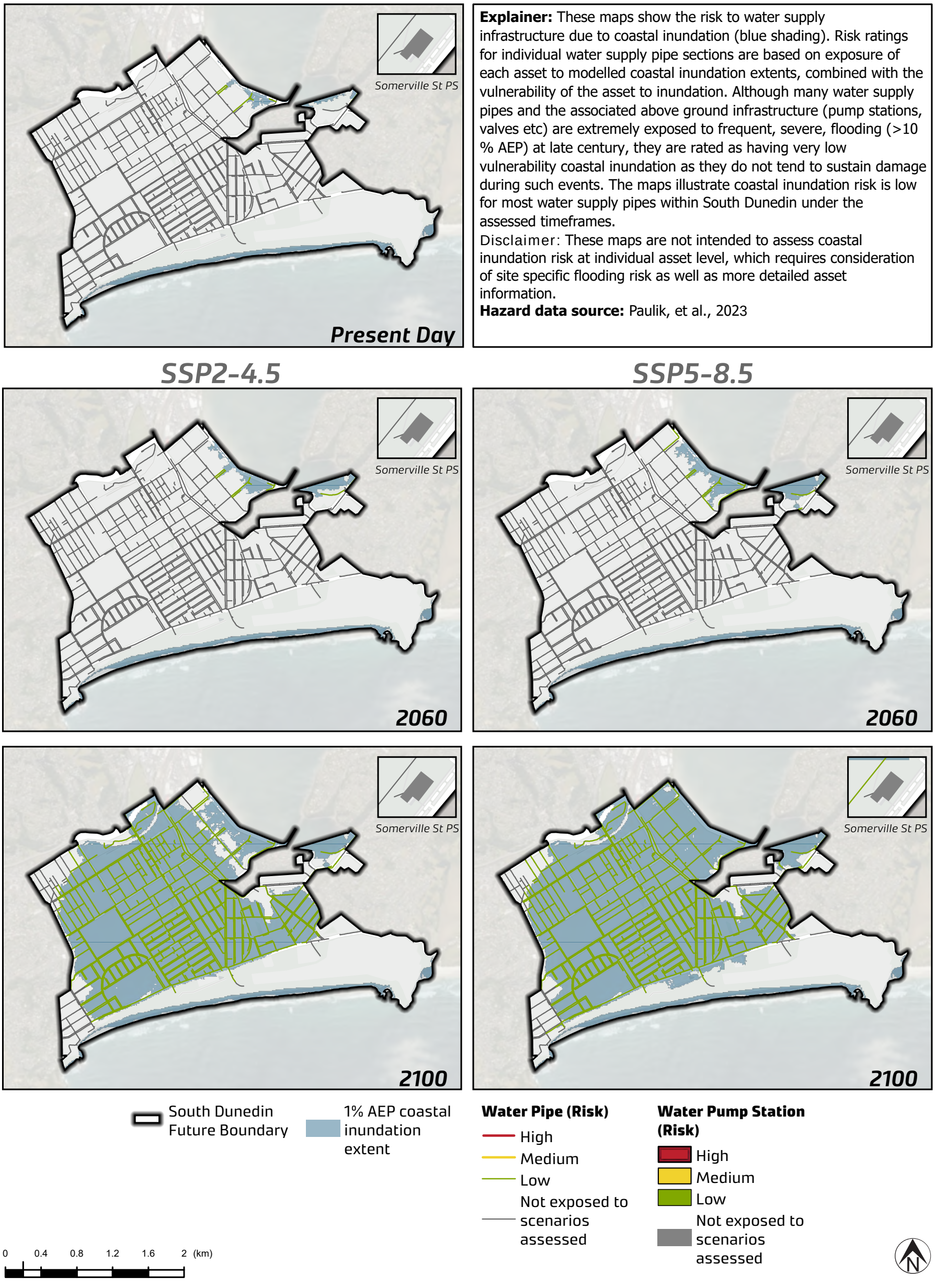
Hazard data source: WSP, 2024

Figure 5.29 Water supply infrastructure risk due to pluvial flooding



Explainer: These maps show the risk to water supply infrastructure due to pluvial flooding (blue shading). Risk ratings for individual water supply pipe sections are based on exposure of each asset to modelled pluvial flooding combined with the asset's vulnerability to flooding. Although many water supply pipes and the associated above ground infrastructure (pump stations, valves etc) are extremely exposed to frequent, severe, flooding (>10% AEP), they are rated as having very low vulnerability to pluvial flooding as they typically do not sustain damage during such events. The maps illustrate pluvial flood risk is low for all water supply pipes within South Dunedin under the assessed timeframes.
Disclaimer: Note these maps are not intended to assess pluvial flooding risk at individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.
Hazard data source: DCC ICMP Flood Model (Beca, WSP, 2024)

Figure 5.30 Water supply infrastructure risk due to coastal inundation

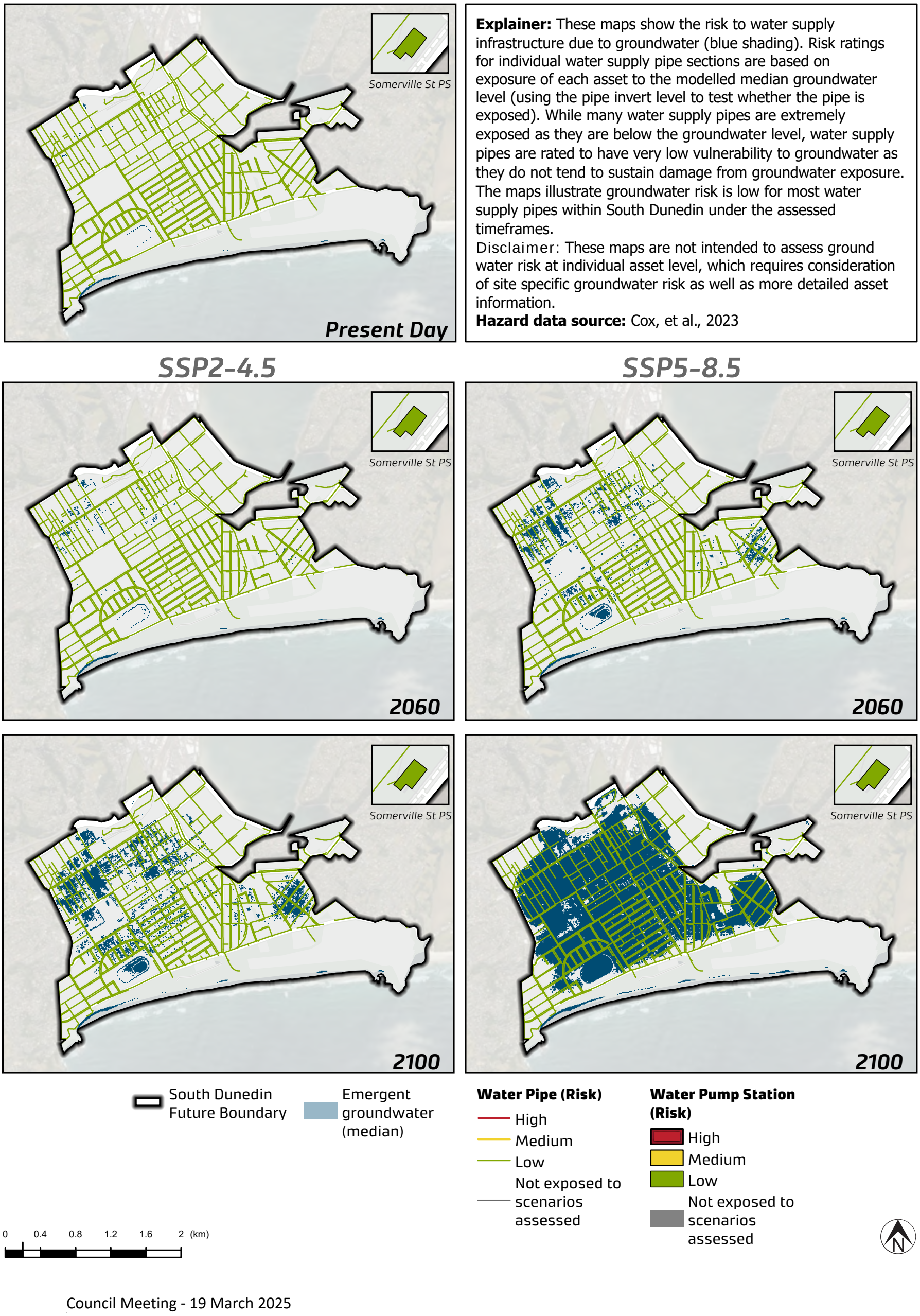


Explainer: These maps show the risk to water supply infrastructure due to coastal inundation (blue shading). Risk ratings for individual water supply pipe sections are based on exposure of each asset to modelled coastal inundation extents, combined with the vulnerability of the asset to inundation. Although many water supply pipes and the associated above ground infrastructure (pump stations, valves etc) are extremely exposed to frequent, severe, flooding (>10 % AEP) at late century, they are rated as having very low vulnerability coastal inundation as they do not tend to sustain damage during such events. The maps illustrate coastal inundation risk is low for most water supply pipes within South Dunedin under the assessed timeframes.

Disclaimer: These maps are not intended to assess coastal inundation risk at individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.

Hazard data source: Paulik, et al., 2023

Figure 5.31 Water supply infrastructure risk due to groundwater



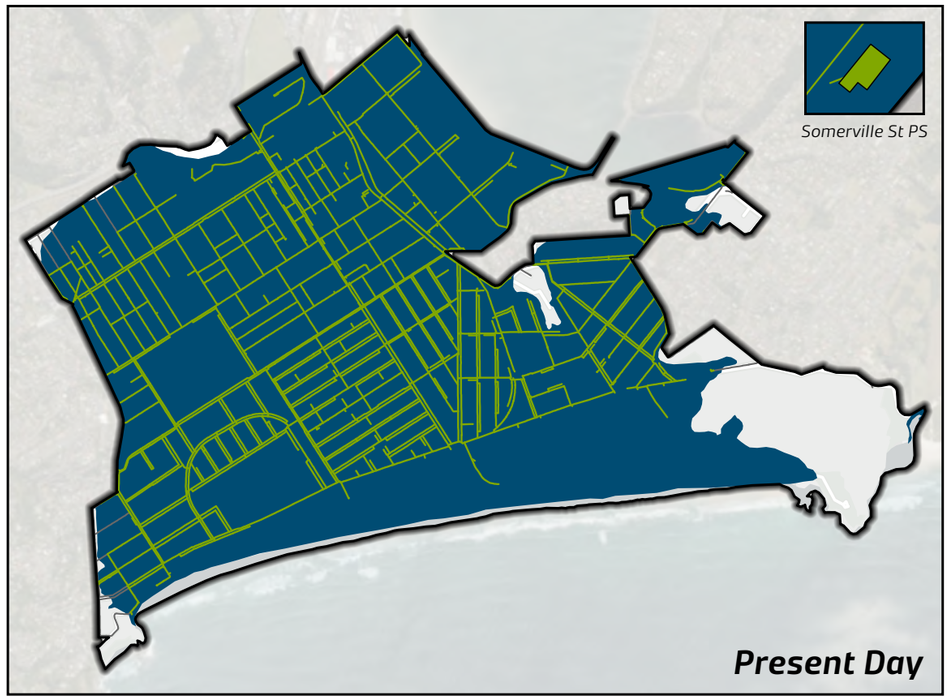
Explainer: These maps show the risk to water supply infrastructure due to groundwater (blue shading). Risk ratings for individual water supply pipe sections are based on exposure of each asset to the modelled median groundwater level (using the pipe invert level to test whether the pipe is exposed). While many water supply pipes are extremely exposed as they are below the groundwater level, water supply pipes are rated to have very low vulnerability to groundwater as they do not tend to sustain damage from groundwater exposure. The maps illustrate groundwater risk is low for most water supply pipes within South Dunedin under the assessed timeframes.

Disclaimer: These maps are not intended to assess ground water risk at individual asset level, which requires consideration of site specific groundwater risk as well as more detailed asset information.

Hazard data source: Cox, et al., 2023

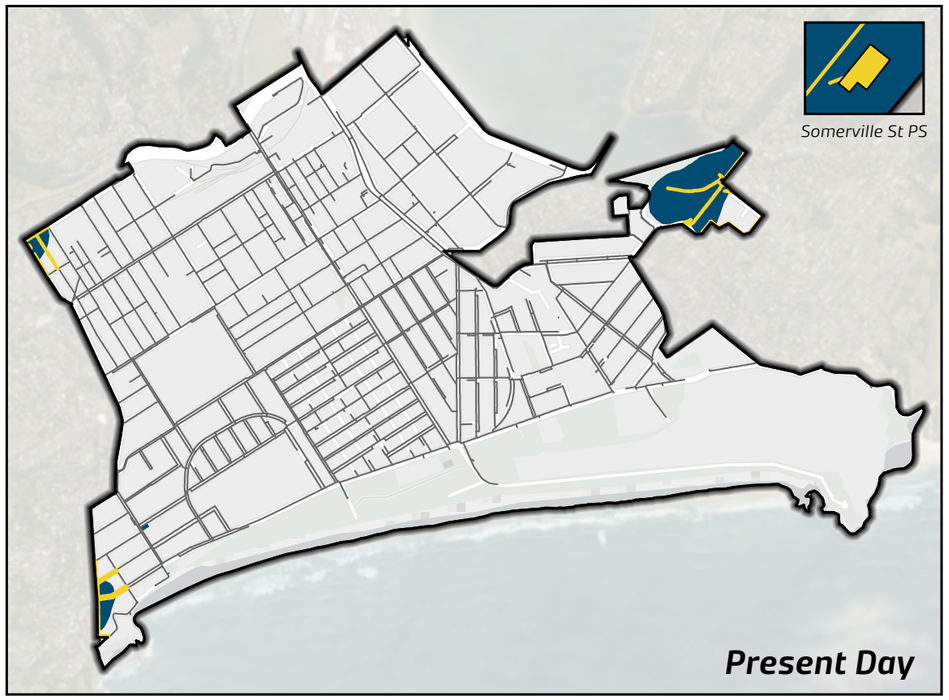
Figure 5.32 Water supply infrastructure risk due to landslide and liquefaction

Liquefaction



Explainer: These maps show the risk to water supply due to liquefaction. Risk ratings for individual pipe lengths are based on exposure of each asset to liquefaction potential, combined with their vulnerability rating (high). The maps illustrate liquefaction risk is low across South Dunedin at the present day. Liquefaction risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of sea level rise on liquefaction potential. If it were to occur, liquefaction can impact water infrastructure by deforming the pipe network. Ground settlement or stretching may damage or disconnect pipes and chambers and subsequent inflow of sediment can cause blockages. Buoyancy can cause uplift of buried structures, and disrupt drainage systems, while sediment discharge can reduce water quality and affect aquatic habitats.
Disclaimer: These maps are not intended to assess liquefaction risk at individual asset level, which requires consideration of site specific liquefaction risk as well as more detailed asset information. Liquefaction hazard information is based on a high level desktop review, where subsequent site specific assessment (Hornblow, 2020) has found that liquefaction potential is highly variable across sites analysed.
Hazard data source: Barrell, 2014

Landslide



Explainer: These maps show the risk to water supply due to landslide, where some pipes at the South Dunedin boundary are rated medium risk. Risk ratings for individual water supply pipes are based on exposure of each asset to landslides, combined with their vulnerability rating. Landslides can severely damage water supply resulting in sudden collapse or failure. The maps illustrate that landslide risk is confined to areas around the South Dunedin boundary. Landslide risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of climate change (groundwater level rising or increased rainfall intensity) on landslide.
Disclaimer: These maps are not intended to assess landslide risk at individual asset level, which requires consideration of a site specific landslide risk as well as more detailed asset information. The landslide extent is based on known landslide areas and does not account for other potential sources of landslide nor represent the extent of the area of deposition/runout.
Hazard data source: DCC Hazard database data provided for South Dunedin Future programme

South Dunedin Future Boundary

Land instability

Liquefaction (Domain C: moderate liquefaction potential)

Water Pipe (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

Water Pump Station (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

N

0 0.4 0.8 1.2 1.6 2 (km)

5.5.2 RISK TO STORMWATER INFRASTRUCTURE

There are 71 km of stormwater pipes in South Dunedin, key features within the stormwater network include:

- Tainui SW pump station (on same site as WW pump).
- Portobello stormwater pump station.
- Portobello Road Screens.
- All flap gates.
- High criticality pipes.

Figure 5.39 shows how the risk to stormwater infrastructure within South Dunedin changes over time with each hazard. Spatial representation of risk to stormwater infrastructure is shown in Figure 5.34, Figure 5.35, Figure 5.36, Figure 5.37, Figure 5.38, with high criticality pipes highlighted with grey shadow. Table 5-5 shows risk ratings for stormwater key features (structures only). Further detail regarding stormwater infrastructure vulnerability is contained in Appendix C.

The stormwater pipe network is at high risk due to groundwater, with 22% of pipes at high risk at present, which slightly increases over time to reach 28% of the pipe network at high risk by late century under a high-end climate scenario. These pipes are at high risk because they are at a level that is lower than the modelled groundwater table and are of an age and or material type that means they are extremely vulnerable to groundwater infiltration. Groundwater infiltration into the stormwater network will reduce the pipe capacity causing a reduction in level of service. The overall effect of this reduction in pipe capacity on the network is currently under investigation, but is likely to drive increased pluvial flooding.

The other notable risks to the stormwater pipe network are due to pluvial flooding and coastal inundation. At present day 60% of the network is at moderate risk due to pluvial flooding, which rises to 80% at late century. Risk due to coastal inundation jumps sharply from 2% to 86% of the network at moderate risk at late century under a high-end climate scenario. Similarly to the wastewater network, flooding can cause a reduction in level of service resulting in environmental contamination.

Risk to stormwater structures is shown in Table 5-5. This shows that Portobello Pump Station and Tainui Pump Station are both at high risk due to pluvial flooding (present day and mid-century respectively) and coastal inundation (late century). If flooded, these pump stations may fail due to switchboard damage. This could significantly worsen the impact of flooding on the community as this type of pump failure would occur during a flooding or coastal inundation event. The proximity of Wilkie Road pump station to the coast means it is at high risk due to coastal erosion[35] and coastal inundation under all timeframes and scenarios.

[35] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

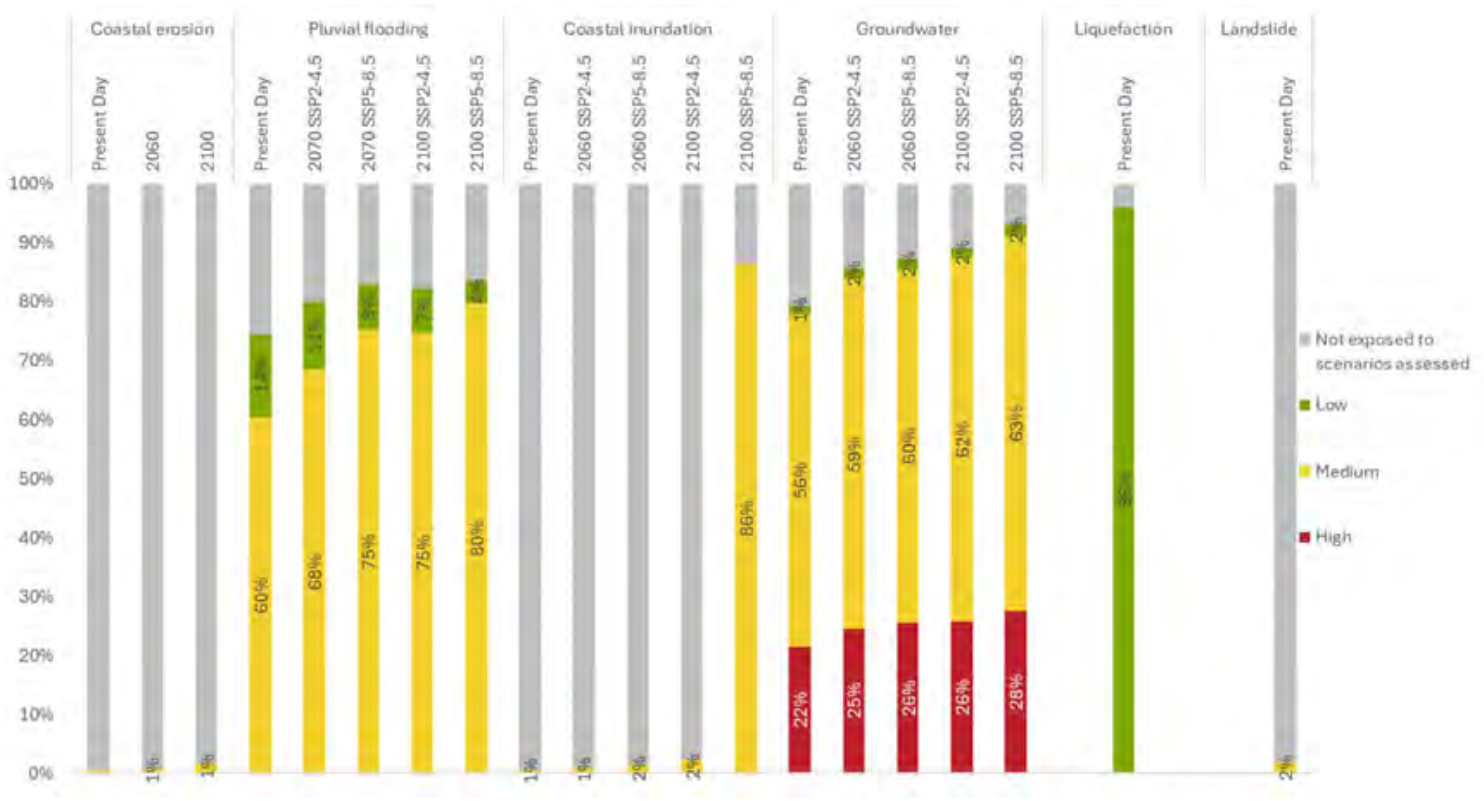


Figure 5.33 Risk to stormwater pipes presented as percentage of pipe length at each risk rating[35]

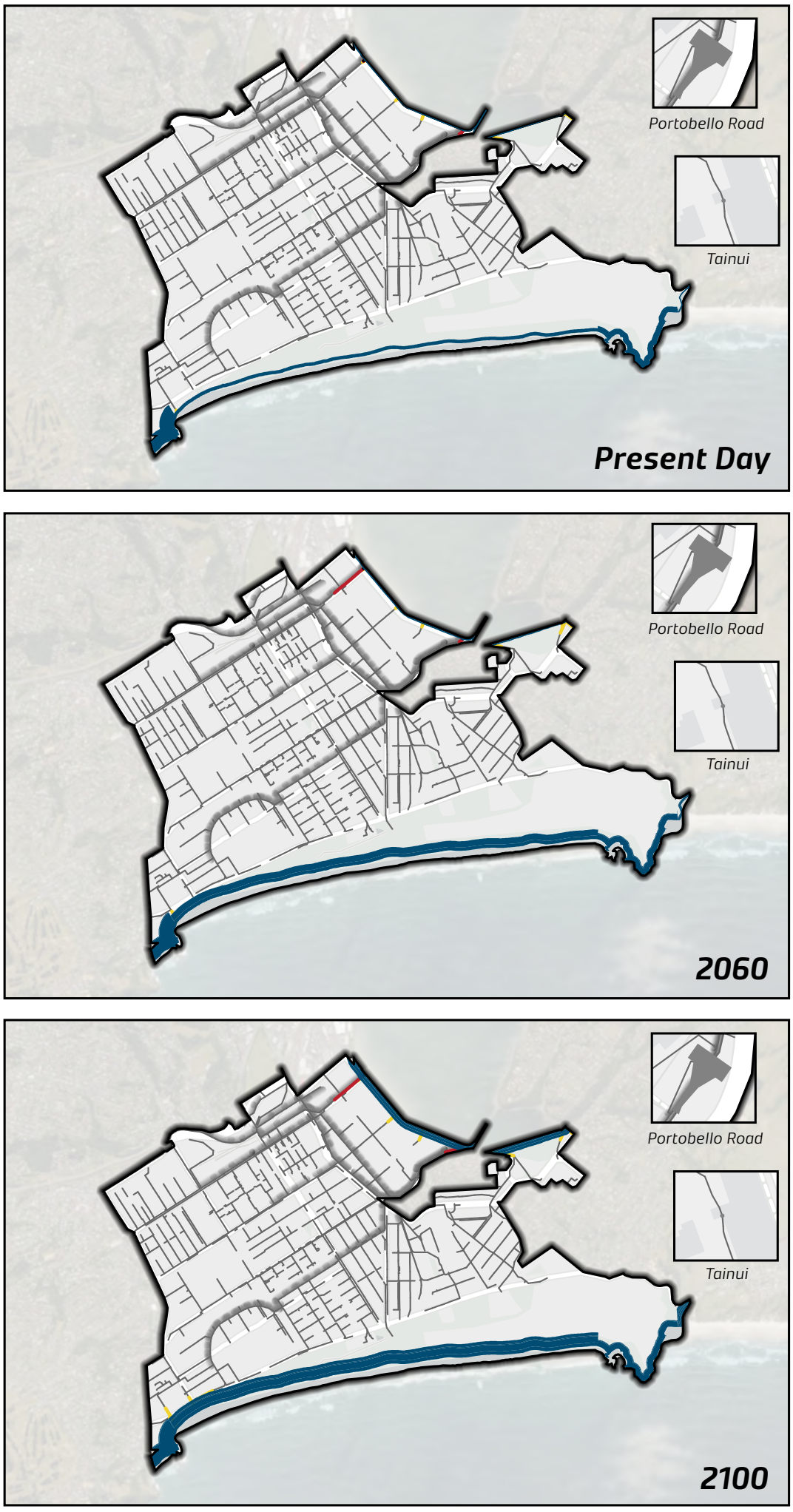
Table 5-5 Risk to stormwater structures[1]

	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Portobello pump station (SW)																				
Tainui Stormwater Pumping Station (SW)																				
Wilkie Road Stormwater Pump Station (SW)																				

Low Medium High Not exposed to scenarios assessed

[1]There is a high level of uncertainty regarding coastal erosion risk in localised areas, particularly around engineered coastal erosion structures (e.g. sea walls) as a result of the scale of the district-wide screening assessment. More detailed coastal erosion hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed later in 2025.

Figure 5.34 Stormwater infrastructure risk due to coastal erosion

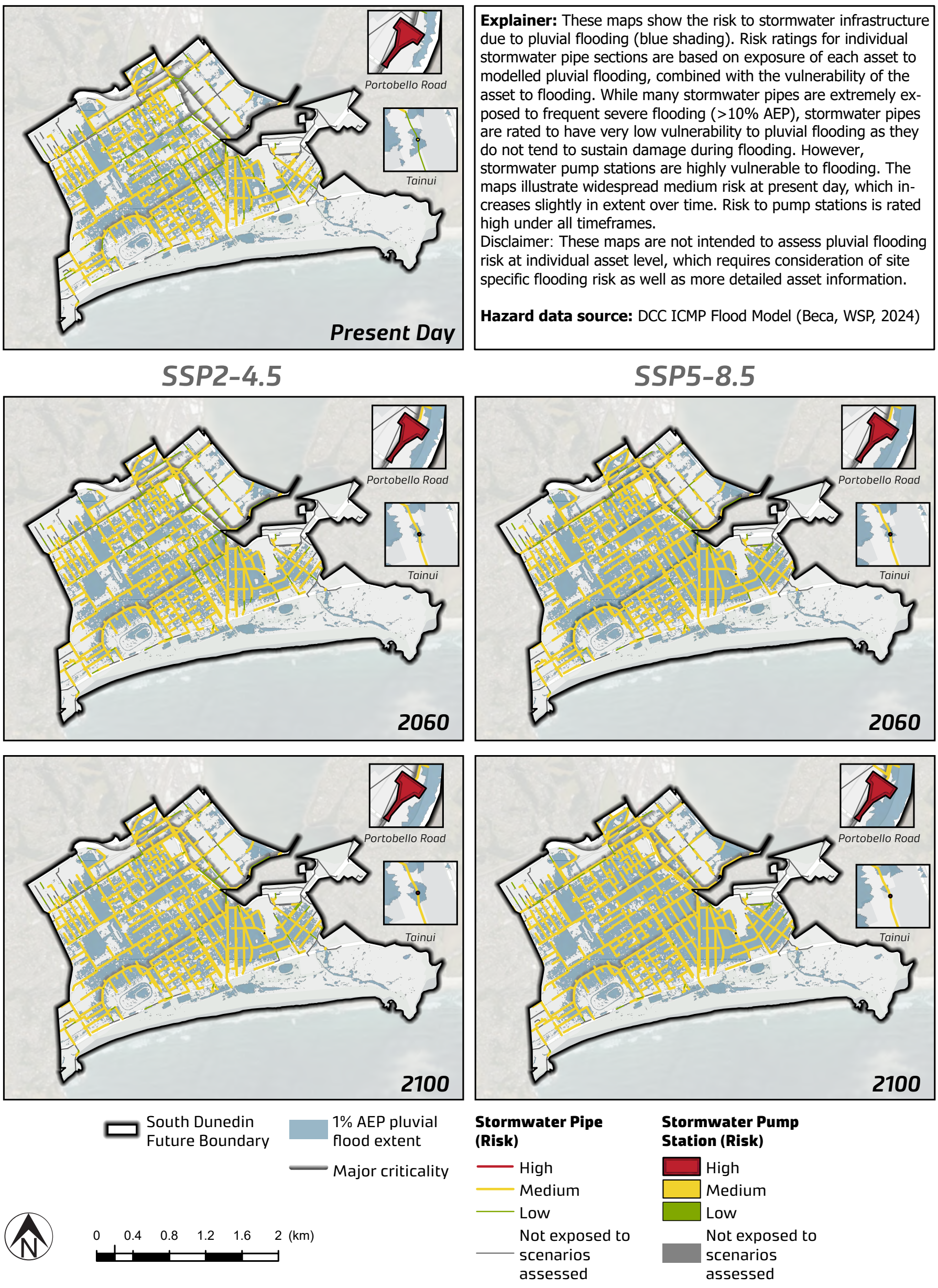


Explainer: These maps show the risk to stormwater infrastructure due to coastal erosion, noting that there is a high level of uncertainty regarding coastal erosion risk due to data limitations at present (e.g. scale of screening study and accounting for impact of engineered structures). The maps indicate that coastal erosion risk to stormwater is confined to the Otago Harbour coastline at present day, and increases to a small number of pipes along the St Clair-St Kilda Coastline at mid-century, with higher risk of erosion at the St Clair end of the beach.

Disclaimer: These maps are not intended to assess coastal erosion risk to specific assets, which requires more detailed hazard data and consideration of a range of building specific factors (e.g. foundation type). More detailed coastal hazard assessments are underway as part of the St Clair-St Kilda Coastal Plan, these will be completed in late-2025, after which coastal erosion risk ratings will be reviewed.

Hazard data source: WSP, 2024

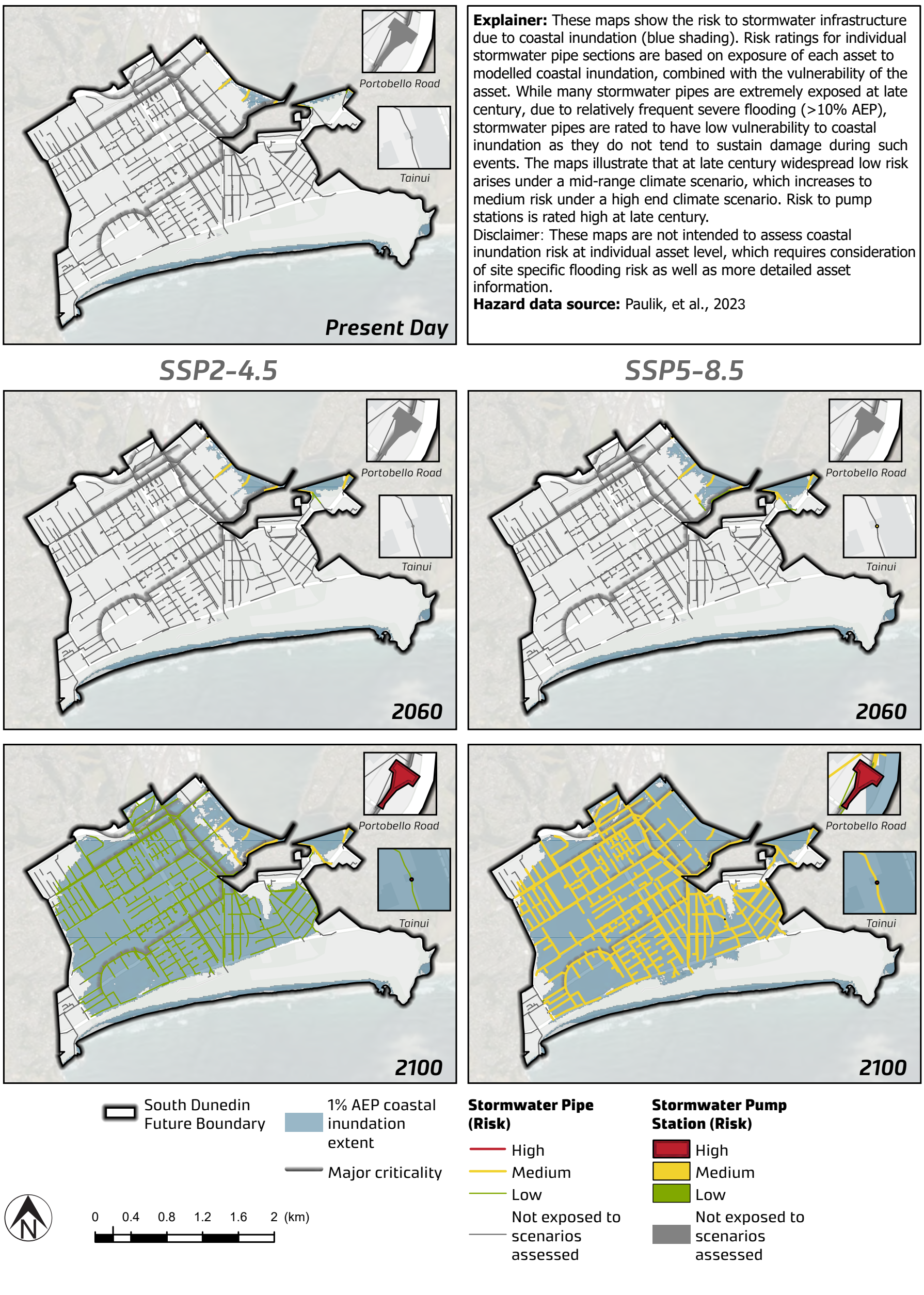
Figure 5.35 Stormwater infrastructure risk due to pluvial flooding



Explainer: These maps show the risk to stormwater infrastructure due to pluvial flooding (blue shading). Risk ratings for individual stormwater pipe sections are based on exposure of each asset to modelled pluvial flooding, combined with the vulnerability of the asset to flooding. While many stormwater pipes are extremely exposed to frequent severe flooding (>10% AEP), stormwater pipes are rated to have very low vulnerability to pluvial flooding as they do not tend to sustain damage during flooding. However, stormwater pump stations are highly vulnerable to flooding. The maps illustrate widespread medium risk at present day, which increases slightly in extent over time. Risk to pump stations is rated high under all timeframes.
Disclaimer: These maps are not intended to assess pluvial flooding risk at individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.

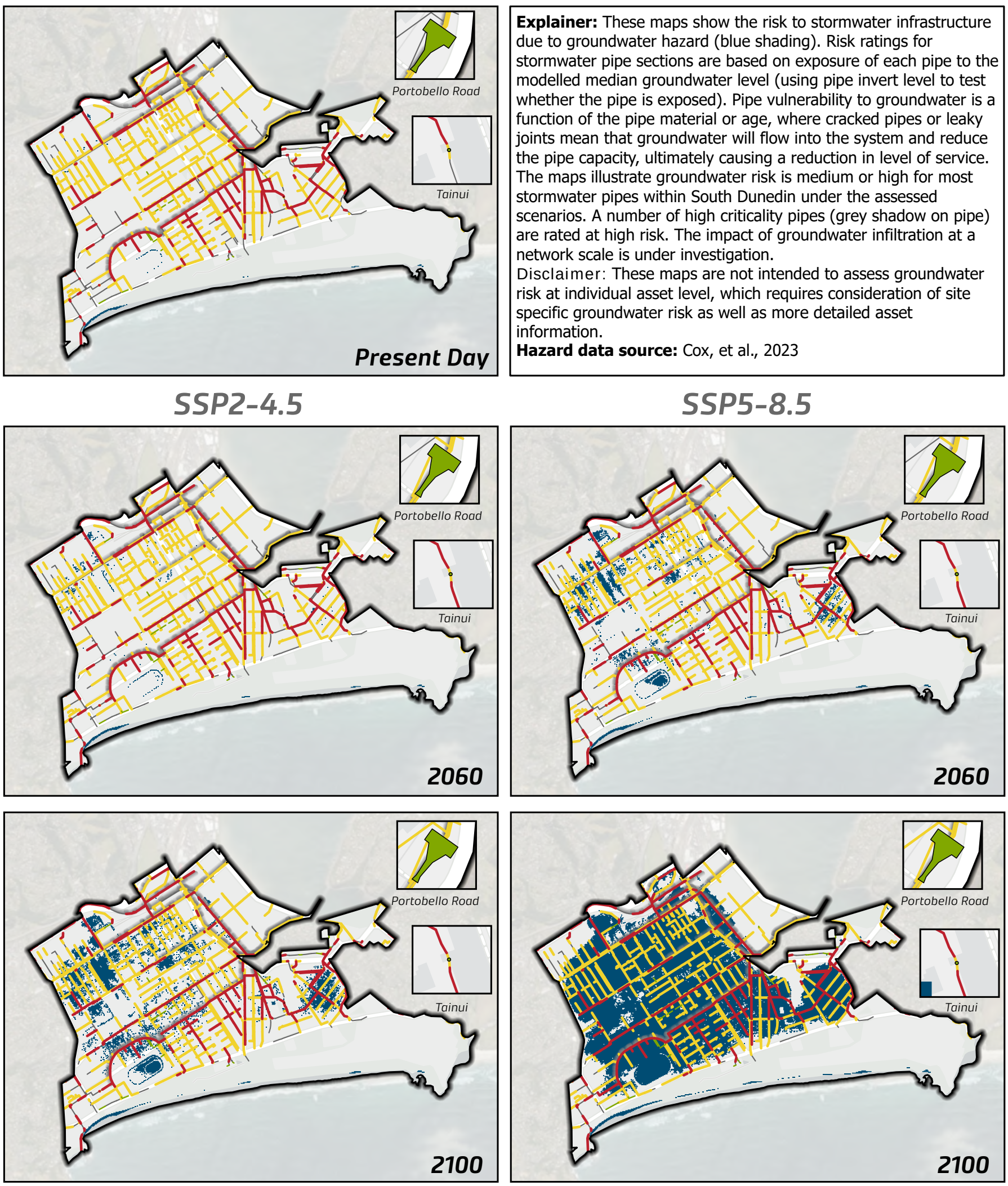
Hazard data source: DCC ICMP Flood Model (Beca, WSP, 2024)

Figure 5.36 Stormwater infrastructure risk due to coastal inundation



Explainer: These maps show the risk to stormwater infrastructure due to coastal inundation (blue shading). Risk ratings for individual stormwater pipe sections are based on exposure of each asset to modelled coastal inundation, combined with the vulnerability of the asset. While many stormwater pipes are extremely exposed at late century, due to relatively frequent severe flooding (>10% AEP), stormwater pipes are rated to have low vulnerability to coastal inundation as they do not tend to sustain damage during such events. The maps illustrate that at late century widespread low risk arises under a mid-range climate scenario, which increases to medium risk under a high end climate scenario. Risk to pump stations is rated high at late century.
Disclaimer: These maps are not intended to assess coastal inundation risk at individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.
Hazard data source: Paulik, et al., 2023

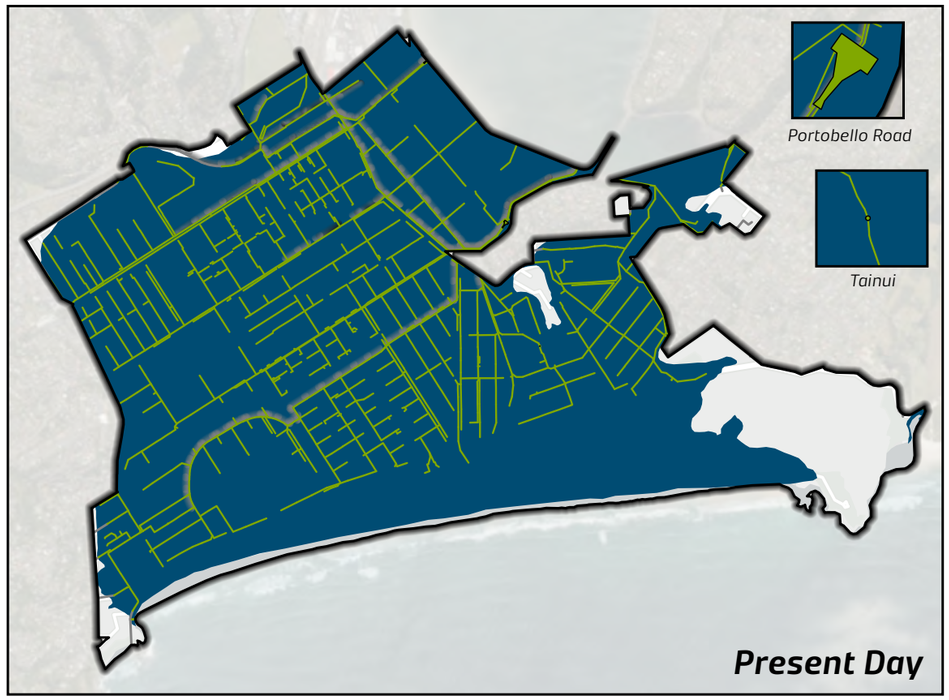
Figure 5.37 Stormwater infrastructure risk due to groundwater



Explainer: These maps show the risk to stormwater infrastructure due to groundwater hazard (blue shading). Risk ratings for stormwater pipe sections are based on exposure of each pipe to the modelled median groundwater level (using pipe invert level to test whether the pipe is exposed). Pipe vulnerability to groundwater is a function of the pipe material or age, where cracked pipes or leaky joints mean that groundwater will flow into the system and reduce the pipe capacity, ultimately causing a reduction in level of service. The maps illustrate groundwater risk is medium or high for most stormwater pipes within South Dunedin under the assessed scenarios. A number of high criticality pipes (grey shadow on pipe) are rated at high risk. The impact of groundwater infiltration at a network scale is under investigation.
Disclaimer: These maps are not intended to assess groundwater risk at individual asset level, which requires consideration of site specific groundwater risk as well as more detailed asset information.
Hazard data source: Cox, et al., 2023

Figure 5.38 Stormwater infrastructure risk due to landslide and liquefaction

Liquefaction



Explainer: These maps show the risk to stormwater infrastructure due to liquefaction. Risk ratings for individual pipe lengths are based on exposure of each asset to liquefaction potential, combined with their vulnerability rating which is based on pipe material and age. The maps illustrate liquefaction risk is low across South Dunedin at the present day. Liquefaction risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of sea level rise on liquefaction potential. If it were to occur, liquefaction can impact water infrastructure by deforming the pipe network. Ground settlement or stretching may damage or disconnect pipes and chambers and subsequent inflow of sediment can cause blockages. Buoyancy can cause uplift of buried structures, and disrupt drainage systems, while sediment discharge can reduce water quality and affect aquatic habitats.
Disclaimer: These maps are not intended to assess liquefaction risk at individual asset level, which requires consideration of site specific liquefaction risk as well as more detailed asset information. Liquefaction hazard information is based on a high level desktop review, where subsequent site specific assessment (Hornblow, 2020) has found that liquefaction potential is highly variable across sites analysed.
Hazard data source: Barrell, 2014

Landslide

Explainer: These maps show the risk to stormwater infrastructure due to landslide, where some pipes at the South Dunedin boundary are rated medium risk. Risk ratings for individual stormwater pipes are based on exposure of each asset to landslides, combined with their vulnerability rating and adjusted for pipe criticality (grey shadow on pipe). Landslides can severely damage stormwater resulting in major repairs and reduction in level of service. The maps illustrate that landslide risk is confined to areas around the South Dunedin boundary. Landslide risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of climate change (groundwater level rising or increased rainfall intensity) on landslide.
Disclaimer: These maps are not intended to assess landslide risk at individual asset level, which requires consideration of a site specific landslide risk as well as more detailed asset information. The landslide extent is based on known landslide areas and does not account for other potential sources of landslide nor represent the extent of the area of deposition/runout.
Hazard data source: DCC Hazard database data provided for South Dunedin Future programme

South Dunedin Future Boundary

Land instability

Liquefaction (Domain C: moderate liquefaction potential)

Major criticality

Stormwater Pipe (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

Stormwater Pump Station (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

N

0 0.4 0.8 1.2 1.6 2 (km)

5.5.3 RISK TO WASTEWATER INFRASTRUCTURE

There are 79 km of wastewater pipes in South Dunedin, key features within the wastewater network include:

- Musselburgh WW pump station.
- Tahuna WWTP.
- All flap gates.
- WW Pump station - Marne St Pump station (overflow pump station which pumps to Musselburgh).
- High criticality pipes.

The graph shown in Figure 5.39 identifies how the risk to wastewater infrastructure within South Dunedin changes over time with each hazard. Spatial representation of risk to wastewater infrastructure is shown in Figure 5.40, Figure 5.42, Figure 5.43 and Figure 5.44, with high criticality pipes (criticality rating greater than >4) identified. Table 5-6 shows risk ratings for key wastewater structures. Further detail regarding wastewater infrastructure vulnerability is contained in Appendix C.

The wastewater pipe network is at high risk due to pluvial flooding, coastal inundation, groundwater and coastal erosion (Figure 5.39). Present day risk is highest due to pluvial flooding and groundwater, with 39 km (51% and 50% respectively) of pipes rated at high risk which increases to 57 km (72%) at late century for pluvial flooding, and 46 km (58%) at late century. These pipes are at high risk because they are at a level that is lower than the modelled groundwater table and are of an age and or material type that means they are extremely vulnerable to groundwater infiltration. Groundwater infiltration into the wastewater network presents a chronic issue that will reduce the pipe capacity causing a reduction in level of service. The overall effect of this reduction in pipe capacity on the network is currently under investigation.

At late century, coastal inundation poses a high risk to the greatest proportion of the network with 63 km (80%) of the pipe network rated at high risk. Pipe network vulnerability to flooding and groundwater is related to impacts on the pipe level of service. Pipe surcharging due to inflow and infiltration results in widespread reduction in level of service. Flooding can result in widespread environmental contamination. It is important to note that pipe infiltration draws down groundwater level.

Risk to wastewater structures is shown in Table 5-6. This shows Tahuna WWTP and Musselburgh Pump Station are at high risk from pluvial flooding at present day, with Musselburgh also at high risk from coastal inundation at mid-century under a high end climate scenario. Flooding of wastewater Pump Stations may flood the dry well, resulting in failure of the pump station. Unless a bypass is used, this would mean flows could not be pumped to sea, resulting in high environmental and public health consequences. The proximity of Marne Street to the coast means it is at high risk due to coastal erosion at present day[36].

[36] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

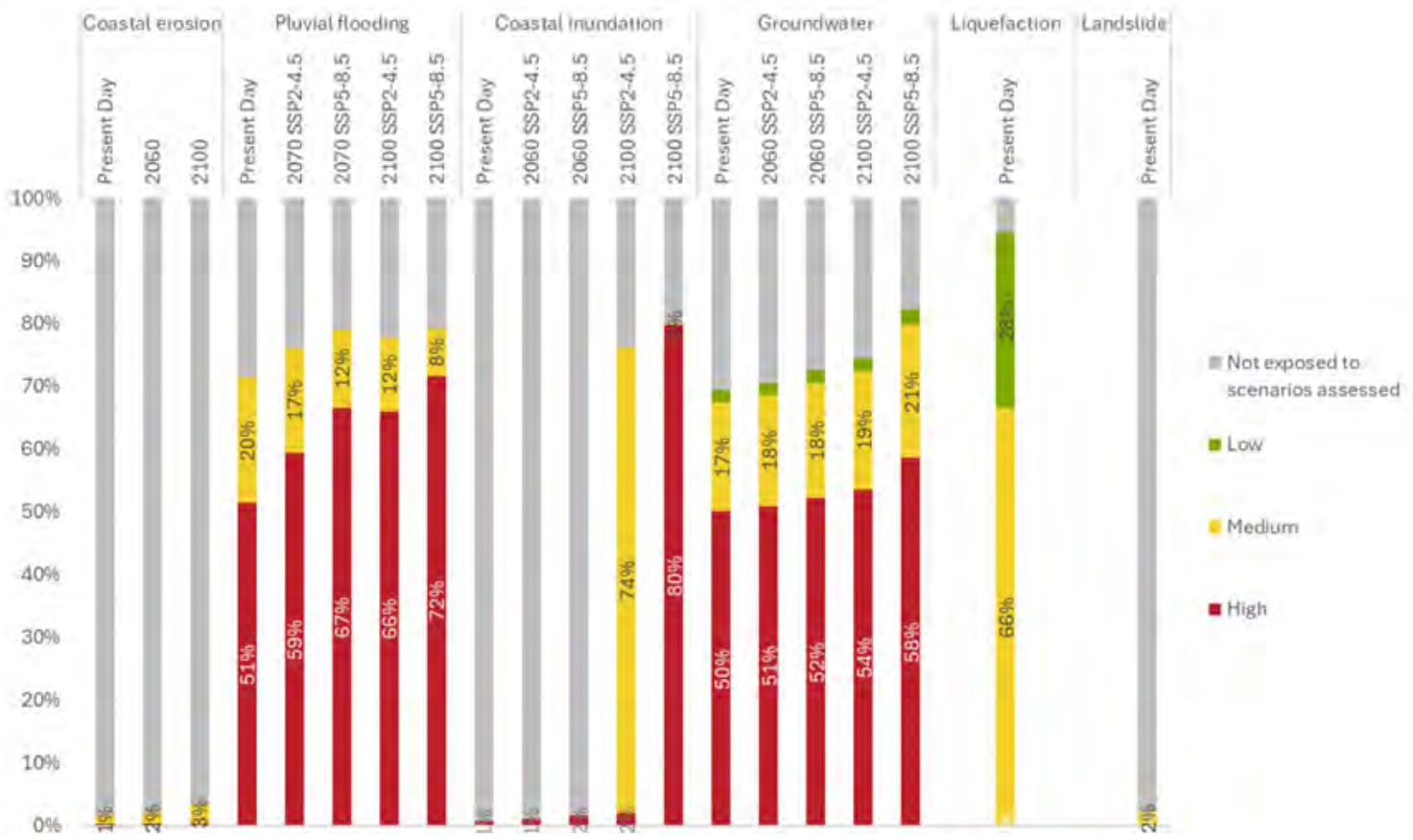


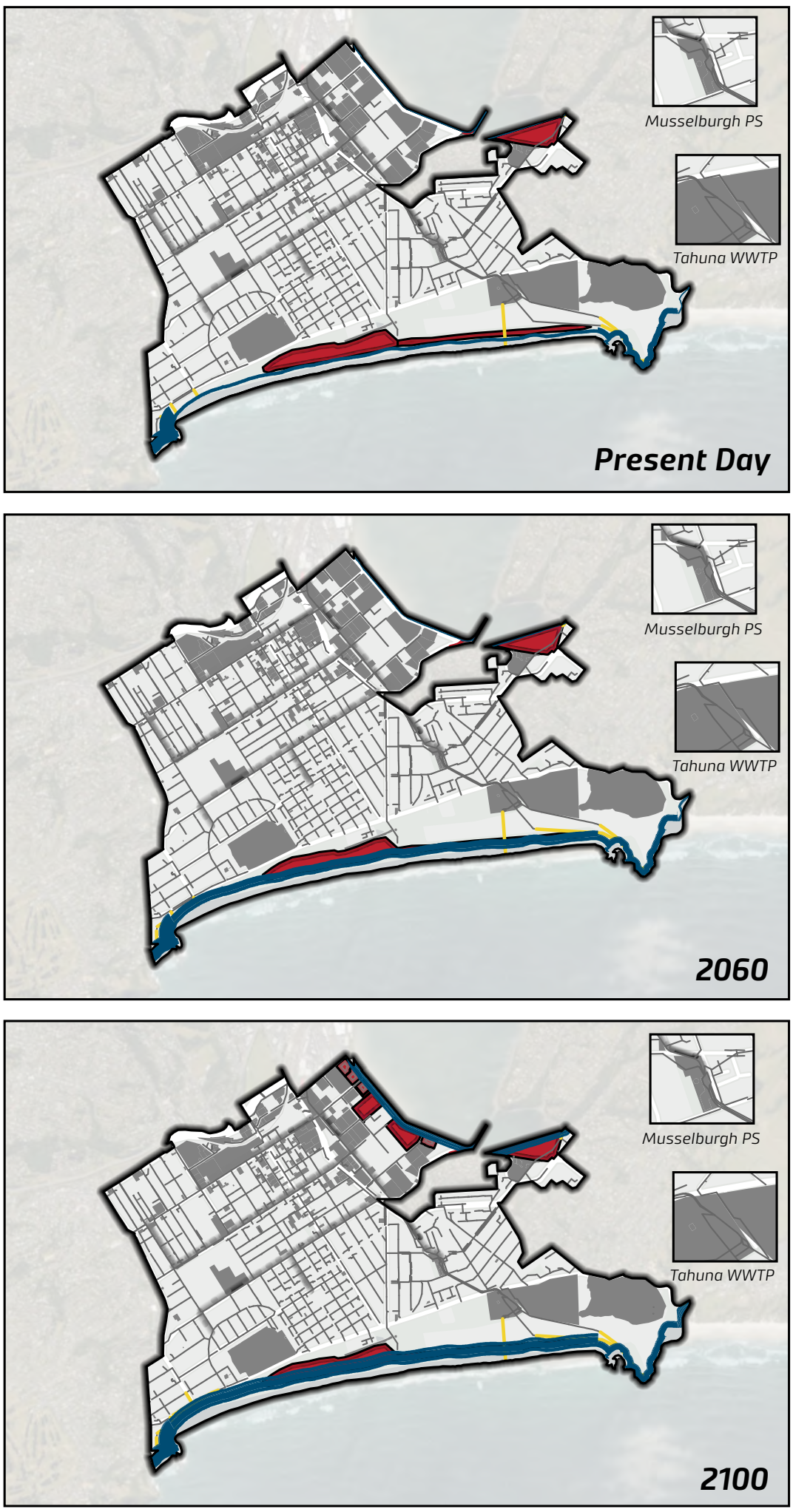
Figure 5.39 Risk to wastewater pipes presented as percentage of pipe length at each risk rating[36]

Table 5-6 Risk to wastewater structures[36]

	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Tahuna WWTP Building																				
Tahuna WWTP Outfall & Trickling Filter Pump Station																				
Musselburgh Pumping Station (FS)																				
Marne Street Pump Station (FS)																				

Low Medium High Not exposed to scenarios assessed

Figure 5.40 Wastewater infrastructure and contaminated land (HAIL sites) risk due to coastal erosion

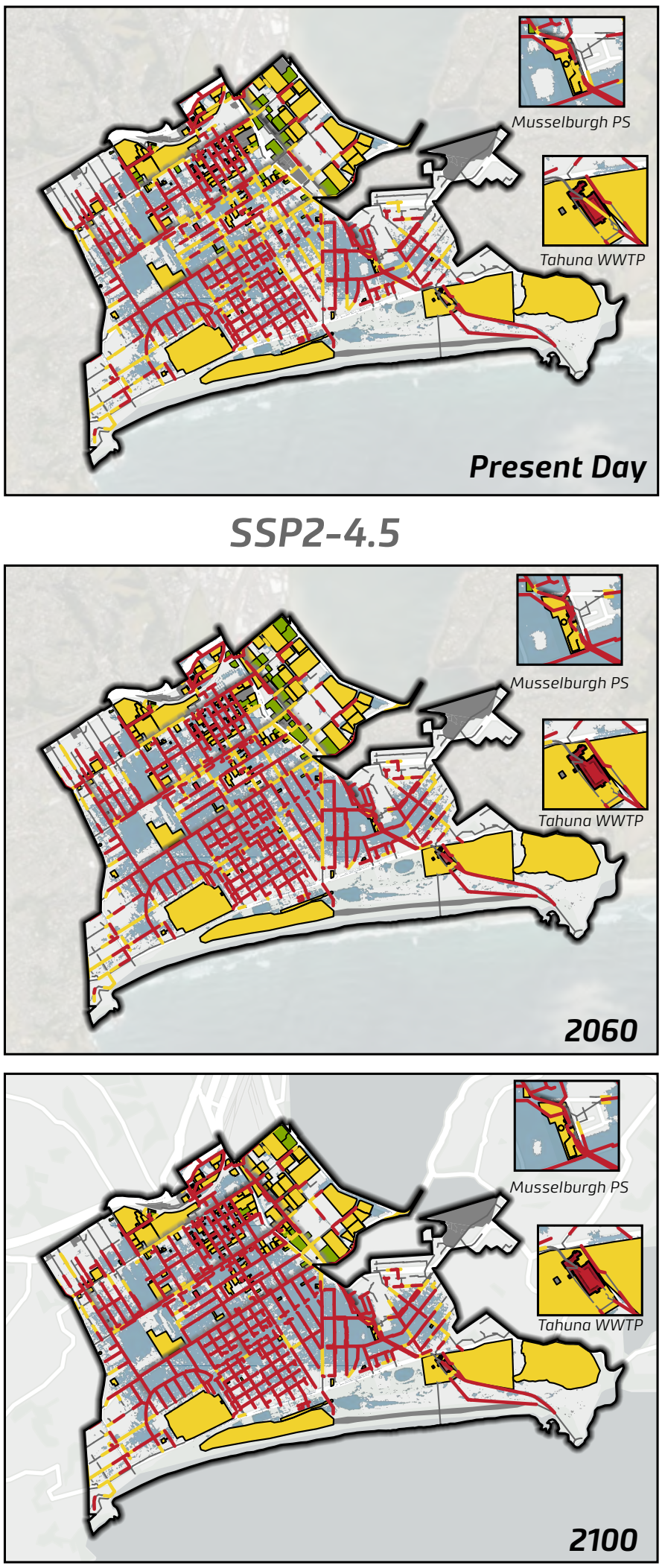


Explainer: These maps show the risk to wastewater and HAIL sites due to coastal erosion (blue shading), noting that there is a high level of uncertainty regarding coastal erosion risk due to data limitations at present (e.g. scale of screening study and accounting for impact of engineered structures). The maps illustrate that coastal erosion risk to wastewater is confined to the St Clair-St Kilda coastline at all timeframes. The maps illustrate a high risk to HAIL sites located along the St Clair-St Kilda and Harbour coastlines at all timeframes.

Disclaimer: These maps are not intended to assess coastal erosion risk to specific assets, which requires more detailed hazard data and consideration of a range of building specific factors (e.g. foundation type). More detailed coastal hazard assessments are underway as part of the St Clair-St Kilda Coastal Plan, these will be completed in late-2025, after which coastal erosion risk ratings will be reviewed.

Hazard data source: WSP, 2024

Figure 5.41 Wastewater infrastructure and contaminated land (HAIL sites) risk due to pluvial flooding

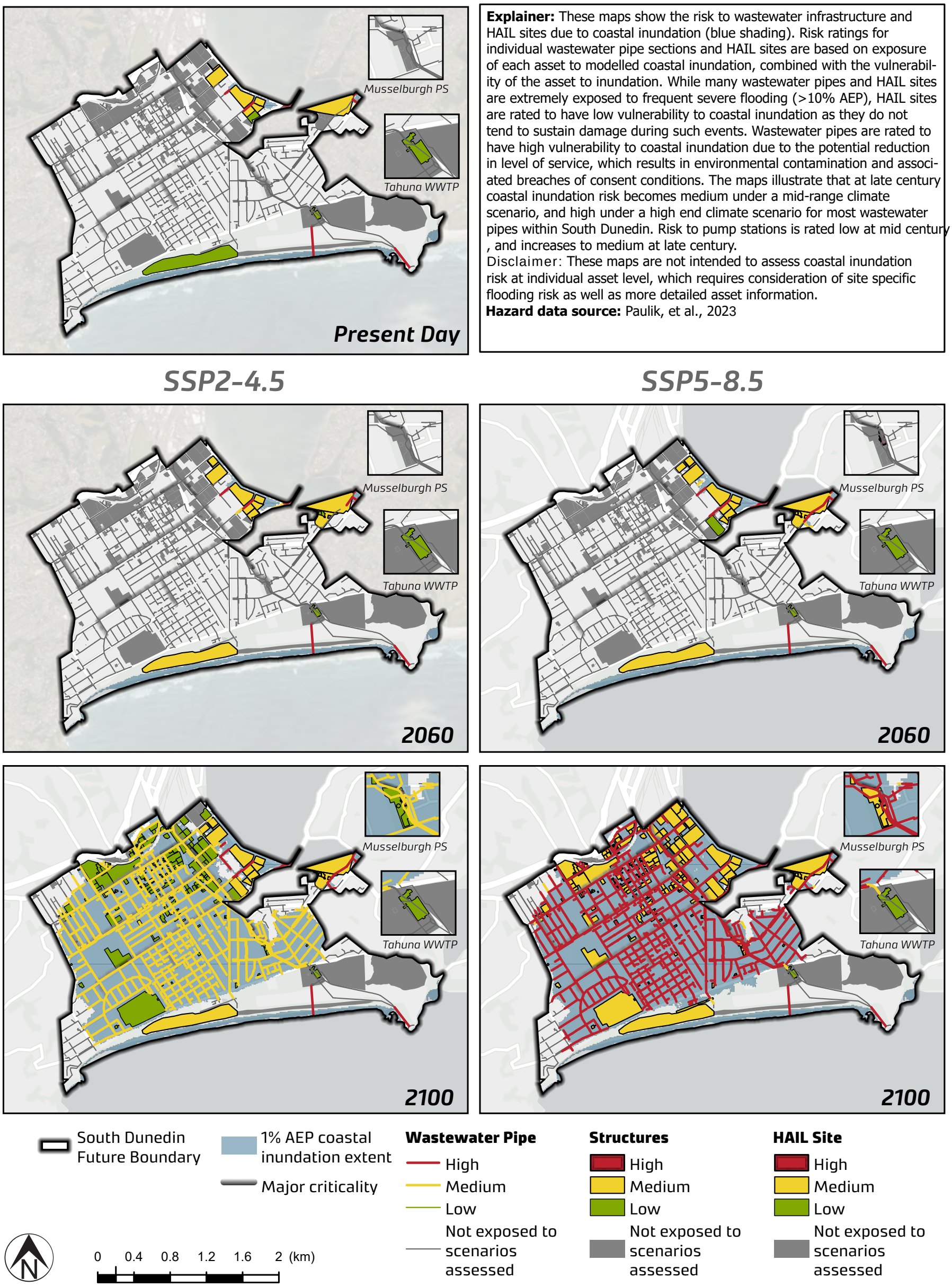


Explainer: These maps show the risk to wastewater infrastructure and HAIL sites due to pluvial flooding (blue shading). Risk ratings for individual wastewater pipe sections and HAIL sites are based on exposure of each asset or site to modelled pluvial flooding, combined with the vulnerability of the asset to flooding. Many wastewater pipes and HAIL sites are extremely exposed, due to frequent severe flooding (>10% AEP). Wastewater pipes are rated to have high vulnerability to pluvial flooding due to the potential for a reduction in level of service, which results in environmental contamination and associated breaches of consent conditions. Wastewater pump stations are extremely vulnerable to flooding. HAIL sites are rated to have low vulnerability to pluvial flooding. The maps illustrate pluvial flood risk is medium or high across most of the pipe network at present day, with the extent of high risk increasing in future timeframes. Risk to Musselburgh Pump Station is rated medium and Tahuna Wastewater Treatment Plant is rated high under all timeframes. Risk to many HAIL sites is medium at all timeframes.

Disclaimer: These maps are not intended to assess pluvial flooding risk at individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.

Hazard data source: DCC ICMP Flood Model (Beca, WSP, 2024)

Figure 5.42 Wastewater infrastructure and contaminated land (HAIL sites) risk due to coastal inundation

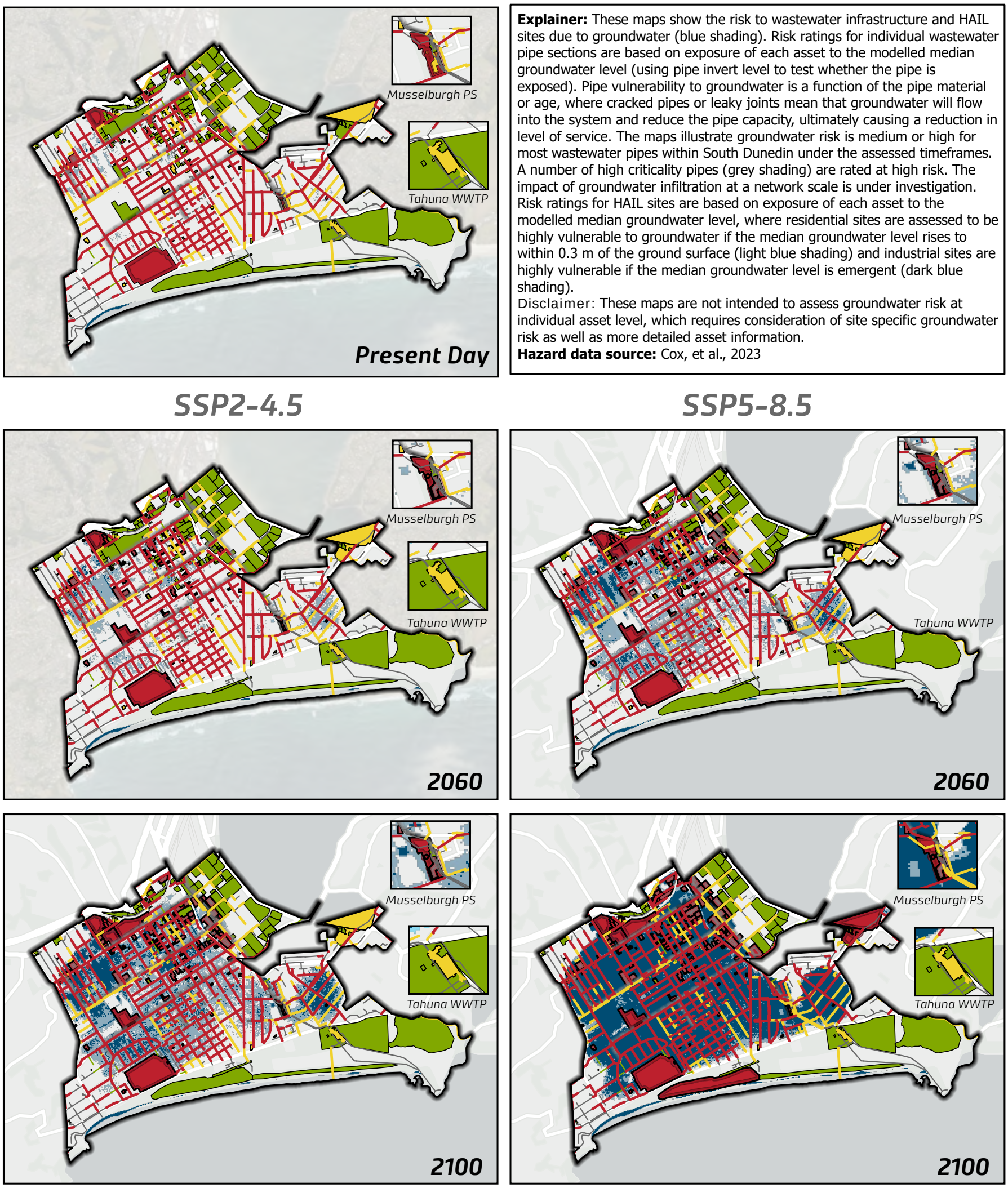


Explainer: These maps show the risk to wastewater infrastructure and HAIL sites due to coastal inundation (blue shading). Risk ratings for individual wastewater pipe sections and HAIL sites are based on exposure of each asset to modelled coastal inundation, combined with the vulnerability of the asset to inundation. While many wastewater pipes and HAIL sites are extremely exposed to frequent severe flooding (>10% AEP), HAIL sites are rated to have low vulnerability to coastal inundation as they do not tend to sustain damage during such events. Wastewater pipes are rated to have high vulnerability to coastal inundation due to the potential reduction in level of service, which results in environmental contamination and associated breaches of consent conditions. The maps illustrate that at late century coastal inundation risk becomes medium under a mid-range climate scenario, and high under a high end climate scenario for most wastewater pipes within South Dunedin. Risk to pump stations is rated low at mid century , and increases to medium at late century.

Disclaimer: These maps are not intended to assess coastal inundation risk at individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.

Hazard data source: Paulik, et al., 2023

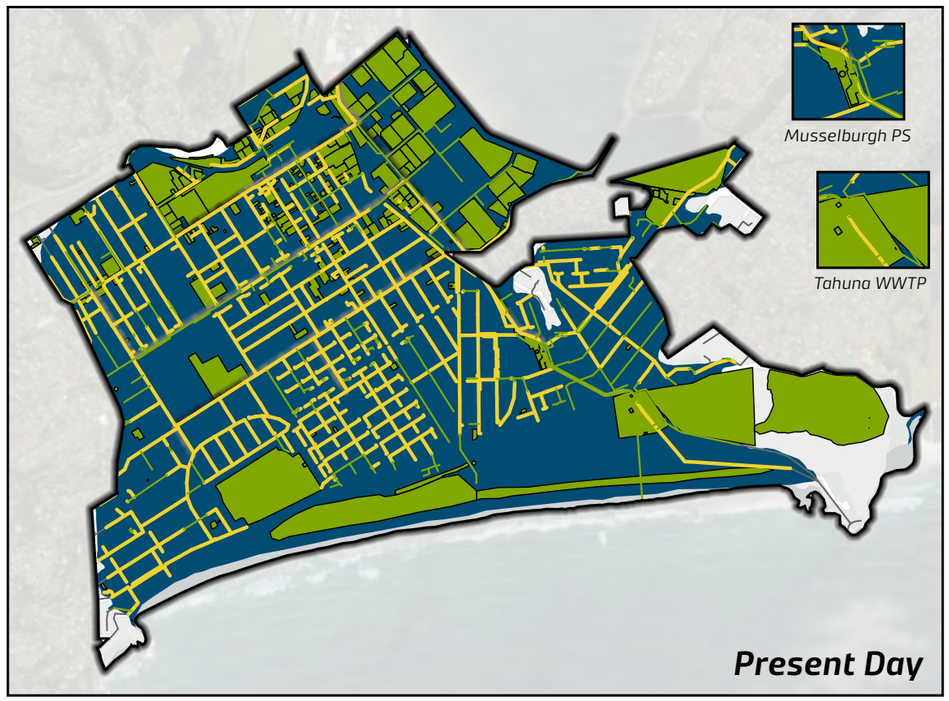
Figure 5.43 Wastewater infrastructure and contaminated land (HAIL sites) risk due to groundwater



Explainer: These maps show the risk to wastewater infrastructure and HAIL sites due to groundwater (blue shading). Risk ratings for individual wastewater pipe sections are based on exposure of each asset to the modelled median groundwater level (using pipe invert level to test whether the pipe is exposed). Pipe vulnerability to groundwater is a function of the pipe material or age, where cracked pipes or leaky joints mean that groundwater will flow into the system and reduce the pipe capacity, ultimately causing a reduction in level of service. The maps illustrate groundwater risk is medium or high for most wastewater pipes within South Dunedin under the assessed timeframes. A number of high criticality pipes (grey shading) are rated at high risk. The impact of groundwater infiltration at a network scale is under investigation. Risk ratings for HAIL sites are based on exposure of each asset to the modelled median groundwater level, where residential sites are assessed to be highly vulnerable to groundwater if the median groundwater level rises to within 0.3 m of the ground surface (light blue shading) and industrial sites are highly vulnerable if the median groundwater level is emergent (dark blue shading).
Disclaimer: These maps are not intended to assess groundwater risk at individual asset level, which requires consideration of site specific groundwater risk as well as more detailed asset information.
Hazard data source: Cox, et al., 2023

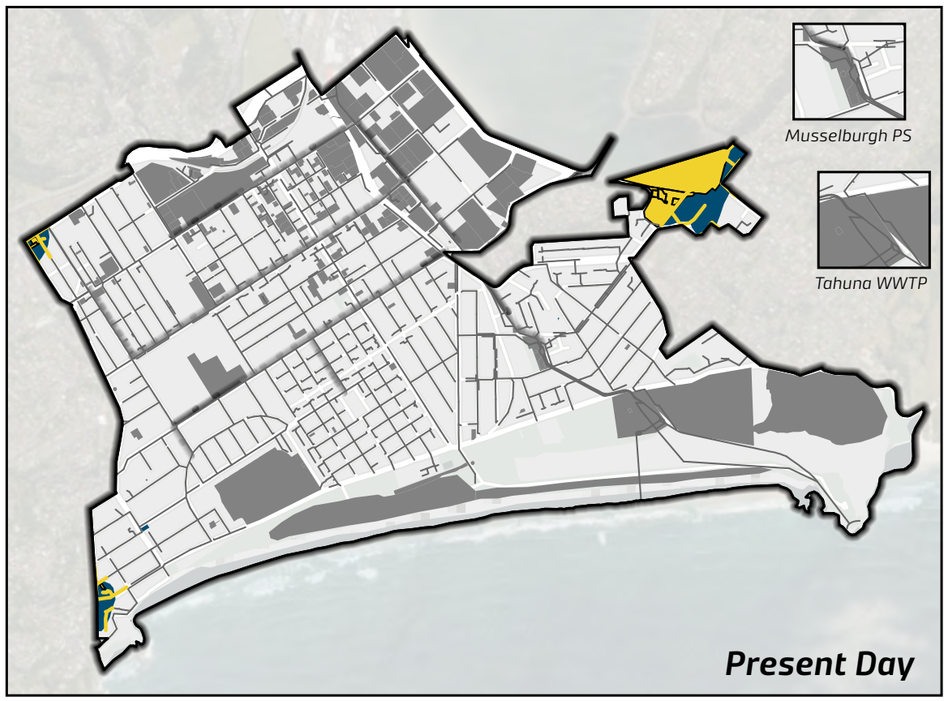
Figure 5.44 Wastewater infrastructure and contaminated land (HAIL sites) risk due to landslide and liquefaction

Liquefaction



Explainer: These maps show the risk to wastewater infrastructure and HAIL sites due to liquefaction. Risk ratings are based on exposure of each asset or site to liquefaction potential, combined with their vulnerability rating. The maps illustrate liquefaction risk is low across South Dunedin at the present day. Liquefaction risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of sea level rise on liquefaction potential. If it were to occur, liquefaction can impact water infrastructure by deforming the pipe network. ground settlement or stretching may damage or disconnect pipes and chambers and subsequent inflow of sediment can cause blockages. Buoyancy can cause uplift of buried structures, and disrupt drainage systems, while sediment discharge can reduce water quality and affect aquatic habitats.
Disclaimer: These maps are not intended to assess liquefaction risk at individual asset level, which requires consideration of site specific liquefaction risk as well as more detailed asset information. Liquefaction hazard information is based on a high level desktop review, where subsequent site specific assessment (Hornblow, 2020) has found that liquefaction potential is highly variable across sites analysed.
Hazard data source: Barrell, 2014

Landslide



Explainer: These maps show the risk to wastewater infrastructure and HAIL sites due to landslide. Risk ratings for individual wastewater pipes are based on exposure of each asset to landslides, combined with their vulnerability rating and adjusted for pipe criticality (grey shadow on pipe). Landslides can severely damage wastewater resulting in sudden collapse or failure and posing a potential risk to life in critical assets. The maps illustrate that some pipes and HAIL sites at the South Dunedin boundary are rated medium risk. Landslide risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of climate change (groundwater level rising or increased rainfall intensity) on landslide.
Disclaimer: These maps are not intended to assess landslide risk at individual asset level, which requires consideration of a site specific landslide risk as well as more detailed asset information. The landslide extent is based on known landslide areas and does not account for other potential sources of landslide nor represent the extent of the area of deposition/runout.
Hazard data source: DCC Hazard database data provided for South Dunedin Future programme

South Dunedin Future Boundary

Land instability

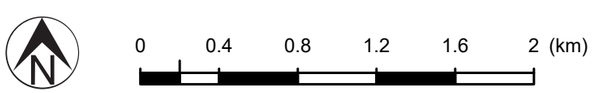
Liquefaction (Domain C: moderate liquefaction potential)

Major criticality

Wastewater Pipe (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

Structures (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

HAIL Site (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed



5.6 CONTAMINATED LAND RISK

Potentially contaminated sites have been identified in the HAIL register[37]. This register has limitations with data relating to both completeness, (i.e. not all sites have been identified) and some sites are unable to be identified (e.g. lead paint on buildings).

There are 236 contaminated sites in South Dunedin with a combined area of approximately 1.5 km^2. Key features are:

- Sites within industrial areas.
- Sites residential areas.
- Kettle Park (Ocean Beach Domain Landfills).
- Gas Works.

The graph shown in Figure 5.45 identifies how the contaminated land risk within South Dunedin changes over time with each hazard. Spatial representation of risk to contaminated land is shown in Figure 5.40, Figure 5.42, Figure 5.43, and Figure 5.44. Further detail regarding contaminated land vulnerability is contained in Appendix C.

As shown in Figure 5.45, groundwater poses the greatest risk to contaminated sites both at present day and into the future. The number of sites rated high risk due to groundwater increases significantly with time, from 7% at present day, rising to 80% of sites at late century under a high end climate change scenario. Sites within industrial zoning that are rated high risk are those that are exposed to emergent groundwater. Sites within residential zones that are rated high risk are those that are exposed to groundwater above 0.3 m below ground level. Sites that are rated moderate risk are located within residential areas that are exposed to groundwater shallower than 1 m below ground level.

Where near surface contamination is exposed to emergent groundwater there is potential for contamination to be transported, resulting in spread of contamination. Contaminated sites within industrial areas tend to have higher contamination loading and are extremely vulnerable to emergent groundwater due to the potential for transport and exposure of contaminants. These sites have the potential for exposing workers and public. Widespread hardstand in these areas mean there is a greater tolerance for high (but not emergent) groundwater due to the presence of barriers between contamination and the surface.

The nature of contamination in residential areas tends to be less severe, however activities carried out in residential areas tend to have a higher likelihood of interacting with the ground (for example vegetable gardens, sportsgrounds). Consequences relating to residential contamination may impact the health of residents e.g. ingested via residential vegetable gardens. At a catchment scale, changing groundwater levels may result in increased infiltration of contaminants into stormwater or wastewater network.

Contaminated sites are also rated at high risk due to coastal erosion at present day, where the number of sites rated at high rises from 1% at present day to 7% at late century.

A large number of sites are rated at medium risk due to pluvial flooding and coastal inundation. Exposure to these hazards may drive some increase in contaminant transport, resulting in environmental or health risks.

[37] https://environment.govt.nz/publications/hazardous-activities-and-industries-list-hail/

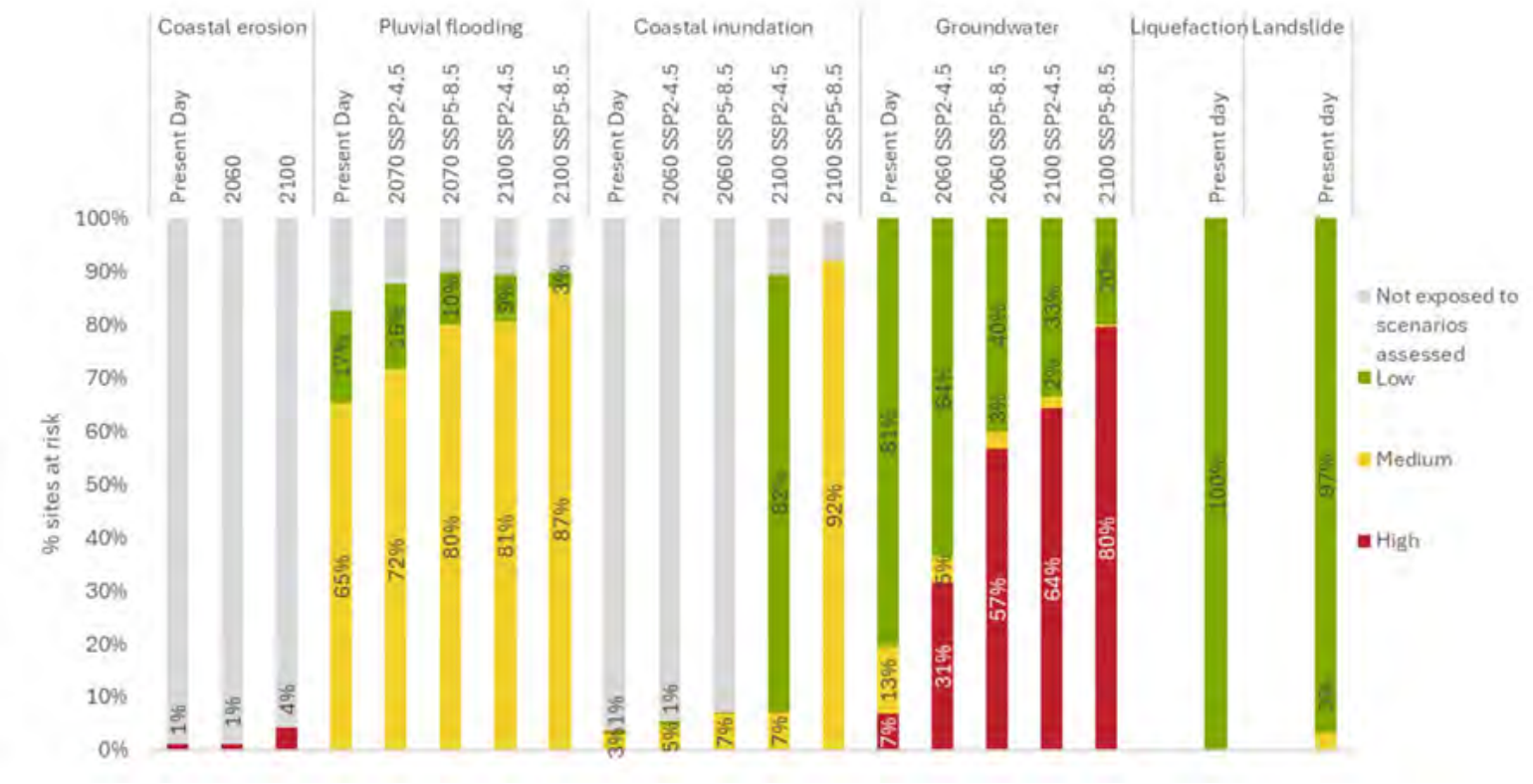


Figure 5.45 Risk to contaminated land presented as percentage of HAIL sites (by number) at each risk rating[38].

Risk to identified contaminated sites is shown in Table 5-7. This shows the Ocean Beach Domain landfills and Andersons Bay Closed Landfill are at high risk from coastal erosion at present day and into the future due to their proximity to the coast[38]. These sites are rated to be at high risk due to groundwater at late century under a high end climate change scenario. These sites are at medium risk due to coastal inundation, groundwater and landslide at all timeframes and climate change scenarios.

The Gasworks sites are rated to be at high risk due to groundwater at later timeframes, with some sites rated at high risk at mid-century under a high end climate change scenario. This risk is driven primarily by the extent of emergent groundwater encroaching on the Gasworks sites.

[38] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

Table 5-7 Risk to contaminated land: identified key features[38]

	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Andersons Bay Closed Landfill																				
Ocean Beach Domain Landfill 1 & 2																				
Ocean Beach Domain Landfill 3																				
Chisholm Park Landfill																				
DCC Gasworks, Shell Site																				
DCC Gasworks, Countdown Site																				
DCC Gasworks, Museum Site																				
DCC Gasworks, Tar Well Site																				
DCC Gasworks, Honda Site																				
DCC Gasworks, Nova Energy Site																				

Low Medium High Not exposed to scenarios assessed

5.7 RISK TO TELECOMMUNICATIONS INFRASTRUCTURE

The telecommunications network within south Dunedin comprises the lines and South Dunedin Exchange site (Melbourne St). Identified key features are:

- Telecommunication lines.
- South Dunedin Exchange.

Risk ratings for the South Dunedin Exchange are shown in Table 5-8, these ratings are based on the building vulnerability ratings established for the building stock of South Dunedin. This shows that at present day the site is rated medium risk due to groundwater, which increases to high risk at mid-century under a high end climate scenario when the median groundwater level is modelled to rise above 0.3 m below ground level. Coastal inundation risk is rated medium and high at late century under mid-range and high end climate scenarios respectively on account of the location of the exchange within the 1% AEP and 10% AEP coastal inundation floodplain respectively.

Chorus is in the process of improving site resilience across the network and has recently retrofitted the South Dunedin Exchange with flood protection measures (these measures were not factored into the risk assessment). Spatial representation of risk to the South Dunedin Exchange is shown in Figure 5.48, Figure 5.50, Figure 5.51, and Figure 5.52. Further detail regarding telecommunications infrastructure vulnerability is contained in Appendix C.

A site specific risk assessment of telecommunication lines has not been assessed, however the following points are provided to support adaptation planning:

- Location of lines are not available as part of this assessment, although we understand that they generally follow roads.

- Parts of the telecommunication network are vulnerable to hazards (particularly coastal erosion, landslide, and liquefaction) however a key vulnerability of telecommunications infrastructure relates to their dependency on road access and power supply.
- Some copper connections remain in South Dunedin. This may decrease as the copper network is phased out in areas where fibre is available.
- Groundwater ingress is an issue for copper lines.
- Many network faults can be remedied (including reconnections) relatively quickly, giving the network a high adaptive capacity. Chorus has also built redundancy into their network such that connections between exchanges may not impact on service delivery. In addition, two containerised exchange sites ('MEOW's) have been set up which could be commissioned if damage occurred to the South Dunedin Exchange.

Table 5-8 Risk to the Chorus exchange site[39]

	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Chorus exchange																				

Low Medium High Not exposed to scenarios assessed

[39] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

5.8 RISK TO ENERGY INFRASTRUCTURE

The South Dunedin electricity network is managed by Transpower (national grid) and Aurora (local grid). The network comprises the following key features, where risk was assessed to each asset within the features:

- Transpower South Dunedin Substation.
- Transpower: Transmission line.
- Aurora Substations: Carisbrook, St Kilda.
- Aurora 33kV Buried lines.
- Aurora Overhead lines.
- Genesis bulk LPG Facility.

Electricity is supplied into Dunedin City from two Transpower substations, one of which is within South Dunedin. From these substations, two adjacent power lines feeds into one of the Aurora zone substations to form the local distribution network.

The Transpower South Dunedin Substation and a small section of the Halfway Bush - South Dunedin A transmission line (7 structures) are located within South Dunedin. Transpower considers South Dunedin substation to be nationally significant based on to it being part of the South Island 'black start' plan, regionally significant based on the number of power connections (~21,000 ICPs - Installation Control Points).

The Dunedin reticulated LPG network crosses South Dunedin. The Genesis bulk LPG Facility is located at Hillside Road and operates at 55kPa. It powers approximately 350 homes and business with LPG and was commissioned in 2001. Specific risks to gas reticulation are not assessed as part of this assessment, however risks to buildings at the Genesis LPG facility are assessed as part of the building stock of South Dunedin, with risk ratings included Table 5-9.

Figure 5.46 and Figure 5.47 show how the risk to overhead lines and underground lines within South Dunedin changes over time with each hazard. Spatial representation of risk to energy infrastructure is shown in Figure 5.48, Figure 5.50, Figure 5.51, and Figure 5.52. Further detail regarding energy infrastructure vulnerability is contained in Appendix C.

Risk to the Transpower transmission line and substation (Transpower South Dunedin Substation) and Aurora substations (St Kilda and Carisbrook) are shown in Table 5-9. At mid-century, under a high end climate change scenario, the Transpower South Dunedin Substation site is rated high risk to coastal inundation. The St Kilda substation is rated at medium risk to coastal inundation at present day, increasing to high risk at mid-century under a mid-range scenario, and Carisbrook substation is rated at medium risk to groundwater under all scenarios and timeframes.

Table 5-9 Risk to energy key features[40]

	Coastal erosion			Coastal inundation					Groundwater					Pluvial flooding					Land-slide	Lique-faction
	Present Day	2060	2100	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Transpower Transmission line Halfway Bush - South Dunedin A																				
Transpower South Dunedin Substation																				
Carisbrook Zone Substation																				
St Kilda Zone Substation																				
Genesis bulk LPG Facility *Ratings show building risk to all buildings at 61-65 Hillside Road Risk ratings were assessed under building risk assessment criteria and are not specific to gas reticulation services.*																				

Low Medium High Not exposed to scenarios assessed

There are 20 km of overhead high voltage and sub transmission lines within the South Dunedin energy distribution network. Figure 5.46 shows the risk to overhead lines (and associated poles) presented as a percentage of line length at risk for each risk rating. This shows that groundwater poses the highest rated risk at present day and into the future for overhead lines. Poles may be sensitive to waterlogged soils as a result of rising groundwater, which can cause instability depending on foundation type (no data available to inform the assessment). Asset managers have indicated that this slow onset chronic risk is likely to have impacts that can be managed over time and therefore ongoing service delivery is unlikely to be impacted.

There are 59 km of underground high voltage and sub transmission lines. Figure 5.47 shows the risk to underground lines, which is relatively low compared to overhead lines, and most other

[40] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

elements at risk within South Dunedin. Coastal erosion poses the only high rated hazard, with 1% of lines rated at high risk at present day, which rises to 6.7% of lines at late century.

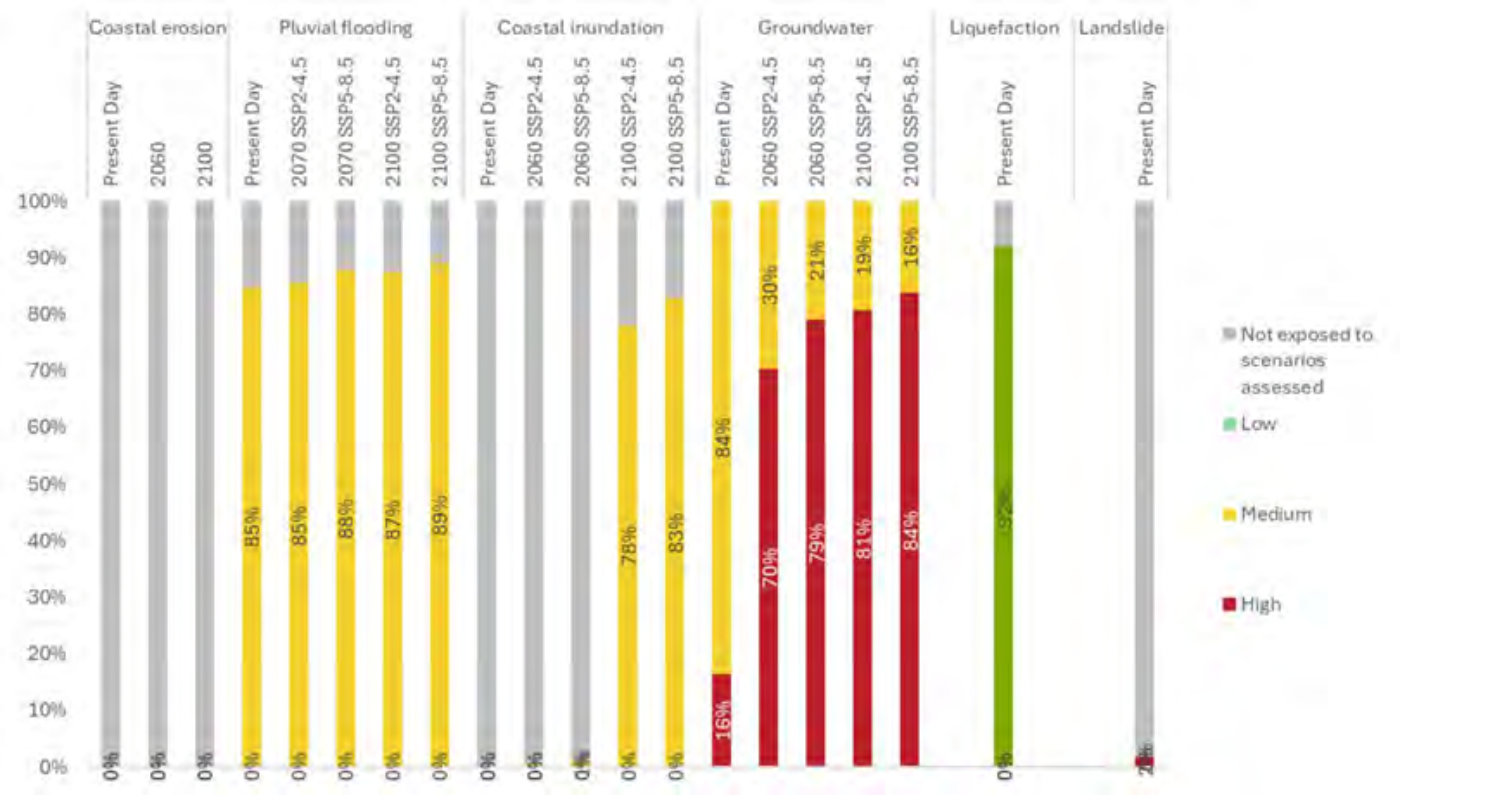


Figure 5.46 Risk to overhead lines (and associated poles) presented as percentage of line length at risk for each risk rating[41]

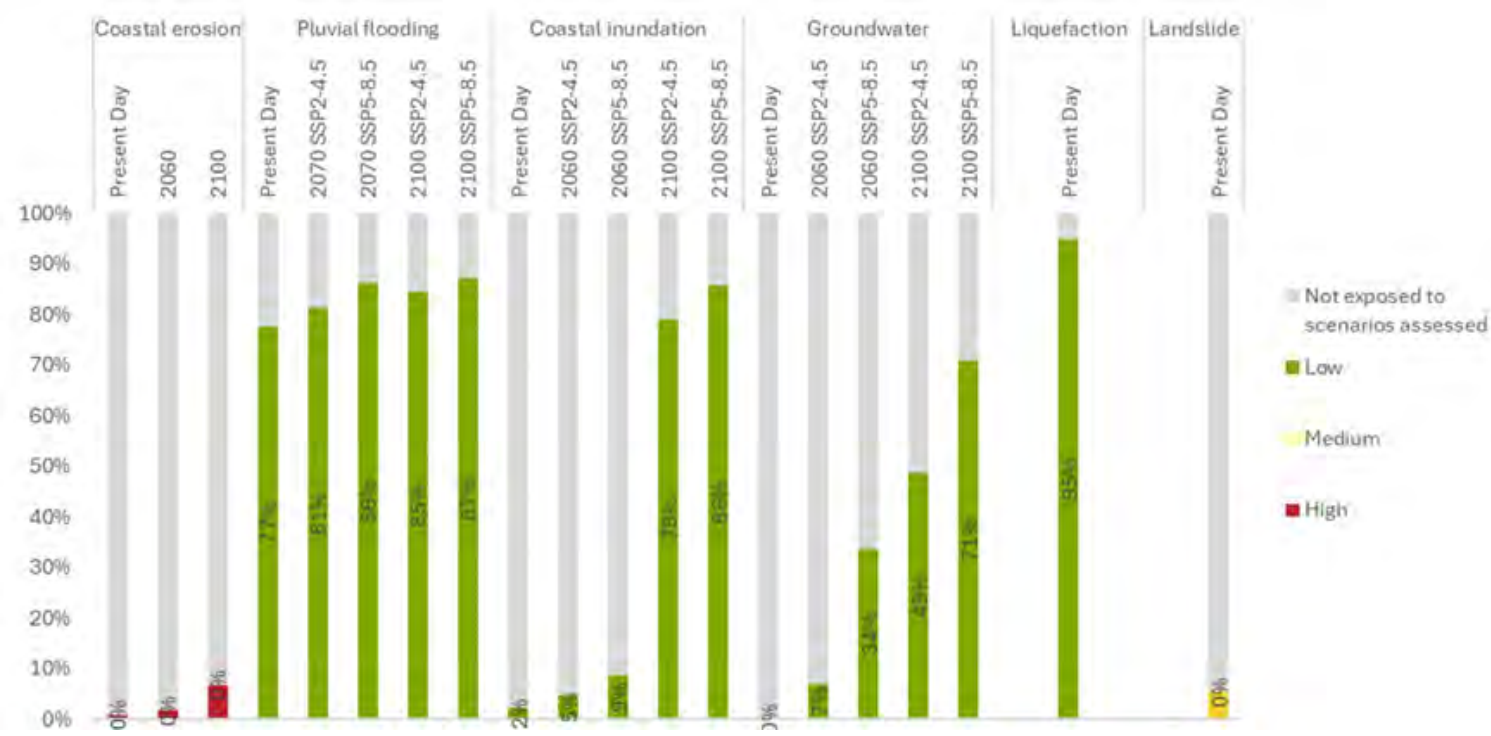
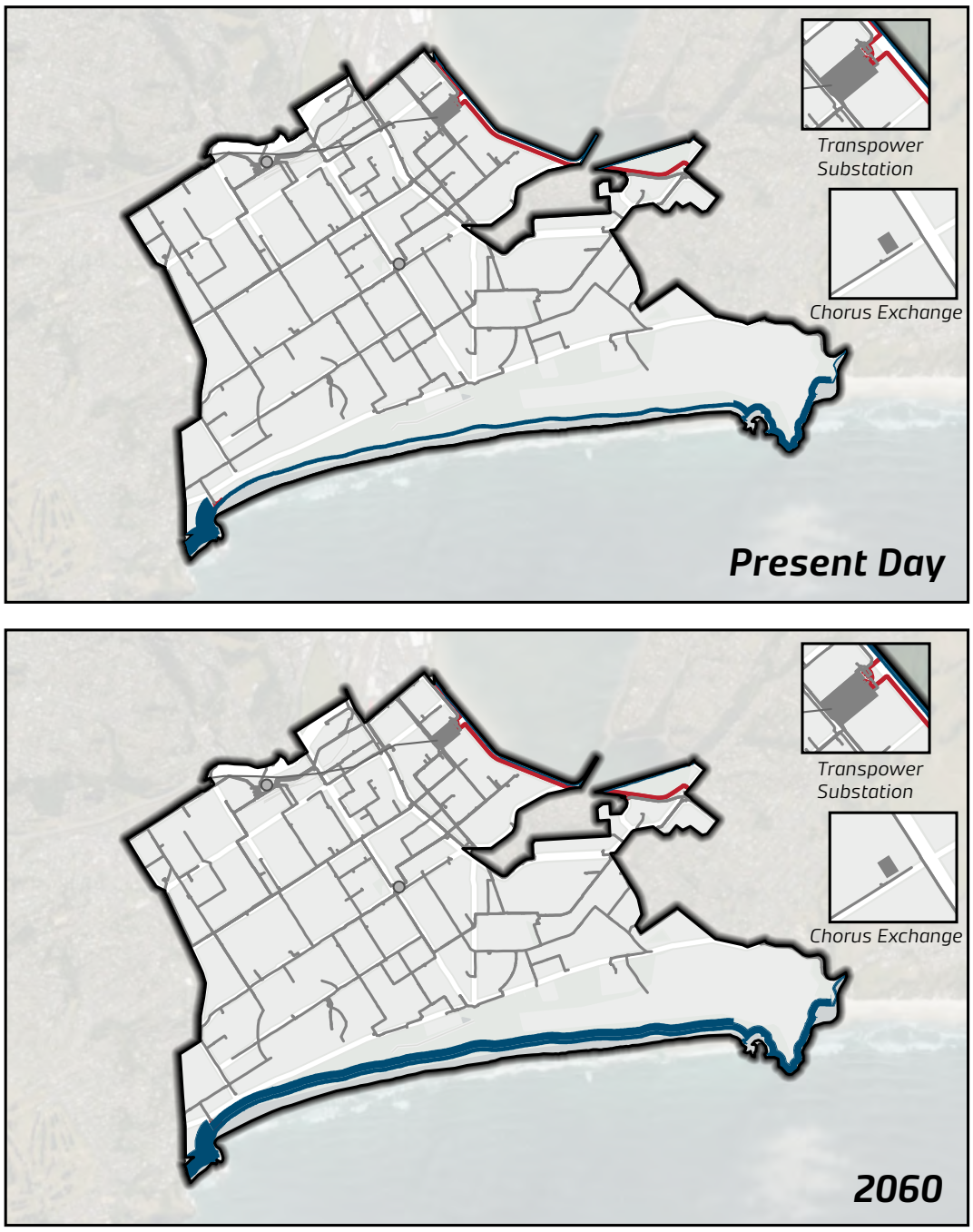


Figure 5.47 Risk to underground lines presented as percentage of line length at risk for each risk rating[42]

[41] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

[42] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

Figure 5.48 Energy and telecommunications infrastructure risk due to coastal erosion

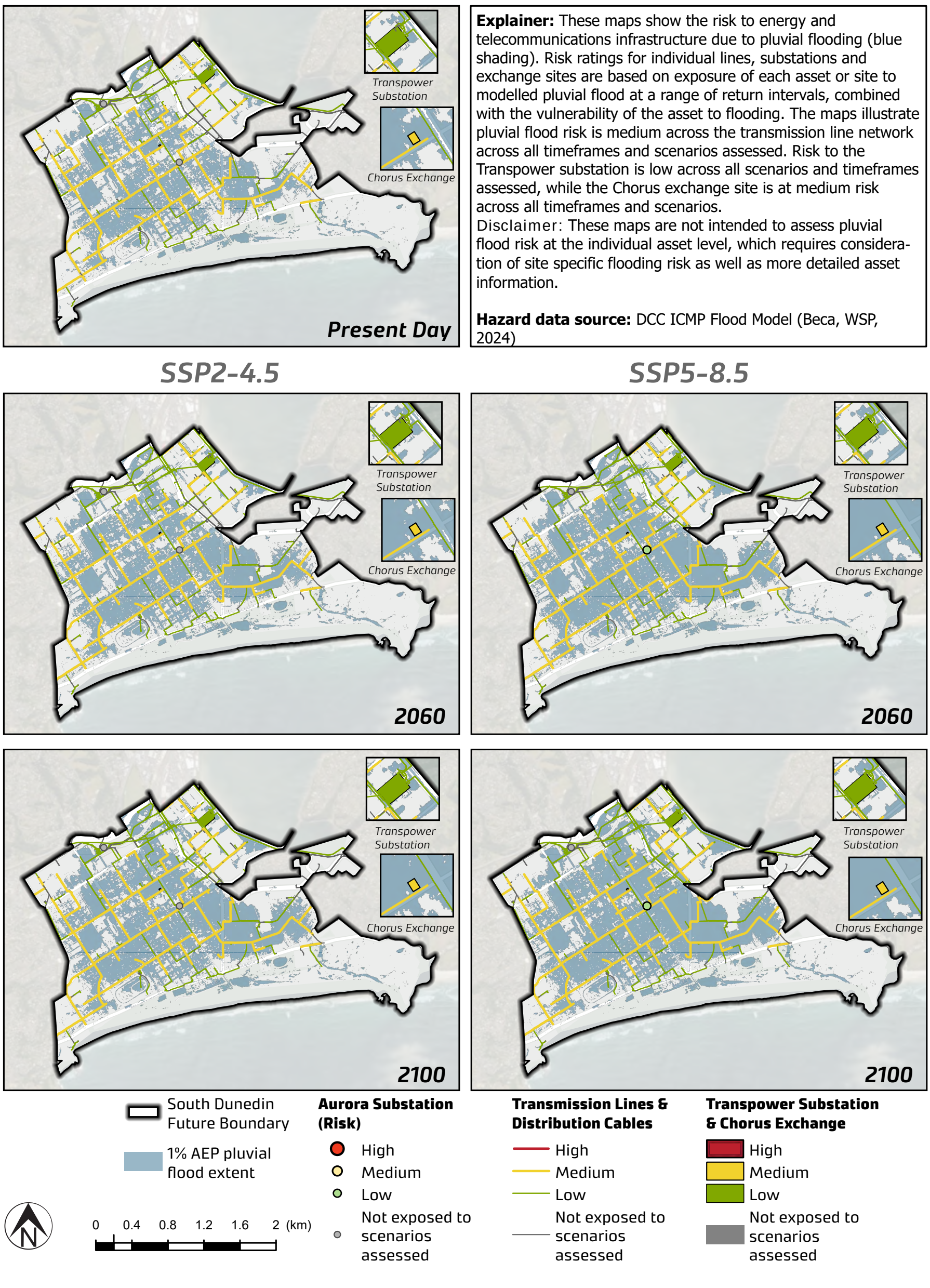


Explainer: These maps show the risk to energy and telecommunications infrastructure due to coastal erosion (blue shading), noting that there is a high level of uncertainty regarding coastal erosion risk due to data limitations at present (e.g. scale of screening study and accounting for impact of engineered structures). The maps indicate that coastal erosion risk to telecommunications lines is confined to areas directly adjacent to the Otago Harbour, and a small number of lines along the St Clair-St Kilda coastline at the St Clair end of the beach. More detailed coastal hazard assessments are underway as part of the St Clair-St Kilda Coastal Plan, these will be completed in late-2025, after which coastal erosion risk ratings will be reviewed.

Disclaimer: These maps are not intended to assess coastal erosion risk to specific assets, which requires more detailed hazard data and consideration of a range of building specific factors (e.g. foundation type).

Hazard data source: WSP, 2024

Figure 5.49 Energy and telecommunications infrastructure risk due to pluvial flooding

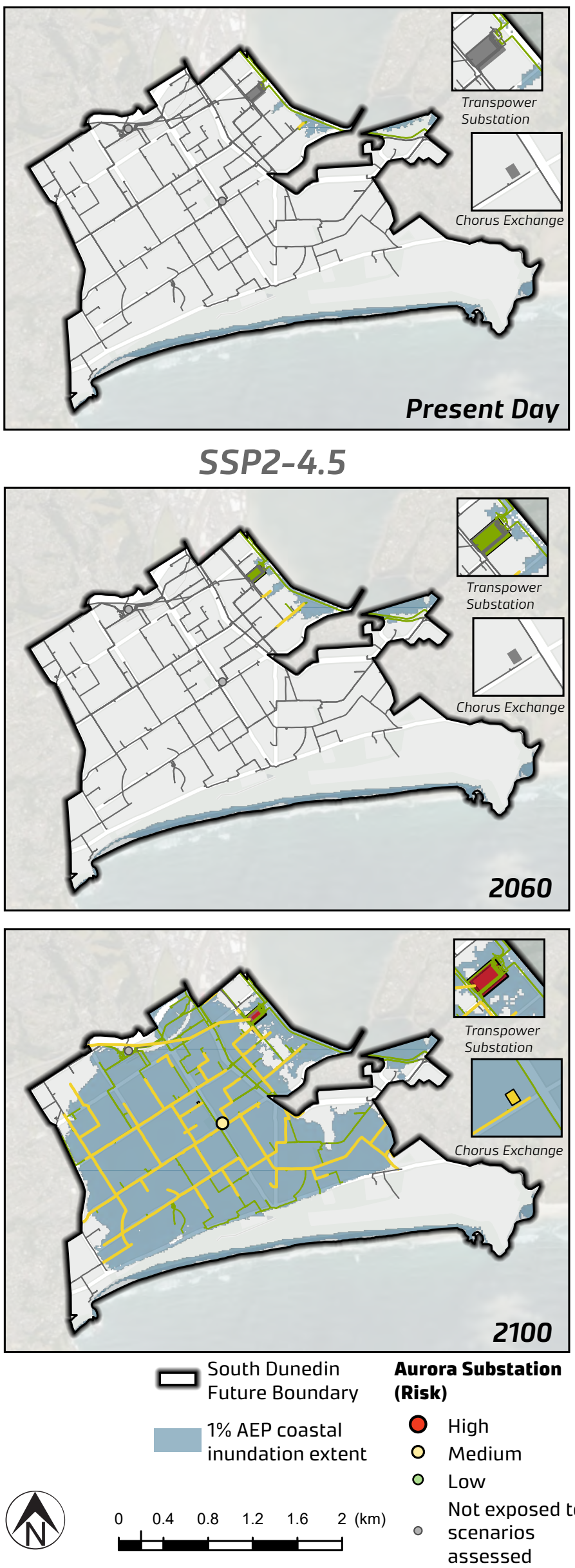


Explainer: These maps show the risk to energy and telecommunications infrastructure due to pluvial flooding (blue shading). Risk ratings for individual lines, substations and exchange sites are based on exposure of each asset or site to modelled pluvial flood at a range of return intervals, combined with the vulnerability of the asset to flooding. The maps illustrate pluvial flood risk is medium across the transmission line network across all timeframes and scenarios assessed. Risk to the Transpower substation is low across all scenarios and timeframes assessed, while the Chorus exchange site is at medium risk across all timeframes and scenarios.

Disclaimer: These maps are not intended to assess pluvial flood risk at the individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.

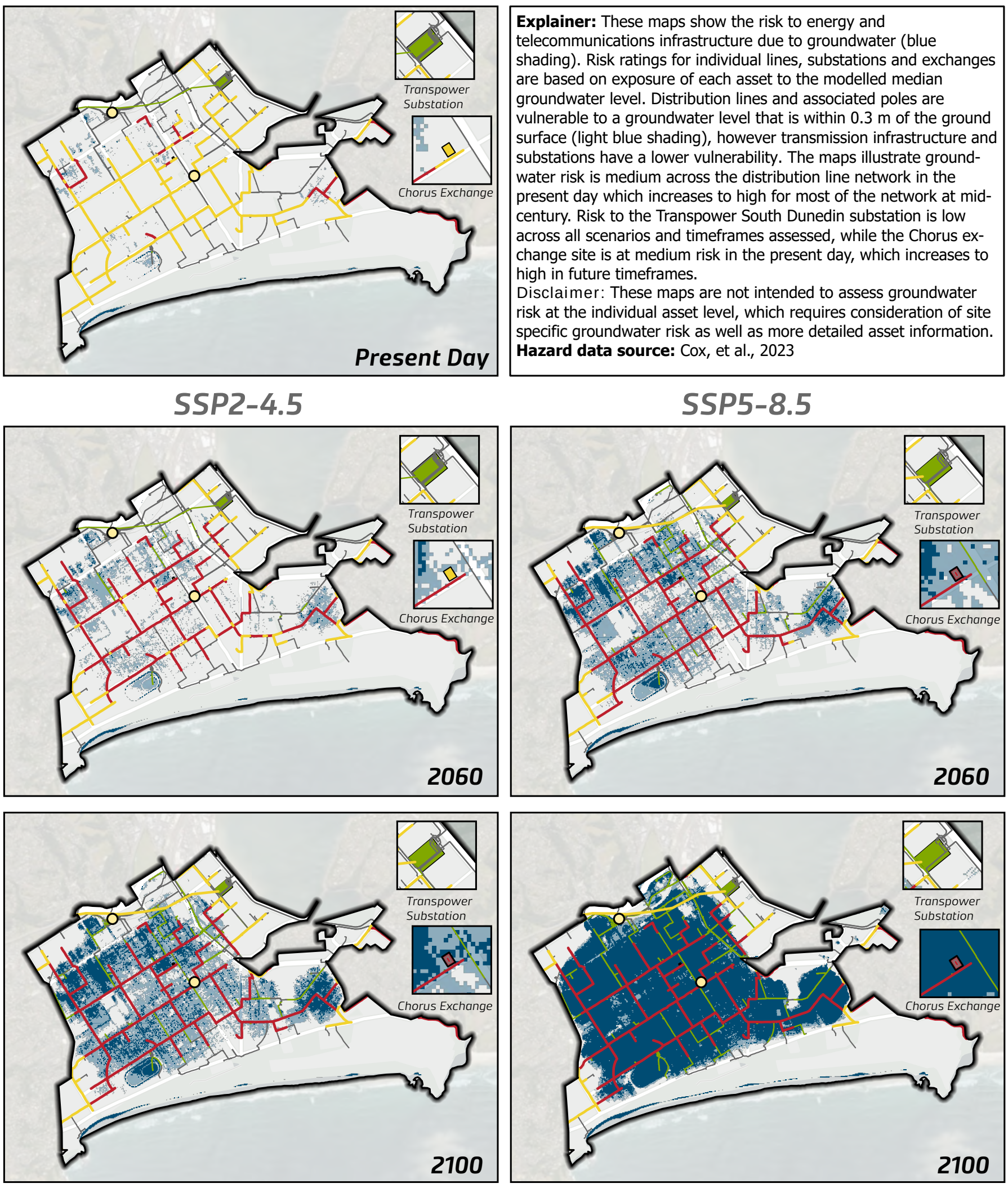
Hazard data source: DCC ICMP Flood Model (Beca, WSP, 2024)

Figure 5.50 Energy and telecommunications infrastructure risk due to coastal inundation



Explainer: These maps show the risk to energy and telecommunications infrastructure due to coastal inundation (blue shading). Risk ratings for individual lines, substations and exchange sites are based on exposure of each asset to modelled coastal inundation at a range of return intervals, combined with the vulnerability of the asset to inundation. Underground cables are rated to have very low vulnerability to pluvial flooding due to their location, while substations are rated high vulnerability where flood depths are greater than 0.2 m. Site specific review of Transpower South Dunedin substation found that sensitive transmission assets are located in minimally affected areas of the site, resulting in a very low service vulnerability for the scenarios assessed. The maps illustrate very little coastal inundation risk for most lines and substations until late century. Under a high end climate scenario, both the Transpower South Dunedin substation and the Chorus exchange are at high risk at late century. Risk to underground cables is low across all timeframes, while overhead cables and associated poles have a medium risk at late century.
Disclaimer: These maps are not intended to assess coastal inundation risk at the individual asset level, which requires consideration of site specific flooding risk as well as more detailed asset information.
Hazard data source: Paulik, et al., 2023

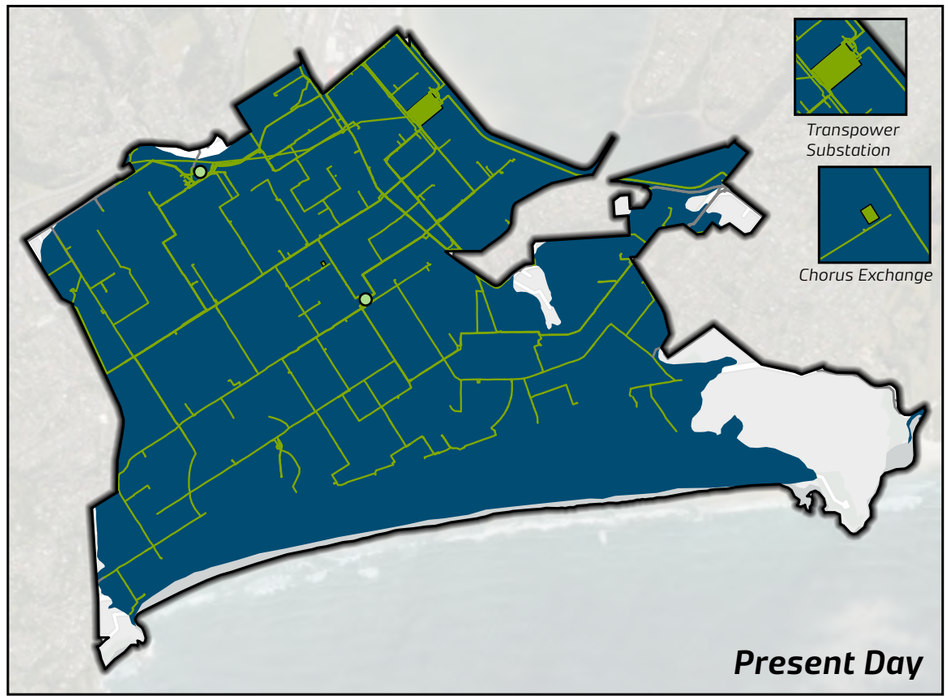
Figure 5.51 Energy and telecommunications infrastructure risk due to groundwater



Explainer: These maps show the risk to energy and telecommunications infrastructure due to groundwater (blue shading). Risk ratings for individual lines, substations and exchanges are based on exposure of each asset to the modelled median groundwater level. Distribution lines and associated poles are vulnerable to a groundwater level that is within 0.3 m of the ground surface (light blue shading), however transmission infrastructure and substations have a lower vulnerability. The maps illustrate groundwater risk is medium across the distribution line network in the present day which increases to high for most of the network at mid-century. Risk to the Transpower South Dunedin substation is low across all scenarios and timeframes assessed, while the Chorus exchange site is at medium risk in the present day, which increases to high in future timeframes.
Disclaimer: These maps are not intended to assess groundwater risk at the individual asset level, which requires consideration of site specific groundwater risk as well as more detailed asset information.
Hazard data source: Cox, et al., 2023

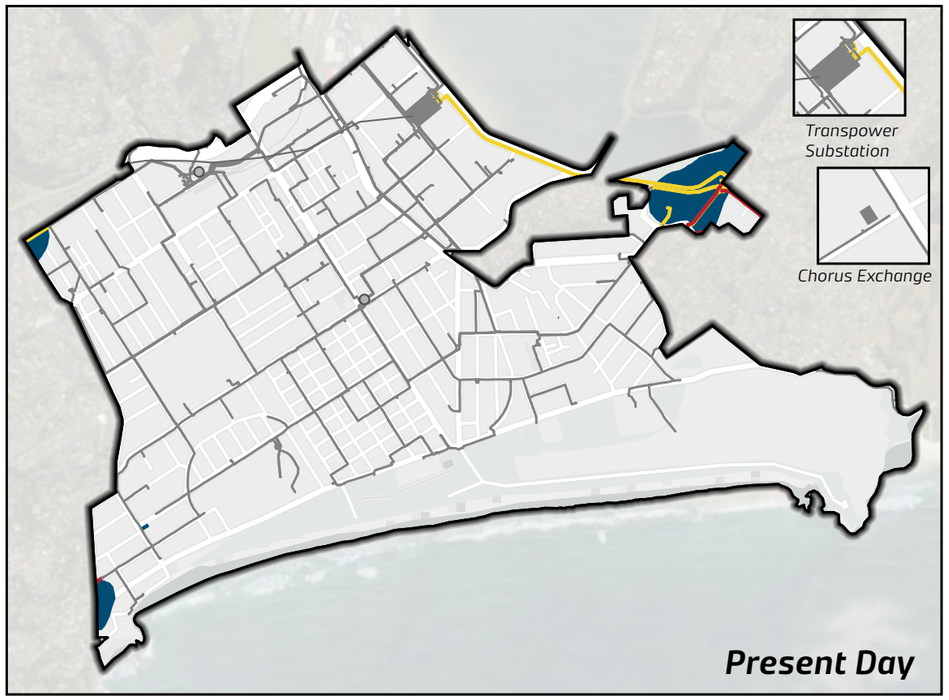
Figure 5.52 Energy and telecommunications infrastructure risk due to landslide and liquefaction

Liquefaction



Explainer: These maps show the risk to energy and telecommunications infrastructure due to liquefaction. Risk ratings for individual lines, substations and exchanges are based on exposure of each asset or site to liquefaction potential, combined with their vulnerability rating. Distribution and transmission poles have a moderate vulnerability rating, while underground cables are have high vulnerability rating. The maps illustrate liquefaction risk is low across South Dunedin at the present day. Liquefaction risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of sea level rise on liquefaction potential. If it were to occur, liquefaction can cause differential settlement and lateral spreading that distorts structures, reduces foundation-bearing capacity, and damages pile supports and service connections.
Disclaimer: These maps are not intended to assess liquefaction risk at individual asset level, which requires consideration of site specific liquefaction risk as well as more detailed asset information. Liquefaction hazard information is based on a high level desktop review, where subsequent site specific assessment (Hornblow, 2020) has found that liquefaction potential is highly variable across sites analysed.
Hazard data source: Barrell, 2014

Landslide



Explainer: These maps show the risk to energy and telecommunications infrastructure due to landslide (blue shading). Risk ratings for individual lines, substations and exchanges are based on exposure of each asset to landslides, combined with their vulnerability rating. Landslides can severely damage infrastructure through sudden collapse or failure. The maps illustrate some cables at the South Dunedin boundary are rated medium and high risk, with very little other exposure across South Dunedin. Landslide risk is not assessed at future timeframes due to the absence of spatial data that incorporates the influence of climate change (groundwater level rising or increased rainfall intensity) on landslide.
Disclaimer: These maps are not intended to assess landslide risk at individual asset level, which requires consideration of a site specific landslide risk as well as more detailed asset information. The landslide extent is based on known landslide areas and does not account for other potential sources of landslide nor represent the extent of the area of deposition/runout.
Hazard data source: DCC Hazard database data provided for South Dunedin Future programme

South Dunedin Future Boundary

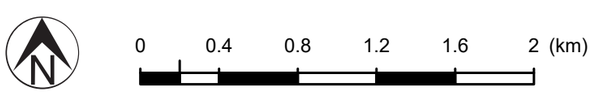
Land instability

Liquefaction (Domain C: moderate liquefaction potential)

Aurora Substation (Risk)
- High
- Medium
- Low
- Not exposed to scenarios assessed

Transmission Lines & Distribution Cables
- High
- Medium
- Low
- Not exposed to scenarios assessed

Transpower Substation & Chorus Exchange
- High
- Medium
- Low
- Not exposed to scenarios assessed



5.9 DIRECT PHYSICAL RISK ASSESSMENT RESULTS SUMMARY

This section provides a summary of findings of the direct physical risk assessment. Table 5-10 identifies the percentage of places or assets across South Dunedin rated high risk from the natural hazards. In general, high rated risks correspond to places or assets that are exposed and extremely vulnerable, or those that are extremely exposed (i.e. to a 10% AEP event) and with high vulnerability. Many of these risks correspond to complete loss of functionality of the element at risk.

Table 5-11 provides similar results, for both medium and high risk elements, these risks encompass a broader set of risks that represent places or assets that have functionality compromised. Spatial summaries of risk have been developed to show risk 'hot spots' at present day, mid-century and late century. These maps show where medium or high rated risk are located, with colouring indicating the number of hazards from which a risk is identified. Risk to buildings, roads and parks are shown in Figure 5.53 because these three elements at risk provide complete spatial coverage of South Dunedin, while also representing important components of the physical landscape of South Dunedin.

The summaries in Table 5-10 and Table 5-11 show that groundwater is the dominant hazard for most elements at risk, both at present and into the future. When seen spatially (in Figure 5.53), the coastal edge experiences risks arising from multiple hazards earliest in time. Areas within the inland low lying area of South Dunedin show widespread risk from a single hazard at present (predominantly groundwater) with patches of risk arising from a second hazard (predominantly pluvial flooding). This pattern of risk becomes more severe with time, where at late century the majority of South Dunedin is at risk from at least 3 hazards.

At present, all roads, sports fields and parks and significant proportions of most other elements are at high or medium risk to groundwater hazard. Of these, roads and wastewater assets have the highest proportion of assets rated at high risk. Pluvial flooding poses a high risk to a significant proportion of buildings and wastewater assets under present day conditions (23% and 53% respectively) as well as a medium or high risk to significant proportions assets within many of the other elements. Coastal erosion and coastal inundation pose high risk to very small proportions of assets within most elements and pose medium to high risk to some sports fields (11% coastal inundation) and parks (13% coastal inundation, 21% coastal erosion[43]). Liquefaction poses a medium risk to a significant proportion of wastewater pipes (66%) but high risk to none, and landslide poses medium risk to a notable proportion of sports fields (13%) but high risk to a very small proportion of a few elements.

At mid-century, many of the risks identified at present day increase incrementally. Additionally significant increases in medium to high risk arise in sports fields due to coastal erosion (increase from 0% at present day to 20% at mid-century), buildings due to groundwater (increase from 23% at present day to 71%-78% at mid-century) and contaminated land due to groundwater (19% at present day to 36%-60% at mid-century).

[43] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

At late century, a large proportion of most elements are at medium to high risk due to groundwater under medium and high-end climate scenarios (buildings (80-84%), stormwater (87-91%), contaminated land (67-80%), energy distribution (100%) and telecommunications infrastructure (100%)). Risk due to coastal inundation rises to become extremely widespread under a high end climate scenario for many elements (buildings, sports fields, roads, wastewater, stormwater, contaminated land, telecommunications, and energy distribution).

Risks to each element at risk are summarised:

- Buildings: The buildings within South Dunedin generally face high and widespread risk from a range of existing hazards. Notably, 23% of buildings are rated as high risk to pluvial flooding at present day, and 84% of buildings are rated as high risk from groundwater by late-century. These risks, if realised, would negatively impact building performance and functionality, making some buildings uninhabitable. This would have a range of adverse impacts on residents, including to physical health and wellbeing and wider economic and societal impacts.
- Parks: The 56 parks in South Dunedin generally face medium risk from various existing hazards, with only 5% at high risk, mainly those with playgrounds vulnerable to waterlogging due to groundwater. Currently, 95% of parks are at medium risk from groundwater and 57% from pluvial flooding. By late century, medium risk due to coastal inundation and erosion will rise to 29% and 30%, respectively.
- Sports fields: Many of the sports fields within South Dunedin currently face medium risk due to a range of hazards. Groundwater and coastal erosion are the two main drivers of high risk to Sports fields. Groundwater impacts the sports fields due to chronic saturation of the playing turf and grass root zones which causes die-off, and coastal erosion causes a loss of sport field area. At present 17% of fields are at high risk due to groundwater, which increases at mid century to 46%. Coastal erosion[44] poses a high risk to parks at mid-(20%) and late century (29%) timeframes, and typically those fields that are at lower risk from groundwater are more impacted by coastal erosion. Consequentially 75% of all fields are at high risk by late century due to either coastal erosion or high groundwater. Loss of sports fields would have widespread impacts on the wide city, as South Dunedin provides for 45% of the Dunedin City playing field area.
- Roads: South Dunedin's 90 km of roads are increasingly at risk due to high groundwater levels and coastal erosion. Currently, 35% of roads are at high risk from groundwater, rising to 76% by 2100, while coastal erosion threatens 2% of roads, increasing to 9% by the end of the century. These conditions will lead to severe road damage, challenging maintenance efforts, and potential road collapses, impacting local and regional transport routes, especially the 3 km of critical routes.
- 3 Waters: Of the 71 km of stormwater pipes in South Dunedin, 22% are currently at high risk from groundwater, increasing to 28% by late century. Medium risk from pluvial flooding affects 28% of pipes today, rising to 38% by mid-century, while coastal inundation will impact 76% by late century. These risks, if realised, will erode the level of service of the stormwater system, resulting in increased flooding.

[44] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

Of the 79 km of wastewater pipes in South Dunedin, 50% are currently at high risk from groundwater, increasing to 58% by the end of the century. Pluvial flooding poses a high risk to 51% of pipes today, rising to 72% by century's end. Coastal inundation risks are lower except in the late-century high-range scenario, where 80% of the network is at high risk. These risks threaten the wastewater system's service, potentially causing widespread contamination and public health issues.

In general, natural hazard risks to the water supply network in South Dunedin is low.

- Contaminated sites: The 236 contaminated sites in South Dunedin are primarily at risk from groundwater, with 7% currently at high risk, rising to 80% by late century. These high-risk sites have the potential for contaminants to be transported, resulting in spread of contamination. Additionally, coastal erosion poses a high risk to 1% of sites, which increases to 4% at late century with further potential for increased spread of contamination.
- Telecommunications: The telecommunications exchange site in South Dunedin is currently at medium risk from groundwater, increasing to high risk by late century. It also faces medium to high risk from coastal erosion by late century. Risks to the wider network haven't been fully assessed, although their dependency on road access and power supply is identified.
- Energy: Risk to energy assets in South Dunedin varies by type. The energy distribution network, with more assets than the transmission network, faces higher risks. Currently, 16% of overhead distribution lines are at high risk from groundwater, increasing to 84% by late century. Pluvial flooding and coastal inundation pose medium risk to most lines by late century (89% and 83%, respectively). The Transpower South Dunedin Substation and St Kilda Zone Substations both become high risk at mid-century[45].

[45] Risk to specific key features (e.g. Wastewater Treatment Plant, Pump stations, Substations, and other features) is shown in Section 5.

Table 5-10 Percentage of elements at risk across South Dunedin rated high risk[1,2,3].

	Coastal erosion			Pluvial flooding					Coastal inundation					Groundwater					Lique-faction	Land-slide
	Present Day	2060	2100	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Buildings	1%	1%	2%	23%	31%	39%	37%	47%	0%	0%	0%	1%	83%	3%	9%	32%	49%	78%	0%	2%
Sports fields	0%	20%	29%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	46%	47%	47%	48%	0%	0%
Parks	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	5%	0%	0%
Roads	2%	5%	9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	35%	63%	68%	70%	76%	0%	2%
Water supply	1%	1%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Wastewater	0%	0%	0%	51%	59%	67%	66%	72%	1%	1%	2%	2%	80%	50%	51%	52%	54%	58%	0%	0%
Stormwater	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	22%	25%	26%	26%	28%	0%	0%
Contaminated land	1%	1%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	31%	57%	64%	80%	0%	0%
Telecommunications	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	100%	100%	0%	0%
Energy distribution	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	16%	70%	79%	81%	84%	0%	2%

Table 5-11 Percentage of places or assets across South Dunedin rated medium or high risk[1,2,3].

	Coastal erosion			Pluvial flooding					Coastal inundation					Groundwater					Lique-faction	Land-slide
	Present Day	2060	2100	Present Day	2070 SSP2-4.5	2070 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	2060 SSP2-4.5	2060 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5	Present Day	Present Day
Buildings	1%	1%	2%	49%	57%	63%	61%	69%	0%	0%	1%	81%	84%	32%	71%	78%	80%	84%	0%	2%
Sports fields	0%	20%	29%	76%	76%	77%	76%	77%	11%	13%	13%	69%	75%	100%	100%	100%	100%	100%	0%	13%
Parks	21%	25%	30%	57%	61%	63%	63%	66%	13%	14%	14%	16%	29%	100%	100%	100%	100%	100%	0%	7%
Roads	2%	5%	9%	43%	47%	52%	50%	55%	2%	4%	4%	5%	72%	100%	100%	100%	100%	100%	0%	2%
Water supply	1%	1%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
Wastewater	2%	2%	3%	71%	76%	79%	78%	79%	1%	1%	2%	76%	80%	67%	69%	70%	72%	80%	66%	2%
Stormwater	1%	1%	2%	60%	68%	75%	75%	80%	1%	1%	2%	2%	86%	78%	84%	85%	87%	91%	0%	2%
Contaminated land	1%	1%	4%	65%	72%	80%	81%	87%	3%	5%	7%	7%	92%	19%	36%	60%	67%	80%	0%	3%
Telecommunications	0%	0%	0%	100%	100%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	0%	0%
Energy distribution	0%	0%	0%	85%	85%	88%	87%	89%	0%	0%	1%	78%	83%	100%	100%	100%	100%	100%	0%	2%

[1] Percentages for each element at risk show: buildings: % number of building footprints; sports fields, parks, contaminated land: % number of sites; roads, 3 waters assets and energy: % length of road. Colour coding is based on Table 3-12.

[2] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

[3] Risk to specific key features (e.g. Wastewater Treatment Plant, Pump stations, Substations, and other features) is shown in Section 5.

Summary of Risks to South Dunedin

Buildings, Parks & Transport

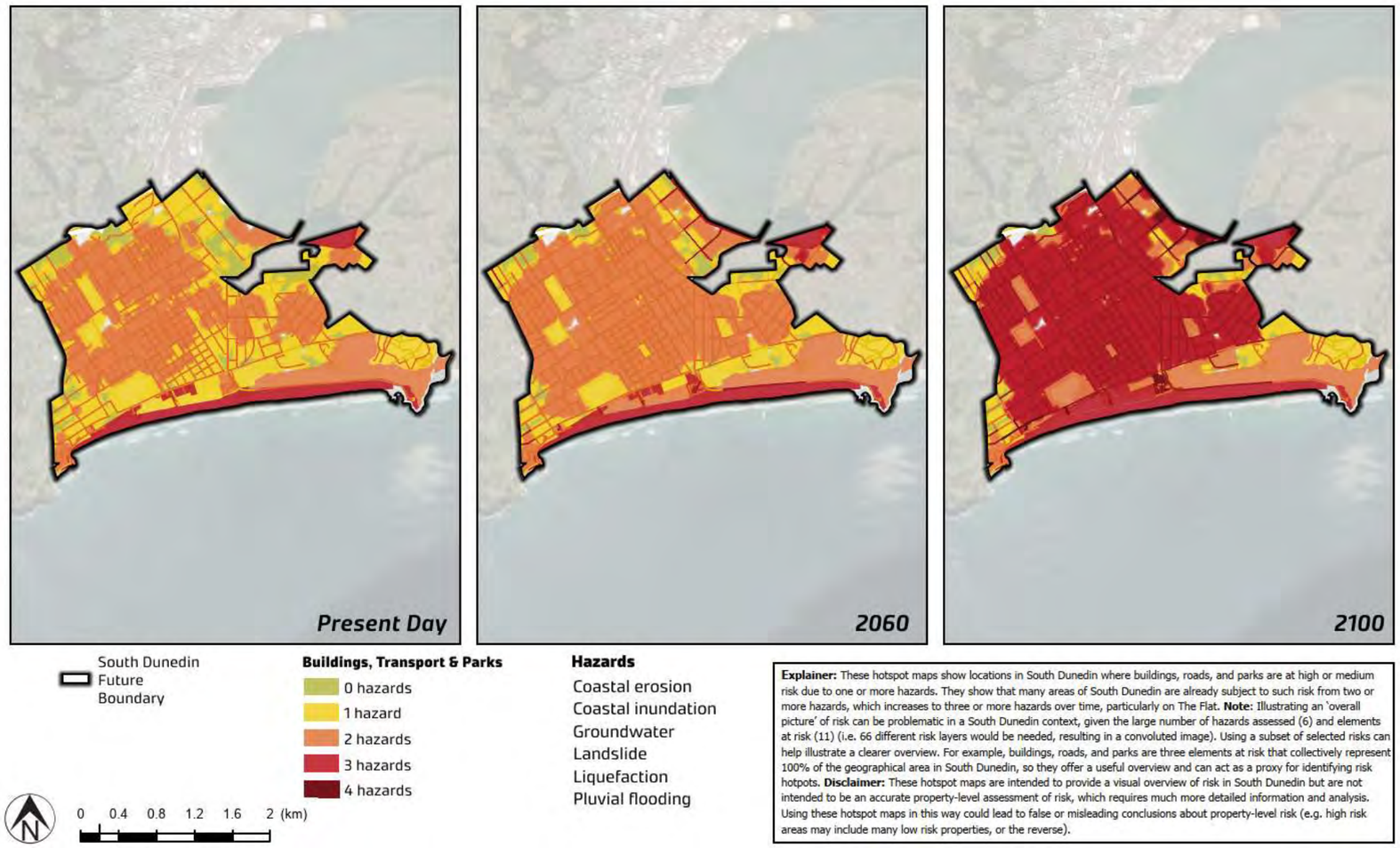


Figure 5.53 Hotspot summary of risks to South Dunedin: Buildings, parks and transport

6 IMPACTS FROM THE PHYSICAL RISKS TO SOUTH DUNEDIN

This section presents the findings relating to impacts arising from the physical risks to South Dunedin. Impacts presented in this section are those that may occur in the absence of risk mitigation. This risk assessment is designed to support the adaptation planning for South Dunedin, which is intended to minimise these impacts.

6.1 OVERVIEW OF CASCADING IMPACTS IN SOUTH DUNEDIN

The interconnectedness of physical elements (places and assets) with their users within South Dunedin means that realised risks or impact on one part of the system can trigger complex interrelated and cascading consequences to other parts (referred to as impacts). While the physical risk assessment relates to clearly defined spatial extents, the spatial extents of impacts are much more complex to define. Impacts will be felt not only in South Dunedin, but also the broader Dunedin City and wider region. This is due to the interactions of businesses and people across spatial boundaries.

A high-level summary of the relationships between impacts identified through this assessment (and which draws on the work of Harrison, et al. (2022)) are presented in Figure 6.1. The diagram shows that physical risk, when realised, can cause impact pathways that extend across social, environmental, and economic domains. Major themes within this diagram are discussed further in subsequent sections and incorporate some of the more detailed insights gathered through previous research into the impacts of climate change on South Dunedin (Harrison, et al., 2022). Some of these discussions have supplementary diagrams designed to capture additional complexity within the system. These major themes are:

- Social impacts including health and wellbeing, accessibility, and residential housing.
- Economic impacts including insurance, property values, and impacts on business.
- Environmental impacts.

Specific Mana Whenua consideration has not been included in this analysis of cascading risk but is covered in the mana whenua risk assessment.

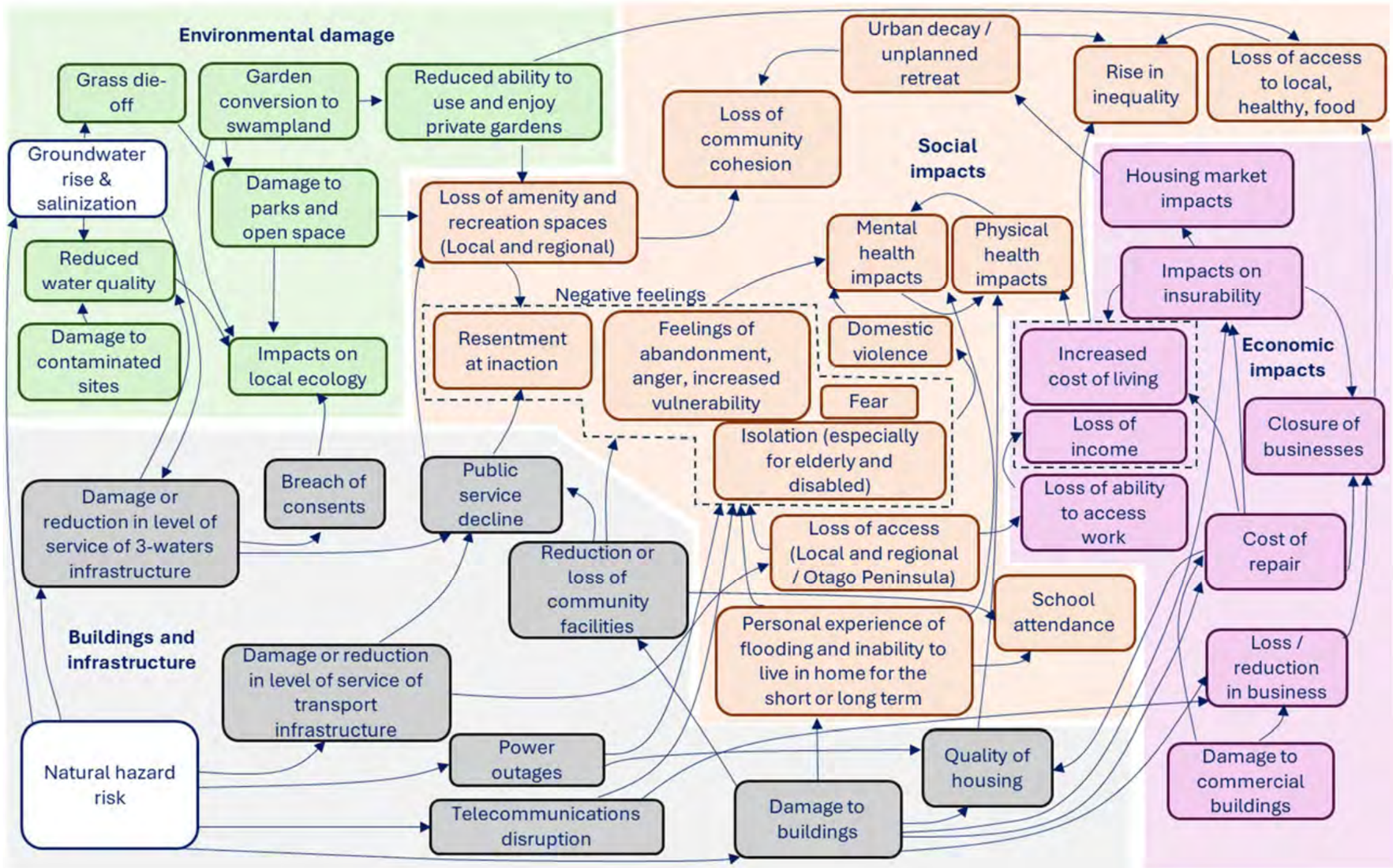


Figure 6.1 Overview of cascading impacts arising from natural hazard and climate change risk to South Dunedin (colour scheme: grey = buildings and infrastructure damage and impacts, orange = social impacts, purple = economic impacts, green=environmental damage)

6.2 SOCIAL IMPACTS

6.2.1 COMMUNITY AND SOCIAL HEALTH AND WELLBEING

Impacts on mental health and physical health are likely to arise from a range of cascading pathways. At a national scale, risks to people and communities are identified as being extreme by mid-century (Ministry for the Environment, 2020), with their relevance to the Otago region highlighted in the Otago Regional Climate Change Risk Assessment (Tonkin and Taylor, 2021):

- Risks to social cohesion and community wellbeing from displacement of individuals, families and communities due to climate change.
- Risks of exacerbating inequities and creating new and additional inequities due to differential distribution of climate change impacts.

The additional national risks are rated to be 'major' by late century (Ministry for the Environment, 2020), and are highlighted as being relevant to the Otago Region in the Regional Assessment (Tonkin and Taylor, 2021):

- Risks to physical health from exposure to extreme weather events.
- Risk of conflict, disruption and loss of trust in government from changing patterns in the value of assets and competition for access to scarce resources primarily due to extreme weather events and ongoing sea level rise.

Ultimately, all impacts tend to influence mental health, and the interrelationship between mental and physical health is very close and can often become a feedback loop. For example, when physical health impacts mental health, or when mental health presents as physical ailments. Some of the main drivers identified include:

- Loss or potential loss of access resulting in feelings of isolation or anxiety.
- Reduced ability to access goods, services and amenities resulting in physical or mental health.
- Reduced ability to access place of work or education, resulting in loss of personal wealth and reduced wellbeing.
- Loss of insurability and access to property finance resulting in loss of personal wealth and reduced wellbeing.
- Increased financial burden (e.g. cost of repairs and insurance) resulting in increased stress and mental health impacts.
- Decline of vibrancy of the area and loss of wider community wellbeing.
- Decline in the quality of housing from both acute and chronic risks resulting in physical health impacts (e.g. due to living in damp, cold housing) with associated impacts on mental health.

Disabled people or the elderly are likely to be disproportionally affected, examples include an inability to reside in standard emergency shelter accommodation due to specialised health requirements and specific housing needs driving a heightened sensitivity to reduction in housing availability (for example if all bottom floors are flooded there would be no accessible options available).

Event related anxiety is identified as a major issue, where some community members reported feeling stressed during heavy rainfall since experiencing previous flooding, and feeling anxious until the rainfall stops. Additionally, high stress associated with uncertainty of the future was

raised, where community members reported fear that severe flooding may occur again. There is also stress relating to potential increases in the costs associated with damaging events, including access to affordable insurance and increased administrative burdens and landlord management, as well as other additional costs (e.g. relocation or disruption costs, vehicle costs, cleaning). These issues are likely to impact homeowners, renters, and landlords in different ways.

Impacts on the disabled community were identified as being most acute earliest in time. Some people within this group have heightened sensitivity to physical risks and may be more vulnerable to physical harm during an event. Many are also highly sensitive to increased mental stress, and may find increasing risk, damage, or disruption to the local area difficult to manage. For example, small changes in local surroundings such as a changed bus route can be highly stressful for someone with vision impairment, closure of an important local business can be highly disruptive for someone who is reliant on those services, or increased anxiety relating to a flood event may be overwhelming for some. Social impacts are likely to become increasingly relevant for the wider population over time.

The sense of community may be undermined with significant impacts on the vibrancy and appeal of South Dunedin. One major cause of this is likely due the voluntary withdrawal of community members in response to increasing damage and/or risk. This mechanism is likely to be taken up earliest by those who have means to relocate, leaving more vulnerable members of the community in place. Some of these people are likely to hold positions as community advocates, further compounding the impact on community wellbeing associated with this voluntary relocation. Resultant vacancies are likely to be filled by increasingly transient or temporary inhabitants, who only stay until they find the risk intolerable themselves. This emptying of the area could exacerbate existing social vulnerabilities and urban decay.

In a discussion regarding a future hazard scenario for South Dunedin one SDF Community Expo participant and resident said:

"*I wouldn't wait for this, but not everyone has the ability to get out*"

While it is possible that services and amenities could relocate to form a new community, the following considerations were identified to be important:

- Retain access to local amenities (flat, short distances).
- Any new housing should be accessible and dry (with ramp and be safe from hazards).
- Relocating support service providers is highly disruptive to disabled communities, particularly those with learning disabilities.
- Change to the housing stock may increase cost, thereby reduce affordability.

6.2.2 ACCESSIBILITY

South Dunedin provides a significant source of accessible housing for the city as it provides the largest area of flat land across Dunedin city. Because of this, South Dunedin is identified as an important location of housing for the disabled and aged care communities. In the 2018 Census, 18% of respondents in the area reported having at least some difficulty walking, which is significantly higher than that of the wider Dunedin population (7.2%). The geographic distribution of people with mobility difficulties is shown in Figure 3.11.

South Dunedin provides a wide range of basic services (e.g. supermarkets, healthcare, vet, gym). It is also where most of Dunedin's disability service providers, rest homes and respite /funded care are located. Relative to wider Dunedin, there is high availability of low cost rental accommodation,

supporting low income individuals and families (including many who may be on social benefit schemes).

Increasing natural hazard damage is likely to cause a range of impacts, the main themes and causal relationships relating to loss of access within South Dunedin are shown in Figure 6.2. Damage to infrastructure or lowered level of service may undermine people's ability to access the goods and services of South Dunedin. Disabled people or those with mobility issues tend to be disproportionally affected; examples based on experience in the 2015 flood events include difficulty using wheelchairs in floodwater or over soggy ground, concern for the welfare of Guide Dogs (e.g. due to broken glass or debris following an event), and heightened or complete dependence on family or care providers to evacuate during an event. Additionally, those who do not drive or are dependent on public transport, cycleways and footpaths may be further disadvantaged should that infrastructure be damaged during an event.

Disruption of access (either due to loss of physical access (e.g. road damage preventing access to an area), or due to relocation of individuals or businesses) has a strong influence on the local economy. Loss of access may disrupt people's ability to access their place of work, impacting personal wealth and the ability of businesses to attract and retain staff. Reduced ability to access local businesses can reduce the amount of money spent in the local economy, and in turn may impact the viability of local businesses. Any decline in the number of businesses operating in the area would further reduce residents' access to goods and services, especially if travelling to other parts of the city is difficult or not possible for them.

Over time, declining confidence in the South Dunedin area could influence decisions about investing the area, including mitigation measures to reduce hazard. This may impact the economic stability of South Dunedin as discussed in Section 6.3.3.

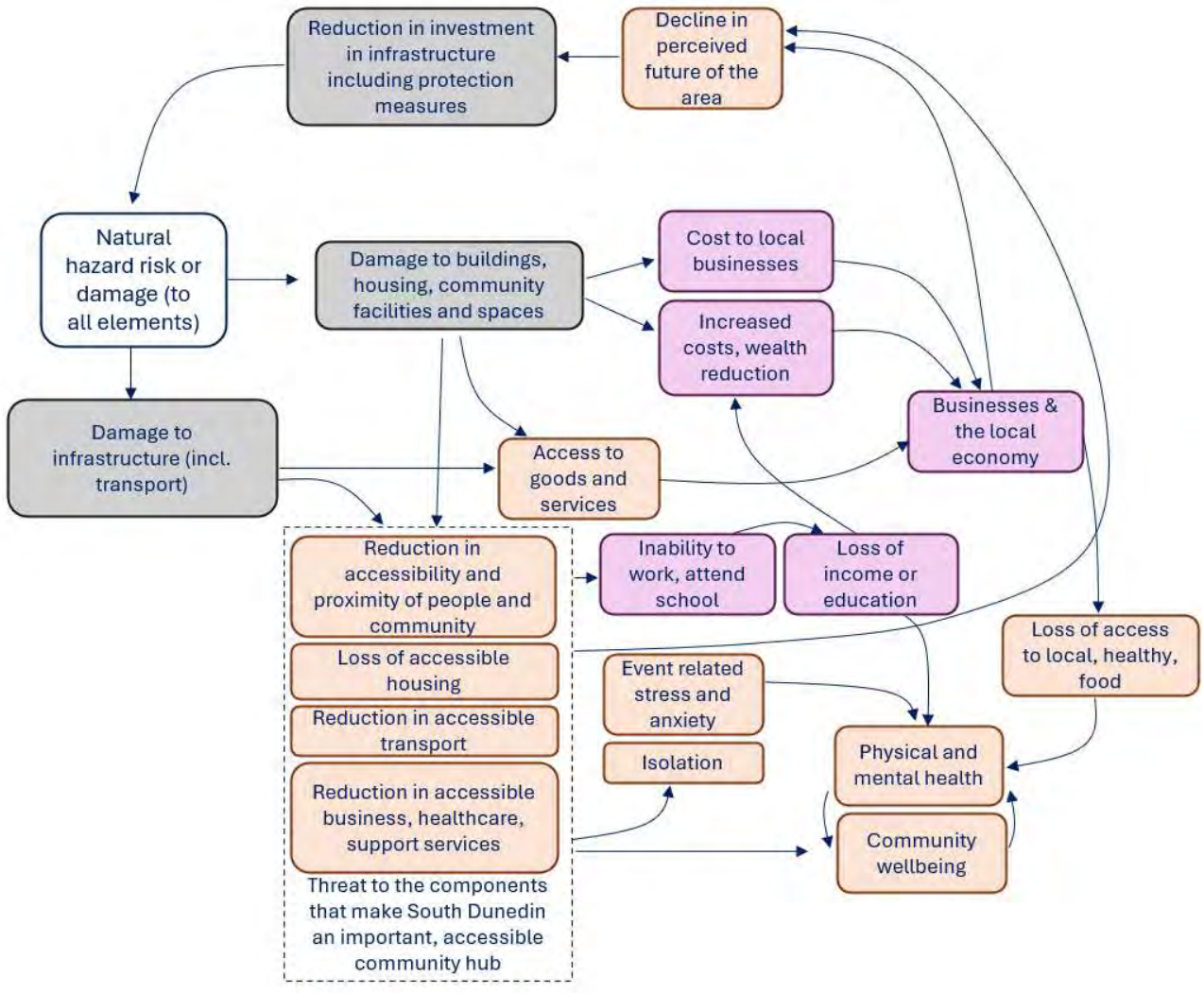


Figure 6.2 Cascading risk related to accessibility within South Dunedin (colour scheme: grey = buildings and infrastructure damage and impacts, orange = social impacts, purple = economic impacts)

6.2.3 QUALITY OF HOUSING

The quality of housing is likely to be impacted by increasing natural hazards, which is likely to cause a range of impacts. Main themes and causal relationships relating to the quality of housing are shown in Figure 6.3. Flooding and groundwater rise can contribute to cold, damp living conditions, with negative effects for resident health. Damp homes typically increase an occupant's desire for heating (if affordable) although deteriorating housing condition are also likely to reduce the house's ability to retain heat. Persistent dampness can lead to rot and the growth of mould, further reducing housing quality and conditions over time. This causes wide ranging implications for people's physical, mental, and social wellbeing.

The negative health outcomes that arise from living in poor quality housing have the potential to adversely affect people's life prospects by undermining their educational achievement or employment. This could exacerbate the potential for declining quality of housing by reducing income or earning potential, potentially compromising people's ability to afford to heat their homes or to live in quality, energy-efficient homes that are cheaper to heat. This can then form a reinforcing cycle of intergenerational fuel poverty and health inequities (Harrison, et al., 2022).

Housing, affordability, and investment are interconnected, where damage and decline in housing may lower house values, which may reduce people's willingness to spend money on upkeep or

renovations. This has the potential, ultimately to reinforce a negative spiral further, adversely impacting residents and community alike.

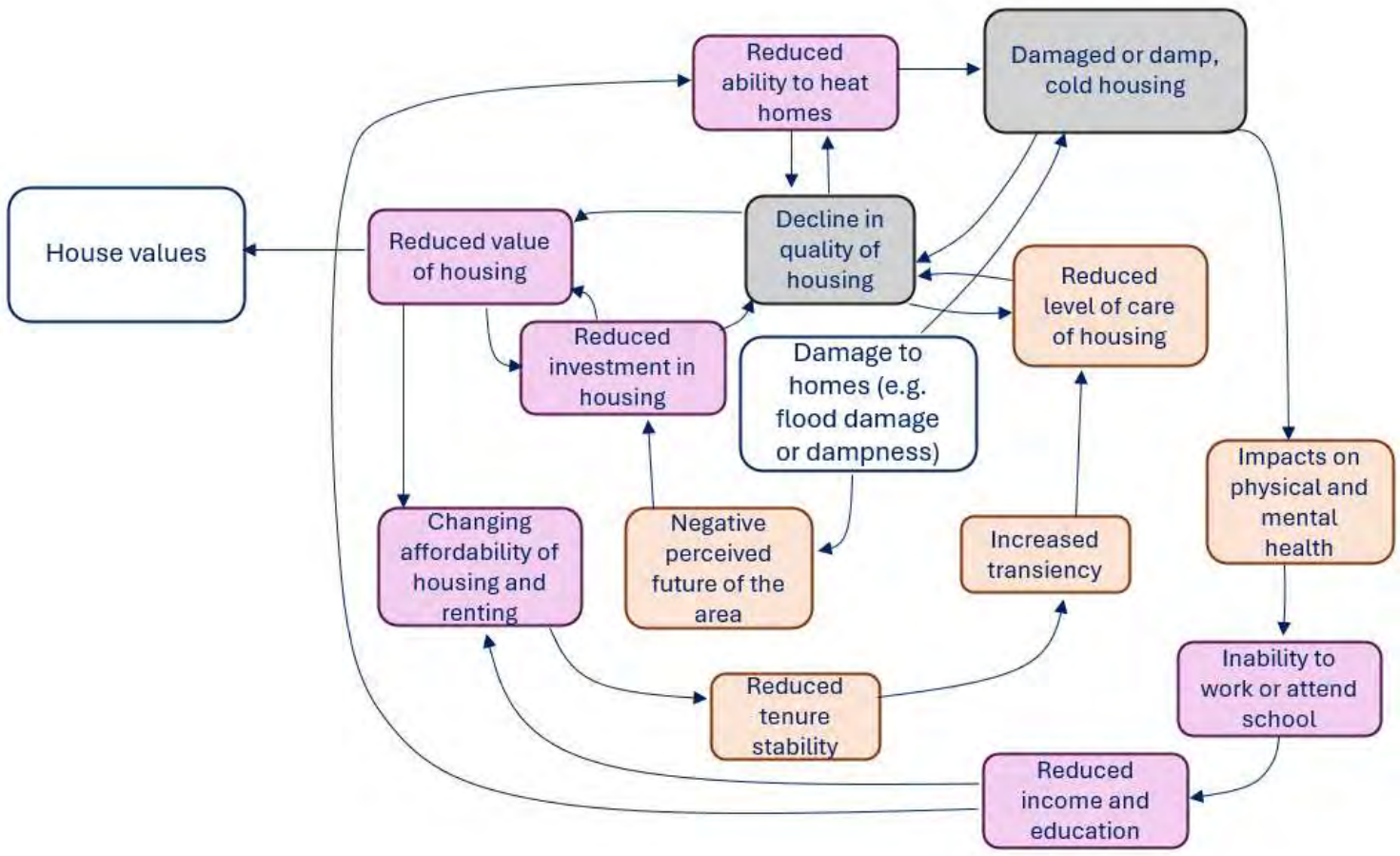


Figure 6.3 Cascading risk relating to the quality of housing in South Dunedin (colour scheme: grey = buildings and infrastructure damage and impacts, orange = social impacts, purple = economic impacts, green=environmental damage)

6.3 ECONOMIC IMPACTS

6.3.1 BACKGROUND

Dunedin City serves as the economic hub of the Otago region, accounting for approximately 54% of the region's total GDP (Statistics NZ, 2018).

South Dunedin (SA3 area[46]) accounts for 9.8% of Dunedin's GDP ($764m), 10.9% of Dunedin City's employment, and houses 4.7% of Dunedin City's business units[47]. Most businesses in South Dunedin fall within the small to medium enterprise (SME) category, encompassing a diverse range of establishments, including health care and social assistance, retail, wholesale, construction, commercial services, restaurants, and light industrial operations. The South Dunedin area also includes the large format and vehicle retail hub centred along Hillside Road, located between Anderson Bay and Portsmouth Drive. A summary of the industries within South Dunedin Statistical area 3 (SA3) is shown in Table 6-1.

[46] Statistical Area 3 is a new output geography developed by Stats NZ. The SA3 geography aims to approximate suburbs in major, large, and medium urban areas, and to allow comparisons between geographical areas that are larger in area and population size than SA2s but smaller than territorial authorities.
[47] Infometrics economic data supplied by DCC (May 2024).

Table 6-1 Summary of major employing industries of South Dunedin SA3 area[48]

Major employing industries and contribution to GDP		
Industry	Jobs	GDP
Health care and social assistance	1,367	$ 107,500,000
Other store-based retailing and non-store retailing	926	$ 66,800,000
Wholesale trade	723	$ 79,000,000
Construction services	700	$ 56,000,000
Supermarket, grocery stores and specialised food retailing	658	$ 43,100,000

South Dunedin has extensive infrastructure network including critical assets that service the wider Dunedin area including the Tahuna Wastewater Treatment Plant, State Highway 1 (SH1), South Island Main Trunk Line, and major Chorus and Transpower assets.

6.3.2 ECONOMIC IMPACTS OF NATURAL HAZARD AND CLIMATE DAMAGE

Natural hazards and climate change present significant potential financial and economic impacts to South Dunedin[49]. Economic implications stemming from the impact of climate change on systems are generally grouped into the following four main types of costs (Tonkin and Taylor, 2019):

- Loss or stranding of property and assets (including land), cost of repairing, rebuilding or replacing assets, and cost of preventative measures.
- Foregone production or lower efficiency of production.
- Medical and related costs.
- Higher insurance (only the component of the premium that represents the price for the service of insurance is an economic cost).

These costs can be both direct costs and indirect costs, where direct costs comprise the directly consequential effects on businesses, residents, or home owners caused by event. Indirect costs comprise the flow-on effects on supplying industries e.g. business interruption and reduction in production of goods and services. They can also be categorised as either financial or economic damages, where financial damages relate to the full replacement value directly incurred by individuals or entities, whereas economic damages consider the resource costs to the whole economy by considering the flow of money, e.g. the flow of insurance claim money into a regional economy following an event.

Climate change is widely acknowledged to pose significant financial and economic risks at the local, regional, and national scale. The National Climate Change Risk Assessment (Ministry for the Environment, 2020) identifies priority risks to the economic domain as:

- Risks to governments from economic costs associated with lost productivity, disaster relief, expenditure and unfunded contingent liabilities due to extreme events and ongoing gradual changes. This is rated as an ‘extreme’ risk at late century.

[48] Infometrics economic data supplied by DCC (May 2024).
[49] Financial damages relate to the full replacement value directly incurred by individuals or entities. Economic damages reflect the depreciated values of goods at the time flooding occurs, considering that one person's loss may be another's gain, thus implying a view from the community or regional/national economy's perspective. For example, a damaged house (loss) will be repaired by a construction business (gain).

- Risks to the financial system from instability due to extreme weather events and ongoing gradual changes. This is rated as a 'major' risk at late century.

Other economic risks were rated to pose a 'major' risk at a national scale by late century

- Risks to insurability of assets due to ongoing sea level rise and extreme weather events.
- Risks to business and public organisations from supply chain and distribution network disruptions, due to extreme weather events and ongoing gradual changes.

Regionally, many of the national scale risks are acknowledged to contribute to an 'extreme' risk[50] to the cost of doing business due to climate change hazards as part of the Regional Climate Change Risk Assessment (Tonkin and Taylor, 2021).

At a national scale, the cost of natural hazards can be seen to be rising through a review of privately insured damages from weather-related events (Figure 6.4). While much of the increase in total insured losses is likely to reflect the rising number of insured assets and the increasing costs of reconstruction, there has been a marked decline in the frequency of years with little or no significant adverse weather events over the last 50 years (The Treasury, 2023). The influence of climate change on insured costs is estimated to be growing, with 10%-40% of risk attributable to climate change across events analysed between 2007 and 2017 (Frame, et al., 2018). The last five years have all seen near record levels of insured losses. Costs in 2023 vastly exceed all previous years due to the Auckland Anniversary Weekend (approx. $2,000 m) flooding and Cyclone Gabrielle (approx. $1,900 m).

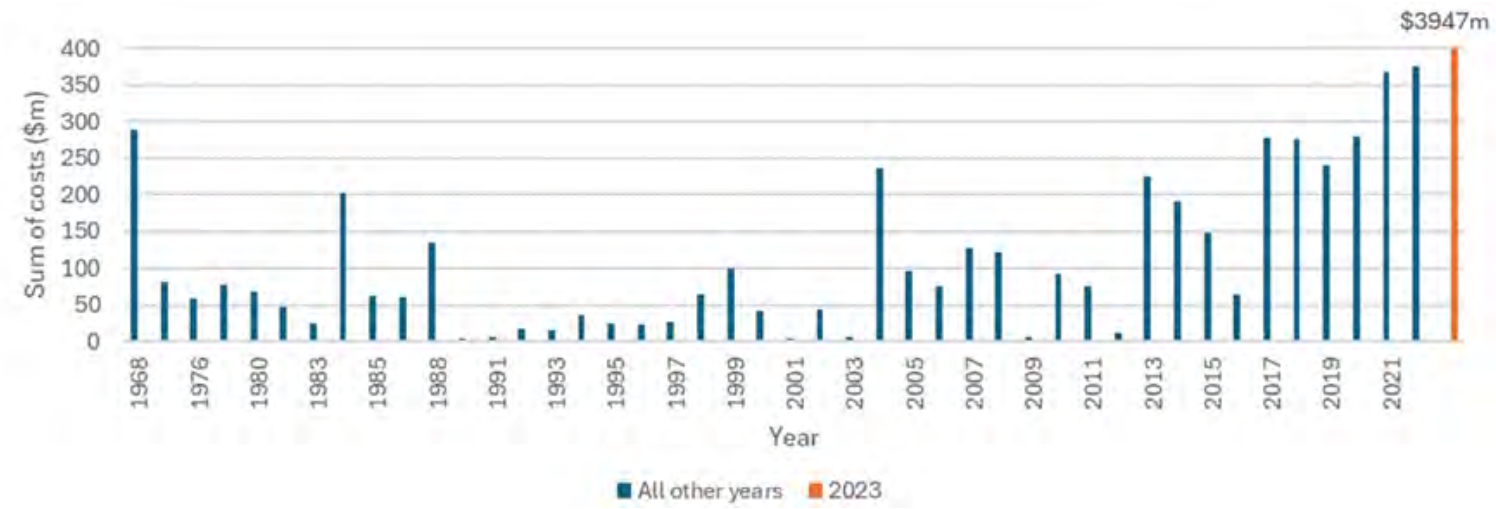


Figure 6.4 National insured weather-related losses from 1968 to 2023 (in 2023 dollars) (ICNZ, 2024)[51]

Weather related disasters are already resulting in significant costs for the Otago Region including but not limited to the following major recent events:

- October 2024 South Dunedin flooding will have incurred costs however details of the event and associated costs are not yet available at the time of writing this report.
- 2015 South Dunedin flooding (63 year ARI) incurred $28 million insurance costs[52] (ICNZ, 2024). However, the floods were estimated by insurer IAG to have social and economic costs of up to $138 million (Otago Regional Council, 2016; Otago Regional Council, 2015).

[50] Note that the method used to evaluate risk in the Regional Climate Change Risk Assessment differs to the method used in this assessment.
[51] Figure shows the cost to the insurance industry in paying claims for damage resulting from natural disasters excluding fire and earthquake. This table has been updated with inflation-adjusted costs, as at 30 June 2023. The costs are exclusive of GST.
[52] ICNZ costs reported for event '2-4 June 2015: Flooding and Storm – Otago'. Costs are unadjusted and therefore do not account for inflation.

- 2017 Central Otago flood repairs cost nearly $1 million for central Otago District. This event also affected most of the entire region with a state of emergency declared. The total cost of the South Island floods was estimated at $31.2 million (ICNZ, 2024).
- 2017 Dunedin flooding cost insurers approximately $1.7 million (ICNZ, 2024).
- 2019 December and 2020 February flood events resulted in an estimated cost for the Regional Council of $3.9M (Otago Regional Council, 2020). This includes Priority 1 and Priority 2 repairs, but excludes Priority 3 repairs and is therefore an underestimate of costs[53].

The identified physical risks to South Dunedin coupled with an understanding of rising costs associated with weather events, and wider national economic context indicate that South Dunedin will continue to see economic shocks that increase in cost following acute events. Additionally, increasing risk due to chronic, slow onset of groundwater rise may incur further costs to manage the declining condition or level of service of places and assets.

In addition to wider economic costs associated with damage and recovery, increasing damage to public infrastructure is likely to increase cost and resourcing demands on Council. It may also have legal implications, for example as a result of increased breach in consent conditions associated with wastewater discharges to the harbour.

If unmanaged, there is a potential for unplanned relocation which can isolate services, or reduce the availability of service options density of services resulting in relatively high cost within an area. This may result in infrastructure that is too expensive to service. This is an issue for council, private, and state owned services and assets.

Damage caused by climate-related natural hazards and the associated large investments required to redesign, reposition and futureproof public infrastructure (such as transport networks and later services) will significantly increase the financial burden on citizens, businesses and public authorities (Boston & Lawrence, 2018). The Insurance Council of New Zealand forecasts that at present (based on historical data), New Zealand can expect on average for natural disasters to cost this country just under 1% of its GDP in any year or about NZ$1.6 billion (ICNZ, 2014). The long term financial impact of increasing drought and storm frequency has been modelled by Treasury. This resulted in a forecast 0.7% decrease in national GDP compared to the assumed trend in 2061 (The Treasury, 2023).

Increasing risks are anticipated to bring additional cost, however adaptation to mitigate this risk is expected to reduce the long-term costs faced by government, businesses, communities and households (The Treasury, 2023). Adaptation to the physical impacts of climate change in a timely way will drive a more efficient climate response, with benefits for broader wellbeing, economic growth and resilience, and reduced impacts on GDP. Conversely, continued investment in South Dunedin without appropriate climate adaptation measures increases the potential for economic loss.

6.3.3 BUSINESS CONFIDENCE

Cascading impacts relating to risk and damage from natural hazards is likely to impact business confidence. Major themes and causal relationships relating to business confidence are mapped in Figure 6.5.

[53] Priority 1 damage ($0.65M) includes immediate response and high priority repairs that could be implemented before the end of June 2020. Priority 2 damage ($3.25M) required investigation and design with work to be undertaken during the 2020/21 financial year. Priority 3 repairs require longer investigation or repairs and undertaken over a longer period

Discussion of natural hazard and climate risk with a range of representatives within the South Dunedin business community identified a range of concerns[54]:

- They were concerned about short term flood risk (more so than long term issues) and would like the council to make more substantive investments in flood protection infrastructure sooner.
- They were concerned about repeated flood events, the negative commentary about South Dunedin's flood risk, and the dampening effect on business confidence and economic activity in the area.
- They are experiencing varying tolerance to flood risk, with some large-scale property developers excluding South Dunedin due to flood risk, and others seeing ongoing opportunities for investment returns.
- They felt that ongoing uncertainty regarding plans for addressing the hazards of South Dunedin is not helpful.

When considering the adaptive capacity area, the business community identified the following considerations:

- They were encouraged by more positive framing that has been generated by South Dunedin Future, which focuses on the opportunities that could come with change and urban regeneration, rather than the negatives.
- Property investors in particular view themselves as 'part of the solution', bringing capital and investment to the area, which could be deployed to support urban regeneration if appropriately incentivised by council.
- They felt that opportunities were associated with potential upzoning and value uplift in areas that are lower risk or where risk can be meaningfully mitigated.
- They felt that tangible plan or proposal for adaptation will enable them to assess and make informed decisions about the future of their businesses.

Harrison, et al., (2022) discusses how a sense of future prosperity is an important factor in maintaining business activity within South Dunedin. A sense of future prosperity provides businesses with the certainty and confidence that keeps them operating locally. It may also give new businesses the confidence to establish themselves in the area. Declining confidence is likely to arise if recurring damage were to cause sustained financial losses or businesses closures, or if it prevents new businesses from establishing themselves in the area.

A strong economy supports the area's appeal and increases the level of vibrancy (i.e. sense of 'life' and 'energy') by attracting people to live or visit the area, which reinforces the economic wellbeing of the area. In a well-functioning economy, businesses that are doing well may hire more employees. These employees are likely to be local to the area which provides increased employment and household income which can flow back into the local economy.

Conversely, adverse impacts to workers and residents impact businesses both in terms of workforce supply and customer demand (e.g. though decreased personal wealth, or decreased physical or mental health, or transport damage). Increasing cost of repairs is increasingly likely over time. Without confidence in future risk mitigation plans, there will likely be a reduction in the ability to distribute risk (e.g. through insurance risk transfer). An inability to distribute risk will likely

[54] Discussion led by DCC SDF team, refer Stakeholder engagement schedule in Appendix B7

reduce business confidence.

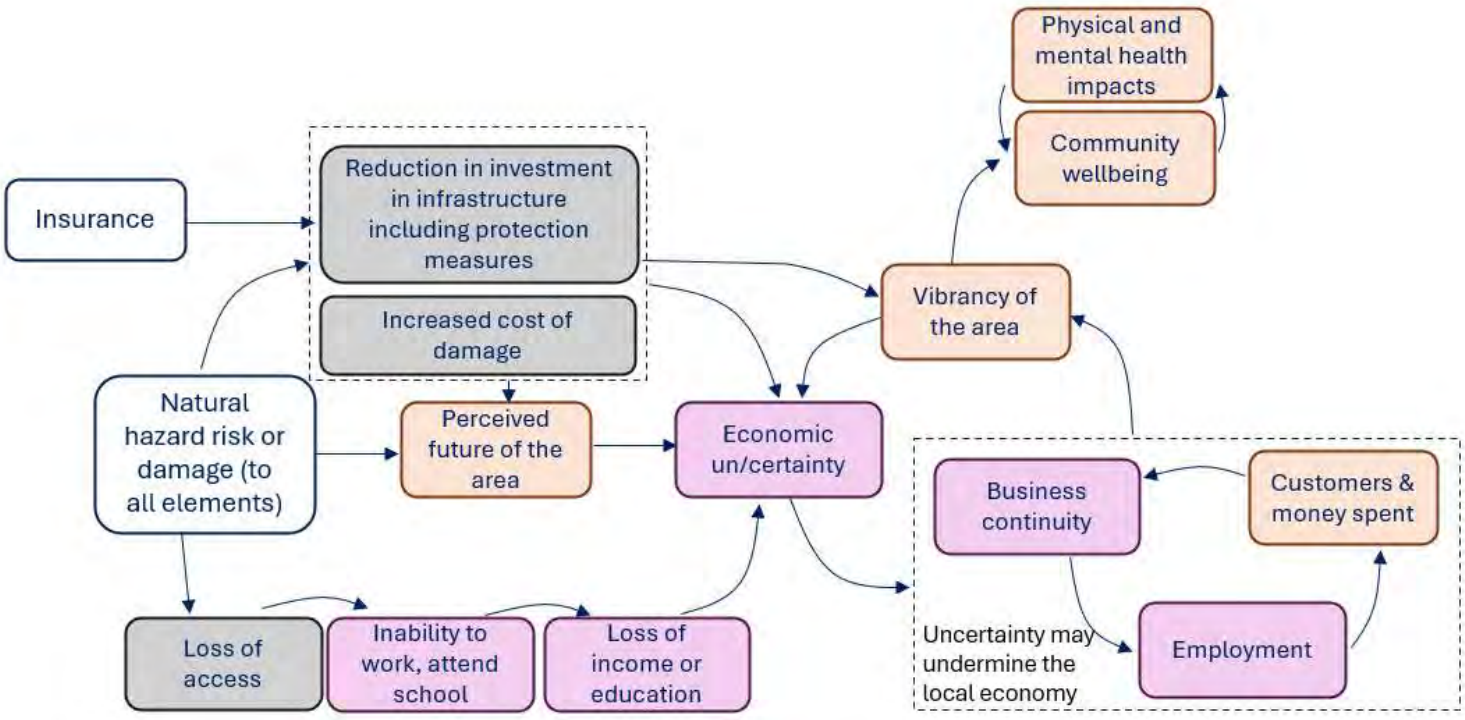


Figure 6.5 Cascading risk relating to confidence in doing business in South Dunedin (colour scheme: grey = buildings and infrastructure damage and impacts, orange = social impacts, purple = economic impacts, green=environmental damage)

6.3.4 HOUSING MARKET

There is a complex relationship between natural hazard damage, housing affordability and the appeal of South Dunedin. Major themes and causal relationships relating to housing market confidence are mapped in Figure 6.6.

Increasing damage or risk from natural hazards is likely to reduce the residential appeal of the South Dunedin area, without risk mitigation. Reduced demand is also likely to lower the relative value of housing, particularly when compounded with reduced investment and building quality. This can have major negative implications for people's financial and mental wellbeing. Review of impacts of the 2015 floods on the South Dunedin housing market found that prior to the floods, houses in the pluvial floodplain sold for a 5% discount relative to the wider area. Following the floods, this discount tripled to become a 15% discount. Over time, this effect reduced and after 15 months there was no long term impact on house prices (Nguyen, et al., 2022).

Harrison, et al. (2022) discusses how the affordability of housing can influence the appeal of the area, and can influence the socioeconomic status and wellbeing of residents. New, high-quality housing developments may increase the appeal of the area, conversely, declining quality of housing may decrease appeal and result in a higher proportion of people living in the area who are renting, experiencing poverty, or unable to afford to upgrade or maintain their properties.

Increasing damage and risk could result in voluntary withdrawal of community members who have the means to relocate. Resultant vacancies would be filled by increasingly vulnerable people. Participants in Harrison, et al., (2022) believed it was highly unlikely people would move out of the area en-masse unless there was a major immediate threat or significant incentives and support to leave. They felt that other aspects of what makes the area appealing to live in would supersede flooding concerns, including the relative affordability of housing, cultural ties, a sense of place, access to natural amenities, and the "appeal of the flat" topography. Instead, they believed that

most people would only leave the area because of insurance retreat, or if it was imposed from above by government. If a mass exodus were to occur, there would be significant negative wellbeing implications, including for those who would effectively be 'stuck' in the area due to financial, physical, or social constraints. Alongside more frequent flood events, this would further reduce the appeal of the area for those who can avoid living there, creating inequities in experience of risk.

Investment in flood resilience and amenity through blue-green infrastructure such as wetlands, may reduce the area's level of flood risk while increasing the appeal of the area, driving up demand for housing in the area.

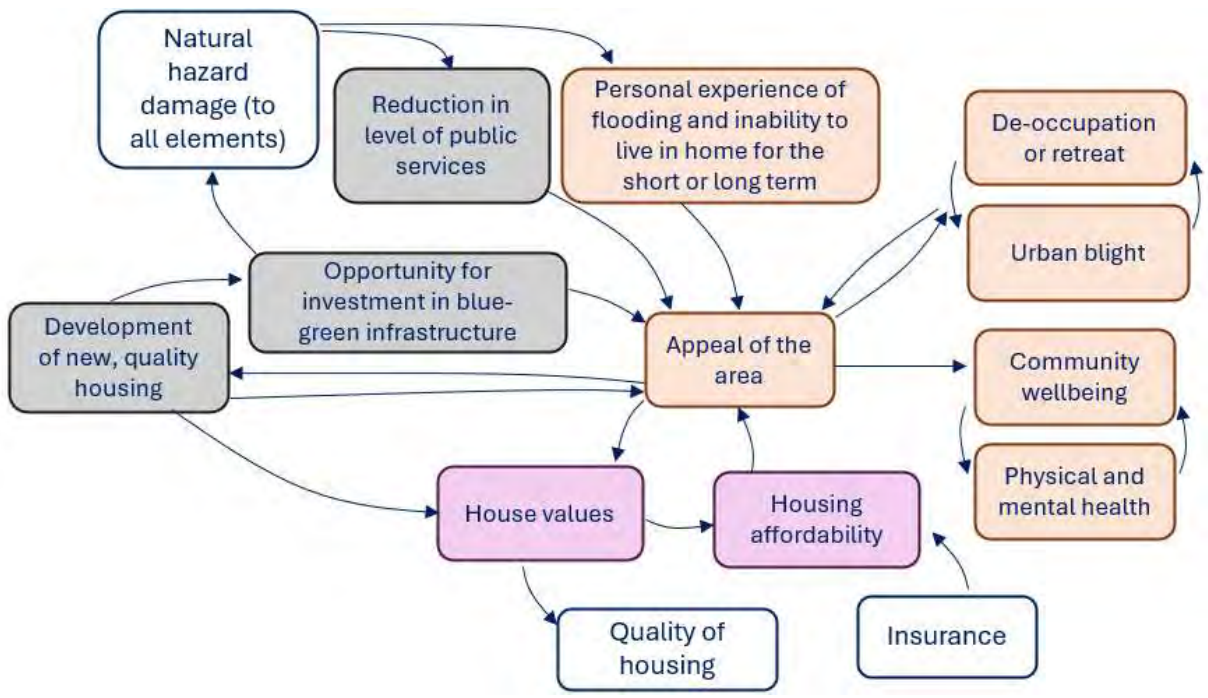


Figure 6.6 Cascading risk relating to the housing market in South Dunedin (colour scheme: grey = buildings and infrastructure damage and impacts, orange = social impacts, purple = economic impacts, green=environmental damage)

6.3.5 INSURANCE

The Treasury highlights that households in areas more exposed to physical risks (such as those near coasts and flood plains) will be disproportionately affected by climate change and face worsening insurance affordability and availability rise (The Treasury, 2023). At a national scale, 'insurance retreat' is an increasing problem, where insurance retreat occurs when a private or public insurer declines an application for insurance coverage or stops offering renewal of existing coverage, based on the property's exposure and vulnerability to an escalating hazard. A review of the insurability of Dunedin homes identifies that those which currently have a 1% probability of coastal inundation are expected to face a partial insurance retreat from around 2030, with full insurance retreat by 2050 (Storey, et al., 2020). This is based on anecdotal evidence from the insurance industry that suggests that partial insurance retreat begins to occur when the likelihood of an event reaches the 2% AEP threshold, and full retreat will have occurred by the time this reaches 5% AEP (Storey, et al., 2020). On this basis, within South Dunedin, most buildings that are rated to be 'high' risk due to either pluvial flooding or coastal inundation would be subject to insurance retreat. This equates to 83% of buildings at late century under a high-end climate scenario.

Availability of insurance has a complex relationship with increasing natural hazard damage and the social and economic landscape of South Dunedin. Major themes and causal relationships relating to insurance are shown in Figure 6.7. Increasing natural hazard damage will expose insurance companies to higher financial risk, who are then likely to raise insurance premiums or withdraw cover altogether. As insurance cover is generally a requirement for a mortgage or lending, the withdrawal of insurance would have serious implications for the housing market. It would also result in immense stress for home owners who would be personally liable for any flood-rated financial losses they incur (Harrison, et al., 2022).

There is an increasing awareness from the financial markets (including insurance) regarding their exposure of existing and future climate-related risks. This increased awareness results from both mandatory requirements (e.g. through the climate-related disclosure reporting) and non-mandatory drivers (e.g. shareholder expectations) and the trend is likely to continue. The likely response from the financial markets to the increased awareness is an evaluation of their risk profile across their portfolio and a subsequent reduction in their commercial exposure from high-risk areas. These high-risk areas could include South Dunedin, and would likely result in a combination of risk-based pricing (where insurance is priced higher in high risk areas) and/or insurance retreat (where insurance is either no longer available or is limited to a small number of suppliers who price accordingly).

Given the importance of insurance in obtaining finance (e.g. through a mortgage) and the likely reduction in property owners ability to transfer risk to insurers, there is significant potential for asset values to reduce. This also has major implications for people's financial and mental wellbeing.

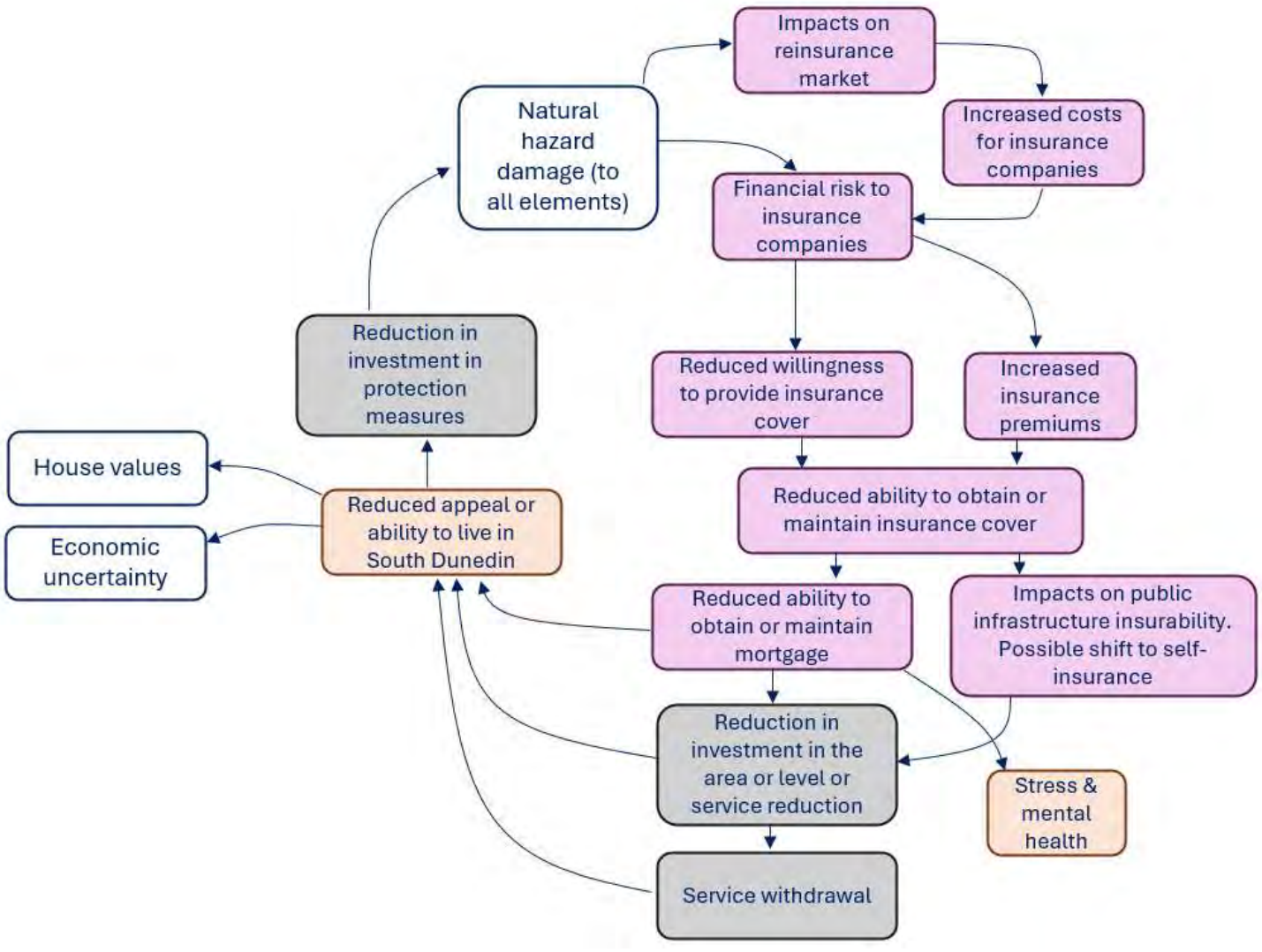


Figure 6.7 Cascading risk relating to insurance availability in South Dunedin (colour scheme: grey = buildings and infrastructure damage and impacts, orange = social impacts, purple = economic impacts, green=environmental damage)

6.4 ENVIRONMENTAL IMPACTS

At a national scale, climate change is identified to pose a range of risks, including the two following priority risks that were rated 'major' by late century:

- Risk to coastal ecosystems, including the intertidal zone, estuaries, due to ongoing sea-level rise and extreme weather events.
- Risks to indigenous ecosystems and species from the enhanced spread, survival and establishment of invasive species due to climate change.
- Additionally, environmental impacts will arise from many of the direct risks within South Dunedin. Increasing groundwater levels and saline intrusion may cause die-off of grass and vegetation. Extremely high groundwater levels will mean ground is soft, and may become unusable. This will impact many aspects of South Dunedin, including loss of the use of personal residential gardens, preventing urban gardening, with potential impacts on nutrition and the cost of food. This risk may be exacerbated by the presence of contaminated sites within residential South Dunedin, where soft ground may be more likely to transport contaminants, making use of some areas unsafe.
- Loss of amenity of public spaces may reduce enjoyment of parks and local open space. These impacts on sports fields would diminish the ability of South Dunedin to host sport to

the extent that it presently does. This would have impacts on the economic wellbeing of South Dunedin as well as the sense of community. It would also have wider impacts on users of playing fields from the wider Dunedin area.

- Increasing flooding, damage, and reduced level of service in stormwater and wastewater networks may cause increasing wastewater overflows. Wastewater overflows cause reduced water quality in both freshwater and marine waterbodies, causing impacts on local ecology, and can pose serious health risks.
- Risks to contaminated land may result in increasing environmental contamination from contaminated sites, most notably from the Kettle Park site which is at high risk due to coastal erosion[55].
- Damage to homes and infrastructure can also generate large volumes of contaminated runoff or debris, and generate large volumes of building waste.

Changing land-use, emphasis on blue green infrastructure and groundwater rise all may present opportunities to expand green space within South Dunedin. This may have a range of social and ecological benefits to South Dunedin and the wider area (also discussed in Section 5.3). Opportunities to restore some of the historical wetlands or salt marshes within South Dunedin may also carry cultural benefits.

[55] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

7 CONCLUSION

The purpose of this r*isk assessment* is to "*assess the potential for elements at risk (people, places, assets) to be negatively affected by pluvial flooding, coastal inundation, coastal erosion, groundwater, landslide and liquefaction natural hazards in South Dunedin*"

This document presents the findings of the SDF Risk Assessment at the present day, mid-century (2060-2070) and long term (2100) timeframes under mid-range climate change scenarios (SSP2-4.5) and high end climate change scenarios (SSP5-8.5), where data is available. This assessment was based on the principle of making the best use of available information, despite a range of limitations to the available data being identified. Importantly, the risk assessment provides a baseline assessment that assumes that risk is not mitigated, which is part of a separate piece of work. In this sense, the report represents a 'status quo' or 'do nothing' option.

The risk assessment is guided by two aims:

1 Outline the "case for change" in response to current and increasing natural hazard risks.
2 Support spatial adaptation planning

Importantly, the risk assessment is intended to support suburb-level adaptation planning, including dialogue with affected stakeholders about the options for mitigating and adapting to identified risks. **The risk assessment is not intended to provide a detailed property-level assessment of risk** and using the report in this way could lead to false or misleading conclusions (e.g. high risk areas may include low risk properties, or the reverse).

The risk assessment seeks to identify, classify, and prioritise risks across South Dunedin by assessing exposure to hazards, vulnerability of elements, and assigning corresponding risk scores. The associated impacts of these risks, should they be realised, are also described. The risk assessment does not however seek to prioritise areas for adaptation, which could be influenced by a range factors, including planning, budget, asset management, and other considerations. These factors could be unique to each of the potential futures explored for South Dunedin and will be considered as part of a separate but related workstream on adaptation options.

7.1 SUMMARY OF FINDINGS TO SUPPORT SPATIAL ADAPTATION PLANNING

The risk assessment supports **spatial adaptation planning** by providing a spatial representation of risk for a range of timeframes to the 12 'Elements at Risk', and their 'key features'.

7.1.1 WHERE ADAPTATION MAY BE NEEDED TO REDUCE RISK

Spatial risk quantification (as shown in Section 5 mapped risks and the accompanying Geospatial database) helps identify locations *where* adaptation measures are most needed to reduce risk.

South Dunedin has many locations that are identified as being of high importance to the community and which are important influences in adaptation planning. These key features are distributed across South Dunedin, with clusters of essential or important places located near St Clair, King Edward Street, Forbury Corner, and Portsmouth Drive (Figure 5.5). Due to the extensive

spatial coverage of risk across South Dunedin, the majority of these are at high risk due to multiple hazards by late century.

7.1.2 WHEN ADAPTATION MAY BE NECESSARY

The changing risk profiles over time helps inform *when* adaptation may be necessary:

- Present: The risk to many elements within South Dunedin is due groundwater and pluvial flooding.
- Mid-century: Current risks intensify and expand due to climate change-driven increases in hazards. Consequently, at least half of all sports fields, roads, wastewater pipes, contaminated land, and overhead electricity distribution lines will be at high risk from groundwater under a high-end climate scenario.
- Late century: Groundwater-related risks continue to escalate in scale and severity across most elements. Additionally, there is a significant rise in risks associated with coastal inundation. This increase is driven by the inundation of inland South Dunedin during the 1% AEP event (mid-range climate scenario) and the 10% AEP event (high-end climate scenario). This frequency of inundation introduces medium and high risks across most elements.

When driven by the chronic, slow onset of groundwater rise, the identified high risks are associated with a decline or potential complete loss in functionality of the elements t risk unless mitigation measures are taken. When driven by acute, periodic events (such as flooding), the identified high risks are associated with increasingly frequent and severe damage. This will require lengthy repairs and, in some cases, may cause sudden failure resulting in threat to life. The scale of high groundwater and pluvial flood risk across most elements by mid century is associated with a range of negative impacts on the liveability and functionality of South Dunedin including:

- Widespread reduction in level of service of stormwater and wastewater systems.
- Loss of functionality of many playing fields.
- Decline in condition across the roading network.
- Increasingly damp living conditions in homes.
- Ponded surface water in parks and open spaces due to permanent emergent groundwater.
- The transport of contaminants across outdoor space and parkland.

These issues will become more widespread by late century, and will be compounded by the increasing frequency of damage from coastal inundation. Approximately 10% of South Dunedin buildings are rated medium or high risk arising from a single hazard, 60% from two hazards, and 20% arising from at least three hazards. This risk progression over time suggests that increasingly large scale mitigating actions will be required to manage risks.

Some of the identified present day risks are currently being managed, for example through existing roading and three waters maintenance schedules. However, this assessment indicates that these maintenance measures will become increasingly inadequate in managing the escalating risks in future scenarios. By late century, significant risk mitigation will likely be necessary for most assessed elements to manage the risks from multiple hazards across large areas of South Dunedin.

7.2 SUMMARY OF FINDINGS TO BUILD THE CASE FOR CHANGE

The interconnectedness of physical elements (places and assets) with their users within South Dunedin means that any disruption or impact on one part of the system can trigger complex interrelated and cascading consequences to other parts (referred to as impacts). These impacts relate strongly to the Strategic Objectives of South Dunedin, particularly posing risks to social and economic resilience, and environmental restoration. The following impacts **build the case for change** by highlighting some of the issues likely to occur without adaptation:

- Increasing physical risks to the elements of South Dunedin are likely to lead to increased **physical harm to people** living, working, and visiting the buildings of South Dunedin. These will arise through:
  - Risks to buildings associated with high groundwater which cause damp indoor living and working environments. This can cause higher incidence of respiratory diseases such as asthma, hypersensitivity pneumonitis, rhinosinusitis, bronchitis, and respiratory infections.
  - High groundwater causing mobilised contaminants from numerous contaminated land sites across Dunedin resulting in exposure to unsafe and contaminated water.
  - Increasing risk associated with acute, event based hazards such as pluvial flooding, coastal inundation, landslide, coastal erosion[56], and liquefaction. These risks introduce the potential for loss of life or injury due to structural failure of buildings, drowning, electrocution, or injury.
- **Declining community and social health and well-being** are likely to arise from
  - Increasing physical risk of harm to people.
  - Increasing feelings of anxiety or loss following an event.
  - Reduced ability to access goods, services, amenities, and places of work or education due to worsening road condition and event based disruption.
  - Stress related to increased financial burden of repairs and insurance.
  - General declining vibrancy of the area associated with increased natural hazard damage.
- **Disproportionate impacts on more vulnerable populations**. Many of Dunedin's most vulnerable people live in South Dunedin due to factors such as flat land, affordable housing, and proximity to social services. These groups are considered to be those with disabilities, in rental accommodation, over 65 years old, or classified higher on the Social Deprivation Index. Review of social demographic information and risk indicates that many vulnerable community members are likely to be directly affected by the natural hazard risks of South Dunedin. Vulnerable people are the least resilient to increased stresses caused by climate-related hazards. They are also likely to be the least able to adapt to changes caused by climate-related hazards.

[56] There is a high level of uncertainty regarding coastal erosion risk due to data limitations (scale of screening study and accounting for impact of engineered structures). More detailed coastal hazard assessment is underway as part of the St Clair-St Kilda Coastal Plan and will be completed in 2025.

- Increased **environmental contamination** may cause reduced water quality in both freshwater and marine waterbodies, cause impacts on local ecology, and pose serious health risks. These impacts may arise through:
  - Increasing groundwater and coastal erosion risk to contaminated sites.
  - Risks to stormwater and wastewater network due to multiple hazards will drive increased overflows leading to environmental contamination.
- Increasing **costs and wider economic impacts are likely to arise** due to increasing frequency and severity of natural hazards associate with climate change. The identified physical risks to South Dunedin coupled with an understanding of rising costs associated with weather events, and wider national economic context indicate that South Dunedin will:
  - Experience increasing costs resulting from property damage, foregone production or reduced efficiency of production, and increasing medical costs.
  - Experience increasing cost of insurance
  - incur further costs to manage the declining condition or level of service of places and assets associated with increasing risk due to chronic, slow onset of groundwater rise.
  - Continue to see increasing economic shocks following acute events.
  - Experience cascading impacts that influence consumer and business confidence, the housing market and insurance.
- Declining **service delivery** across South Dunedin driven by risks to the stormwater and wastewater networks due to multiple hazards. This is likely to:
  - Have adverse impacts on local residents as well as the wider Dunedin City and region including increasing negative feelings of residents and reduced access and mobility.
  - Increase environmental damage.
  - Increase costs and resourcing demands on Council.

  There is also potential for unplanned relocation. This has the potential to isolate services, resulting in infrastructure that is too expensive to service. Additionally, unmanaged relocation has the potential to generate negative community dynamics. The sense of community may be undermined with significant impacts on the vibrancy and appeal of South Dunedin. Unplanned relocation could exacerbate existing social vulnerabilities and urban decay.

Risks identified within this report and accompanying geospatial database[57] shows that South Dunedin has high exposure to natural hazards and a correspondingly high baseline risk profile. Anticipated changes in climate and associated increases in exposure to key natural hazards are expected to materially increase risk across all elements assessed in the risk assessment. If realised, these may result in complex interrelated and cascading consequences.

Consistent with the broader risk assessment findings, the **mana whenua risk assessment** has shown that, from a Kāi Tahu perspective, there is substantial risk resulting from a 'keep doing what we are doing' scenario, where there are no additional interventions to address the issues facing South Dunedin. Risk to the key Te Taki Haruru values is generally significant, ranging from high

[57] The results of the spatial risk assessment have been compiled into a geospatial database which has been provided to DCC alongside this report. The database holds spatial files relating to each element at risk with metadata holding risk ratings and some supporting information (e.g. identification of key features).

(mana, whakapapa, tapu & noa) to extreme (mauri) levels of risk. These results support the case for change in response to the modelled natural hazards and climate risks.

The findings of this assessment are being used to inform the SDF adaptation workstream, which will focus on developing a suite of preferred mitigation options (including timeframes, thresholds and triggers) that enable South Dunedin to prepare for and adapt to the impacts of climate change.

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APPENDIX A: RISK ASSESSMENT STAGES AND PURPOSE

A1 STAGES OF THE RISK ASSESSMENT PROCESS

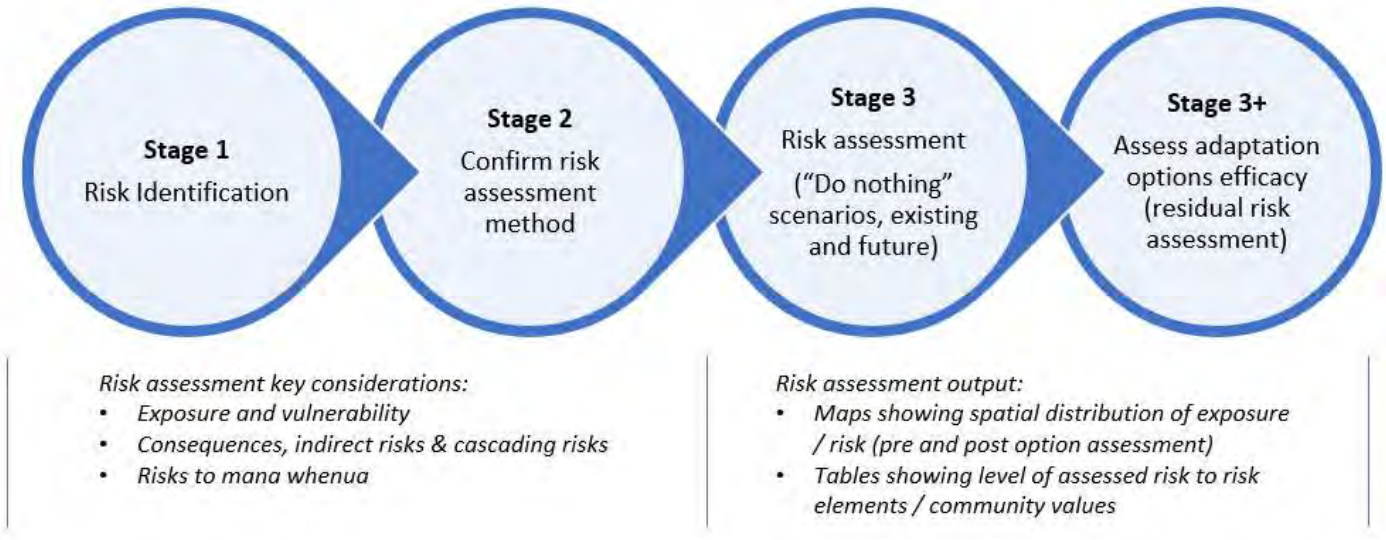


Figure A-1 Risk assessment stages, considerations and high level outputs

Stage 1 - Risk Identification: The Risk Identification Report (Kia Ropine, 2023) was the first stage of work, with the objectives:

- Collate available existing information regarding:
- Hazard awareness in relation to rainfall induced, coastal, groundwater and seismic natural hazards and climate change.
- People, places and asset information to support the exposure and vulnerability component of a risk assessment within South Dunedin.
- Provide a foundational understanding of natural hazard and climate change risk to South Dunedin that was to be built upon in the subsequent stages of the risk assessment.

Stage 2 – Risk Assessment Methodology: The draft risk assessment methodology (February 2024) was developed with input from Workstream 4 (Adaptation), DCC, and ORC. The approach adopted was reliant on input from engagement, particularly regarding the assessment of vulnerability and impacts on the community. This engagement was caried out between March and June 2024. Findings from this engagement was used to inform the risk assessment.

Stage 3 – Risk Assessment: This report documents the findings of the risk assessment as based on the information gathered through Stage 1 and Stage 2 of the risk assessment process. The main steps in the risk assessment are:

- Carry out the geospatial risk assessment.
- Identify key features.
- Assess exposure of elements at risk to hazards.
- Assess vulnerability of elements at risk to hazards.
- Assess risk based on exposure and vulnerability assessment.

- Present spatial mapping of risk, where outputs are presented by hazard and by element.
- Document supporting spatial metadata relating to impacts arising from risks to key features.
- Describe impacts and present relevant supporting spatial data where available.

Stage 3+: The Risk Assessment is designed to be applied to evaluate residual risk relating to the adaptation options. This process is to be implemented under the Efficacy Assessment component of Workstream 4: Adaptation Options.

A2 RISK ASSESSMENT PURPOSE DETAIL

Within the wider programme purpose, the **purpose** of *Workstream 3: Risk Assessment* is to "*assess the potential for elements at risk (people, places, assets) to be negatively affected by rainfall, coastal, groundwater and seismic natural hazards in South Dunedin*".[58] This is an important component for **achieving the** SDF Strategic Operational Objectives because it identifies what may happen if nothing is done. It also provides a framework for assessing efficacy of adaptation options.

Specifically, the risk assessment methodology aims to provide natural-hazard exposure and vulnerability information for "key features" within the twelve "elements at risk". This is required to support two aims:

1 Support spatial adaptation planning
2 Outline the case for change in response to current and increasing natural hazard risk.

For both of these aims, there are key stakeholders that inform the outputs needed from the risk assessment, and the level of confidence and reporting detail needed. The two aims and stakeholders are discussed further in Sections A2.1 and A2.2 respectively.

A2.1 (AIM 2) OUTLINING THE CASE FOR CHANGE WILL BE ACHIEVED BY:

- Providing an overview of risks to South Dunedin with relevant supporting information. This will draw together the results and conclusions from the spatial risk assessment designed to meet Aim 1.
- Identification and discussion of non-spatial risks and their potential impacts. Many of these will be cascading risks (also termed indirect or compounding risks) that arise when an element is damaged. These impacts relate strongly to the Strategic Objectives of South Dunedin, particularly posing risks to social and economic resilience, and environmental and cultural restoration. This will identify what may occur if South Dunedin does not adapt, which is a critical component of the case for change.

The case for change has a relatively wide range of stakeholders, these include the community, Councillors, and business case decision makers. A range of stakeholders may draw on the results generated by the risk assessment for general adaptation and development decision-making purposes, including Council, ministries (Education, Health, Justice) and Kāinga Ora. These stakeholders are considered secondary, and their needs will not directly inform the risk assessment methodology.

[58] This purpose is stated in the RFP and has been adopted in the Risk Identification Report, noting that the terminology 'things of value' is changed to 'elements at risk'.

A2.2 (AIM 1) THE RISK ASSESSMENT SUPPORTS SPATIAL ADAPTATION PLANNING BY:

- Providing a spatial representation of risk for a range of timeframes[59] to the 11 'Elements at Risk' as identified in the *Risk Identification Report*, and their 'key features'.
  - Spatial risk quantification of these key elements will inform *where* adaptation is required to reduce risk.
  - Evaluation of risk at differing time horizons will show how risk profiles change over time, which will help inform *when* adaptation may be required.
  - The key features help characterise the elements at risk (e.g. residential buildings are a key feature that characterises the "buildings and open space" element at risk).
  - The inclusion of spatial risks is considered in line with the Principles of the risk assessment (refer Section 3).
- Providing a spatial representation of risk to key features. This will help guide decision making on what *type* of adaptation options are most appropriate for different areas.
- Informing efficacy of adaptation options. Evaluation of the efficacy of adaptation options to reduce risk to South Dunedin will draw on the risk assessment process.

The primary stakeholder in spatial adaptation planning is Workstream 4. Therefore, when planning to inform spatial adaptation planning, the Workstream 3 methodology is guided by the needs of Workstream 4 (which will be influenced by their stakeholders). The needs of Workstream 4 are identified below.

A2.2.1 WORKSTREAM 4: ADAPTATION OBJECTIVES AND RISK DATA REQUIREMENTS.

To ensure the risk assessment meets Purpose 1, it must provide required outputs to Workstream 4: Adaptation. The objectives of the adaptation workstream and corresponding data requirements from the risk assessment are outlined in Table A-1 These requirements and supporting discussion with Workstream 4 have helped to shape the risk assessment methodology.

Table A-1. Adaptation data needs from risk workstream

Adaptation Workstream objectives (Workstream 4)	Outputs needed from the Risk Assessment (Workstream 3) to assist Adaptation Workstream
(1) Inform drawing of cell/zone/adaptation-area boundaries	Geospatial identification of *Key Feature* risk within each *Risk Element*. e.g. either high/medium/low or scored mapped key features.
(2) Inform type of adaptation option e.g. is high risk due to high vulnerability (and therefore building modification or social initiatives may reduce risk sufficiently) or high exposure (and therefore requiring changes to hazard extents)	Supporting geospatial information (or metadata) that provides the rationale for each *Key Feature* risk within each *Risk Element*. e.g. industrial buildings at X location are high risk due to the high frequency flooding which is likely to exceed the floor level.

[59] 'Scenarios and time horizons' are discussed in Section 3.1.6.

(3) Inform how adaptation options are scoped / scaled / described e.g. if vulnerability data suggests inequities, how could blue green corridors or retreat be designed or conceptualized to reduce inequities; if rugby club is central to community cohesion, reshaping of communities must include a rugby club	Supporting geospatial information (or metadata) that provides the rationale for each *Key Feature* risk within each *Risk Element*. e.g. the rugby club has been identified as high risk because of the impacts associated with loss of playing surface due to groundwater inundation and the large number of local people that are either members or supporters of the club.
(4) Inform when adaptive actions are required e.g. when risk is above an acceptable threshold, action is required, and potential action lead time will guide development of signals and triggers Note: risk thresholds or intolerable risk is defined by WS1 but will be informed by information provided by WS2 and WS3	Supporting geospatial information (or metadata) that provides the rationale for each *Key Feature* risk within each *Risk Element* for different future timeframes. e.g. the wastewater underground assets at X location are predicted to shift from medium risk to high risk between 2080 and 2110 as a result of saline intrusion in the rising groundwater.

APPENDIX B: RISK ASSESSMENT APPROACH

B1 HAZARD DATA

The physical risk assessment draws on spatially mapped hazard data to evaluate exposure of elements to hazards. The key hazards facing South Dunedin (included in this risk assessment) are listed in Table B1. The inclusion of these hazards has been determined by the SDF programme scope, and subsequent considerations evaluated through the methodology development process.

Table B--1 Spatial hazard data availability and materiality

Hazard	Data availability	Materiality / assumptions	Data gaps / known updates (as of April 2024) (not included in assessment)
Pluvial flooding	ICMP Hydrodynamic model results (WSP, 2011): 'Current' state (circa 2011) 10%, 2% & 1% AEP Future state (2060) 10%, 2% & 1% AEP Rev 1 addition: Updated ICMP Hydrodynamic model results (Beca, WSP, 2024) at: 1%, 2%, 10% AEP Present day, 2070 SSP2 4.5, 2100 SSP2 4.5, 2070 SSP5 8.5, 2100 SSP5 8.5	Rev 1 addition: Include 2024 results in assessment	**Rev 1 edition includes updated model results available August 2024** Model updates to the previous model (WSP, 2011) as part of ICMP. These include incorporation of groundwater influences associated with sea level rise.
SLR and coastal inundation	NIWA 1%, 2%, 10% AEP at 0.1 m RSLR increments to 2 m showing inundation of South Dunedin from Harbour	Include in assessment. Limitation: Coastal inundation modelling is based on a 'bathtub' approach that assumes inundation of all areas lower than the calculated extreme sea level (while also assuming no connectivity/permeability of the raised land/dune systems within the	**Known gaps but no known plans underway** Inundation from a breach of the St Clair/St Kilda dunes is not available. Modelling is not currently procured but may be material to the adaptation plan. The coastal inundation extent associated with

Hazard	Data availability	Materiality / assumptions	Data gaps / known updates (as of April 2024) (not included in assessment)
		proximity of the coast). This may be conservative (i.e. result in higher risk) as it does not account for the time varying nature of a storm event (i.e. when modelled to represent the time limited nature of a storm event, the level may be lower). It also does not account for any potential influence of permeability of the dunes or connectivity of the raised land around Andersons Bay Road area and therefore may underestimate the inundation potential.	tidal influences under SLR is not available but may be material to the adaptation plan.
Coastal erosion	WSP district coastal hazards data is available as of April 2024. Potential coastal erosion zone: Current day, 0.3, 0.6, 1.5 m SLR Kettle Park Coastal Erosion Exposure and Remediation (T+T 2023) is available, this assessment provides Areas Susceptible to Coastal Erosion (ASCE) along the Kettle Park shoreline. These results are not available for the full length of the coastline.	WSP district coastal hazards data has been used in the absence of any better dataset. Fewer SLR increments are available than are required for risk assessment. Substitution of available data has been done to fill gaps. The coastal erosion assessment is based on district scale analysis and therefore may not be fully reflective of the coastal environment. The coastal erosion analysis used to inform this study is of a high-level nature and has a number of limitations associated with it, notably it should not be used for the assessment of the erosion hazard for individual properties and infrastructure. Accordingly, the Coastal Erosion risk assessment at this stage	St Clair/St Kilda Coastal Erosion modelling underway as part of the St Clair – St Kilda Coastal Plan. **Updated model results available: in 2025**

Hazard	Data availability	Materiality / assumptions	Data gaps / known updates (as of April 2024) (not included in assessment)
		the South Dunedin Future Programme is not being used to inform adaptation planning along St Clair-St Kilda.	
Groundwater	GNS 2023 SR2023-43 Dunedin Groundwater Monitoring and Spatial Observations. Groundwater levels & emergent groundwater: at 0.1 m SLR increments to 1 m. Median, MHWS, p95, Extreme sea level: ESL10%, ESL1%, ESL0.1% Loss of subsurface storage for 12hr rainfall at 10%, 1%, 0.1% with SLR	Include: Median scenario groundwater level is applied for exposure assessment of all elements assessed (this is the equivalent of a 63% AEP) Vulnerability thresholds for some elements are tied to depth to groundwater (for example, buildings are vulnerable to groundwater within 0.5 m of the ground surface). These thresholds are included in element vulnerability tables (Appendix C).	No known updates, possible additional scenario testing the 2130 or 2150 groundwater extent may be required.
Tsunami	Not included on the grounds that available tsunami extents (NIWA, 2012) are smaller than those from 1% AEP storm event coastal inundation. Therefore, no further benefit is expected from assessing Tsunami separately. (Status – agreed exclusion with ORC)		
Landslide	DCC Landslide database (single timeframe, no inclusion for climate change)	Landslide exposure classification is Moderate (2 – 1% AEP) based on the following: Likelihood is based on the 'Risk status' classification in the DCC Hazard database data provided for South Dunedin Future programme	Future work could improve this dataset by incorporating the impact of climate change.
Earthquake	Not included on the grounds that Earthquake risk is unlikely to drive adaptation options as the level of risk is similar across the wider Dunedin area. Risk mitigation measures to be included in all adaptation options where appropriate. (Status – agreed exclusion with ORC)		
Liquefaction	Barrell 2014 dataset provides a coarse, conservative spatial liquefaction potential across South Dunedin. Hornblow, 2020 has provided an updated	Include: Barrell 2014 spatial data. Domain C exposure classification is 'Low' (1 –	

Hazard	Data availability	Materiality / assumptions	Data gaps / known updates (as of April 2024) (not included in assessment)
	assessment however data is not in a useable spatial format to inform the analysis. This update states South Dunedin is 'not very liquefiable'. High spatial variability in liquefaction potential (with no defined spatial pattern). Tonkin & Taylor (2025 publication pending). South Dunedin Liquefaction Hazard Groundwater Sensitivity Assessment The influence of rising groundwater (associated with climate change induced sea level rise) on liquefaction potential has been assessed. The assessment showed that generally across the South Dunedin area an increase in groundwater level does not translate to a material increase in liquefaction risk. More significant sensitivity may exist at specific sites due to localised near-surface soil conditions (e.g. local surface fill or infilled channels), however it is not possible to delineate these zones to a satisfactory level of accuracy with the currently available dataset.	0.04% AEP) based on the following: Liquefaction likelihood is based on the findings of Tonkin & Taylor (2025 publication pending): The 250-year and 1000-year levels of shaking provide lower and upper seismic cases. The 1 in 100-year levels of shaking are insufficient to cause any significant levels of liquefaction. Liquefaction susceptibility: • Domain C liquefaction susceptibility (Barrell, et al., 2014): Moderate to high likelihood of liquefaction-susceptible materials being present in some areas.	

Hazard data available at the time of developing the methodology is presented in Figure B-2. This figure shows climate hazard data available at 10 year increments, with corresponding climate scenario and increment of sea level rise.

Data that is currently under development and near completion is also presented, with the dataset title shaded orange.

Table B-2. Hazard data availability

Climate related hazards																							
	Timeframe	**Present day**	**2050**			**2060**			**2070**			**2080**			**2100**			**2130**			**2150**		
	Scenario	Best estimat	SSP1-2.6 50th percenti	SSP5-8.5 83rd percenti	SSP2-4.5 50th percenti	SSP1-2.6 50th percenti	SSP5-8.5 83rd percenti	SSP2-4.5 50th percenti	SSP1-2.6 50th percenti	SSP5-8.5 83rd percenti	SSP2-4.5 50th percenti	SSP1-2.6 50th percenti	SSP5-8.5 83rd percenti	SSP2-4.5 50th percenti	SSP1-2.6 50th percenti	SSP5-8.5 83rd percenti	SSP2-4.5 50th percenti	SSP1-2.6 50th percenti	SSP5-8.5 83rd percenti	SSP2-4.5 50th percenti	SSP1-2.6 50th percenti	SSP5-8.5 83rd percenti	SSP2-4.5 50th percentile
Relative sea level rise (m) (NZ SeaRise, 2022)		0 m SLR	0.2 m SLR	0.4 m SLR	0.2 m SLR	0.3m SLR	0.5m SLR	0.3m SLR	0.3m SLR	0.6 m SLR	0.4 m SLR	0.4 m SLR	0.8 m SLR	0.5m SLR	0.5m SLR	1.1 m SLR	0.6 m SLR	0.6 m SLR	1.7 m SLR	0.9 m SLR	0.79 SLR	2.31 SLR	1.06 SLR
Coastal inundation (NIWA, 2023)	**1% (AEP)**																						
	2%																						
	10%																						
	20%																						
Coastal inundation (WSP, 2024)	**1%**																						
	2%																						
	10%																						
	20%																						
Pluvial flooding (WSP 2012/13 data)	**1%**																						
	2%																						
	10%																						
	20%																						
Pluvial flooding (Beca & WSP, 2024)	**1%**																						
	2%																						
	10%																						
	20%																						
Groundwater & episodic extreme sea level (GNS, 2023)	**ESL 1%**																						
	ESL 2%																						
	ESL 10%																						
	ESL 20% (substitute 63% (1 yr ARI))																						
Groundwater (subsurface infiltration exceedance) (GNS, 2023)	**1%**																						
	2%																						
	10%																						
	20%																						
Coastal erosion (WSP, 2024)																							

** Sea level taken off the Kitchener Street data point from SeaRise. This is the more conservative data point in the area (in terms of subsidence), noting that local variations are not accounted for within SeaRise.*

Key:	
	Available and fits the scenario + probability
	No data available
	Superseded data (was used in Rev 0 and updated for Rev 1)
	Exact scenario does not exist, alternative proposed

Geohazards	
	1 in 100 year ARI
Tsunami	1 in 500 year ARI
Liquefaction	No geospatial data
Landslide	Historical GNS landslide data

B3 ASSET DATA

Spatial files assessed or analysed to provide supporting metadata are listed in Table B-3.

Table B-3 Elements at risk characterisation and assessment component

Elements at risk	Spatial files assessed or used to inform metadata	Data source
Buildings	Archaeological sites	1
	Buildings	1
	Heritage sites	1
	Heritage character sites	1
	Property	1
	Census data (2018)	1
Parks and sports fields	Park locations	1
	Sports field	1
Ecological areas	No spatial data	
Roads and associated infrastructure	Road criticality	3
	Roads (line dataset buffered to make road 8 m wide)	1
	Cycle lanes	1
Rail	Rail corridor	1
	Rail transport buildings	1
Water	Tank	1
	Plant	1
	Node	1
	Pipe	1
	Criticality	2
Wastewater	Node	1
	Pipe	1
	Drain pipe	1
	Criticality	2
Stormwater	Node	1
	Pipe	1
	Retention pond	1
	Criticality	2
Contaminated land	HAIL register	1
Telecommunications infrastructure	Exchange site	1
Energy	Transpower assets	4
	Aurora assets	5
	LPG gas facility	1
Mana whenua	Assessed separately	

Source 1: DCC Rest Server (2023)
Source 2: DCC Three Waters Team (May 2024)
Source 3: DCC Roading team May (2024)
Source 4: Transpower website (2023)
Source 5: Aurora (June 2024)

Spatial risk outputs were assessed and presented separately by risk element (in some cases key feature), geometry, and hazard, allowing adaptation options to be developed in response to risks

arising from specific hazards to specific elements. The spatial definition and exposure criteria for which each risk element will be assessed and results presented is shown in Table B-4:

Table B-4 Asset spatial definition and exposure criteria

Element / asset	Spatial definition	Exposure criteria[1]		
		Coastal & Pluvial	Coastal erosion, landslide, liquefaction	Groundwater (emergent and ground water level (GWL))
Buildings and open space	Asset feature class: Building footprint or land parcel.	Binary in/out (Proportion exposed)	Binary in/out (Proportion of polygon exposed)	Emergent and minimum GWL level under the building / parcel (Emergent proportion exposed, GWL average level under the building / parcel)
Roads and rail	Road block to block lengths (buffered to 8 m width)	Binary in/out & proportion exposed	Proportion of road area exposed	Emergent (binary in/out, proportion), GWL (average and minimum level under the road area)
3 waters and energy	Points	Binary (in/out)	Binary (in/out)	Manholes: invert level is below the GWL, not exposed = invert level is above GWL Treatment plant/ pump station: (Emergent GW: binary in/out, GWL, average and minimum depth at node)
	Line	Binary in/out & proportion exposed	Proportion of pipe exposed (retain original geometry, no splitting of lines)	Emergent GW: (not assessed), GWL (average and minimum groundwater level across the pipe)
	Polygon	Binary (in/out), proportion of polygon exposed	Binary (in/out), proportion of polygon exposed	Emergent (binary in/out), GWL (average and minimum level under poly)
Contaminated sites (HAIL)	Polygon	Binary in/out (Proportion exposed)	Binary in/out (Proportion of polygon exposed)	Emergent and minimum GWL level under the site (Emergent proportion exposed, GWL average level under the site)
Tele-communications	Exchange site assessed as part of buildings. No other data provided.			

[1]No minimum area or proportion threshold applied.

B4 EXPOSURE

Hazard exposure is categorised in accordance with the likelihood of its occurrence. The proposed relationship between timeframes, hazard scenarios and likelihood rating is based on the generic relationships shown in Table B-5, with hazard specific relationships shown in Section 3.3.2.

Table B-5: Exposure (adapted from pORPS Hazard likelihood[60])

Exposure	Present day	Medium-term	Long-term
Extreme	Up to once every 10 years (99%-10% AEP)	Up to once every 10 years (99%-10% AEP)	Up to once every 10 years (99%-10% AEP)
High	Once every 11-50 years (10%-2% AEP)	Once every 11-50 years (10%-2% AEP)	Once every 11-50 years (10%-2% AEP)
Moderate	Once every 51 – 100 years (2 – 1% AEP)	Once every 51 – 100 years (2 – 1% AEP)	Once every 51 – 100 years (2 – 1% AEP)
Low	Once every 100 – 2,500 years (1 – 0.04% AEP)	Once every 100 – 2,500 years (1 – 0.04% AEP)	Once every 100 – 2,500 years (1 – 0.04% AEP)
Very low	2,501 years plus (<0.04%AEP)	2,501 years plus (<0.04%AEP)	2,501 years plus (<0.04%AEP)

B5 VULNERABILITY

Vulnerability ratings have been developed to evaluate physical risk to key features.

B5.1 KEY FEATURES

Key features have been identified through:

- Stage 1 Risk identification Report
- Discussion with Workstream 4
- Engagement with owners, managers and those responsible for the elements at risk and key features
- Engagement with the community.

Identification of specific “Important or essential" features represents features that are of high value to the community (e.g. school, sports clubs, church, mosque, civil defence facility, emergency facility etc), or provide essential services to the area or wider Dunedin- (e.g. critical transport routes). These key features provide an indication of high consequence community features within South Dunedin. Supporting information for high consequence key features is provided in an accompanying database where this was able to be obtained. The following information was sought:

- Who is it of value to?
- Why is it of value?
- What are the impacts of damage to the feature?
- Whether the value the feature provides is intrinsically tied to its location. I.e. Could the feature / service be provided from elsewhere?

[60] ORC (2021) Proposed Regional Policy Statement APP6 Methodology for natural hazard risk assessment. Hazard likelihood table has been adapted by adding a new class 'up to once every 10 years', and combining the 100-1000 and 1000-2500 year classes.

- Whether it is locally or regionally important?

B5.2 VULNERABILITY - PHYSICAL RISK ASSESSMENT

The physical risk assessment considers asset specific vulnerability information, such as design, condition, and age. The availability and materiality of this information was tested with owners, managers and those responsible for the elements at risk. Physical vulnerability ratings were gathered through consultation with owners, managers and those responsible for the elements at risk and through community engagement (refer to engagement schedule outlined in Section B7.

Vulnerability was rated using a scale, where example guidance for the vulnerability rating is shown in Table B-5-1. This guidance has been developed to reflect damage arising from acute hazards. Specific vulnerability scale was developed for assets using the example as a guide, and incorporating considerations for chronic hazards if these were necessary.

Table B-5-1. Example vulnerability attributes by hazard

Vulnerability	Description
Extreme	Sudden collapse or failure likely, causing potential risk to life. For example house/culvert collapse putting people's lives at risk.
High	High damage likely. Loss of service with lengthy time to restore to operation (months).
Moderate	Moderate damage likely or possible. Short to medium time to restore to operation (less than one month).
Low	Minor damage sustained although it does not impact the operation of the asset.
Very low	No damage or loss of service

B6 IMPACT ASSESSMENT

Impacts (consequences, indirect risks, and cascading risks) are considered separately to physical risk and include social, cultural, economic and environmental impacts. In general, they are not rated or scored.

Cascading impacts arising from risks to South Dunedin have been identified through community engagement and discussion with SMEs. Many of the issues identified align with the findings of previous in-depth research into the cascading impacts of flooding on the South Dunedin community. Findings of this previous study have been incorporated into this discussion of cascading impacts of climate risk on South Dunedin.

These findings are presented through a description of impacts, casual maps, and where available, relevant supporting data is presented spatially.

Refer to Appendix B7 for details regarding stakeholder engagement. Refer to the South Dunedin Future Engagement Report: Risk and Long List of Adaptation Approaches for details of the public engagement activities.

B7 STAKEHOLDER ENGAGEMENT SCHEDULE

outlines the planned engagement sessions to inform the risk assessment.

Table B-7 Risk assessment stakeholder engagement schedule

Engagement	Purpose	Stakeholder group	Date	Status
Public engagement South Dunedin	Dunedin Future Expo 29 February – 3 March	Community	Expo 29 February – 3 March	Complete
	Street festival	Community		Complete
	Moana Nui	Community/Pasifika		Complete
	Online survey	Community	29 Feb - 28 March 2024	Complete
Engagement with community / social agencies	SD Risk & social impact	Community Network	March/April 2024	Complete
	SD Risk & social impact	Disability	18 March 2024	Complete
	SD Risk & social impact	Youth -Queens High -Bayfield High -Dunedin Youth council -Rangitahi workshop	March 2024 20 March	Complete (Note: not as much risk data from these sessions)
	Potential impacts arising from damage to education facilities & Key feature vulnerability	Ministry of Education (MoE)	June 2024	Complete
Engagement with economic sector representatives	SD Risk & economic impact	The DCC SDF team have carried out engagement with the business community through a range of activities over 2023-24. These activities have included: town hall meetings, presentations with community groups, one-to-one meetings. Groups spoken to include (but are not limited to): • South Dunedin Business Association • Otago Property Investors Association • Property Council of New Zealand (Otago Sub-Committee) • Infrastructure New Zealand • Business South		
	Initial call: Economic profile of	Sarah Gell, DCC	21 March 2024	Complete

Engagement	Purpose	Stakeholder group	Date	Status
	Dunedin / South Dunedin			
Emergency Management	Identification of key features and impacts	CDEM	May 2024	Complete
Risk to buildings and open spaces	Initial call: Data availability & materiality regarding: Residential buildings Non-residential buildings Built heritage Parks and open spaces	Pete Hebden, DCC*	19 March 2024	Complete
		Mark Mawdsley Katie Eglesfield Parks and Recreation Paul Freeland Principal Policy Advisor, City Development, DCC*.	21 March 2024	Complete
		Neil McLeod Principal Advisor Building Solutions, Building Services, DCC*.	22 March 2024	Complete
	Risk Workshop: • Agree key features • Potential impacts arising from damage to key features • Key feature vulnerability	Residential buildings Neil McLeod	19 April 2024	Complete
		Non-residential buildings Neil McLeod Pete Hebden Katie Eglesfield	19 April 2024	Complete
		Parks and open spaces Katie Eglesfield Aidan Battrick	18 April 2024	Complete
Risk to Marae, and other culturally significant sites	Carried out by Aukaha – refer Appendix D			
Risk to roads	Initial call: Data availability & materiality	Simon Smith, DCC	19 March 2024	Complete
	Risk Workshop: • Agree key features • Potential impacts arising from damage to key features	DCC Roading team: Simon Smith Peter Tomlinson Cynthia Wilson	19 April 2024	Complete

Engagement	Purpose	Stakeholder group	Date	Status
	• Key feature vulnerability			
Risk to seawalls	Risk discussion	Simon Smith Raphael Krier-Mariani. DCC	10 May 2024	Complete
UpRisk to areas of ecological significance	Initial call: Data availability & materiality	DCC parks and ecology: Zoe Lunniss Luke McKinlay Katie Eglesfield	22 March 2024	Complete
Risk to rail	Risk discussion:	KiwiRail	13 May 2024	Complete
Risk to telecommunications infrastructure	Risk discussion: • Data availability • Key features • Potential impacts • Key feature vulnerability	Chorus	6 May 2024	Complete
Risk to energy infrastructure	Risk discussion: • Data availability • Key features • Potential impacts • Key feature vulnerability	Aurora, Transpower	2 May 2024 & December 2024	Complete
Risk to water supply, stormwater, and wastewater infrastructure	Initial call: Data availability & materiality	DCC 3 Waters team: Jared Oliver, Heinz Jacobs, Sarah Stewart	18 March 2024	Complete
	Risk Workshop: • Agree key features • Potential impacts arising from damage to key features • Key feature vulnerability	DCC 3 Waters team: Jared Oliver, Heinz Jacobs, Sarah Stewart, Darrin Lane, David Dewhirst	18 April 2024 & 23 April 2024	Complete
Risk to solid waste and contaminated sites		Lincoln Coe, DCC	19 March 2024	Complete

Engagement	Purpose	Stakeholder group	Date	Status
	Initial call: Data availability & materiality	Raphael Krier-Mariani. DCC		
		Joon van der Linde, ORC Jean-Luc Payan, ORC	22 March 2024	Complete
	Risk Workshop: • Agree key features • Potential impacts arising from damage to key features • Key feature vulnerability	Lincoln Coe, DCC Simon Beardmore E3 Scientific, on behalf of ORC Contaminated Land team	15 April 2024	Complete

APPENDIX C: RISK ASSESSMENT VULNERABILITY DATA, LIMITATIONS, AND ASSESSMENT METHOD

This section outlines the data availability and method used to assess risks to each element. The level of detail to inform vulnerability and the corresponding data requirements has been determined based on the assessment principles (i.e. making the best use of available information and, ensuring effort is proportional to outcomes) and it also follows a series of workshops between Kia Rōpine, DCC and ORC during January and February 2024.

People and communities are a fundamental consideration in the risk assessment. Risks to people have been considered in relation to the elements identified below, where the physical risk of harm to people living, working and using South Dunedin's features has been considered, as well as the impacts arising from damage or loss to the other elements. These potential impacts will be reported in the findings of the risk assessment, where the cascading social, cultural, economic and environmental risks will be identified.

The following sub-sections present each of the 12 elements at risk and identifies the approach to the vulnerability assessment regarding how it will support the risk assessment. The fields in the tables are described below:

- Risk – identifies the physical risk consideration within each element at risk.
- Supports – this indicates whether the key feature is included to support Aim 1 and/or Aim 2.
- Key features – The components of importance to characterise the element at risk.
- Vulnerability criteria data availability – this is a list of considerations that were potential factors in the assessment of vulnerability. This informed our data requests and helped to inform conversations with owners, managers and those responsible for the elements at risk, as well as community engagement.
- Method – this is an indication of the type of method to assess risk to the element/key feature.
- Output – an indication of the outputs from the risk assessment.
- Limitations / uncertainties / assumptions – Important information relating to confidence levels in the risk assessment. These will be recorded in the risk assessment report for transparency.

C1 BUILDINGS AND OPEN SPACES

Risks to buildings and open spaces were assessed using the methods and outputs identified in Table C-1-1.

Table C-1-1. Buildings and open spaces data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to residential buildings **Physical risk to non-residential buildings** **Physical risk to important or essential buildings** **Physical risk to heritage buildings**	Aim 1, Aim 2	People	Population Physical risk to people from inundation hazard information. Refer also "Social impacts arising from damage to buildings"	**Physical risk to people:** Estimate number of people at risk using SA1 mesh-block population data (residential).	**Map:** Spatial distribution of population at risk **Table:** Quantification of population exposed to high risk residential buildings (or other buildings if information is available) (e.g. X people residing in SA1 areas with X% buildings rated at high risk)	Employee/patronage data is not available at time of assessment (June 2024), so cannot be used to estimate number of people at risk in non-residential buildings.
	Aim 1, Aim 2	Residential buildings, Non-residential buildings, Important or essential buildings	1. Location 2. Usage - assume based on land use zoning 3. Floor level – developed by proxy. 4. Building properties (foundation type. no. of storeys, age, build material) - see assumptions. 5. Property value – RV available 6. Fragility curves - see assumptions.	**Physical risk to buildings:** Assess exposure to a) property (i.e. land) b) above floor level (i.e. building). Vulnerability rating was developed and agreed through workshop with property / planning team at DCC. Key features were identified through community engagement and SME workshop. **Risk to contents**: Reported in relation to Aim 2 only. Indicate likely content damage range based on number of buildings with flooding above floor level, based off generic research.	**Map:** Risk to buildings arising from hazards showing identified key features **Table:** Quantification of risk assessment results at a property scale (may include building information – TBC following engagement) **Report section:** Description of risks and impacts	No information available for: 3. Floor level - Assume proxy 4. Building vulnerability properties – Where data is not available, propose qualitative generic ratings through workshop with City Development and Building Services team at DCC. 6. Fragility curves-propose not to use fragility curves, this level of detail is not required for spatial adaptation planning. Assumption: Exclude separate non-residential outbuildings buildings in residential areas (e.g. garages, sheds, outbuildings) - assume buildings less than 40m² are non-residential based on some high level assumptions from MBIE exemptions for building consents. Assume no allowance for warning time or experience (which both reduce damage).
Social impacts arising from damage to buildings	Aim 1, Aim 2	Residential buildings, Non-residential buildings, Important or essential buildings Contents	2018 Census data (available): Age, Ethnicity, Mobility issues Difficulty communicating Income Home ownership / renting Social deprivation Index Employment/ worker number need to confirm availability of information. Patronage / customer numbers - need to confirm availability of information.	**Social vulnerability:** Spatial data overlay upon hazard. Accompanied by a descriptive narrative in report including findings from community engagement.	**Map:** Spatial distribution of: Age Mobility issues Disability (Difficulty hearing or difficulty communicating) Social deprivation Index **Table:** Quantification of social indicators (e.g. X people have mobility issues that are in an area with high exposure to flooding) **Report section:** Description of impacts including cascading risks	Employment/ worker numbers were not available at time of assessment (June 2024). Patronage / customer numbers were not available at time of assessment (June 2024)..
Economic impacts arising from damage to buildings	Aim 1, Aim 2	Residential buildings, Non-residential buildings, Important or	Property value (RV available) Industry classification - need to confirm availability of information. Employment/ worker number - need to confirm availability of information.	Limited data is available at present, therefore limited economic assessment is possible. Where data is available, this will be used to produce: Spatial data overlay upon hazard.	Limited data is available at present, therefore limited economic assessment is possible. **Map:** Spatial distribution of economic data **Report section:** Description of impacts including cascading risks	Limited data is available at present, therefore limited economic assessment is possible.

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
		essential buildings Contents	Detailed GDP data - need to confirm availability of information. Patronage / customer numbers - need to confirm availability of information.	Accompanied by a descriptive narrative in report.		
Physical risk to open spaces	Aim 1, Aim 2	Parks	1. Land use 2. Surface - Need to confirm availability of information, see assumptions. 3. Condition - Need to confirm availability of information, see assumptions.	**Physical risk:** Assess exposure to a) property (i.e. land) Vulnerability rating to be developed through workshop with property / planning / parks team at DCC. Key features to be identified through community engagement and SME workshop	**Map:** Risk to open space arising from hazards showing identified key features **Table:** Quantification of areas at risk **Report section:** Description of risk and impacts	No information currently available for: 2. Surface, 3. Condition – information established through a qualitative generic ratings through workshop with Parks & Recreation team at DCC.
Impacts arising from damage to open spaces	Aim 2	Parks	High level assessment	Gather information from community engagement and managers of Open Space	**Report section:** Description of impacts including cascading risks	

BUILDING FLOOR LEVEL

Floor level is an important factor in building vulnerability. At the time of writing this report DCC had recently carried out a street-based observational assessment of floor levels in South Dunedin (Figure C1-1). These floor levels were incorporated into the analysis. A professional survey has been conducted on a sample of houses with the intention of confirming the accuracy of the observational assessment. The findings of this assessment are not available at the time of writing.

Floor levels gathered through the observational assessment were assigned to property parcels and were based on the floor height above ground of the assumed 'primary dwelling'.

When applying the floor level assumptions to the buildings assessed for the purpose of the risk assessment, the following assumptions were applied:

- Where multiple buildings are located on a land parcel, the analysis assumes the floor level of primary dwelling is applied to all buildings on the property parcel.
- Where the parcel has 'no data', this parcel is excluded in the analysis.

Building floor levels were estimated to fall within the categories in Table C-1-2, which also shows the floor level applied in the risk assessment.

Table C-1-2. Building floor level categories applied through observational assessment by DCC (July-September 2024)

Range	Height used in risk assessment
Less than 15 cm	0 cm
Between 15 and 30 cm	15 cm
Between 30 and 45 cm	30 cm
Above 45 cm	45 cm
No data	No data (buildings were not assessed)

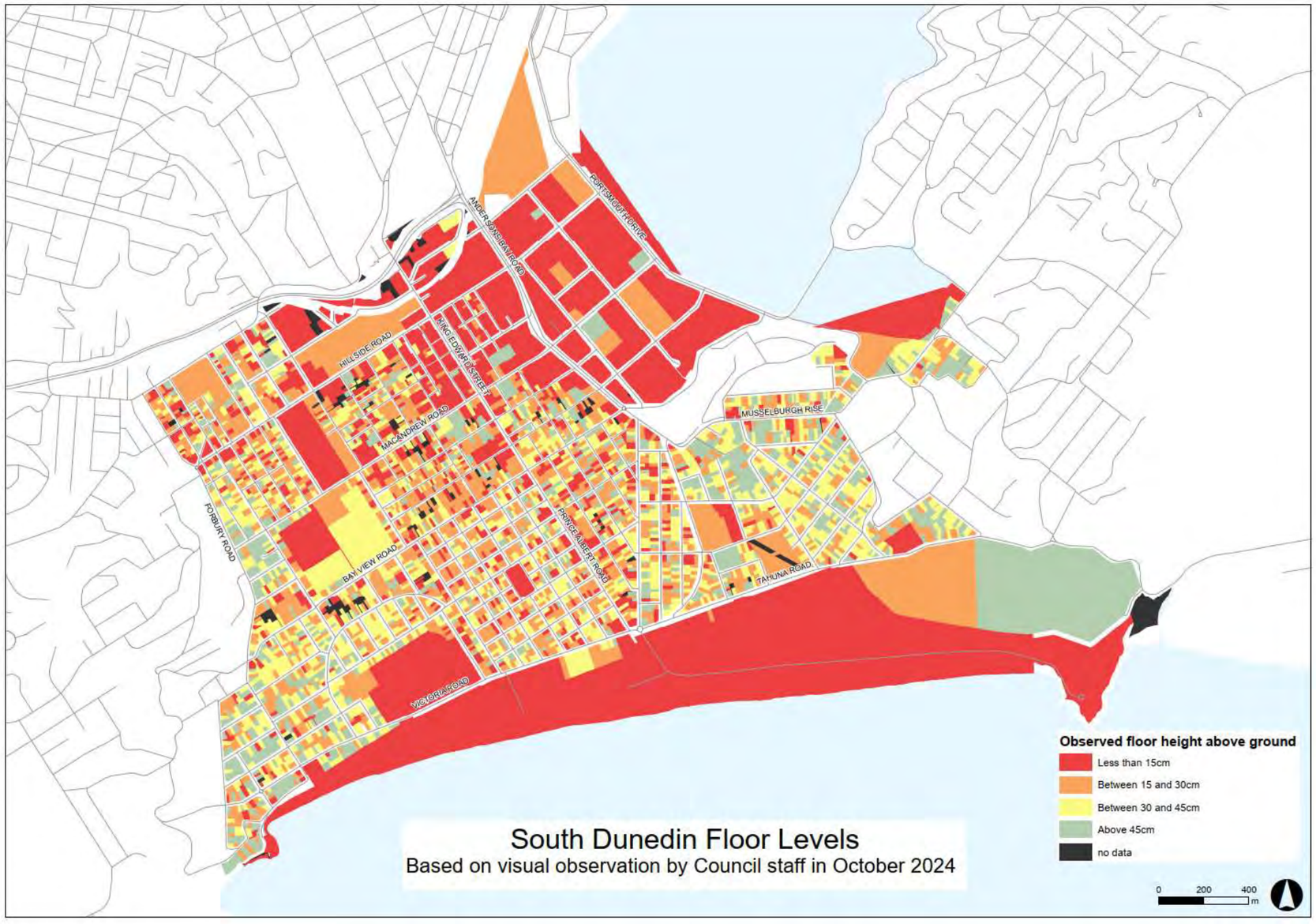


Figure C1-1 South Dunedin observed floor height above ground (Source: DCC)

SUMMARY OF WORKSHOP: BUILDINGS

KEY FEATURES

Key features were agreed through workshop with DCC staff:

- Residential, residential institution.
- Non-residential buildings:
  - Commercial.
  - School.
  - Church.
  - Built Heritage (heritage zoning).
  - Important or essential buildings (as identified by the community).
  - National significance.
  - International significance.
  - Local significance.
  - Rugby clubs (members tend to be very attached to home turf, could move fields but could not relocate clubs).
  - Sport facilities.

BUILDING VULNERABILITY TO PLUVIAL FLOODING AND COASTAL INUNDATION

Flooding can cause complete loss or damage to buildings and can lead to the need for extensive repairs . Building vulnerability to flooding is related to floor level, construction material, and building age. These characteristics are variable between building type and use. South Dunedin has a high proportion of ageing and poor condition buildings, which are particularly sensitive to flood damage.

Building resilience to flooding tends to vary with the age of the building where additional resilience measures (typically increase in minimum floor level) tend to be adopted following major floods. Updated controls in response to 2015 came into effect circa 2017.

New buildings tend to use Gib board in internal wall linings to provide seismic and wind strength. Gib board loses structural strength when wet or following an earthquake with resultant reduction in bottom plate strength. This requires complete re-lining following a floor or seismic event. Older buildings are more resilient to flooding due to the use of flood resilient building materials.

BUILDING VULNERABILITY TO GROUNDWATER

Emergent groundwater can cause instability in building foundations, lead to issues of dampness and mould in housing, and may cause various environmental problems such as pollution and salinity stress in properties. Where groundwater is high but not yet emergent, groundwater is unlikely to damage building condition, but will impact the liveability of homes. This may be less of an issue in non-residential settings due to extensive paving.
Reduction in level of service of roads, stormwater and wastewater may severely limit the function of buildings.

BUILDING VULNERABILITY TO COASTAL EROSION AND LANDSLIDE

Buildings and building foundations are highly vulnerable to erosion, landslide, or other ground instability, which can cause complete loss or damage to buildings, and can lead to the need for extensive repairs. Landslides may smother buildings.

BUILDING VULNERABILITY TO LIQUEFACTION

Liquefaction can cause differential settlement and lateral spreading that distorts structures, reduce foundation-bearing capacity, and damage pile supports and service connections.

BUILDING VULNERABILITY RATING

The below vulnerability rating table was informed by discussions through the workshop with property / planning team at DCC. In order to ensure that the vulnerability could be more widely applied and compared with other key elements some adjustments to agreed ratings have been made. Therefore, it may not completely align to outcomes from the discussion. All key features are to be assessed using the same vulnerability rating criteria.

Table C-1-3: Building vulnerability criteria*

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	Vulnerability considerations relating to hazard and rating category	Floor level is the primary vulnerability consideration. Any flooding above the minimum floor level is assumed to possibly enter the building.		Emergent groundwater is likely to cause dampness and mould in buildings, which would render them uninhabitable over the long term. Near-surface groundwater would impact functionality of buildings, potentially disrupting access and posing a threat to health).	All assets are highly vulnerable	All assets are highly vulnerable	All assets are highly vulnerable
Extreme	Sudden collapse/failure causing potential risk to life.				All buildings are extremely sensitive to damage	All buildings are extremely sensitive to damage	n/a**
High	Acute hazards: Damage sustained resulting in the building being uninhabitable for > 1 month . Chronic hazards: No moisture barrier and inefficient drainage for the removal of stormwater (residential and non-residential buildings.).	All buildings when exposed to flood level > 0 mm above floor level	All buildings when exposed to flood level > 0 mm above floor level	No information regarding private drainage or moisture barrier. Therefore all buildings included in this category when exposed to emergent groundwater	n/a**	n/a**	All buildings are highly sensitive to damage
Moderate	Acute hazards: Damage sustained resulting in the building being uninhabitable for < 1 month. Chronic hazards: No moisture barrier but good drainage for stormwater (residential buildings).	n/a**	n/a**	No information regarding private drainage or moisture barrier. Therefore all residential buildings when exposed to groundwater 0-0.5 mbgl (access & health related)	n/a**	n/a**	n/a**
Low	Chronic hazards: No moisture barrier but good drainage for stormwater (non-residential buildings).	Building exposed to flooding with depth below floor level.	Building exposed to flooding with depth below floor level.	No information regarding private drainage or moisture barrier. Therefore all Non-Residential buildings when exposed GWL 0-0.5 mbgl	n/a**	n/a**	n/a**
Very low	No loss of service or repairs	n/a**	n/a**	n/a**	n/a**	n/a**	n/a**

* Spatial vulnerability indicators were not available. Therefore, vulnerability ratings have been developed based on subject matter expert judgement (refer to Appendix A for details of engagement)

** n/a assigned due to insufficient information to differentiate vulnerability between ratings

SUMMARY OF WORKSHOP: PARKS AND OPEN SPACES

KEY FEATURES

Key features were agreed with DCC staff and through community engagement:

- St Clair/St Kilda beach.
- Sports grounds.
- Marlow Park.
- Other parks & playgrounds.
- Tahuna Park.
- Tahuna Park.
- Caledonian gym and sporting facilities.

ADAPTIVE CAPACITY

Considerations regarding the development of adaptation options:

- Options to improve park performance under increasing flooding and groundwater rise are to change parks to turf or re-lay fields to improve drainage. These measures are a limit to their effectiveness which means their overall vulnerability should not change.
- When considering adaptation of playing fields, parks that are also HAIL sites should be preferentially removed because these need higher maintenance due to re-levelling (land subsidence).
- Playgrounds have 30 year renewal lifespan, and many are comprised of equipment that can be relocated, making theme very adaptable. Playgrounds can also adapt to reflect their changing environment, for example creating water features where groundwater is high.

Note on buildings associated with parks – many of these are community led, which means they have less funding. These buildings are likely to have lower adaptive capacity compared to private commercial. Loss of facilities would be a major community loss.

PARKS AND OPEN SPACES VULNERABILITY TO PLUVIAL FLOODING AND COASTAL INUNDATION

Flooding of open spaces is likely to prevent use where regular flooding would result in complete loss of field use. Associated buildings and playing fields may be damaged and grounds may become waterlogged.

PARKS AND OPEN SPACES VULNERABILITY TO GROUNDWATER

Rising groundwater is expected to compound the impact of rainfall by making fields more susceptible to waterlogging. The extent of this effect is currently unknown however any increase in groundwater is expected to be damaging to fields. The impact of waterlogging on fields is also related to recent rainfall and the frequency of use, where fields can be closed to reduce damage from playing. All fields are expected to become unusable when the root zone becomes waterlogged.

PARKS AND OPEN SPACES VULNERABILITY TO COASTAL EROSION

Direct damage from erosion would be highly damaging to parks. The Ocean Beach Reserve acts as a buffer for the dune system. This area is vulnerable to being buried by shifting dunes and sand is excavated from these areas at present.

PARKS AND OPEN SPACES VULNERABILITY TO LIQUEFACTION

Liquefaction may induce ground settlement and undulation in parks and sports fields, resulting in uneven surfaces. Sand boils can occur, posing hazards and necessitating cleanup, while lateral spreading near free faces may lead to ground cracking.

PARKS AND OPEN SPACES VULNERABILITY RATING

The below vulnerability rating table was developed and agreed through workshop with the roading team at DCC. Some of the agreed ratings have been adjusted to achieve standardisation across all elements.

Table C-1-4: Playing field vulnerability criteria

	Hazard	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Vulnerability Rating	Vulnerability considerations	Fields cannot be used when flooded, with increasing frequency of flooding posing a threat to the useability of fields.	Fields cannot be used when flooded. However coastal inundation events occur less frequently than pluvial flooding, meaning fields can recover between events.	Fields are highly vulnerable to groundwater, in many locations they would be vulnerable to any increase in groundwater level. The impact of waterlogging on fields is also related to recent rainfall and the frequency of use, where fields can be closed to reduce damage from playing. All fields are expected to become unusable when the root zone becomes waterlogged (the top approx. 0.3 m below the surface).	Direct damage from erosion would be highly damaging. Ocean Beach Reserve fields are not exposed directly to coastal erosion, but are vulnerable to being buried by shifting dunes.	All assets are highly vulnerable	All assets are highly vulnerable
Extreme	Permanent complete loss of field function	~~All sites~~	n/a	GWL 0-0.3 mbgl (or emergent)	All exposed areas and Ocean Beach reserve[1]		
High	Acute: Loss of field function during and following flood requiring a lengthy	All sites for increasing seasonality and annual rainfall (Not assessed as no hazard	~~All sites~~		n/a	All sites	All sites

	Hazard	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	time to restore functionality. Chronic: Permanent reduction in level of service	information is available regarding frequent storm events (this is out of scope))					
Moderate	Acute: Loss of field function during and following flood requiring a lengthy time to restore functionality. Chronic: Permanent reduction in level of service	All sites	All sites	All other sites are vulnerable to any increase in groundwater	n/a	n/a	n/a
Low	Minimal damage managed through routine maintenance.	All astroturf sites (not factored into assessment due to no data)	All astroturf sites (not factored into assessment due to no data)			n/a	n/a
Very low	No damage or change in function	n/a	n/a		All other sites (assume protection from seawall)	n/a	n/a

[1] Risk to Ocean Beach Reserve is exacerbated due to dune migration for which there is no hazard data (this is out of scope)

Table C-1-5: Playground vulnerability criteria

	Hazard	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Vulnerability rating	**Vulnerability considerations**	Flooding or inundation and associated storm damage may damage playgrounds. Permanent inundation is possible at Andersons Bay, which would be a major issue and result in complete loss of park function.		Emergent groundwater would mean playground should be removed. This is done relatively easily, however some facilities may have a higher cost to replace, e.g. soft fall	All assets are highly sensitive to damage. However, playgrounds have high adaptive capacity (multi dimensional play purposes and high frequency of renewal). Playgrounds can be redesigned to respond to changing conditions, and can incorporate resilient materials (e.g. less corrosion / rust susceptibility)	All assets are highly vulnerable	All assets are highly vulnerable
Extreme	Permanent complete loss of park function	n/a	MHWS inundation (Andersons Bay) not assessed	Playground GWL emergent or <0.3 mbgl	n/a	n/a	n/a
High	Acute: Severe damage likely Chronic: Reduction in park function	n/a	n/a	Playgrounds – all other sites Cemeteries GWL >2 mbgl	n/a	n/a	n/a
Moderate	Moderate damage may occur resulting in short term closure. No expected change in park functionality.				n/a	All sites	All sites
Low	Minimal damage managed through routine maintenance.	All sites	All sites		All sites	n/a	n/a

Very low	No damage or change in function	n/a	n/a	All other parkland	n/a	n/a	n/a

C2 MARAE, AND OTHER CULTURALLY SIGNIFICANT SITES

The approach to assessing risk to Marae, and other culturally significant sites is covered in the Mana Whenua Risk Assessment.

C3 ROADS

Risks to roads were be assessed using the methods and outputs identified in Table C-3-1.

Table C-3-1. Roads data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to roads	Aim 1, Aim 2	Road criticality Associated infrastructure (e.g. footpaths, cycleways)	1. Road criticality 2. Road condition – not available. 3. Road material – not available. , see assumptions. 4. Road vulnerability information in relation to the hazards – need to confirm availability of information., see assumptions. 5. Flood depth 6. Flood velocity – not available.	**Physical risk:** Assess exposure to road length. Workshop with transport team at DCC to agree: Key feature classification Vulnerability rating.	**Map:** Risk to roads arising from hazards showing identified key features **Table:** Quantification of road length at risk **Report section:** Description of risk and impacts	Need to confirm availability of information for: 2. Condition, 3. Material, 4. Vulnerability Propose follow up workshop with roading team at DCC to gather any available material data or undertake qualitative generic vulnerability ratings.
Impacts arising from loss or damage to roads	Aim 1, Aim 2		2018 Census data: Mobility issues	Spatial data overlay upon hazard. Accompanied by a descriptive narrative in report.	**Map:** Spatial distribution of mobility **Report section:** Description of impacts including cascading risks	

SUMMARY OF WORKSHOP: ROADS AND ASSOCIATED INFRASTRUCTURE

KEY FEATURES

Key features were agreed through workshop with DCC staff:

- Electrical assets (street lights, signals).
- Stormwater infrastructure (Kerb, Catch pits, Lateral, culverts).
- Structures (retaining wall, sea wall, causeway).
- Bus routes.
- Cycle paths.
- Foot paths.
- Criticality - a layer has been developed also AF8 priority routes (not yet available).

Criticality scores used by the DCC roading team, provided May 2024
Table C-3-2 Summary of critical transport routes within South Dunedin

Criticality scale[1]	Description	Length of DCC roads within South Dunedin (km)
Criticality 1 (Vital)	A vital route or section of road whose failure would have a nationally significant economic or social impact, or is a nationally significant lifeline, ensuring access or continuity of supply of essential services during an unforeseen event.	SH1 No DCC roads in South Dunedin
Criticality 2 (Major)	A major route or section of road whose failure would have a significant economic or social impact to more than one region, or is a regionally significant lifeline, ensuring access or continuity of supply of essential services during an unforeseen event.	3
Criticality 3 (Significant)	An important route or section of road whose failure would have a significant economic or social impact to a region, or is a significant lifeline, ensuring access or continuity of supply of essential services during an unforeseen event.	17
Criticality 4 (local)	A local route or section of road whose failure would have a serious local economic or social impact, or is a locally important lifeline, ensuring access or continuity of supply of essential services during an unforeseen event.	64
Criticality 0		5,952*

[1]

*Includes 4km of null values that are assumed to be 0

ADAPTIVE CAPACITY

Roading infrastructure has interdependencies that may influence adaptation planning:

- Raising of roads as a measure to adapt to high groundwater is limited due to the potential that this may prevent overland flow paths and increase pluvial flood risk.
- The 3 Waters network as roading drainage provides stormwater management and connects to the wider stormwater network.
- Parks as these influence stormwater generation, where greater parkland coverage results in lower stormwater runoff generation.

ROADS AND ASSOCIATED INFRASTRUCTURE VULNERABILITY TO PLUVIAL FLOODING AND COASTAL INUNDATION

Much of the flooding within South Dunedin occurs within the local road network. Although flooding of roads prevents access, this provides important flood storage volume to minimise the flooding of private properties and buildings.

Pavements may be damaged through repeated / regular wetting causing faster deterioration rates driving increased roading maintenance needs.. Roads and associated infrastructure have low vulnerability to flooding in South Dunedin. The generally flat terrain means scour and erosion are uncommon.

Streetlight and signal poles may start to rust if exposed to salinity through coastal inundation.

ROADS AND ASSOCIATED INFRASTRUCTURE VULNERABILITY TO GROUNDWATER

High groundwater is already impacting road strength, resulting in maintenance issues. Damage to roads is dependent on vehicle loading, where high volume and heavy loading result in increased deterioration of the road. As median groundwater levels approach the roading sub-base at around 300-400 mm below ground level, increased maintenance is expected. If groundwater is at or near the ground surface, it is unlikely that roads will be able to be maintained.

ROADS AND ASSOCIATED INFRASTRUCTURE VULNERABILITY TO COASTAL EROSION AND LANDSLIDE

Sections of roading adjacent to the St Clair – St Kilda coastline may be exposed to coastal erosion. This may cause direct damage or complete loss of roads and associated infrastructure.

ROADS AND ASSOCIATED INFRASTRUCTURE VULNERABILITY TO LIQUEFACTION

Liquefaction can compromise roads and related infrastructure by causing settlement, cracking, and sinkholes, as well as by ejecting soil onto the surface. These processes may deform embankments and bridge abutments, reducing the stability of road surfaces and bridge foundations, and may also disrupt nearby underground services.

ROADS AND ASSOCIATED INFRASTRUCTURE VULNERABILITY RATING

The below vulnerability rating table was developed and agreed through workshop with the roading team at DCC.

Unless otherwise noted, all key features are to be assessed using the same vulnerability rating criteria apart from the following exceptions:

- Infer rating of SW assets from associated main.
- Seawalls to be assessed separately.

- Retaining walls are not currently included, DCC to send retaining wall locations (not assessed).

Table C-3-3: Roads and associated infrastructure vulnerability criteria

	Hazard	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Vulnerability rating	Vulnerability considerations	Roads and associated infrastructure have low vulnerability to flooding in South Dunedin. The generally flat terrain means the main mechanisms for damage; scour and erosion are uncommon. Streetlight and signal poles may be damaged by flooding or rust due to exposure to seawater.		Groundwater level applies to all roads and includes damage and loss of all utilities.	All assets are highly vulnerable	All assets are highly vulnerable	Risk Assessment team to discuss with liquefaction specialist.
Extreme	Sudden collapse/failure causing potential risk to life.	n/a	n/a		All roads are highly sensitive to damage	All roads are extremely sensitive to damage	
High	Damage sustained so that asset is not functional until repairs are made.	n/a	~~Streetlight and signal poles~~	GWL above 0.6 mbgl for heavily trafficked roads GWL above 0.4 mbgl for all other roads,	~~All roads are highly sensitive to damage~~	n/a	All roads are highly sensitive to damage
Moderate	Damage sustained that can be repaired without any loss of functionality.	n/a	Streetlight and signal poles	Default value for all other roads. This is based on the present road condition related to widespread high groundwater.	n/a	n/a	
Low	Minor damage sustained that can be repaired through regular maintenance.	All road assets	All roads	n/a	n/a	n/a	
Very low	No loss of service or repairs	n/a	n/a	Streetlight and signal poles	n/a	n/a	

C4 AREAS OF ECOLOGICAL SIGNIFICANCE

Risks to areas of ecological significance will be assessed using the methods and outputs identified in Table C-4-1

Table C-4-1. Areas of ecological significance data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to areas of ecological significance	Aim 1, Aim 2	Important habitats, species or ecosystems	1. Location of ecological sites within South Dunedin - need to confirm availability of information. 2. Ecological assessment of South Dunedin - need to confirm availability of information.	Should data be available, this will be used to produce a physical risk assessment: **Physical risk:** Assess exposure to ecological areas. Vulnerability rating to be developed through workshop with environment team at DCC/ORC.	**Map:** Risk areas of ecological significance arising from hazards showing identified key features **Table:** Quantification of areas at risk **Report section:** Description of risk and impacts	Need to confirm availability of information regarding areas of ecological significance. Propose qualitative generic ratings through workshop with environment team at DCC/ORC.
Impacts arising from damage to areas of ecological assessment	Aim 2		High level assessment	Gather information from community engagement	**Report section:** Description of impacts including cascading risks	

SUMMARY OF ECOLOGY FOCUSSED DISCUSSION WITH DCC PARKS TEAM

South Dunedin has a lack of biodiversity, however there are pockets of ecological value in and around the area. The primary feature of ecological significance within South Dunedin is the coastal beaches. These are frequently visited by sea lions and marine birds and provide habitat for native reptiles. Common plant and bird species are likely to be present in the gardens of residential properties.

Within the local area are nature parks within the Caversham Area, this includes the Caversham Peripatus Reserve, Caversham Valley Bush Reserve, Sidney Park and Caversham Station Reserve. The Dunedin Town Belt, wider dune system, and Otago Peninsula are also relevant ecological areas to South Dunedin. South Dunedin provides the land-link to the Otago Peninsula which has several breeding grounds/ habitats for local/ regional/ nationally important species. Preventing possums entering the soon-to-be possum free Peninsula is top priority for Predator Free Dunedin (DCC coordinated conservation collective comprising 22 member organisations). While the vast urban and industrial areas of South Dunedin largely stop possum movement, a corridor of vegetation along the coast creates another pathway.

C5 RAIL INFRASTRUCTURE

Risks to rail will be assessed using the methods and outputs identified in Table C-5-1

Table C-5-1 Rail infrastructure data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to rail infrastructure	Aim 1 in part (exposure only) Aim 2	Railway line Other (e.g. buildings, structures, equipment, land, yards to support the rail lines)	1. Rail locations 2. Rail vulnerability information in relation to the hazards	Physical exposure: Rail exposure to hazards The risk assessment will be informed by exposure only.	**Map:** Rail exposure	
Impacts arising from loss or damage to rail	Aim 2		High level assessment	High level description of impacts arising from loss of rail services.	**Report section:** Description of impacts including cascading risks	If risks to rail and associated services become too high, it is presumed that KiwiRail will develop their own adaptation management plans.

Rail exposure ratings are based on tables in Section, with the exception of Groundwater exposure. The following exposure thresholds have been used:

Extreme	Emergent groundwater (median)
High	Groundwater level higher than 0.6 mbgl
Moderate	
Low	Groundwater level lower than 0.6 mbgl
Very low	

C6 WATER SUPPLY INFRASTRUCTURE

Risks to water supply infrastructure will be assessed using the methods and outputs identified in Table C-6-1.

Table C-6-1 Water supply infrastructure data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to water supply infrastructure	Aim 1, Aim 2	Feature classification to be based on DCC criticality rating (e.g. Above and below ground water supply infrastructure: Regionally significant, locally significant, Local)	1. Level of service - need to confirm availability of information, see assumptions. 2. Condition - need to confirm availability of information, see assumptions. 3. Material and age	**Physical risk:** Assess exposure Workshop with 3 waters team at DCC to agree: Key feature classification: Regionally significant, locally significant, local Vulnerability rating.	**Map:** Risk to water supply arising from hazards showing identified key features **Table:** Quantification of areas at risk **Report section:** Description of risk and impacts	Need to confirm availability of information: 1. – 2. Propose follow up workshop with three waters team at DCC to gather any available material data or undertake qualitative generic vulnerability ratings.
Impacts arising from damage to water supply infrastructure	Aim 2		High level assessment	Gather information from community engagement	**Report section:** Description of impacts including cascading risks	

SUMMARY OF WORKSHOP: WATER SUPPLY

KEY FEATURES

Key features were agreed through workshop with DCC staff:

- Criticality rating (from ISP).
- Somerville Street Water Pumping Station.
- Somerville Distribution mains (from treatment plant that feeds Somerville).

WATER SUPPLY INFRASTRUCTURE VULNERABILITY TO FLOODING

Pluvial and coastal flooding: LoS damage may occur if buried air valves are damaged and result in floodwater entering system due to negative pressure (this is a rare event and requires multiple issues to occur).
Pump station: Flooding may interrupt site access, meaning if a problem were to occur it could not be fixed.

VULNERABILITY RATINGS WATER SUPPLY

Table C-6-2 Vulnerability ratings for all Water Supply Assets

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	Vulnerability considerations	**Network unlikely to be vulnerable to flooding.**	**Network unlikely to be vulnerable to flooding.**	**Network unlikely to be vulnerable to groundwater rise.**	**All assets are highly vulnerable**	**All assets are highly vulnerable**	**All assets are highly vulnerable Or Material Age (experience from the 2011 Christchurch Earthquake sequence found that ageing pipes of asbestos cement (AC) or Cast Iron (CI) were the most susceptible to damage).**
Extreme	Sudden collapse/failure causing potential risk to life.				Criticality 5	Criticality 5	

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	For example house/culvert collapse putting people's lives at risk.						
High	High damage likely and loss of service with lengthy time to restore to operation (months).				Criticality 3-4	Criticality 3-4	Highly sensitive to damage unless foundations are specifically designed
Moderate	Moderate damage likely or possible although only short to medium time to restore to operation (less than one month).				Criticality 1-2	Criticality 1-2	
Low	Minor damage sustained although it does not impact the operation of the asset.						
Very low	No damage or loss of service	All parts of network	All parts of network	All parts of network			

C7 STORMWATER AND WASTEWATER INFRASTRUCTURE

Risks to wastewater will be assessed using the methods and outputs identified in Table C-7-1Table C-7-1.

Table C-7-1. Wastewater infrastructure data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to wastewater infrastructure	Aim 1, Aim 2	Above and below ground water supply infrastructure: Regionally significant, locally significant, Local	1. Level of service -, see assumptions. 2. Condition - see assumptions. 3. Material and age.	**Physical risk:** Assess exposure Workshop with 3 waters team at DCC to agree: Key feature classification: Regionally significant, locally significant, local Vulnerability rating	**Map:** Risk to waste water arising from hazards showing identified key features **Table:** Quantification of areas at risk **Report section:** Description of risk and impacts	Need to confirm availability of information: 1. – 2. Propose follow up workshop with three waters team at DCC to gather any available material data or undertake qualitative generic vulnerability ratings.
Impacts arising from damage to wastewater infrastructure	Aim 2		High level assessment	Gather information from community engagement	**Report section:** Description of impacts including cascading risks	

Risks to stormwater will be assessed using the methods and outputs identified in Table C-7-2.

Table C-7-2. Stormwater infrastructure data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to stormwater infrastructure	Aim 1, Aim 2	Above and below ground water supply infrastructure: Regionally significant, locally significant, Local	1. Level of service - see assumptions. 2. Condition - see assumptions. 3. Material and age	**Physical risk:** Assess exposure Workshop with 3 waters team at DCC to agree: Key feature classification: Regionally significant, locally significant, local Vulnerability rating	**Map:** Risk to stormwater arising from hazards showing identified key features **Table:** Quantification of areas at risk **Report section:** Description of risk and impacts	Need to confirm availability of information: 1. – 2 Propose follow up workshop with three waters team at DCC to gather any available material data or undertake qualitative generic vulnerability ratings.
Impacts arising from damage to stormwater infrastructure	Aim 2		High level assessment	Gather information from community engagement	**Report section:** Description of impacts including cascading risks	

SUMMARY OF WORKSHOP: STORMWATER AND WASTEWATER

KEY FEATURES

Key features were agreed through workshop with DCC staff:

- Criticality rating (from ISP).
- Musselburgh WW pump station.
- Tahuna WWTP.
- Tainui SW pump station (on same site as WW pump).
- Portobello sw pump station.
- Portobello Road Screens.
- All flap gates.
- WW Pump station - Marne St Pump station (overflow pump station which pumps to Musselburgh).

8.1.1.1 VULNERABILITY RATINGS WW & SW

Vulnerability ratings WW & SW Pipes & Manholes/nodes (all criticality ratings).

Liquefaction can impact water infrastructure by deforming underground systems, such as water supply, wastewater, and stormwater networks. Ground settlement or stretching may damage or disconnect pipes and chambers and subsequent inflow of sediment can cause blockages. Buoyancy can cause uplift of buried structures, and disrupt drainage systems, while sediment discharge can reduce water quality and affect aquatic habitats.

Table C-7-3. WW & SW Pipes & Manholes/nodes (all criticality ratings)

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	Failure mode	LoS failure mode & damage	LoS failure mode	LoS failure mode NB: MH have same rating as adjacent pipe	Damage failure mode	Damage failure mode	Damage failure mode
	Vulnerability considerations	Pipe surcharging results in widespread reduction in LoS which results in environmental contamination and associated breaches of consent conditions.	Pipe surcharging results in widespread reduction in LoS which results in environmental contamination	Material and/or age are the main factors determining pipe vulnerability. Cracks and leaky joints mean groundwater inflows will enter system and reduce pipe capacity. The extent of this reduction in pipe	All assets are highly vulnerable	All assets are highly vulnerable	All assets are highly vulnerable Or Material Age (experience from the 2011 Christchurch Earthquake sequence found that ageing pipes of asbestos cement (AC) or Cast Iron (CI) were the most susceptible to damage).

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
		Increase in the severity of scour damage to surrounding areas in steep zones.		capacity is currently under investigation. Pipe infiltration also draws down groundwater level.			
Extreme	Damage failure mode: WW Physical damage to level 5 Criticality asset, Level of service failure mode: Sustained level of service reduction resulting in a failure to meet minimum standards (e.g. capacity reduction to the limit of functionality)			WW - All non-plastic based pipes that have past their useful life	WW -Criticality 5	WW -Criticality 5	WW All non-plastic based pipes that have past their useful life
High	WW Physical damage to level 3 & 4 Criticality asset, Level of service failure mode: Event based level of service reduction resulting in a failure to meet minimum standards (e.g. consent condition breach)	WW-All wastewater pipes: Level of service	WW - All pipes: Level of service	SW, WW - All plastic based pipes that have past their useful life	WW - Criticality 3-4 SW – Criticality 3-5	WW – Criticality 3-4 SW – Criticality 3-5	WW All plastic based pipes that have past their useful life SW All pipes past their useful life
Moderate	Damage sustained that can be repaired within short timeframes (days / weeks).	SW-Damage to pipe & nodes: Steep zone Sandringham St and Forbury Rd	n/a	SW, WW – Pipes within their useful life that were installed before 1960 Non-plastic based pipes that are within the last 1/3 of useful life	WW – Criticality 1-2 SW - Criticality 1-2	WW - Criticality 1-2 SW - Criticality 1-2	Pipes within their useful life that were installed before 1960 Non-plastic based pipes that are within the last 1/3 of useful life
Low	Level of service failure mode: Minor damage sustained that can be repaired through regular maintenance.	n/a SW All pipes: Level of service	SW - All pipes	SW, WW - Non-plastic based pipes within first 2/3 of useful life	n/a	n/a	Non-plastic based pipes within first 2/3 of useful life
Very low	No loss of service or repairs	Damage to pipe & nodes: all other areas	n/a	SW, WW - Plastic based pipes within their useful life that were installed after 1960 Non-plastic based pipes within first 1/3 of useful life	n/a	n/a	Plastic based pipes within their useful life that were installed after 1960 Non-plastic based pipes within first 1/3 of useful life

WW & SW Pump stations (Musselburgh WW, Portobello SW, Tainui SW)

Table C-7-4. WW & SW Pump stations

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	Vulnerability considerations	Flooding of SW pump stations may damage the switchboard, resulting in pump station failure. Flooding of Musselburgh Pump Station may flood the dry well, resulting in failure of the pump station. This would mean flows could not be pumped to sea, resulting in very high consequence.		The main issue relates to groundwater infiltration into the drywell, however as this is a slow process leaks will be detected and fixed with no risk to the function.	All assets are highly vulnerable	All assets are highly vulnerable	Extremely sensitive to damage unless foundations are specifically designed
Failure mode		Damage failure mode	Damage failure mode	LoS failure mode	Damage failure mode	Damage failure mode	Damage failure mode

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Extreme	Sudden collapse/failure causing potential risk to life. e.g. wastewater pump station failure causing extensive flooding and contamination.	Musselburgh Pump Station: depth >0 (including criticality +1)	Musselburgh Pump Station: depth >0 (including criticality +1)				
High	High damage likely and loss of service with lengthy time to restore to operation (months).	SW pump stations: depth >0 (including criticality +1)	SW pump stations: depth >0 (including criticality +1)		All assets	All assets	All assets
Moderate	Moderate damage likely or possible although only short to medium time to restore to operation (less than one month).				n/a	n/a	n/a
Low	Minor damage sustained although it does not impact the operation of the asset.	All other pump stations	All other pump stations		n/a	n/a	n/a
Very low	No damage or loss of service			All pump stations	n/a	n/a	n/a

Table C-7-5.Tahuna WWTP

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	Vulnerability considerations	Flood water may cause damage and prevent operation. Flooding is likely to trigger the emergency bypass, which would reduce consequence of failure.	Salinity and debris may cause damage or blockages. High salinity loading may wash out treatment plant.	Loss of level of service and increasing salinity entering WWTP resulting from damage to the network.	All assets are highly vulnerable	All assets are highly vulnerable	Extremely sensitive to damage unless foundations are specifically designed
Extreme	Sudden collapse/failure causing potential risk to life. For example house/culvert collapse putting people's lives at risk.						~~Extremely sensitive to damage unless foundations are specifically designed (tbc with SDF Liquefaction specialist)~~
High	High damage likely and loss of service with lengthy time to restore to operation (months).	Flood depth > 0 (including criticality +1)	Flood depth > 0 (including criticality +1)		All assets	All assets	All assets
Moderate	Moderate damage likely or possible although only short to medium time to restore to operation (less than one month). Repair works would reinstate to original design only (i.e. no betterment) at the existing location.			Moderate sensitivity to increasing salinity in inflows. (including criticality +1)	n/a	n/a	n/a
Low	Minor damage sustained although it does not impact the operation of the asset.				n/a	n/a	n/a
Very low	No damage or loss of service				n/a	n/a	n/a

Table C-7-6. Flap gates and outlet

Vulnerability	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Vulnerability considerations	Not specifically assessed	Not specifically assessed	Not specifically assessed	Flap gates and outlets are located at the coastal edge within the seawall. If the seawall is performing as designed there is unlikely to be any change in vulnerability of the flap gates and outlets. Same vulnerability as seawall (low / very low on harbourside).	Not specifically assessed	Not specifically assessed
Extreme	n/a	n/a	n/a		n/a	n/a
High	n/a	n/a	n/a		n/a	n/a
Moderate	n/a	n/a	n/a		n/a	n/a
Low	n/a	n/a	n/a		n/a	n/a
Very low	n/a	n/a	n/a	All harbourside outlets	n/a	n/a

C8 CONTAMINATED LAND

Risks to contaminated land will be assessed using the methods and outputs identified in Table C-8-1.

Table C-8-1. Solid waste and contaminated sites data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to contaminated land	Aim 1, Aim 2	Closed landfills Contaminated sites	1. HAIL register 2. Cap thickness - see assumptions. 3. Cap material - see assumptions. 4. Waste material type - see assumptions. 5. Closure dates - see assumptions. 6. Size of landfill - see assumptions. 7. Volume of landfill - see assumptions.	**Physical risk:** Assess exposure to site. Vulnerability rating to be developed through workshop with property / planning team at DCC.	**Map:** Risk to solid waste and contaminated sites arising from hazards showing identified key features **Table:** Quantification of areas at risk **Report section:** Description of risk and impacts	Need to confirm availability of information for: 2. – 7. Propose follow up workshop with contaminated land team at DCC to gather any available material data or undertake qualitative generic vulnerability ratings.
Impacts arising from damage to contaminated sites	Aim 2		High level assessment	Gather information from community engagement	**Report section:** Description of impacts including cascading risks	

SUMMARY OF WORKSHOP: SOLID WASTE AND CONTAMINATED SITES

DATA AVAILABILITY

Potentially contaminated sites are those identified in the Hail register. This register has limitations with data relating to both completeness, (i.e. not all sites have been identified) and some sites are unable to be identified (due to other contaminates are not identified e.g. lead paint on buildings). Data records show which sites have been investigated (some have been tested to not be contaminated)

KEY FEATURES

Key features were agreed through workshop with DCC staff:

- Kettle Park.
- Gas Works.
- Industrial area.
- Residential area.

CONTAMINATED SITES VULNERABILITY TO PLUVIAL FLOODING AND COASTAL INUNDATION

Saturation of contaminated sites may result in discharge of contaminated water. However, most events will be short infrequent events that are unlikely to drive contamination transport. If contaminant transport were to occur, it is expected that floodwater will also be contaminated by other contaminants of potentially larger magnitude e.g. wastewater overflows.

Transport of contaminants may also occur via erosion. The potential for eroding is considered low due to an assumed low velocity of flood water.

CONTAMINATED SITES VULNERABILITY TO GROUNDWATER

Contaminated sites are likely to be increasingly exposed to higher groundwater levels. Where near surface contamination is exposed to emergent groundwater there is potential for contamination to be transported, resulting in spread of contamination.

Contaminated sites within industrial areas tend to have higher contamination loading and are extremely vulnerable to emergent groundwater due to the potential for transport and exposure of contaminants. These sites have the potential for exposing workers and public. Widespread hardstand in these areas mean there is a greater tolerance for high (but not emergent) groundwater due to the presence of barriers between contamination and the surface.

The nature of contamination in residential areas is less severe, however activities carried out in residential areas tend to have a higher likelihood of interacting with the ground (vegetable gardens, sportsground (mud),... Consequences relating to residential contamination potentially may impact the health of residents e.g. vegetable gardens.

At a catchment scale, changing groundwater levels may result in increased infiltration of contaminants into SW/WW network.

CONTAMINATED SITES VULNERABILITY TO COASTAL EROSION

Coastal erosion is likely to increase over time and will exacerbate existing erosion issues at the Kettle Park Landfill. Erosion of these sites may result in contaminated material entering the receiving environment and may cause issues with land stability and integrity.

Contaminated sites are located adjacent to Andersons Bay Road however the presence of the seawall is expected to provide protection from coastal erosion.

CONTAMINATED SITES VULNERABILITY TO LANDSLIDE

Contaminated sites are vulnerable to landslide as this would cause damage and require clean up of the site. The damage is likely to be relatively limited, however the nature of the site contaminant would determine the consequences of the damage.

CONTAMINATED SITES VULNERABILITY TO LIQUEFACTION

IN AREAS WITH PRE-EXISTING CONTAMINATION, LIQUEFACTION CAN MOBILISE AND SPREAD HAZARDOUS SUBSTANCES BY EJECTING CONTAMINATED SOIL OVER A WIDER AREA. THIS INCREASES ENVIRONMENTAL AND PUBLIC HEALTH RISKS AND COMPLICATES SUBSEQUENT REMEDIATION EFFORTS. CONTAMINATED SITES VULNERABILITY RATING

The below vulnerability rating table was developed and agreed through workshop with the roading team at DCC.

Unless otherwise noted, all key features are to be assessed using the same vulnerability rating criteria.

Table C-8-2: Contaminated sites vulnerability criteria

Vulnerability		Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
	Vulnerability considerations	Contaminated sites have low vulnerability to flooding in South Dunedin. Mobilisation of contaminants is likely to be lower or a similar level of contamination to contamination from other sources. The generally flat terrain means scour and erosion are uncommon.		Potential for transport and exposure of contaminants under emergent groundwater. Industrial contaminated sites have higher contaminant loading, but widespread paving provides a barrier to below surface groundwater.	All assets are highly vulnerable	All assets are highly vulnerable	All assets are highly vulnerable
Extreme	Permanent damage and/or widespread mobilisation of severe contaminants through new pathways.	n/a	n/a			n/a	n/a
High	Remediable damage and/or widespread permanent mobilisation of less severe contaminants through new pathways.	n/a	n/a	Industrial sites: GWL emergent Residential sites: GWL 0-0.3 mbgl	All sites	All sites	
Moderate	Temporary mobilisation of moderate contaminants / mobilisation through existing pathways	n/a	n/a	Residential sites: GWL 0.3-1 mbgl	n/a	n/a	All sites
Low	Temporary mobilisation of contaminants through existing pathways	All sites	All sites	n/a		n/a	n/a
Very low	No damage	n/a	n/a	Industrial sites GWL < 0mbgl Residential sites: GWL < 1mbgl	n/a	n/a	n/a

C9 TELECOMMUNICATION INFRASTRUCTURE

Risks to telecommunication infrastructure will be assessed using the methods and outputs identified in Table C-9-1.

Table C-9-1. Telecommunication infrastructure data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to Tele-communication infrastructure	Aim 2	Critical assets	Geospatial telecommunication data to be provided by Chorus – see limitations	**Physical risk:** Assess exposure to site. Vulnerability rating to be developed through workshop with Chorus.	**Map:** Critical assets **Report section:** Description of risk and impacts	Location of exchange site provided by Chorus. Lines information not shared.

The telecommunications network within south Dunedin comprises the lines and South Dunedin Exchange site (Melbourne St).

Key features:

- Lines.
- South Dunedin Exchange (1 site within South Dunedin, corner Melbourne St & King Edward St).

RISK TO THE TELECOMMUNICATIONS NETWORK

As a network, telecommunications is relatively resilient due to redundancy that is built into the system. Telecommunications have high adaptive capacity due to regular renewal and ease of reinstatement. Risk to the provision of telecommunications is primarily dependent on the availability of power and roads.

Risk to specific assets has not been assessed due to the following points:

- Site specific risk to the South Dunedin Exchange is assessed alongside other buildings and identified as a key feature in the risk to buildings assessment.
- Location of lines are not available, but follow roads.

VULNERABILITY OF THE TELECOMMUNICATIONS NETWORK

Lines are not sensitive to flooding as they are buried and not exposed. Floodwater ingress could be a major issue for exchange sites. However, sites are easy to retrofit (status of South Dunedin site is unconfirmed but Chorus is in the process of improving site resilience across the network). The South Dunedin exchange is an Access exchange. That means if the site was flooded (if our remedial measures proved insufficient) it would result in a loss of service to South Dunedin customers: the Access function in exchanges is not duplicated elsewhere and so is vulnerable to loss of the site.

Groundwater ingress is an issue for copper lines. The copper network is being phased out in areas where fibre is available.

The network is vulnerable to destructive hazards (coastal erosion, landslide, and liquefaction), but no more so than other services. The primary vulnerability relates to the dependency on road access and power supply. Telecommunications equipment requires power to operate. For most modern telecommunications services, power is needed at the exchange and the end-users' premises, whilst copper connections require power to the exchange, to cabinets in the street, and to powered devices in the end-users' premises. . Some copper connections remain in South Dunedin. This may decrease as the copper network is phased out in areas where fibre is available. .

The network is easy to rebuild, giving it a high adaptive capacity. Chorus seek to build redundancy into their network, The Dunedin area operates as a network where damage or loss of a single exchange would be compensated for through the wider network. In addition, two containerised exchange sites ('Meow') have been set up which could be commissioned if damage occurred to the South Dunedin Exchange.

There is a potential for retreat creating isolated services, or reduced density of services resulting in relatively high cost within an area. This may result in infrastructure that is too expensive to service.

C10 ENERGY

Risks to telecommunication infrastructure will be assessed using the methods and outputs identified in Table C-10-1Table C-10-1.

Table C-10-1. Electricity transmission and distribution data availability, method, outputs and limitations

Risk	Supports	Key features	Vulnerability criteria data availability	Proposed method	Output	Limitations / uncertainties / assumptions
Physical risk to energy	Aim 2	Critical assets	Geospatial transmission and distribution data to be provided by Transpower and Aurora – see limitations	**Physical risk:** Assess exposure to site. Vulnerability rating to be developed through workshop with Aurora and Transpower.	**Map:** Critical assets **Report section:** Description of risk and impacts	Locations of critical assets provided by Aurora and Transpower

KEY FEATURES:

- Transpower GXP: South Dunedin.
- Transpower: Transmission lines.
- Aurora Substations: Andersons Bay, Carisbrook, St Kilda.
- Aurora 33kV Buried.
- Aurora Overhead lines.

CONSEQUENCE / CRITICALITY

Transpower considers South Dunedin substation to be nationally significant based on to it being part of the South Island 'black start' plan, regionally significant based on the number of power connections (~21,000 ICPs - Installation Control Points)

No additional comments have been provided by Aurora or Gas facilities.

ADAPTIVE CAPACITY

Considerations that may be relevant to adaptation planning:

- Transpower applied to the Commerce Commission for resilience funding for 2025-2030, including some potential funding for South Dunedin. The Commerce Commission approved some funding to mitigate substation flooding in their final determination, with options for Transpower to request additional funding later.
- Transpower published a Transpower Adaptation Plan in September 2024, which sets out action areas and high-level actions to both deliver climate resilience and adaptive capacity, and further develop their organisational adaptation planning.
- Transpower is planning to apply dynamic adaptive pathways planning for transmission infrastructure in South Dunedin. This will consider replacement, upgrade, or resilience work planned or forecast, and should provide sufficient adaptive capacity. Transpower would look to integrate it's planning with Aurora and South Dunedin Future adaptation planning later in that process.

VULNERABILITY

Table C-10-2: Overhead transmission lines (Transpower)

Vulnerability	Pluvial flooding	Coastal inundation	Groundwater level (GWL)	Coastal erosion	Landslide	Liquefaction
Vulnerability considerations	Poles & towers in South Dunedin have very low sensitivity to pluvial flooding.	Poles & towers may be sensitive to coastal inundation and associated potential wave action and salinity.	Poles & towers may be sensitive to waterlogged soils as a result of rising groundwater, which can cause instability. Unlikely to be vulnerable from a service perspective, as this is a chronic risk with impacts that can be managed over time	Poles may be damaged if impacted severely and directly. However, lines are not exposed and therefore not a credible risk for Transmission assets in South Dunedin	Landslide may damage or cause failure of tower or pole. Qualitatively indicating slightly higher vulnerability for poles due to smaller foundation footprint.	Liquefaction may cause pole or tower instability. The transmission network has performed well during past seismic events. Even if damage does occur, this may not result in interruption to service, and may only require repairs. Qualitatively indicating slightly higher vulnerability for poles due to smaller foundation footprint.
Extreme	n/a	n/a	n/a	n/a	Poles sensitive to damage if impacted severely and directly (or n/a)	n/a
High	n/a	n/a	n/a	n/a	Towers are sensitive to damage if impacted severely and directly (or n/a)	n/a
Moderate	n/a	All poles and towers	n/a	n/a	n/a	Poles
Low	n/a	n/a	GWL >= 0. mbgl (groundwater level is emergent), and the poles/towers foundations are sufficient to withstand permanently high groundwater.		n/a	Towers
Very low	All poles and towers	n/a	All other poles and towers (when groundwater is not emergent).	n/a	n/a	n/a

Table C-10-3: Overhead distribution lines (Aurora) - towers / poles vulnerability criteria

Vulnerability	Pluvial flooding	Coastal inundation	Groundwater level (GWL)	Coastal erosion	Landslide	Liquefaction
Vulnerability considerations	Poles & towers may be sensitive to waterlogged soils as a result of flooding, which can cause failure.	Poles & towers may be sensitive to waterlogged soils as a result of flooding, which can cause failure.	Poles & towers may be sensitive to waterlogged soils as a result of rising groundwater, which can cause instability. Unlikely to be vulnerable from a service perspective, as this is a chronic risk with impacts that can be managed over time	Poles may be damaged if impacted severely and directly.	Landslide may damage or cause failure of tower or pole. Qualitatively indicating slightly higher vulnerability for poles due to smaller foundation footprint.	Liquefaction may cause pole or tower instability. The transmission network has performed well during past seismic events. Even if damage does occur, this may not result in interruption to service, and may only require repairs. Qualitatively indicating slightly higher vulnerability for poles due to smaller foundation footprint.
Extreme	n/a	n/a	n/a	Poles sensitive to damage if impacted severely and directly (or n/a)	Poles sensitive to damage if impacted severely and directly (or n/a)	n/a
High	n/a	n/a	GWL > 0.3 mbgl (groundwater level is higher than 300 mm below ground level), and the poles/towers foundations are not sufficient.	n/a	Towers are sensitive to damage if impacted severely and directly (or n/a)	n/a
Moderate	All poles and towers	All poles and towers	n/a	n/a	n/a	Poles
Low	n/a	n/a	All other poles and towers	n/a	n/a	Towers
Very low	n/a	n/a	n/a	n/a	n/a	n/a

Table C10-4: Underground cables (Aurora)

Vulnerability	Pluvial flooding	Coastal inundation	Groundwater level (GWL)	Coastal erosion	Landslide	Liquefaction
Vulnerability considerations	Cables are not affected by surface flooding unless located in steeply sloping locations where erosion may occur.	Cables are not affected by surface flooding but terminations in Substations may be susceptible.	Buried cables are designed to resist moisture - vulnerability low	Coastal erosion may expose and damage buried cables	Landslide may damage or cause failure of buried cables.	Liquefaction may cause damage to buried cables
Extreme	n/a	n/a	n/a	n/a	n/a	n/a
High	n/a	n/a	n/a	All cables	All cables	All cables
Moderate	n/a	n/a	n/a	n/a	n/a	n/a
Low	n/a	n/a	n/a	~~All cables~~	~~All cables~~	~~All cables~~
Very low	All cables	All cables	All cables	n/a	n/a	n/a

Table C10-5: Transmission (Transpower) substation

Vulnerability	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Vulnerability considerations	Flooding can potentially damage electrical equipment located on the ground surface such as control and comms equipment and cable terminations, leading to power outages. Power transformers are relatively robust to low-level flooding	Flooding can potentially damage electrical equipment located on the ground surface such as control and comms equipment and cable terminations, leading to power outages. Power transformers are relatively robust to low-level flooding	Unlikely to be vulnerable from a service perspective, as this is a chronic risk with impacts that can be managed over time. The substation is on reclaimed land, and we already see some subsidence at this site, which does not interrupt service.	If exposed, coastal erosion can cause extensive damage to assets on the exposed parts of sites. However, this is not a material risk for the South Dunedin substation due to site layout. Qualitatively less vulnerable as low % of assets on site may be impacted at once.	If exposed, landslides can cause extensive damage to assets on the exposed parts of sites. However, this is not a credible risk for the transmission network in South Dunedin.	The transmission network has performed well during past seismic events. Even if damage does occur, this may not result in interruption to service, and may only require repairs.
Extreme	n/a	n/a	n/a	n/a	n/a	n/a
High	If the site is exposed at flood depth >0.2m, this could start to affect some, but not all substation assets.	If the site is exposed at flood depth >0.2m this could start to affect some, but not all substation assets.	n/a	n/a	n/a	n/a
Moderate	n/a	n/a	n/a	n/a	n/a	n/a
Low	All other sites if exposed to flood depth <0.2 m.	All other sites if exposed to flood depth <0.2 m.	If ground water is near the surface, some assets could be affected, to differing degrees over time. Most likely to be managed proactively, limiting impacts.	Vulnerability of site is low because while some assets could be affected, assets are spread out over a larger site and most assets are located outside erosion extent. Individual assets exposed may have higher vulnerability than the site-level vulnerability. Or n/a if no exposure.	n/a	Liquefaction may cause damage to some assets at a site. This may be to different degrees and may not result in interruptions to service.
Very low	Based on a site-specific review of exposure extent and intensity at South Dunedin substation, sensitive transmission assets are located in minimally affected areas of the site, resulting in a very low service vulnerability for the scenarios assessed.	n/a	n/a	n/a	n/a	n/a

Table C10-5: Distribution (Aurora) substations

Vulnerability	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Vulnerability considerations	Flooding can potentially damage electrical equipment located on the ground surface such as control and comms equipment and cable terminations, leading to power outages. Power transformers are relatively robust to low-level flooding	Flooding can potentially damage electrical equipment located on the ground surface such as control and comms equipment and cable terminations, leading to power outages. Power transformers are relatively robust to low-level flooding	Unlikely to be vulnerable from a service perspective, as this is a chronic risk with impacts that can be managed over time. The substation is on reclaimed land, and we already see some subsidence at this site, which does not interrupt service.	If exposed, coastal erosion can cause extensive damage to assets on the exposed parts of sites. However, this is not a material risk for the South Dunedin substation due to site layout. Qualitatively less vulnerable as low % of assets on site may be impacted at once.	If exposed, landslides can cause extensive damage to assets on the exposed parts of sites. However, this is not a credible risk for the transmission network in South Dunedin.	The transmission network has performed well during past seismic events. Even if damage does occur, this may not result in interruption to service, and may only require repairs.
Extreme	n/a	n/a	n/a	n/a	n/a	n/a
High	Aurora zone substations 33/6.6 kV if the site is exposed at flood depth >0.2m. This could start to affect some, but not all substation assets. Types of assets more likely to be negatively affected include local power supply for the substation itself and secondary assets that are used to control the substation and lines. Potential for minor damage to other assets like switchgear and buildings. Primary assets like transformers not likely to be affected. This could interrupt service, however restoration times could be expected to be lower as only some assets affected.	Aurora zone substations 33/6.6 kV if the site is exposed at flood depth >0.2m. As per Pluvial flooding.	n/a	Aurora zone substations 33/6.6 kV.	Aurora zone substations 33/6.6 kV.	n/a
Moderate	Aurora zone substations 6.6/0.4 kV if the site is exposed at flood depth >0.2m	Aurora zone substations 6.6/0.4 kV if the site is exposed at flood depth >0.2m	n/a	Aurora zone substations 6.6/0.4 kV (small localised outages if exposed)	Aurora zone substations 6.6/0.4 kV (small localised outages if exposed)	All Aurora zone substations. Asset foundation movement may cause outages

Vulnerability	Pluvial flooding	Coastal inundation	Groundwater	Coastal erosion	Landslide	Liquefaction
Low	All other sites if exposed to flood depth <0.2 m.	All other sites if exposed to flood depth <0.2 m.	If ground water is near the surface, some assets could be affected, to differing degrees over time. Most likely to be managed proactively, limiting impacts.	n/a	n/a	n/a
Very low	n/a	n/a	n/a	n/a	n/a	n/a

APPENDIX D: MANA WHENUA RISK ASSESSMENT SUMMARY (DRAFT)

The following information has been provided by Aukaha to Kia Rōpine (February, 2025). Final reporting will be available in early-mid 2025:

A mana whenua risk assessment has been undertaken for the South Dunedin Future programme, which has identified and rated risks through a Kāi Tahu lens. Based on an analysis of cultural values, it takes a broad approach to risk. As well as risks to specific places and features important for the cultural associations to mana whenua, it considers risks to Kāi Tahu perspectives and values relating to wider environmental, social and economic factors in South Dunedin. This mahi was facilitated by Aukaha with guidance and validation from a panel of Kāi Tahu mana whenua representatives.

The risk assessment was conducted on a 'keep doing what we are doing' scenario, where no additional interventions are made to address the climate and hazard issues facing South Dunedin. The methodology has been aligned as far as possible with the wider Workstream 3 risk assessment, including an approach based on identifying risk elements, then assessing the level of vulnerability and exposure to those risks. Aukaka will be providing further detail regarding their methodology in a separate report. ical approach will follow in a separate and more detailed report on the mana whenua risk assessment.

MANA WHENUA VALUES

The starting point for identifying mana whenua risk was to examine mana whenua values relating to South Dunedin. A series of wānaka involving the mana whenua panel was used to formulate a cultural values framework for South Dunedin Future. This framework was built on the foundations laid by Te Taki Haruru, the Māori Strategic Framework developed to operationalise the Dunedin City Council Treaty of Waitangi partnership with mana whenua.

The key principles and key values of Te Taki Haruru are set out in Table D1, along with an articulation of these in the South Dunedin context.

Several related mana whenua values and cultural practices were also identified for the South Dunedin Future programme, associated with the four key Te Taki Haruru principles/values. These related values and practices also helped with the development of mana whenua risk factors. More detail on these will be provided in the separate mana whenua risk assessment report to follow.

Table D1: Te Taki Haruru Values in South Dunedin

Key Principle	Key Value	South Dunedin Context
Autūroa	Mana (Rakatirataka, authority, responsibility)	Mana whenua are decision-makers in relation to te taiao, including how wai is managed, in adaptation responses to climate change and in management approaches to Three Waters. Mana whenua are leaders able to influence decisions affecting the social and economic wellbeing of South Dunedin, with a focus on building empowered, connected and resilient communities. Use of Kāi Tahu knowledge and reflections of Kāi Tahu identity are led and approved by Mana Whenua according to tikaka.
Auora	Mauri (Life force, vital essence)	The restoration and enhancement of the mauri of te taiao is an integral part in the South Dunedin programme. The restoration and regeneration of South Dunedin is guided by Kāi Tahu kaitiakitaka. Socio-economic and cultural well-being are at the heart of a just transition for the South Dunedin community. The hauora of the people and communities of South Dunedin are enhanced.
Autakata	Whakapapa (Genealogy, history, layers, connections)	Kāi Tahu traditions and connections, including to wai, whenua and moana, are recognised in the South Dunedin programme. Contemporary mana whenua relationships guide the journey to a just and equitable transition Mana whenua names and places are used and celebrated, along with Kāi Tahu design elements, to enhance sense of place and identity. Kāi Tahu mātauraka and tikaka inform planning and decision-making approaches.
Autaketake	Tapu and Noa (Safety, restoration of balance, restriction)	Human activities, including those relating to stormwater and wastewater, are managed to protect te taiao. Community safety and well-being are protected through responsible regulatory measures and other processes. Mana whenua will identify and lead the appropriate tikaka regarding tapu and noa.

MANA WHENUA RISK FACTORS & RATINGS

The South Dunedin Future Cultural Values Framework was used to identify mana whenua risk factors, set out in Table D3 below. Some of the risk factors are of a quantitative nature and draw on Workstream 3 data relating to the impact of modelled natural hazards on physical assets and socio-economic factors. Other risks are of a qualitative nature, including those relating to the Kāi Tahu mana whenua lived experience – such as perceptions of the Treaty partnership experience, ability to exercise rakatirataka or impacts on whakapapa associations to the South Dunedin area.

A risk assessment was undertaken for each risk factor set out in Table D3 below. The outcome of this exercise is set out in Figure D1 below, showing both vulnerability and exposure ratings for each risk factor. These risk ratings were aggregated up to the level of the four key Te Taki Haruru principles / values to give an overarching picture of risk. More detail on the methodology underpinning this will follow in the separate mana whenua risk report.

In describing the level of risk, Aukaha developed a vulnerability rating scale for each Te Taki Haruru principle. This aligns with the vulnerability ratings used across the wider Workstream 3 risk assessment, allowing the risks to mana whenua values to be meaningfully viewed alongside the other risks. The vulnerability ratings are set out in Table D2 below. The descriptors for these risk ratings also include representations in te reo Māori which, rather than necessarily being a direct translation, articulate the level of risk using te ao Māori concepts.

Risk exposure ratings were evaluated using both the geospatial data provided by as part of the wider Workstream 3 risk assessment; allowing distribution and likelihood of hazards to be inferred, and qualitative inputs from the mana whenua panel which captured their perceptions of the risk to values that are not tied to physical features or assets.

Table D2. Vulnerability Ratings for Te Taki Haruru Principles & Values

Autūroa - Mana		
Extreme	Rakatirataka lost, community disempowered	*He pokorehu, he whare puehu*
High	Rakatirataka compromised, community fragmented	*He ahi teretere, he whare tīwekaweka*
Moderate	Rakatirataka understood, community cohesion observed	*He ahi tāwhiri, he whare pūmahana*
Low	Rakatirataka asserted, community strengthened	*He ahi muramura, he whare ruruhau*
Very Low	Rakatirataka fully realised, community empowered and resilient	*He ahi kā roa, he whare taurikura, he āhuru mōwai*
Auora - Mauri		
Extreme	Mauri is depleted	*He mauri e mate ana*
High	Mauri is damaged	*He mauri e pakoki ana*
Moderate	Mauri is unchanged	*He mauri e noho ana*
Low	Mauri improves	*He mauri e tū ana*
Very Low	Mauri flourishes	*He mauri e puāwai ana*
Autakata - Whakapapa		
Extreme	Past/future connections to place broken	*Kua motu ngā aho o te taura takata ki inamata, ki anamata hoki*
High	Past/future connections to place diminished	*Kua tāwekoweko haere te taura takata*
Moderate	Past/future connections to place acknowledged	*Kua kitea te taura takata*
Low	Past/future connections to place improved	*Kua purutia te taura takata*
Very Low	Past/future connections to place strengthened & celebrated	*Kua whiria aukahatia te taura tangata, ā, kua whakanuia hoki ia*
Autaketake – Tapu & Noa		
Extreme	Tikaka & Kawa are trampled on	*Kua takahia a Tikaka rāua ko Kawa*
High	Tikaka & Kawa are ignored	*Kua waiho(tia) a Tikaka rāua ko Kawa*
Moderate	Tikaka & Kawa are known about but not actively utilised	*Kua mōhiotia noatia a Tikaka rāua ko Kawa*
Low	Tikaka & Kawa are utilised to maintain balance	*Kua whakamahia a Tikaka rāua ko Kawa hei whakanonoi i te taurite*
Very Low	Tikaka & Kawa are embedded into social structure and used to restore and maintain balance	*Kua whakatōria a Tikaka rāua ko Kawa ki ngā pūnaha maha, mā rāua kē te taurite e whakarauora*

MANA WHENUA RISK FINDINGS

The mana whenua risks identified are shown in Table D3. These were evaluated using the above methodology to clarify the risk ratings. The findings are summarised to a high level in Figure D1.

Table D3: Risks to mana whenua values in South Dunedin

Autūroa Mana	01. Risk that te tiriti partnership is not upheld 02. Risk of further disadvantaging communities that are currently disadvantaged and / or struggling 03. Risk to ahi kā / Rakatirataka and subsequent manaakitaka and kaitiakitaka responsibilities 04. Risk to Te Taki Haruru not being honoured or upheld 05. Risk to social and cultural connections of whānau and hapori
Auora Mauri	06. Risk to the protection of whenua, awa, moana, wāhi tapu, marae access, ara tawhito, archaological sites, mahika kai, hauora 07. Risk to te mana o te wai 08. Risk to the ki uta ki tai perspective
Autakata Whakapapa	09. Risk to mātauraka-ā-hapū, mātauraka-ā-iwi, tikaka-ā-iwi, tikaka-ā-hapū 10. Risk to economic capacity to adapt and thrive in an equitable manner 11. Risk to upholding the traditions, pūrākau and relations that weave mana whenua to te taiao 12. Risk to cultural landscapes 13. Risk of ongoing social isolation, social marginalisation to communities 14. Risk of overlooking intergenerational impacts (both past and potential future) of inequitable transitions
Autaketake Tapu & Noa	15. Risk to using / practicing of tikaka and kawa to restore and maintain balance

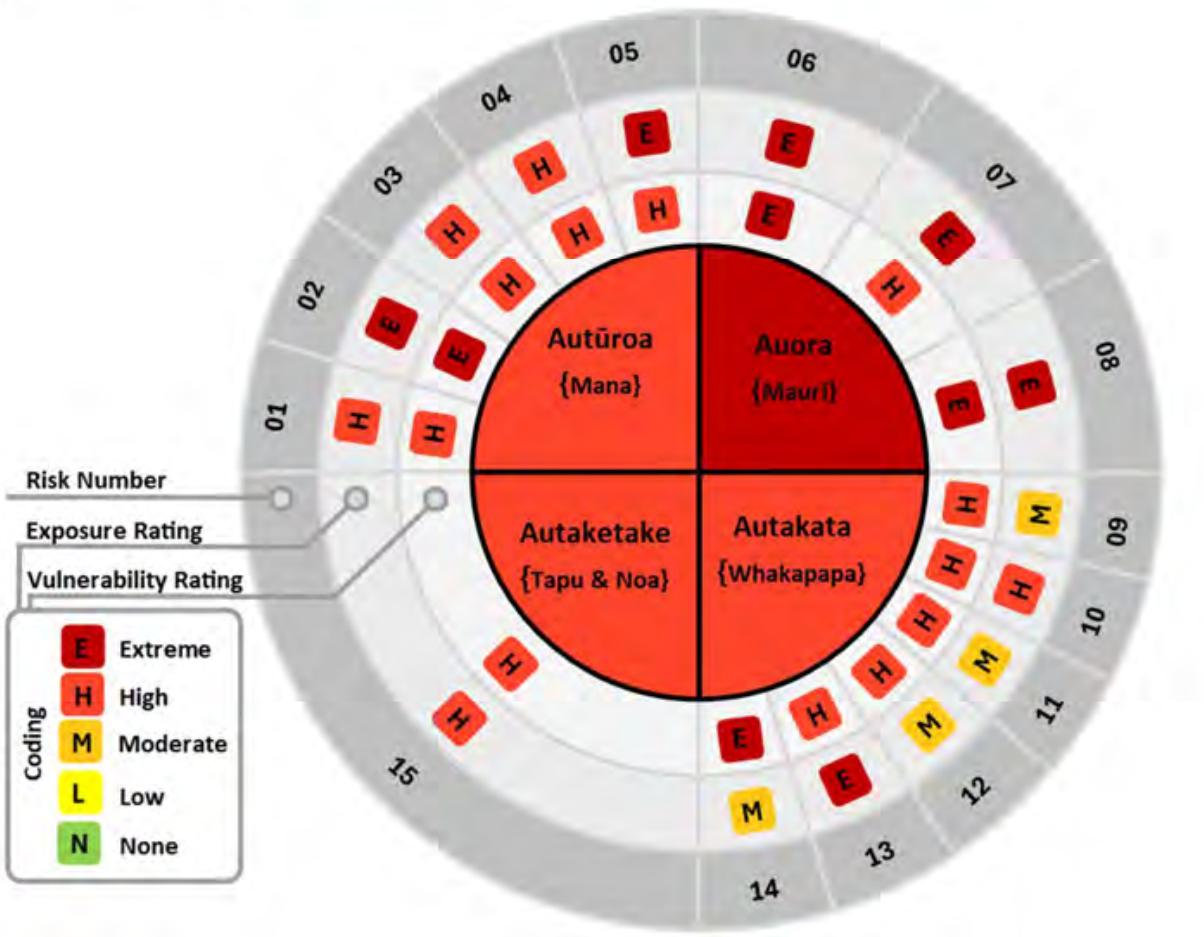


Figure D1: Combined risk to each Te Taki Haruru Principle / Value

The mana whenua risk assessment has shown that, from a Kāi Tahu perspective, there is substantial risk resulting from a 'keep doing what we are doing' scenario, where there are no

additional interventions to address the issues facing South Dunedin. The level of risk to all four Te Taki Harura values is significant, ranging from high (mana, whakapapa, tapu & noa) to extreme (mauri). The results from the mana whenua risk analysis support the case for change in response to the modelled natural hazards and climate risks.

APPENDIX E: GEOSPATIAL OUTPUTS

The geospatial files listed in Table E-1 accompany this report. Geospatial files should be viewed alongside the 'Readme' explanatory information in Table E-2.

Table E-1: Geospatial files that accompany the risk assessment

Element	File name	Source of base file	Date	Joined data	File description
Energy	Aurora_Substation_Risk	Aurora	Jun-24		Base file with spatial join data and risk assessment attributes added: Binary exposure assessment (refer Readme file) Exposure rating (refer Readme file) Vulnerability rating (refer Readme file) Risk rating (refer Readme file)
Energy	Aurora_Subtransmission_HV_OHConductor_Risk	Aurora	Jun-24		
Energy	Aurora_Subtransmission_HV_UGCable_Risk	Aurora	Jun-24		
Buildings	Buildings_Risk	DCC Rest server	Oct-23	Property, rate assessment property, key features	
Telecommunications	ChorusExchangeRisk	DCC Rest server	Oct-23		
Roads	CycleLanes_Risk	DCC Rest server	Oct-23		
Contaminated land	HAILSites_Risk	DCC Rest server	Oct-23	Land use	
Energy	NationalGridTransmissionLine_Risk	Transpower	Oct-23		
Parks	ParkLocations_Risk	DCC Rest server	Oct-23	Key features	
Railways	Railway_Exposure	DCC Rest server	Oct-23		
Roads	Roads_Risk	DCC Rest server	Oct-23	Criticality	
Sports fields	SportField_Risk	DCC Rest server	Oct-23		
Stormwater	StormwaterPipes_Risk	DCC Rest server	Oct-23	Criticality	
Three waters	ThreeWaters_PumpStations_Risk	DCC Rest server	Oct-23		
Three waters	ThreeWatersFacilities_TahunaWWTPOnly_Risk	DCC Rest server	Oct-23		
Energy	Transpower_Substation_Risk	Transpower	Oct-23		
Waste water	WastewaterPipes_Risk	DCC Rest server	Oct-23	Criticality	
Water supply	WaterPipes_Risk	DCC Rest server	Oct-23	Criticality	
Social demographics	SA1_BuildingRisk	Statistics New Zealand (via DCC Rest server)	Oct-23	Aggregated building risk	

Table E-2: Readme files that accompany the geospatial files

READ ME	
Acronym	**Description**
CE	Coastal erosion
CF	Coastal flooding
GW	Groundwater
LS	Landslide
PF	Pluvial flooding
OD	One dataset
PD	Present day
LQ	Liquefaction
Vuln	Vulnerability
Exp	Exposure
Risk	Risk
Med	Median
dep	depth
min	Minimum
SSP2_4_5	SSP2-4.5
SSP5_8_5	SSP5-8.5
Numbers (e.g. CF**_20_**2060_SSP2_4_5)	**_20_** Represents 20% AEP
Note the following scenarios relate to SLR increments	
Coastal Flooding Present Day (0 cm)	
Coastal Flooding 2060 SSP2 (30 cm)	
Coastal Flooding 2060 SSP5 (50 cm)	
Coastal Flooding 2100 SSP2 (60 cm)	
Coastal Flooding 2100 SSP5 (110 cm)	
Ground Water Level Present Day (0 cm)	
Ground Water Level 2060 SSP2 (30 cm)	
Ground Water Level 2060 SSP5 (50 cm)	
Ground Water Level 2100 SSP2 (60 cm)	
Ground Water Level 2100 SSP5 (100 cm)	
Coastal Erosion Present Day (0 cm)	
Coastal Erosion 2060 (30 cm)	
Coastal Erosion 2100 (150 cm)	

For some layers the exposure values represent a binary (0= not exposed, 1= exposed) value, and for others the value represents the proportion of the asset exposed (0= no exposure, 1= entire asset exposed). *Note: proportion of exposure for polygon layers can be supplied if desired.*	
Layer	**Exposure result type: Binary/Proportion**
Building footprint	Binary
Cycle lanes	Proportion
Park Locations	Binary
Roads	Proportion
Sport Fields	Binary
Stormwater Pipes	Proportion
Three Waters Facilities	Binary
Three Waters Pump Stations	Binary
Water Supply Pipes	Proportion
Wastewater Pipes	Proportion

South Dunedin Future Adaptation Workstream:
South Dunedin Future Programme Overview

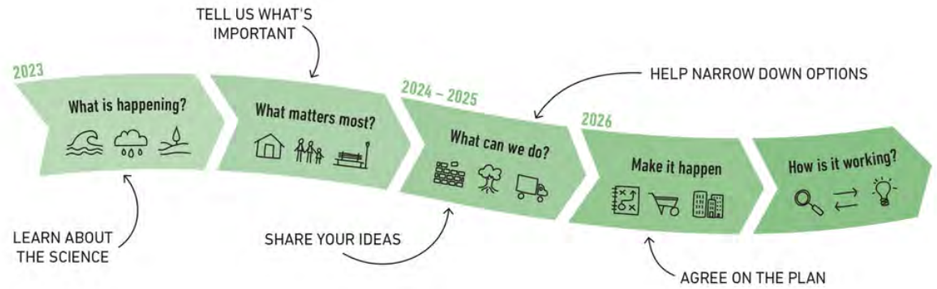
February 2025

South Dunedin Future

Adapting to our changing climate is a big challenge. South Dunedin Future (SDF) is a programme aimed at better understanding how the environment is changing, considering how that will affect us, and looking at what we can do about it.

Methodology Overview

The five stages of the SDF programme are summarised in the ribbon above, which captures the key questions relating to adaptation planning, as outlined in the Ministry for the Environment Coastal Hazards and Climate Change Guidance (2024). These are described below.



What is happening?

The initial stage of the SDF programme involved monitoring, investigation, and prediction work relating to a wide range of natural hazards affecting South Dunedin. The South Dunedin Risk Assessment summarises our current understanding of these hazards and outlines how they are expected to change over time, including in response to climate change.

What matters most?

The Risk Assessment also considers South Dunedin's exposure to these changing hazards, the vulnerability of things affected, and analyses the resulting risk – now and in the future. Understanding what is important and why allows an assessment of the consequences of risks to people, places, and assets in South Dunedin. This work considers many viewpoints and is informed by community engagement as well as a cultural values framework and assessment of risk from a mana whenua perspective. The Risk Assessment sets a risk baseline, providing a picture of what could happen to the things we value if appropriate action is not taken.

What can we do?

There are many things that can be done to adapt and reduce the level of risks affecting South Dunedin. Adaptation options are typically put into four categories – protect, accommodate, retreat, and avoid – each of which uses different ways to manage risk with each having a corresponding residual risk (the risk that remains with the option in place). This phase of the SDF programme seeks to determine the best mix of adaptation approaches for South Dunedin.

Drawing on best practice approaches from around the world, and ideas crowd-sourced from the community and stakeholders, a list of 16 generic approaches for helping South Dunedin adapt to flooding and future climate change was released in December 2023. These 16 approaches were consulted with the community in early 2024, with the feedback informing further analysis.

The 16 approaches have now been combined in different ways to form seven Potential Adaptation Futures for South Dunedin. They include a 'status quo' future - essentially the path we're currently on if we don't change anything - and six other futures representing a spectrum of responses, with a focus on infrastructure at one end and land use change at the other.

Visualisations of each of the seven potential futures are intended to show how South Dunedin could look in 75 years (end century) to inform further discussions with the community and stakeholders. The illustrations are based on best available information and expert analysis to date and offer a good early indication of where change might be required, what it could look like, as well as the potential implications of that change. The illustrations provide an understanding of what level of residual risk can be expected with each combination and this will in turn assist in identifying what is considered unacceptable risk for the South Dunedin community. In future phases, the viability of these futures and the limits of when further intervention is required will be further considered.

More work will occur over the next two years of the SDF programme, including detailed assessment of a shortlist and then preferred adaptation futures, which will confirm the locations, timing, scale and pathways for the recommended adaptation options. While a preferred future and pathway will be recommended through this work, the plan remains an adaptive one – allowing flexibility to shift to other pathways, accelerate or slow down as the climate and our communities change in order to avoid unacceptable risk. This will be documented in a final Adaptation Strategy for South Dunedin by December 2026.

Make it happen

Following completion of the final adaptation strategy for South Dunedin, and conclusion of the SDF programme, implementation will occur via a range of separate processes. This may include, for example, infrastructure investments, new council policies, and changes to the District Plan.

Is it working?

A range of processes will also be put in place to monitor progress, to determine how well the adaptation strategy is working, and whether changes are required to remain fit for purpose.

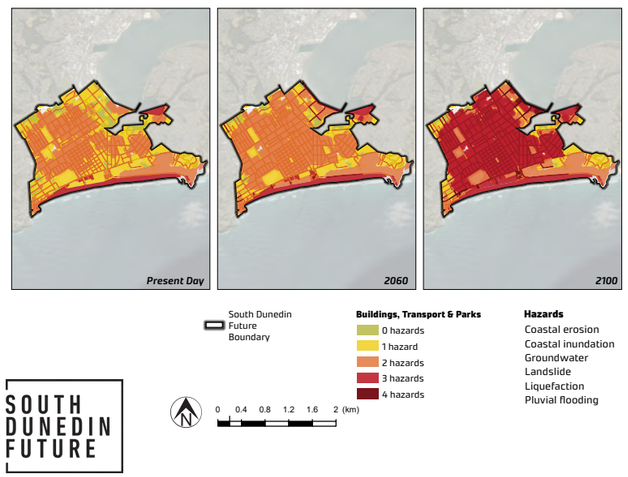
Immediate next steps

The next steps for the SDF programme include:

- Community engagement on the seven Potential Adaptation Futures.
- Refine the Potential Adaptation Futures into a shortlist of three or four futures and potential pathways to get there, followed by another round of community engagement.
- Further refine the shortlist of Potential Adaptation Futures into a preferred future and agreed pathway, supported by a final round of community engagement.
- Present the preferred adaptation future and pathways in an Adaptation Strategy for South Dunedin, which is expected by late-2026.

Summary of Risks to South Dunedin

Buildings, Parks & Transport



SOUTH DUNEDIN FUTURE

Summary of Risk Explainer: *These hotspot maps show locations in South Dunedin where buildings, roads, and parks are at high or medium risk due to one or more hazards. They show that many areas of South Dunedin are already subject to such risk from two or more hazards, which increases to three or more hazards over time, particularly on The Flat. Note: Illustrating an 'overall picture' of risk can be problematic in a South Dunedin context, given the large number of hazards assessed (6) and elements at risk (11) (i.e. 66 different risk layers would be needed, resulting in a convoluted image). Using a subset of selected risks can help illustrate a clearer overview. For example, buildings, roads, and parks are three elements at risk that collectively represent 100% of the geographical area in South Dunedin, so they offer a useful overview and can act as a proxy for identifying risk hotpots.*

Disclaimer: *These hotspot maps are intended to provide a visual overview of risk in South Dunedin but are not intended to be an accurate property-level assessment of risk, which requires much more detailed information and analysis. Using these hotspot maps in this way could lead to false or misleading conclusions about property-level risk (e.g. high risk areas may include many low risk properties, or the reverse).*

South Dunedin Future Adaptation Workstream:
Adaptation Planning Steps 1-5

Adaptation Planning Steps 1-5
Research and development of 16 adaptation approaches

The diagram to the right outlines how the SDF programme is moving through the five steps of "What can we do?" on the way to producing an Adaptation Strategy for South Dunedin.

Steps 1 & 2
Research on climate adaptation around the world was combined with ideas crowd-sourced from the community and stakeholders to develop 280 options consolidated into a list of 16 generic adaptation approaches. Community engagement on the 16 approaches occurred in early-2024.

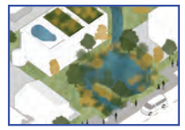

1. Ground Reinforcements

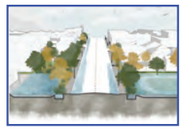

2. Ground water/ Lowering


3. Land Grading


4. Water Flow Improvements


5. Remove wastewater Network Overflow


6. Dedicated Water Storage


7. Floodable Infrastructure


8. Increase permeability


9. Coastal Protection


10. Behavioural/ Societal Changes


11. Readiness and Response


12. Property Interventions


13. Reactive Retreat


14. Managed Relocation


15. More Restrictive Standards


16. No New Development

Step 3: 7 Potential Adaptation Futures (Longlist)

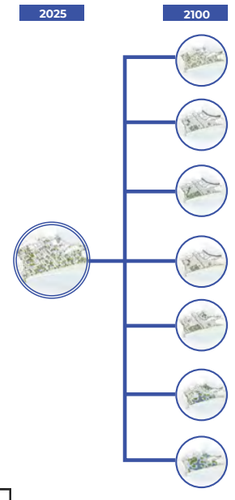
The 16 adaptation approaches have been refined and categorised as shown in the diagram on the next page, following community feedback and further technical analysis, then combined in different ways to form seven potential adaptation futures. Each of the seven possible adaptation futures represents what South Dunedin could look like in 75 years (the year 2100), noting that as conditions change over time, these futures could be realised earlier or later than 2100. Community engagement on the seven futures is planned for early-2025.

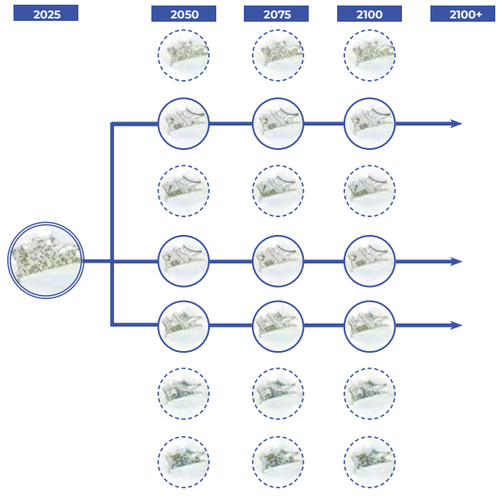
Step 4: 3-4 potential adaption futures and pathways (Shortlist)

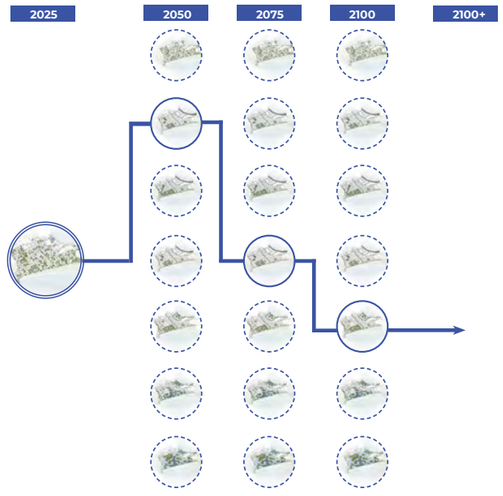
Feedback from community engagement, and further technical and economic analysis, will be used to refine the seven potential adaptation futures into a shortlist. Each of the shortlisted futures will include pathways showing what changes could look like at 2050, 2075, 2100 and beyond with more detailed information regarding the useful life for adaptation actions over time. New actions along the pathway begin when conditions signal the need for change. Community engagement on the shortlisted futures and pathways is planned for early-2026.

Step 5: Preferred adaptation futures and pathways

Feedback from community engagement and a final round of technical and economic analysis will be used to refine the shortlist into a preferred adaptation future and pathway. As shown, the other pathways still remain "on the table" if the climate or communities change in unexpected ways. Community engagement is planned for late-2026. The final version of the preferred adaptation future and pathway will be presented in an Adaptation Strategy for South Dunedin, which is expected by the end of 2026.







SOUTH DUNEDIN FUTURE

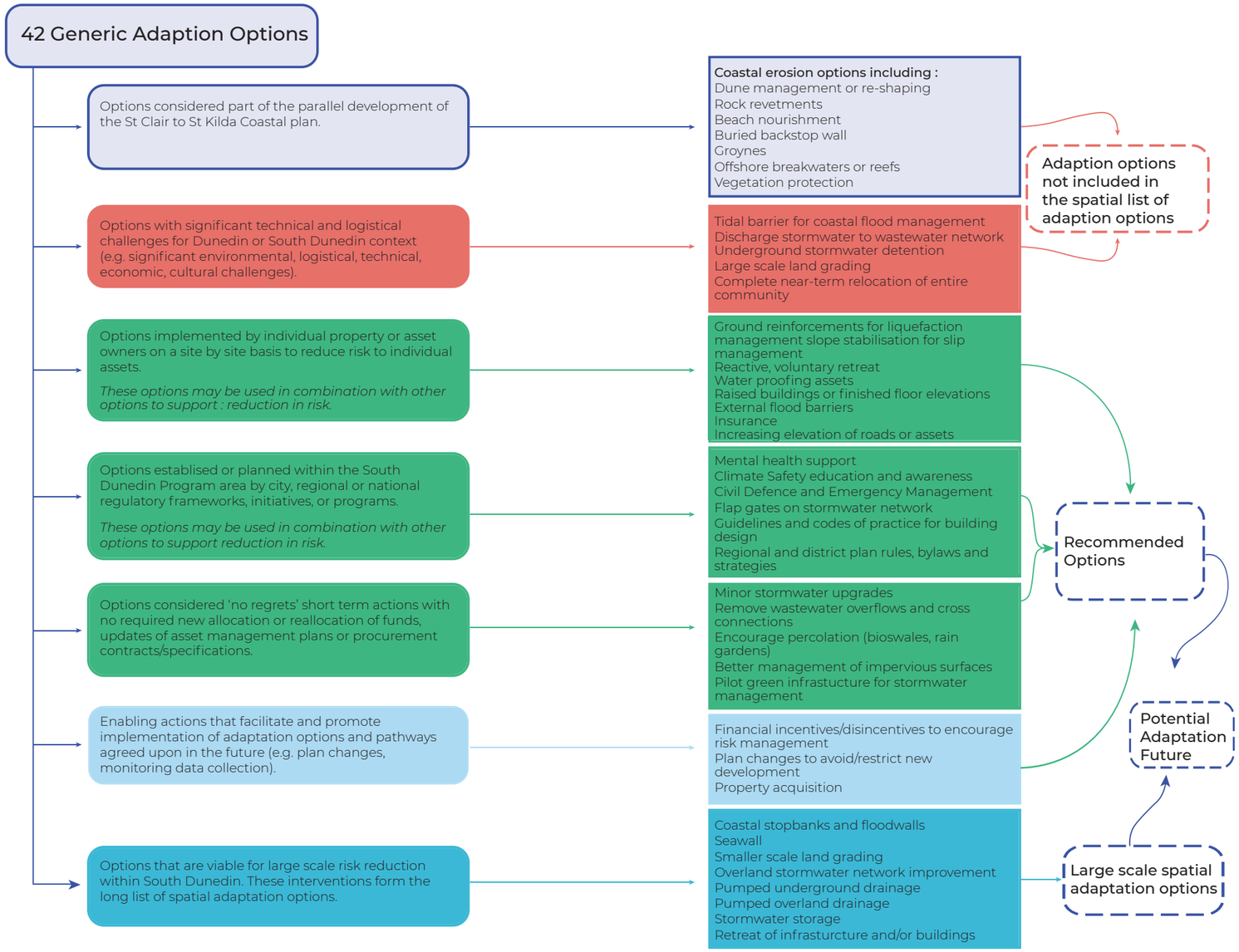
South Dunedin Future Adaptation Workstream:
Developing Potential Adaptation Futures

Developing Adaptation Futures

The seven potential adaptation futures developed during this stage reflect the spatial understanding of hazard and risk provided by the South Dunedin Risk Assessment (released February 2025). The Risk Assessment has highlighted the complex interrelated nature of the risks to South Dunedin and how they may change over time. It is clear that a holistic approach to the consideration of what we can do about the identified risks is needed and that there will be opportunities and implications with each, including the residual risk that remains (e.g. it is often not possible to completely eliminate risk, and 'residual risk' is the amount of risk remaining after efforts to reduce or eliminate it, such as the risk of a larger than planned flood event overtopping a stop bank).

A multi-step approach was used to develop adaptation futures starting with expanding the list of sixteen generic adaptation approaches to forty-two individual options. These options were screened to remove those considered in a parallel process in St. Clair/St Kilda (e.g., dune management or reshaping) as well as options that presented significant technical or logistic challenges rendering them not suitable (e.g., tidal barrier for coastal flood management).

The remaining options were divided into individual property-level interventions, existing or planned actions, recommended short-term actions, and viable community-scale interventions that could be effective into the long term. The viable community-scale interventions have been grouped into the seven potential adaptation futures, nothing that South Dunedin will continue to evolve in response to changing risks and communities beyond 2100.



SOUTH DUNEDIN FUTURE

South Dunedin Future Adaptation Workstream:
Potential Adaptation Futures Micro-business Cases Introduction

Summary of micro-business cases

The microbusiness cases provide an initial assessment of the potential adaptation futures. They serve as a tool for informed discussions with the community about how different combinations of adaptation options may help reduce risk, as well as what residual risks remain under each future, and the high-level costs and benefits. There is also an assessment against what matters most – what the community has told us is important and alignment with strategic objectives.

The seven potential adaptation futures each provide a snapshot in time. They sit on a spectrum, with an emphasis on infrastructure investment at one end and land use change at the other. There are infinite other potential adaptation futures, where different combinations of infrastructure and land use change could produce any number of new futures. These futures represent the spectrum from full reliance on traditional engineering interventions to reduce risk to making space for water relocating away from risky areas, with options that use blue-green networks and nature-based solutions in the middle. There are variations on these futures that include land elevation to create more space outside of the floodplain and above groundwater levels over the next 100 years.

The locations of adaptation options (e.g. seawalls, inland defences, waterways, elevated areas) shown in the visualisations are indicative and will be subject to further technical analysis, but are presented based on a high-level understanding of geography, hazards, and land use in South Dunedin.

Using cells to understand spatial adaptation options:

By dividing the SDF Programme area into smaller, manageable units (termed "cells" for this programme), climate impacts and adaptation options can be reviewed at an appropriate level of detail. This enables a more tailored approach and could support the delivery of targeted interventions that respond to the specific conditions of each cell. The risk assessment utilises census area units due to the availability of more refined data to support the detailed analysis. The cells were defined based on hazards and land use, namely:

Cell 1 – represents the area exposed to at least a medium risk of groundwater emergence (levels with 0.5m of the surface) for the 2060 SSP5-8.5 scenario that show a broadly similar pattern to the rainfall flooding exposure.

Cell 2 – covers the remaining area within the SDF project area that is lower than the water level of the 2100 SSP5-8.5 scenario (1.1m of sea level rise) and 1% coastal AEP event – to represent the maximum identified area of exposed area to coastal inundation.

Cell 3 – represents all other areas with the SDF project area higher than the level set for Cell 2.

Cell 4 – includes coastal areas from St Clair to St Kilda Beaches, Lawyer's Head, and adjacent sand dunes. This cell is outside the scope of the SDF programme in this phase of work, but will be incorporated into Stage 4 Potential Adaptation Futures and Pathways (Shortlist).

Over time, the proportion of land contained within each of these cells would change in line with the potential options and futures invested in as the risk profiles change, with options that include land raising taking land from Cells 1 or 2 into Cell 3. This is illustrated in shifting cell boundaries in the visualisations of each future.

Mana Whenua partnership and collaboration

DCC and ORC each have partnership commitments with Mana Whenua. These partnerships are operationalised in a number of ways through the SDF programme, including in establishment of Mana Whenua Panel (the 'Panel') that provides Kāi Tahu inputs and oversight on behalf of Te Rūnaka o Ōtākou, and technical advice and operational support from Aukaha Ltd. Te Taki Haruru – the DCC's Māori Strategic Framework – has also guided the SDF programme, helping councils to incorporate inputs and direction from the Panel.

A cultural values framework and assessment of risk from a mana whenua perspective have informed development of potential adaptation futures for South Dunedin, providing for rūnaka values, associations, and aspirations for South Dunedin to be captured in the overall assessments.

Throughout the assessments, a number of Te Reo words and concepts are used. These include:

- Wai - water
- Moana - ocean
- Mahika kai - food and resource gathering sites and practices
- Mauri - life force and vitality
- Te Mana o Te Wai - concept that protecting the health and mauri of water bodies is paramount to the health of wider natural ecosystem environment and health of people
- Ki Uta Ki Tai - a holistic, inter-connected and or catchment-wide approach to natural resource management
- Marae - meeting area hosted by mana whenua in front of a wharenui (meeting house), also used to refer to surrounding land and buildings
- Kaitiakitaka – exercise of guardianship by mana whenua
- Hauora – health and wellbeing.

SOUTH DUNEDIN FUTURE

South Dunedin Future Adaptation Workstream:
How to interpret the dashboard

Potential Adaptation Futures and Option Name

The seven Potential Adaptation Futures are presented in the dashboard and in the following micro-business cases. They include continuing with the status quo, hard infrastructure actions to keep the land dry through to land-use change enabling retreat to let water in.

Main components

Each of these Potential Adaptation Futures represent a combination of many actions to manage risk. The main components within each Potential Adaptation Future are presented in order of importance. The scale of relocation (land-use change) is a captured within key components such as elevated land, additional water storage (or wetlands), and open channels in particular – with the extent of change mostly represented through the 'properties potentially affected' figures. The components are colour coded to match icons within the visualisations presented in the micro-business cases.

Explanation of costs, benefits and benefit to cost ratio

Costs and benefits have been provided in the micro business cases to enable consideration of the possible implications of each potential adaptation future. The costs are based on a spatial mapping exercise undertaken to create one potential visualisation of the Potential Future scenarios presented in the microbusiness cases – noting that each 'Future' consists of multiple Adaptation Options. The identified options / assets incorporated within each potential future are one possible version of the quantity and type of options / assets included, their alignments, and locations. These have been utilised to create the quantities of each type of option (intervention) and the totals presented as the likely costs for each potential future.

The costs are high-level estimations and are intended to be comparative only at this long-list stage of the SDF Programme given the high associated uncertainty, particularly in relation to the pathways of short-, medium- and long-term options that may combine as part of each scenario. The cost estimates will become more accurate as the project progresses as options are further refined.

Each cost estimate is based on a typical detail for that option, calculated in accordance with available rates from a range of similar projects across New Zealand. The cost estimates follow established good practice methodologies adopted in Better Business Case processes in New Zealand. Costs are assumed to occur within the near future, with the costs presented at 2024 present values.

Costs

For the seven potential futures costs considered include:

- Construction capital costs – a build-up of costs per option included within each potential future. The costs include demolition and site clearance, utility services replacement and reinstatement
- Construction preliminaries
- Operation and maintenance costs
- Professional and internal fees
- Contingency and optimism bias
- Acquisition of properties - landholdings and buildings.

Capital costs have been adjusted including an optimism bias for a non-standard civil engineering project at this stage in accordance with Better Business case practice. Given the nature of this work and the early stage in an investment cycle, an upper bound for this bias range has been applied. This increases the expected net costs by 66%1. This is in line with Treasury advice for projects at this stage of development and this factor can be progressively reduced.

Exclusions at this stage of development include GST, contaminated waste disposal, unexpected ground conditions, rebuild of existing properties in new location, escalation or operational costs/downtime due to operations.

Failing to adapt will result in widening inequalities, with Potential Adaptation Future 1, showing a future where responses are primarily driven by individual actions and responses with minimal planned Council (or public) investment. This has been estimated to result in a $2 billion cost when accounting for damage to properties (insured and uninsured), lost productivity, work to fix infrastructure, etc. Notably, it is expected that the costs will climb higher still once social costs including stress suffered by affected residents and business owners are factored in, or in response to major weather events where the costs of recovery could be substantially higher still.

It is worth noting that economic assessments of benefits and costs are one method for evaluating potential benefits and disbenefits of actions, but given the complexities associated with changing urban environments, benefit cost ratios of 0.8 are generally accepted as being a good return on investment (based on experience from other jurisdictions and New Zealand). Additionally, other benefits that are traditionally hard to monetise could easily add further impetus to one of the potential adaptation futures.

The PV was calculated as the discounted sum of the annual average damages over the project horizon, where:

The discount rate applied is 2%, consistent with the social rate of time preference (SRTP) as prescribed by the New Zealand Treasury for cost-benefit analysis purposes.

The project horizon applied is 75 years.

Benefits

The main sources of benefits are monetised and grouped broadly as follows:

- Benefits associated with avoided fatalities
- Avoided residential and commercial property damages
- Avoided trauma
- Improved water quality
- Ecosystem Services benefits
- The value of new open spaces created
- Hedonic analysis – changes in property values and redevelopment premia within South Dunedin
- Avoided income loss from displacement
- Avoided emergency services costs.

Each potential adaptation future will have a different mix and makeup of the above monetised benefits, but the benefits are measured using the same methodology between the potential adaptation futures to ensure comparability between the scenarios.

Benefit to cost ratio

Irrespective of which potential adaptation future pathway is followed, these additional costs represent a considerable future delivery challenge for the local market when contrasted with the current Dunedin City Council capital delivery budget of $200m per annum for the entire city. If these costs were spread evenly over the next 50 years, the additional capital investment would be between $50m to $220m per annum within South Dunedin only.

For each of the seven potential adaptation futures, costs and benefits have been estimated based on present value (PV) in '$ billions of dollars'. This helps understand the 'estimated benefit to cost ratio' (BCR), whereby a BCR of zero or just above that is not viable and not likely to be funded, and a BCR close to 1 or more demonstrates more positive outcomes and as such more likely to be funded. Notably, it is acknowledged that the BCR should not be 'the' determining factor in the options selection process. Rather, it is one of the factors informing the evaluation of options through a multiple criteria assessment (MCA) exercise. BCR focuses on quantifiable costs and benefits. It may not capture important qualitative factors like environmental impact, social equity, or strategic alignment.

In summary, the BCR is a valuable tool for evaluating the financial viability of projects and decisions. However, it should be used in conjunction with other analyses and a thorough consideration of qualitative factors to make informed and well-rounded decisions.

Going forward, potential futures with a stronger performing BCR could be further refined through participatory public engagement and consideration of potential value uplift opportunities.

SOUTH DUNEDIN FUTURE

South Dunedin Future Adaptation Workstream:
How to interpret the dashboard

Properties potentially affected

The 'properties potentially affected' information presented on the dashboard represents the number of properties likely to be part of a managed relocation effort to enable reduction of risk to the surrounding area.

We have based our analysis on GIS overlays for residential and commercial property boundaries provided by Dunedin City Council. Overall, it has been assessed that there a total of 5,800 residential properties within South Dunedin (within the study area). For Potential Future 1, we have assumed that some 2,500 residential properties may need to be retreated with the total number of properties likely affected overall exceeding 5,000 properties. For Potential Futures 2 – 7 involving interventions, we have assessed the indicative number of properties likely to be part of a managed relocation effort to enable reduction of risk to the surrounding area.

We note that some of the affected properties may intersect with an identified option such as a potential wetland or a potential blue green corridor. An intersection may require relocation to enable the option to be delivered.

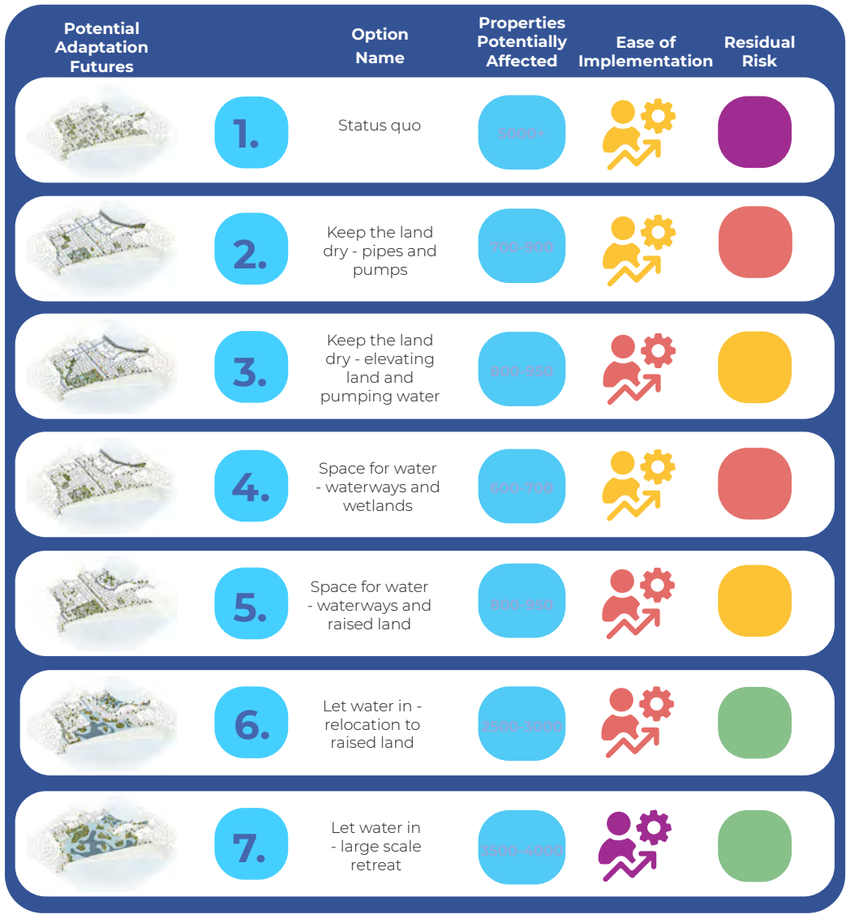
Ultimately, the true number of properties to be affected will only be known later once efficacy studies undertaken to test the place, size and number of adaptation options required. This will also determine the efficacy of the interventions and enable the benefits to be firmed up.

Ease of implementation

Ease of implementation includes considerations of constructability, phasing, and general feasibility of Council to action the potential adaptation future. Futures that require large scale property acquisition and/or land elevation will generally be challenging to execute and will require careful planning as well as community support.

Residual risk

A high level, qualitative assessment of how much risk remains unmitigated in each future is also presented, noting that this residual risk will evolve over time. Futures that include large scale managed relocation and/or land grading are likely to reduce risk to communities the most in the long-term, while futures that maintain the status quo or try to manage flooding via a hard engineering network are likely to have the highest residual risk.



SOUTH DUNEDIN FUTURE

South Dunedin Potential Adaptation Futures - Dashboard

Potential Adaptation Futures	Option Name	Main Components	Cost in Billions $ (2025-2100)	Benefit in Billions $ (2025-2100)	Benefit to Cost Ratio(BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
	1.	Status quo	Pipes and pumps (minor stormwater network), reactive retreat, individual interventions 	$2.0B ($1.5B-$2.5B)	$0.2B ($0.1B-$0.3B)	0.1 (0.05-0.2)	5000+		
	2.	Keep the land dry - pipes and pumps	Pipes and pumps, coastal protection, storage 	$3.2B ($2.5B-$4.0B)	$2.3B ($1.5B-$2.5B)	0.7 (0.3-1.0)	700-900		
	3.	Keep the land dry - elevating land and pumping water	Pipes and pumps, land elevation, coastal protection, storage 	$5.8B ($5.0B-$8.0B)	$3.8B ($3.5B-$4.5B)	0.6 (0.4-0.8)	800-950		
	4.	Space for water - waterways and wetlands	Pipes and pumps, coastal protection, open channels, storage 	$2.8B ($2.0B-$4.0B)	$2.8B ($2.5B-$3.5B)	1 (0.6-1.6)	600-700		
	5.	Space for water - waterways and raised land	Pipes and pumps, coastal protection, open channels, storage, land elevation 	$7.1B ($6.0B-$10B)	$4.5B ($4.0B-$5.5B)	0.7 (0.4-0.9)	800-950		
	6.	Let water in - relocation to raised land	Pipes and pumps, coastal protection, open channels, storage, land elevation 	$6.8B ($6.0B-$10B)	$3.7B ($3.5B-$5.5B)	0.6 (0.3-0.9)	2500-3000		
	7.	Let water in - large scale retreat	Pipes and pumps, open channels, storage 	$5.0B ($4.5B-$8B)	$3.7B ($3.5B-$4.5B)	0.7 (0.4-1.0)	3500-4000		

SOUTH DUNEDIN FUTURE

Pipes and pumps
Coastal protection
Open channels
Individual interventions
Storage
Land elevation
Reactive retreat

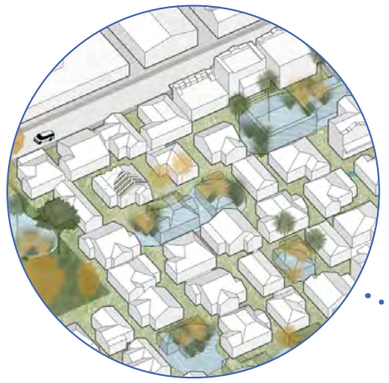
Note: Cost, benefit, properties potentially affected, implementation and residual risk are estimated over a 75 years period 2025-2100.

Low
Medium
High
Extreme

South Dunedin Future - Long List Adaptation Options, Feb 2025

Potential Adaptation Future 1 : Status quo

Main Component	Cost in Billions $	Benefit in Billions $	Benefit to Cost Ratio (BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
Pipes and pumps (minor stormwater network), reactive retreat, individual interventions	$2B	$0.2B	0.1	5000+		



Reactive retreat (relocation)

Over time, residents who have the financial means to move would relocate from South Dunedin as they become less willing to endure damp conditions with increasingly frequent flooding and associated costs of repairs. For residents who cannot afford to retreat or make changes to their properties, they will live in increasingly damp and flood prone conditions.

Minor stormwater network upgrades

Minor stormwater network upgrades, such as increasing pipe sizes at bottle necks and installing check-valves to help control the flow of water, would be actioned with continued and improved maintenance of the network.

Changes to individual properties

Because there are no significant community scale flood risk management actions, people would need to self-fund changes to their own properties so they're more resilient to flooding. This might include waterproofing or raising first floors or installing small pumps to manage groundwater and flooding around private property. Changes to building foundations to manage liquefaction and seismic risks would also be likely to be needed.

KEY

- Retreat
- Property-level intervention
- Civil Defence and Emergency Preparedness
- Better management of impervious surfaces
- Minor stormwater network upgrades
- Cell 1
- Cell 2
- Cell 3

Civil Defence and Emergency Preparedness

The Civil Defence team would need to become increasingly active in supporting communities before, during and after emergency events.

Slowing the flow of stormwater

Better management of surfaces that don't absorb water could be achieved by property owners adding more tanks to their individual properties to capture rain or green roofs in the upper catchment. This would help to reduce the flow of rain into the stormwater network and to the Flat, during small rainfall events as it would not be effective during extreme rain.

Disclaimer: Options shown are not limited to the spatial locations shown but are rather intended to provide indicative examples.

Potential Adaptation Future 1:
Status quo

Advantages:

Disadvantages:

Impacts and Outcomes

Sustainable urban development

- Unlikely to result in substantial reductions in whole-of-life emissions and energy use. This is due to the lack of long-term planning and collective efforts to optimise materials use and reduce emissions.
- Limits any changes from current urban form and would not provide improved spaces for people, water or wildlife.
- Relies on individual uptake for integration of water sensitive design into urban design. There would be a potential decrease in amenity due to reliance on individual change and the risk of area deterioration.

Promote community safety

- Likely significant negative impacts on community hauora, health and wellbeing due to frequent flooding, damp conditions and future uncertainty which can lead to health issues, stress and anxiety, especially for vulnerable populations and those unable to afford property-level interventions.
- Changes in community safety driven by enhancement of awareness due to frequent hazard events but are limited by individual uptake of preventative measures.

Environmental and cultural restoration

- Offers minimal ecological improvements in the long-term (i.e., ecological state in this future would be like the existing state) likely enabling continued degradation and loss of biodiversity, wai, moana and cultural practices such as mahika kai.
- Possible improvement in the water quality of runoff to marine ecosystems during regular rainfall events, likely outweighed by the negative impacts of frequent flood events.
- Negative impacts on cultural connection to places and spaces in South Dunedin as deterioration and possible pockets of green space would occur as groundwater emerges and some opt to abandon buildings.
- Negative mauri effects in the harbour and coastal waters due to ongoing contamination. Misalignment with Te Mana o Te Wai due to the continued changes to watercourses and with ki uta ki tai approach due to heavy reliance on hard infrastructure to move water, and lost opportunities for mana whenua to work as a partner in developing adaptation responses.

Just transition

- Limits opportunities for the community by gradual loss of employment and residential land (including assets) due to increasing hazards. This would result in decreased capital value affecting the ability to draw-down finance and insure property.
- Potential for significant disadvantages for vulnerable communities unable to afford property-level interventions or increased insurance premiums, which may result in increasing the socio-economic gap.
- Misalignment with just / equitable transition outcomes, as substandard conditions are the driver for people reactively retreating with no strategic approach to supporting relocations. Poor intergenerational equity as problem will become worse over time with fewer benefits.
- Disruption to transport links within and beyond South Dunedin become more frequent over time, including to Ōtākou marae and the peninsula.

Social and economic resilience

- Reduced community cohesion and fragmenting of networks as frequent floods and deteriorating conditions cause those who can afford to leave to leave.
- Likely enhancement of adaptive capacity via knowledge of what is happening with direct climate hazard experiences and personal responsibility with property-level interventions, but people leaving erodes collective understanding of long-term risks.
- Businesses are likely to experience varying impacts due to their different financial situations that limit the ability to implement risk reduction measures on their properties. Deteriorating property conditions reduce resilience, and people leaving diminishes the collective understanding of long-term risks.
- Likely variable impacts to individuals as unequal financial situations limits ability to incorporate property level risk reduction, deteriorating property conditions reduce resilience, and out-migration erodes communities. Reliance on individuals to make changes to their properties may be uncoordinated and produce unintended consequences for their neighbours.

How it will reduce risk:

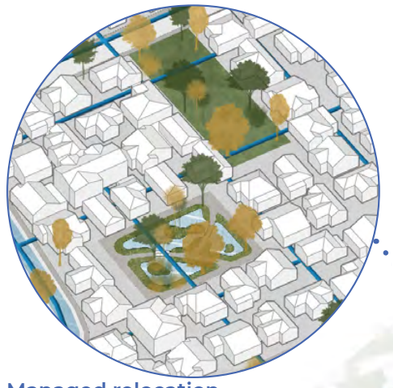
- **Community cultural hubs:** Present and long-term high risk associated with coastal inundation would not change. Pluvial and groundwater flooding risk may be reduced; however, it will be site specific, and further groundwater modelling is necessary.
- **Cultural sites/features:** Present and long-term high risk associated with coastal inundation would not change. Pluvial and groundwater flooding risk may be reduced; however, it will be site specific, and further groundwater modelling is necessary.
- **Social networks and exposure of community features:** In the long-term, this option does not reduce exposure to flooding hazards and maintains high long-term risk rating to communities' capacity to participate in community networking activities and accessibility to goods, services, and amenities. Damage to property increases with frequent flooding events.
- **Community safety:** In the long-term, it does not reduce risks to residents' health and wellbeing, as accessibility to work, education, insurance and property finance decreases with frequency of flooding events.

What we've heard from the community:

- ✕ The community wants action, many say doing nothing is unacceptable.
- ✕ Many say they feel nervous every time it rains; they do not want people to be stranded in a flood.

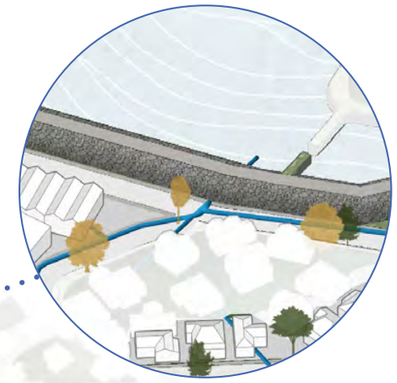
Potential Adaptation Future 2 : Keep the land dry with pipes and pumps

Main Component	Cost in Billions $	Benefit in Billions $	Benefit to Cost Ratio (BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
Pipes and pumps, coastal protection, storage	$3.2B	$2.3B	0.7	700-900		



Managed relocation

Managed relocation requires the strategic and proactive buyout of properties and assets to reduce risks. Managed relocation via strategic acquisition (buyouts) of properties in key areas of the Flat would be needed to make space for risk management infrastructure (e.g., wetlands or ponds and pump stations).



Coastal protection

The seawall along Portsmouth Drive is made bigger and extended to protect Bayfield Park and the rest of South Dunedin from future coastal flood events. This is not likely to be required until mid to late century.

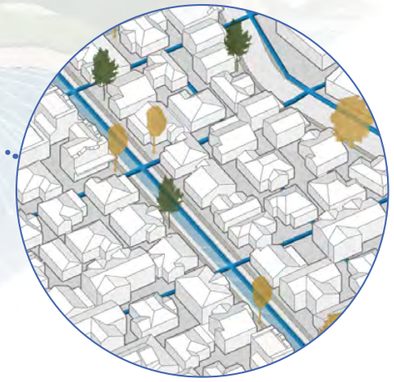
Storage

This would include conversion of open spaces in the Flat (e.g., Forbury Park) to intentional water storage that manages high groundwater and provides flooding attenuation. This option is connected to the pumped drainage network and provides additional capacity to the system.

KEY

- Retreat
- Storage
- Overland Flowpath
- Sub-surface Drainage
- Coastal Protection
- Pump

- Cell 1
- Cell 2
- Cell 3

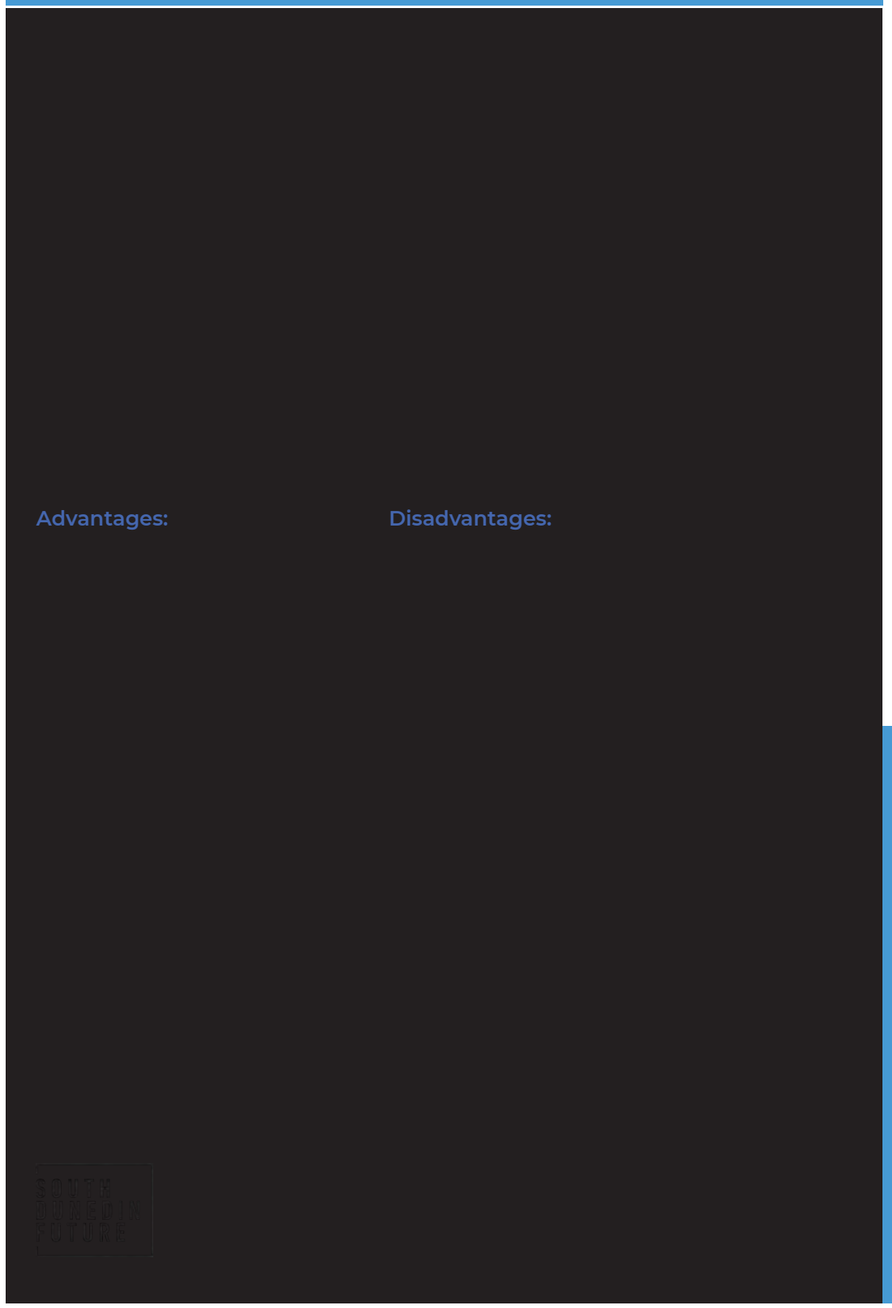


Pipes, pumps and flow paths

Sub-surface drainage network improvements include pipes or permeable underground layers to manage groundwater and stormwater throughout South Dunedin. These systems would lower groundwater daily via pumping while also having sufficient capacity to drain water when it rains. Overland flow paths along roadways or other open spaces would improve drainage capacity and reduce the risk of pluvial flooding hazard to properties.

Disclaimer: Options shown are not limited to the spatial locations shown but are rather intended to provide indicative examples.

Potential Adaptation Future 2:
Keep the land dry with pipes and pumps



Impacts and Outcomes

Sustainable urban development

- Likely to result in high operational and embodied emissions associated with reliance on pipe and pump based sub-surface drainage, limiting potential for long-term sustainability.
- Misses most of the opportunities for improving the urban and natural environment by maintaining current urban form.
- Limited application of water sensitive design and enhancement of amenity.

Promote community safety

- Likely positive impacts to hauora, health and wellbeing due to reducing extents of high-risk areas, reducing health risks from flooding and damp conditions, alleviating the burden on health services and maintaining access to essential services. Visible improvements can reduce anxiety and foster safety.
- Positive reductions in risk and improvements in safety; however, risks during extreme events and if infrastructure (e.g. pumps) fail remain significant.

Environmental and cultural restoration

- Moderate increase in ecological benefits from the creation of green spaces and freshwater ecosystems but limited due to lack of direct connectivity with lost opportunities to restore and enhance biodiversity, wai, moana and cultural practices such as mahika kai. Coastal fauna will likely be impacted by seawall footprint, but incorporating design features like living seawalls could improve habitat quality.
- Likely improvements to discharge water quality due to integration of modern treatment devices in pipe network.
- Limited enhancement of cultural connections to place as the natural environment would not be integrated into the urban framework, and while open spaces may become more naturalised, the changes of their existing use may damage connections to place.
- Missed opportunity for restoration of mauri due to focus on piped solutions, misalignment with Te Mana o Te Wai due to the continued watercourse modification and with ki uta ki tai approach due to heavy reliance on hard infrastructure to move water, and lost opportunities for mana whenua to work as a partner in developing adaptation responses.
- Missed opportunities for a tikaka approach to water management and limited opportunities for mana whenua to re-establish connections and enhance rakatirataka and kaitiakitaka.

Just transition

- Better enables retention of local employment and income generation by reducing scale of retreat and preserving existing infrastructure, business and commercial areas, resulting in lower impacts on employment and income generating opportunities.
- Reduced financial burden on individuals with community-level infrastructure, reducing direct financial impacts of floods especially for low-income communities.
- Potential for inequitable transitions where only some properties and assets are proactively acquired. Poor intergenerational equity as in the long- term, piped solutions will require increased maintenance and become less effective, and as climate change continues, the risks will compound requiring further interventions beyond this century.
- Access to key facilities and economic opportunities around and beyond South Dunedin is maintained along existing transport routes with some temporary disruption during storms.

Social and economic resilience

- Maintains community cohesion by allowing communities to remain in place and access to services and social hubs retained, including to Ōtākou marae and the peninsula.
- Likely minimal change to adaptive capacity via knowledge of what is happening beyond knowledge sharing during plan development.
- Minor impacts to businesses as existing infrastructure is maintained and risks are reduced with low levels of disruption.
- Positive impacts to individuals and communities as existing infrastructure is maintained and risks are reduced with low levels of disruption.

How it will reduce risk:

- **Community cultural hubs:** Likely reduces long-term pluvial and groundwater flooding risk from high to medium and for coastal inundation from high to low. It may increase cultural impacts associated with access to coast on the harbourside.
- **Cultural sites/features:** Likely reduces long-term pluvial and groundwater flooding risk from high to medium and reduces coastal inundation risks from high to low.
- **Social networks and exposure of community features:** In the long-term, this option does not reduce exposure to flooding hazards and maintains high long-term risk rating to communities' capacity to participate in community networking activities and accessibility to goods, services, and amenities. Damage to property increases with frequent flooding events.
- **Community safety:** Likely long-term reduction in risks to residential buildings from high to medium or low risk. Requires a strong understanding of social and cultural dynamics associated with connection to coastal area on the harbourside. There is potential for damage and harm associated with potential over-design events or failure.

What we've heard from the community:

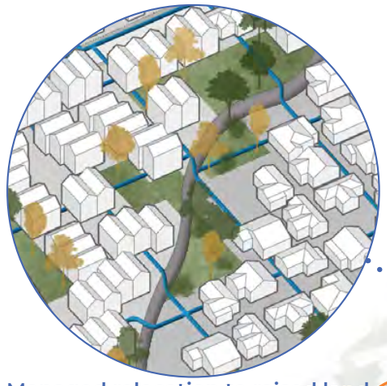
✓ Many thought that water flow improvements like subsurface drainage networks and open channels are a must.

✓ There is an interest in wetlands and ponds providing opportunities for a more attractive natural environment.

✗ There's concern over hard engineering solutions like seawalls and other infrastructure upgrades being costly, in some cases impacting access to coastal areas and possibly only providing short- term relief.

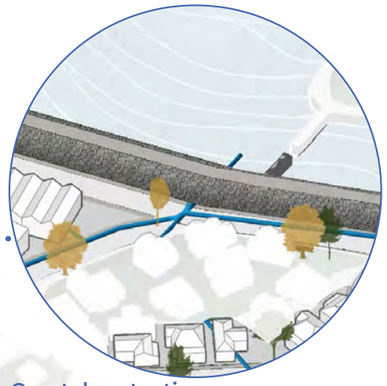
Potential Adaptation Future 3: Keep the land dry - elevating land and pumping water

Main Component	Cost in Billions $	Benefit in Billions $	Benefit to Cost Ratio (BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
Pipes and pumps, land elevation, coastal protection, storage	$5.8B	$3.8B	0.6	800-900		



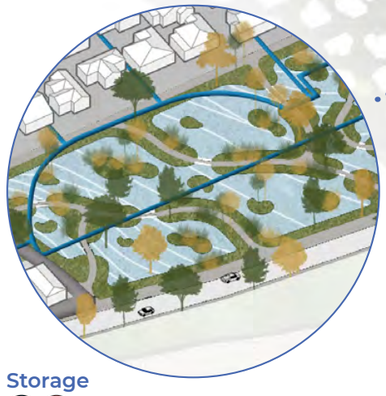
Managed relocation to raised land

Land grading involves making ground levels higher through placement of fill material to reduce risk to pluvial, groundwater and coastal flooding. The managed relocation of communities to raised land would require strategic and proactive acquisition (buyouts) of properties and assets to clear build up and redevelop a safe elevated area.



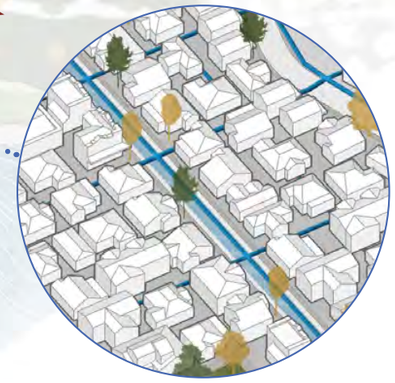
Coastal protection

The seawall along Portsmouth Drive is enlarged and extended to protect Bayfield Park and the rest of South Dunedin from future coastal flood events. This is not likely to be required until mid to late century.



Storage

Open spaces in the Flat, such as Forbury Park, would be turned into areas designated for water storage. This approach helps reduce the risks associated with pluvial and groundwater flooding, as well as liquefaction. The system would be supported by pipes and pumps.



Pipes, pumps and flow paths

Sub-surface drainage network improvements include pipes or permeable underground layers to manage groundwater and stormwater throughout South Dunedin. These systems would lower groundwater daily via pumping while having sufficient capacity to also drain water when it rains. Overland flow paths along roadways or other open spaces improve drainage capacity.

KEY

- Retreat
- Storage
- Overland Flowpath
- Sub-surface Drainage
- Coastal Protection
- Pump

- Cell 1
- Cell 2
- Cell 3

Disclaimer: Options shown are not limited to the spatial locations shown but are rather intended to provide indicative examples.

Potential Adaptation Future 3:

Keep the land dry - elevating land and pumping water

Advantages:

Disadvantages:

Impacts and Outcomes

Sustainable urban development

- Likely to result in very high embodied and high operational emissions due to land raising and ongoing reliance of pipe and pump based sub-surface drainage, limiting potential for long-term sustainability.
- Provides opportunities to improve the urban environment and allow South Dunedin to grow with safer areas for development, with limited opportunity for restoring the natural environment but will temporarily displace many people and businesses out of South Dunedin.
- Limited application of water sensitive design but enhanced amenity in raised area.

Promote community safety

- Likely positive impacts to hauora, health and wellbeing due to reducing extents of high-risk areas, reducing health risks from flooding and damp conditions, alleviating the burden on health services and maintaining access to essential services.
- Visible improvements can reduce anxiety and foster safety, and land raising creates lower risk areas; however, retreat and infrastructure changes to make space for land raising are likely to disrupt communities and cause temporary inconvenience, including access to health services.
- Positive reductions in risk and improvements in safety; however, risks during extreme events and if infrastructure (e.g. pumps) fail remain in the areas not elevated.

Environmental and cultural restoration

- Moderate increase in ecological benefits from the creation of green spaces and freshwater ecosystems but limited due to lack of direct connectivity with lost opportunities to restore and enhance biodiversity, wai, moana and cultural practices such as mahika kai.
- Likely improvements to discharge water quality due to integration of modern treatment devices in pipe network.
- Limited enhancement of cultural connections to place as the natural environment is not integrated into the urban framework, and while open spaces may become more naturalised, the changes of their existing use may damage connections to place.
- Missed opportunity for restoration of mauri due to focus on piped solutions and major earthworks, misalignment with Te Mana o Te Wai due to the continued watercourse modification, and limited opportunities for mana whenua to work as a partner in developing adaptation responses.
- Missed opportunities for a tikaka approach to water management and limited opportunities for mana whenua to re-establish connections and enhance rakatirataka and kaitiakitaka.

Just transition

- Enables choice in risk level and type of housing for community by reducing risk substantially via elevation of land for intensified development and retaining housing in higher risk areas in the Flat.
- Reduced financial burden on individuals with community-level infrastructure, reducing direct financial impacts of floods especially for low-income communities. However, properties on lower risk, raised land could enhance existing inequities as some people will not be able to afford to move.
- Potential for inequitable transitions where only some properties and assets are proactively acquired. Moderate intergenerational equity as in the long-term, piped solutions will require increased maintenance and become less effective, but elevated land provides a lower-risk area for long-term use.
- Access to key facilities and economic opportunities around and beyond South Dunedin is maintained along existing transport routes with some temporary disruption during storms, including to Ōtākou marae and the peninsula.

Social and economic resilience

- Changes to community cohesion as residents will need to temporarily retreat, causing fragmentation, to enable land raising and development, but potential cohesion improvements in the long-term as there are long-term lower risk options for housing.
- Likely minor enhancements to adaptive capacity via knowledge of what is happening as visible interventions like land raising will raise awareness and provide education on climate resilience.
- Positive impacts to businesses as existing infrastructure is generally maintained, risks are reduced and elevation of land supported with higher density zoning likely to attract a redevelopment premium, signalling that building high density housing is both profitable and the best use of the land.
- Positive impacts to individuals and communities as existing infrastructure is maintained and risks are reduced with potential for higher density, lower risk development.

How it will reduce risk:

- **Community cultural hubs:** Likely reduces long-term pluvial and groundwater flooding risk from high to medium and coastal inundation risk from high to low.
- **Cultural sites/features:** Likely reduces long-term pluvial and groundwater flood risk from high to medium and reduces coastal inundation risk from high to low.
- **Social networks and exposure of community features:** Increases long-term impacts on the ability of communities to access the coastal environment along the harbour side. Likely reduces pluvial flood, coastal flood and groundwater risk to community.
- **Community safety:** Likely reduces long-term risks to relocated residential buildings from high to low risk. Requires a strong understanding of social and cultural dynamics associated with connection to coastal area on the harbour side. There is potential for damage and harm associated with potential over-design events or failure.

What we've heard from the community:

- ✗ Engagement on land grading received the largest number of 'dislike' comments with concerns over cost, disruption, and practicality of achieving land elevation.
- ✓ Many thought that water flow improvements like subsurface drainage networks are a must.

Potential Adaptation Future 4: Space for water - waterways and wetlands

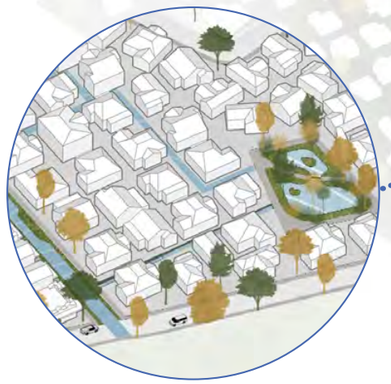
Main Component	Cost in Billions $	Benefit in Billions $	Benefit to Cost Ratio (BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
Pipes and pumps, coastal protection, open channels, storage	$2.8B	$2.8B	1	400-700		

Managed retreat (relocation)

Some managed relocation will be needed to make space for risk management infrastructure, like stormwater storage. This will require strategic and proactive buyouts (property acquisition) of properties to provide more space for water.

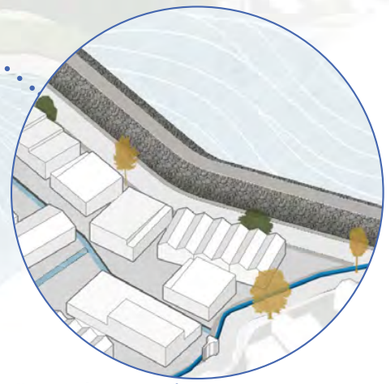
Pipes, pumps and flow paths

Limited pipes and pump stations will be required to support functionality of the waterways and wetlands. Overland flow paths along roadways or other open spaces improve drainage capacity to reduce the risk of pluvial flooding hazard to properties.



Open channels and storage

A waterway network comprising of canals, streams, or lined channels in strategic areas throughout South Dunedin would help drain groundwater and stormwater. This would be supported by conversion of open spaces in the Flat, such as Forbury Park, to water storage. The storage is connected to both the waterway network and a pumped system, which drains the ponds and adds further capacity to the overall system.



Coastal protection

The seawall along Portsmouth Drive is made bigger and extended to protect Bayfield Park and the rest of South Dunedin from future coastal flood events. This is not likely to be required until mid to late century.

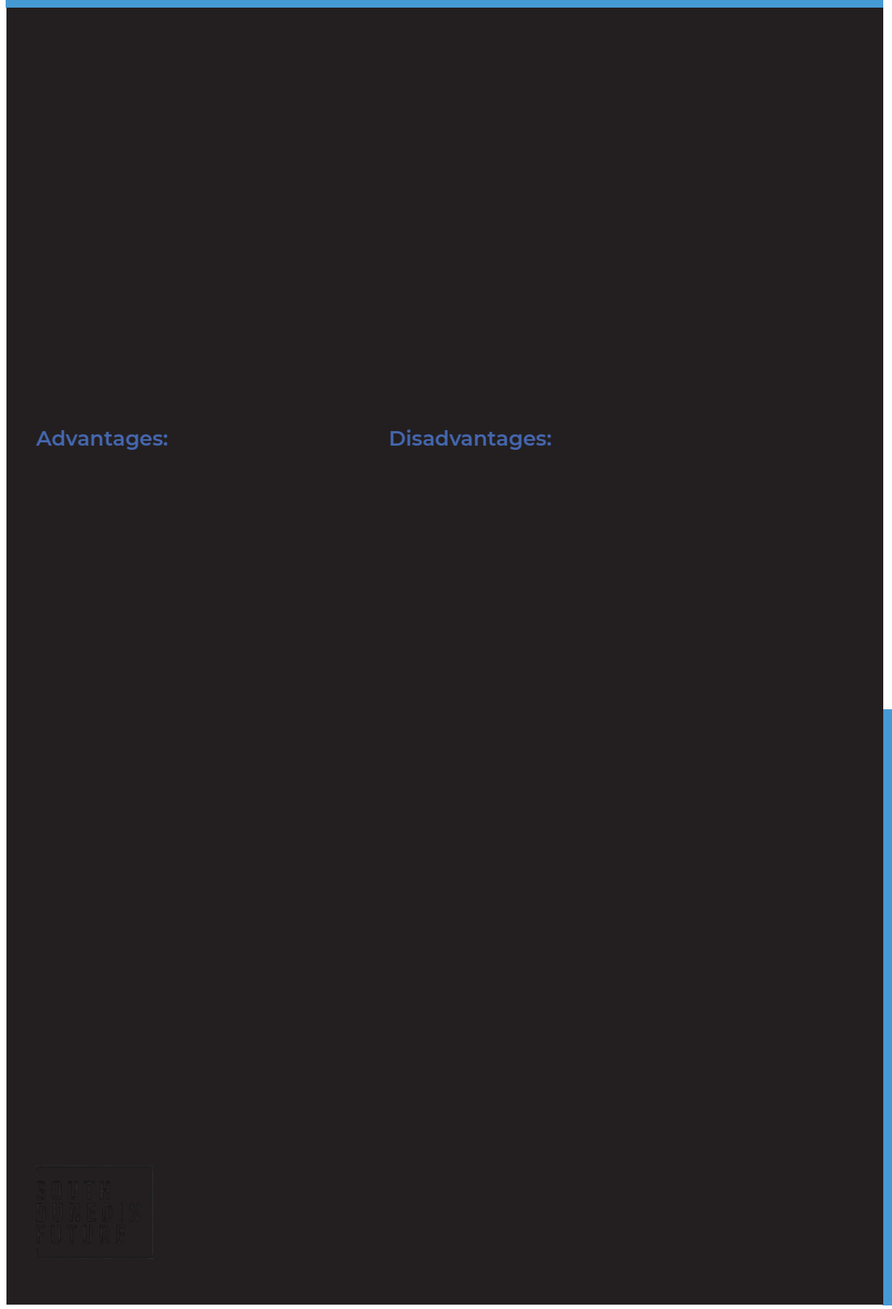
KEY

- Retreat
- Storage
- Overland Flowpath
- Sub-surface Drainage
- Coastal Protection
- Pump
- Open Channels

- Cell 1
- Cell 2
- Cell 3

Disclaimer: ***Options shown are not limited to the spatial locations shown but are rather intended to provide indicative examples.***

Potential Adaptation Future 4:
Space for water – waterways and wetlands



Impacts and Outcomes

Sustainable urban development

- Likely to result in potential for offsetting embodied and operational emissions associated with naturalised waterways drained by pumping by systematically recycling construction waste, using sustainable materials and planted channels and storage areas. Without circular practices, likely significant generation of building waste due to retreat.
- Minimises change to the urban environment while providing minor improvements towards better functioning neighbourhoods and displacing a limited number of people.
- Enhanced water sensitive design, and natural systems are incorporated into the urban framework improving amenity.

Promote community safety

- Likely positive impacts to hauora, health and wellbeing due to reducing extents of high-risk areas, reducing health risks from flooding and damp conditions, alleviating the burden on health services and maintaining access to essential services. Visible improvements can reduce anxiety and foster safety, and access to blue-green spaces improves wellbeing.
- Positive reductions in risk and improvements in safety; however, risks during extreme events and if infrastructure (e.g. pumps) fail remain though blue-green spaces can generally better accommodate over-design events.

Environmental and cultural restoration

- Moderate increase in ecological benefits from the extensive creation of green spaces and freshwater ecosystems throughout South Dunedin, with opportunities for additional biodiversity restoration and enhancement via streams and wetlands for wai, moana and cultural practices such as mahika kai.
- Likely improvements to water quality due to natural systems moderating contaminant load.
- Changes to cultural connections to place are likely through repurposing the existing open spaces into water storage, restoring the natural environment and changing recreational areas for the community.
- Moderate alignment with Te Mana o Te Wai due to favouring relatively natural waterways but still requiring some hard infrastructure, moderate alignment with a ki uta ki tai approaches due to the reinstatement of watercourses, and opportunities for mana whenua to work as a partner in developing adaptation responses. Positive opportunities for mana whenua to re-establish connections and enhance rakatirataka and kaitiakitaka.

Just transition

- Better enables retention of local employment and income generation by reducing scale of retreat and preserving existing infrastructure, business and commercial areas results in less impacts on employment and income generating opportunities.
- Reduced financial burden on individuals with community-level infrastructure, reducing direct financial impacts of floods especially for low-income communities.
- Potential for inequitable transitions where only some properties and assets are proactively acquired. Moderate intergenerational equity as in the long- term, pumped solutions will require increased maintenance and become less effective, but blue-green networks can be readily expanded.
- Access to key facilities and economic opportunities around and beyond South Dunedin is maintained along existing transport routes with some temporary disruption during storms, including to Ōtākou marae and the peninsula.

Social and economic resilience

- Maintains community cohesion by allowing communities to generally remain in place and access to services and social hubs retained. Displacement of some residents may weaken existing social networks as some will remain, but blue-green spaces can foster a sense of community.
- Likely enhancements to adaptive capacity via knowledge of what is happening as visible interventions like blue-green spaces will raise awareness of proximity to water and provide education on climate resilience.
- Minor impacts to businesses as existing infrastructure is maintained and risks are reduced with possible further enhancements of amenity value with low-to-moderate disruption.
- Positive impacts to individuals and communities as existing infrastructure is maintained and risks are reduced by blue-green network corridors with possible greater level of amenity and reduced level of community displacement.

How it will reduce risk:

- **Community cultural hubs:** Likely reduces long-term groundwater and flood risks to hubs that are relocated from high to low provided their functions are preserved after managed retreat. Seawall reduces coastal inundation risk from high to low but loss of connection to coast may have negative social, cultural, and ecological outcomes.
- **Cultural sites/features:** Likely reduces mid- and long-term groundwater and flood risks to heritage character sites from high to medium.
- **Social networks and exposure of community features:** Likely reduces long-term risk to community features due to groundwater, pluvial flooding, and coastal flooding from high to low. Increased impacts on communities' accessibility and their capacity to participate in community networking activities are likely.
- **Community safety:** Likely long-term reduction in long-term risks to relocated residential buildings and businesses from high to low risk. Seawall likely to reduce coastal inundation hazard but requires a strong understanding of social and cultural dynamics connection to coast access in the harbour. There is potential for damage and harm associated with potential over-design events or failure.

What we've heard from the community:

- ✓ Many thought that water flow improvements are a must.
- ✓ There is an interest in wetlands and ponds providing opportunities for a more attractive natural environment.
- ✗ There was support for a seawall that protects areas allowing more people to remain but concern over hard engineering solutions being costly, impacting access and only providing short- term relief.
- ✗ Concerns were voiced regarding displacement though others expressed support for proceeding with selective retreat where it is most needed.

Potential Adaptation Future 5: Space for water – waterways and raised land

Main Component	Cost in Billions $	Benefit in Billions $	Benefit to Cost Ratio (BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
Pipes and pumps, coastal protection, open channels, storage, land elevation	$7.1B	$4.5B	0.7	800-900		

Managed relocation to raised land

Land grading involves making ground levels higher through placement of fill material to reduce risk to pluvial, groundwater and coastal flooding. The managed relocation of communities to elevated land would require strategic and proactive acquisition (buyouts) of properties and assets to clear, build up and redevelop a safe, elevated area.

Changes to individual properties

People would need to make changes to their own properties so they're more resilient to flooding. This might include waterproofing or raising first floors, or installing small pumps to manage groundwater and flooding around private property. These are likely to be required around Portsmouth Drive to manage impacts of periodic coastal flooding.

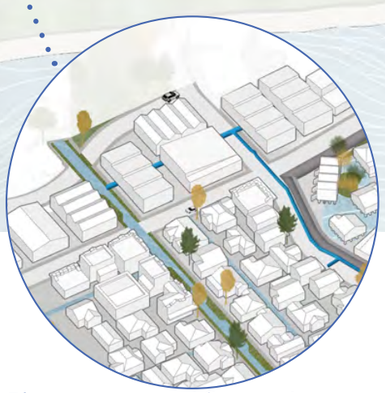
Inland coastal defence

A coastal bund or stopbank would further reduce risk along the raised land by 2150. A bund is also required in the commercial area to stop coastal flooding from flowing into the Flat. The commercial area will periodically flood with seawater during coastal storm events requiring property-level interventions for businesses that remain.

KEY

- Land Grading
- Retreat
- Storage
- Overland Flowpath
- Sub-surface Drainage
- Pump
- Open Channels
- Inland Coastal Defences

- Cell 1
- Cell 2
- Cell 3



Pipes, pumps and flow paths

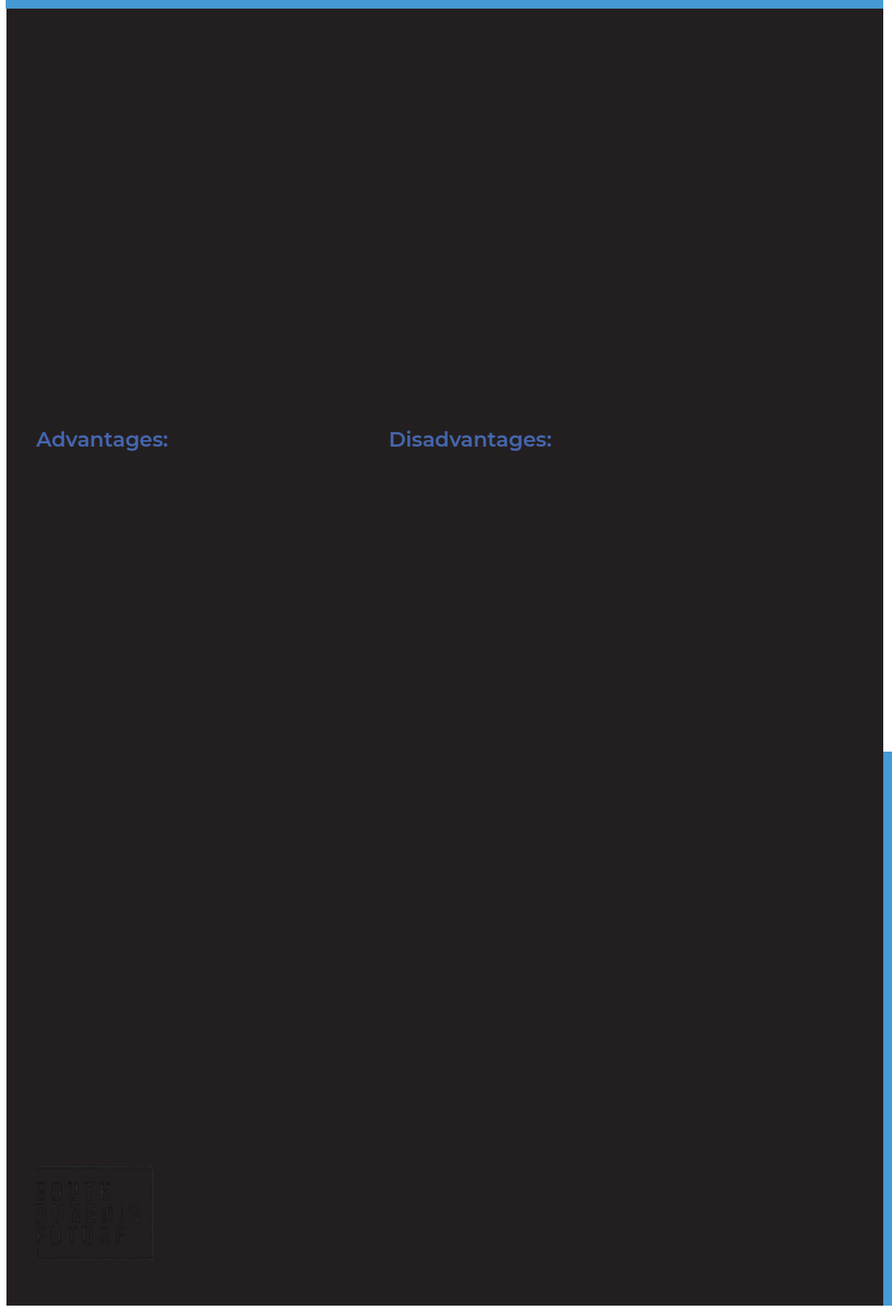
Limited pipes and pump stations will be required to support functionality of the waterways and wetlands. Overland flow paths along roadways or other open spaces improve drainage capacity to reduce the risk of pluvial flooding hazard to properties.

Open channels and storage

A waterway network including canals, streams or lined channels in key areas throughout South Dunedin will encourage drainage of groundwater and stormwater. This is supported by stormwater storage via conversion of open spaces in the Flat (e.g., Forbury Park). Both the waterways and storage will require pumping.

Disclaimer: Options shown are not limited to the spatial locations shown but are rather intended to provide indicative examples.

Potential Adaptation Future 5:
Space for water – waterways and raised land



Impacts and Outcomes

Sustainable urban development

- Raised land results in very high embodied emissions. However, there is potential for emissions reduction through planting of naturalised waterways.
- Significant (and potentially hazardous) waste generated due to removal of buildings, but waste could be minimised through circular practices such as re-use of materials. .
- Balances opportunities for urban improvements and enhancement of landscape and natural systems while limiting displacement of communities.
- Promotes water sensitive design, and natural systems incorporated into the urban framework improve amenity.

Promote community safety

- Likely positive impacts to hauora, health and wellbeing due to reducing extents of risk, reducing health risks from flooding and damp conditions, alleviating the burden on health services.
- Visible improvements can reduce anxiety and foster safety, and land raising creates lower risk areas with access to blue-green spaces improving wellbeing; however, changes to make space for land raising are likely to disrupt communities and cause temporary inconvenience.
- Positive reductions in risk and improvements in safety; however, risks remain in the areas not elevated if during extreme events, infrastructure (e.g. pumps) fail.

Environmental and cultural restoration

- Moderate increase in ecological benefits from the extensive creation of green spaces and freshwater ecosystems with opportunities for biodiversity restoration via streams and wetlands (noting potential biosecurity risks when importing fill material). There may be opportunities to enhance ecological outcomes for coastal fauna, through habitat-focused design features.
- Likely improvements to water quality due to natural systems moderating contaminants.
- Changes to cultural connections to place are likely through repurposing open spaces into water storage, restoring the environment, and creating wetlands for wai, moana and cultural practices such as mahika kai.
- Moderate to high alignment with Te Mana o Te Wai due to favouring relatively natural waterways, moderate to high alignment with a ki uta ki tai approaches due to the reinstatement of watercourses, and opportunities for mana whenua to work as a partner.
- Positive opportunities for mana whenua to re-establish connections and enhance rakatirataka and kaitiakitaka through a tikaka approach to watercourse management, noting that the change in access to the Peninsula may have negative impacts.

Just transition

- Enables choice in risk level and housing type by reducing risk via land elevation for intensified development and retaining housing in the Flat.
- Reduced individual financial burden , reducing direct financial impacts of floods especially for low-income communities. However, properties on lower risk, raised land may result in inequities as some parts of the community may not be able to afford to move.
- Potential for inequitable transitions where only some properties are proactively acquired, or some residents are unable to relocate within the area. Moderate-to-high intergenerational equity as in the long term, pumped solutions become less effective but blue-green networks can be expanded, and elevated land provides a lower-risk area for long-term use.
- Access to key facilities and economic opportunities around and beyond South Dunedin is maintained along diverted transport routes with potential access restrictions and temporary disruption during storms, including to Ōtākou marae and the peninsula.

Social and economic resilience

- Changes to community cohesion due to temporary relocation required to enable land raising, resulting in fragmentation, but potential cohesion improvements as there are long-term lower risk housing options. Displacement of some residents may weaken existing social networks as some will remain, but blue-green spaces can foster community.
- Likely enhancements to adaptive capacity via knowledge of what is happening, as visible interventions will raise awareness.
- Positive impacts to commercial businesses and individuals as infrastructure is generally maintained, risks reduced and elevation of land supported with higher density zoning likely to attract redevelopment. The extent of retreat and intensification enables retention and enhancement of employment and commercial activities as well as individual opportunities.
- It is likely that the current industrial area will be negatively impacted. During raising land, there will be high disruption.

How it will reduce risk:

- **Community cultural hubs:** Likely reduces long-term risks to hubs that are relocated or raised from high to low, as long as their functions are preserved after managed relocation.
- **Cultural sites/features:** Likely reduces long-term groundwater and flood risks to heritage character sites from high to medium risk. Short-term risks are not significantly reduced. Substantial changes in landscape occur along the harbour side, but provide an opportunity to enhance the cultural value of the area through natural restoration.
- **Social networks and exposure of community features:** Likely reduces long-term risk due to groundwater, pluvial flooding, and coastal flooding of community features from high to low risk. Likely increases impacts on communities' accessibility and their capacity to participate in community networking activities due to significant change in community identity associated with relocation.
- **Community safety:** Flood hazard risks are likely reduced from high to low in areas where land is raised or retreat occurs, resulting in increased community safety. Land grading may negatively impact the existing population living in and around the area, particularly during construction.

What we've heard from the community:

- ✗ Land grading received the largest number of 'dislike' comments with concerns over cost, disruption, and practicality.
- ✓ Dedicated water storage was popular with an interest in seeing wetlands, basins, and ponds and 'working with' water rather than 'against'.
- ✗ Concerns remained around the space required and their viability with groundwater.

Potential Adaptation Future 6: Let water in - relocation to raised land

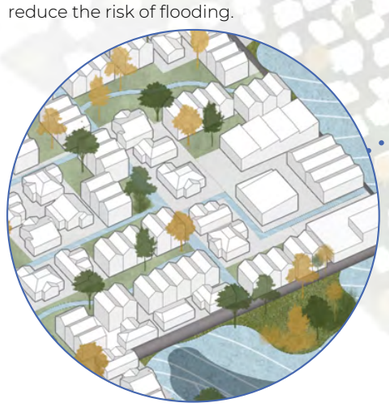
Main Component	Cost in Billions $	Benefit in Billions $	Benefit to Cost Ratio (BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
Pipes and pumps, coastal protection, open channels, storage, land elevation	$6.8B	$3.7B	0.6	2400-3000		

Pipes, pumps and flow paths

Limited pipes and pump stations will be required to support functionality of the waterways and wetlands. Overland flow paths along roadways or other open spaces improve drainage capacity to reduce the risk of flooding.

Coastal Inland Protection

Small scale inland coastal protection could be constructed along the perimeter of the elevated commercial area near Porstmouth Drive to reduce the risk of coastal flooding impacting the Flat.



Managed relocation to raised land

Land grading involves making ground levels higher through placement of fill material to reduce risk to pluvial, groundwater and coastal flooding. The managed relocation of communities to elevated land would require strategic and proactive acquisition (buyouts) of properties and assets to clear, build up and redevelop a safe, elevated area.

KEY

- Land Grading
- Retreat
- Storage
- Overland Flowpath
- Sub-surface Drainage
- Pump
- Open Channels
- Coastal Inland Protection

- Cell 1
- Cell 2
- Cell 3

Open channels and storage

Parts of the Flat and the commercial area around Portsmouth Drive would become floodable green spaces with some permanent water features for water storage. The area near Portsmouth is usually dry and floods temporarily with seawater during coastal storms. A waterway network including canals, streams or lined channels through the green spaces in the flat to encourage drainage of groundwater and stormwater, reducing risk of pluvial flood hazard and groundwater hazard. Both require pump stations.

Disclaimer: Options shown are not limited to the spatial locations shown but are rather intended to provide indicative examples.

Potential Adaptation Future 6:

Let water in – Let water in - relocation to raised land

Advantages:

Disadvantages:

Impacts and Outcomes

Sustainable urban development

- Possible substantial reductions in operational emissions due to potential for new, efficient development. Embodied emissions can be reduced and waste reduction will be possible through reuse of materials. Without circular practices, likely significant generation of potentially hazardous building waste.
- Creates well-functioning urban environments with the opportunity to restore the natural environment, but will temporarily displace many people and businesses out of South Dunedin.
- Promotes water sensitive urban design and enables improved amenity through large-scale green spaces.

Promote community safety

- Likely positive impacts to hauora, health and wellbeing due to retreat from high-risk areas, reducing health risks from flooding and damp conditions, alleviating the burden on health services and maintaining access to essential services. Relocation may also help reduce stress/anxiety about future weather events.
- Visible improvements can reduce anxiety and foster safety, and land raising creates lower risk areas with access to blue-green spaces improving wellbeing; however, relocation and infrastructure changes to make space for land raising are likely to disrupt communities and cause temporary inconvenience.
- Significant positive reductions in risk and improvements in safety via retreat from high-risk areas.

Environmental and cultural restoration

- High increase in ecological benefits from the extensive creation and restoration of green spaces and freshwater ecosystems with opportunities for biodiversity restoration via streams and wetlands (noting potential biosecurity risks when importing fill). Opportunities to restore and enhance biodiversity, wai, moana, and cultural practices such as mahika kai.
- Likely improvements to water quality due to natural systems moderating contaminants.
- Likely changes to cultural connections to place as these blue-green areas offer recreation opportunities for people to connect more deeply with nature but change recreational areas for the community.
- Moderate to high alignment with Te Mana o Te Wai due to favouring relatively natural waterways, high alignment with a ki uta ki tai approaches due to the reinstatement of watercourses and a more natural interface with moana, and opportunities for mana whenua to work as a partner.
- Positive opportunities for mana whenua to re-establish connections and enhance rakatirataka and kaitiakitaka through a tikaka approach to watercourse management, but there are both advantages and disadvantages from a rakatirataka perspective, as the return of the area to a more natural state and enhancement of mauri of the taiao is weighed against the significant population displacement and reduction of community assets and businesses.

Just transition

- Enables choice for Portsmouth Drive area to adapt in place or shift to elevated land or beyond South Dunedin. Provides options for lower risk, intensified housing for those that want to continue to live in South Dunedin.
- Benefits to vulnerable residents as relocating offers safer housing if property swaps enable access.
- High likelihood of inequitable transitions where only some properties and assets are proactively acquired, or some residents unable to relocate within the area. High intergenerational equity as benefits extend beyond this century.
- Access to key facilities and economic opportunities are maintained along diverted transport routes with temporary disruption during storms with the potential for restricted access, including to Ōtākou marae and the peninsula.

Social and economic resilience

- Changes to community cohesion as residents will need to temporarily retreat resulting in fragmentation to enable land raising and development but potential cohesion improvements in the long- term as there are long- term lower risk options for housing. Displacement of some residents may weaken existing social networks as some will remain, but blue-green spaces can foster a sense of community.
- Likely enhancements to adaptive capacity as visible interventions like blue-green spaces raise awareness of proximity of water or land raising on future sea levels.
- Risk of negative impacts to businesses due to the disruption and gradual and over time partial loss of medium- and large-format businesses posing a substantial economic risk, as these will be competing with large-format retail and mixed-use residential development for location. It is likely that the current industrial area will be negatively impacted.
- Positive impacts to individuals and communities as existing infrastructure is maintained and risks are reduced with potential for higher density, lower risk development. However, the scale of change presents a risk to individuals and communities due to disruption during land raising for development and transitioning to more blue-green spaces.

How it will reduce risk:

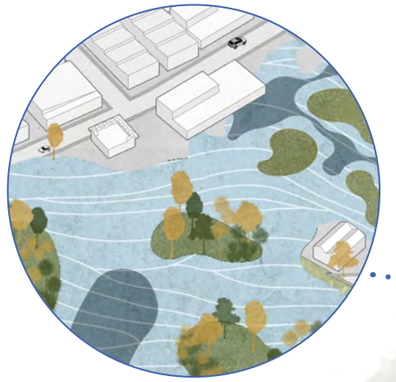
- **Community cultural hubs:** Likely reduces long-term risks to hubs that are relocated from high to low risk, as long as their functions are preserved after managed retreat.
- **Cultural sites/features:** Likely reduces long-term risks to heritage character sites from high to low risk if these can be relocated to raised land. Short-term risks are not likely reduced. This option changes the landscape dramatically but provides an opportunity to enhance the cultural value of the land through natural restoration.
- **Social networks and exposure of community features:** Likely reduces long-term risks to community features due to groundwater and coastal flooding from high to low risk. Likely increases impacts on the accessibility of communities and their capacity to participate in community activities as community identity may change as the landscape changes.
- **Community safety:** Likely reduces long-term risks to relocated residential buildings from high to low risk but requires a strong understanding of social dynamics and potential high short-term psychological impacts due to relocation.

What we've heard from the community:

- ✓ There was support for future green spaces and community spaces.
- ✗ There is likely to be stress and trauma associated with displacement of community and relocation away from generational homes, especially for vulnerable communities.
- ✗ Further concern over sufficient support being provided for low-income, vulnerable communities was expressed.
- ✓ Some stated that proactive retreat was better than reacting to a flood.
- ✗ Land grading received the largest number of 'dislike' comments with concerns over cost, disruption and practicality.

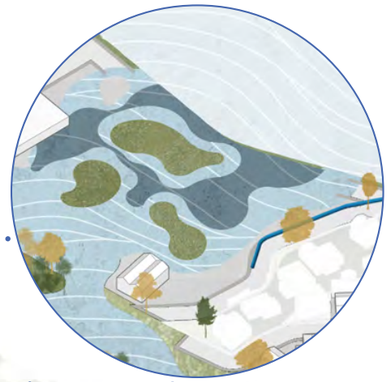
Potential Adaptation Future 7: Let water in – Large scale retreat

Main Component	Cost in Billions $	Benefit in Billions $	Benefit to Cost Ratio (BCR)	Properties Potentially Affected	Ease of Implementation	Residual Risk
Pipes and pumps, open channels, storage	$5B	$3.7B	0.7	3500-4000		



Changes to individual properties

For the remaining properties in high-risk areas, people would need to make changes such as waterproofing or raising first floors, or installing small pumps to manage groundwater and flooding around private property. This is likely to be needed around the commercial area near Portsmouth Drive to manage impacts of periodic coastal flooding.



Pipes, pumps, flow paths

Some minor pipes and pump stations may be required to support the waterways. Overland flow paths will improve drainage.

Managed retreat

Managed relocation requires strategic and proactive acquisition of properties and assets to remove risks. In this future, there is no longer sufficient space for housing South Dunedin's current population with South Dunedin. This option allows space for flood management infrastructure (e.g., wetlands and waterways).

KEY

- Property-level Intervention
- Retreat
- Storage
- Overland Flowpath
- Sub-surface Drainage
- Pump
- Open Channels

- Cell 1
- Cell 2
- Cell 3

Open channels and storage

Parts of the Flat would become floodable green spaces with wetlands and ponds to store water. A waterway network including canals, streams or lined channels through the green spaces in the Flat to encourage drainage of groundwater and stormwater, reducing risk to pluvial flood hazard and groundwater hazard. Both require pump stations.

Disclaimer: ***Options shown are not limited to the spatial locations shown but are rather intended to provide indicative examples.***

Potential Adaptation Future 7:
Let water in – Large scale retreat

Advantages:

Disadvantages:

Impacts and Outcomes

Sustainable urban development

- Likely to result in the lowest whole-of life emissions due to large scale retreat and conversion to naturalised spaces minimising energy use and material demands. Without circular practices, likely significant generation of potentially hazardous building waste due to retreat.
- Results in only a fringe of urban environment remaining on higher ground with the remaining area as open space which could result in increased anti-social behaviour issues if not designed/ managed well.
- Promotes water sensitive urban design approaches and provides large scale green spaces for amenity.

Promote community safety

- Likely positive impacts to hauora, health and wellbeing due to retreat from high-risk areas, removing health risks from flooding and damp conditions. However, relocation will likely cause stress and displacement while also helping reduce stress/anxiety about future events and living conditions. Access to blue/green spaces can promote community health and wellbeing.
- Significant positive reductions in risk and improvements in safety via retreat from high-risk areas.

Environmental and cultural restoration

- High increase in ecological benefits with the creation and restoration of green spaces, freshwater and estuarine ecosystems. Opportunities to restore and enhance biodiversity, wai, moana, and cultural practices such as mahika kai.
- Likely improvements to water quality due to natural systems moderating contaminants.
- Likely significant changes to cultural connections to place as these blue-green areas offer recreation opportunities for people to connect more deeply with nature but removing most buildings from South Dunedin changing the local character substantially.
- Moderate to high alignment with Te Mana o Te Wai due to favouring relatively natural waterways, high alignment with a ki uta ki tai approaches due to the reinstatement of watercourses and a more natural interface with moana, and opportunities for mana whenua to work as a partner.
- Positive opportunities for mana whenua to re-establish connections and enhance rakatirataka and kaitiakitaka through a tikaka approach to watercourse management, but there are both advantages and disadvantages from a rakatirataka perspective, as the return of the area to a more natural state and enhancement of mauri of the taiao is weighed against the significant population displacement and reduction of community assets and businesses.

Just transition

- Limits opportunities for the community to stay in South Dunedin by large scale retreat from low-lying areas.
- Benefits to vulnerable residents as relocating offers safer, more resilient housing if property swaps are in place to enable access; however, vulnerable communities may become fragmented if they cannot shift as a unit.
- Very high potential for inequitable transitions as most residents will be displaced, and very high risk to vulnerable populations. High intergenerational equity as while investment in the short- term is expensive, in the longer term, further investment is minimal with benefits extending beyond this century.
- Access to and beyond South Dunedin is maintained along diverted transport routes with some temporary disruption during storms with the potential for restricted access, including to Ōtākou marae and the Otago Peninsula.

Social and economic resilience

- Significant risks to community cohesion as retreat will displace communities, causing fragmentation and strain social networks as people relocate without a clear place to relocate to (both residencies and services) collectively.
- Changes to adaptive capacity via knowledge of what is happening as relocating from high-risk areas fosters community awareness of climate change impacts, but may reduce understanding of localised risks for displaced communities in their new locations.
- Risk of comprehensive loss of business and employment within South Dunedin. It is likely that the current industrial area will be negatively impacted.
- Significant positive reductions in risk to individuals and communities via retreat from high-risk areas; however, risk reduction experienced by individuals and communities will depend on the risk profile of where they relocate to and the mechanisms of the retreat process.

How it will reduce risk:

- **Community cultural hubs:** Likely reduces long- term risks from high to low, as long as the functions of cultural hubs are preserved after managed retreat, noting that this may be outside of South Dunedin.
- **Cultural sites/features:** Likely reduces mid- and long-term risks to heritage character sites from high to low risk. Short-term risks are unlikely to be reduced. This option changes the landscape dramatically. However, it provides an opportunity to enhance the cultural value of the land through natural restoration.
- **Social networks and exposure of community features:** Likely reduces long-term risk to community features from high to low. However, it likely increases impacts on the accessibility of communities and their capacity to participate in community networking activities due to significant change in community identity associated with relocation.
- **Community safety:** Likely reduces long-term risks to relocated residential buildings from high to low risk but requires a strong understanding of social dynamics and potential high short-term psychological impacts on residents due to relocation.

What we've heard from the community:

- ✗ There is likely to be stress and trauma associated with displacement of community and relocation away from generational homes.
- ✓ Some stated that proactive retreat was better than reacting to a flood when it happens.
- ✗ There's concern over how much support will be provided for low-income, vulnerable communities.
- ✓ There is interest in wetlands and ponds providing opportunities for multiple benefits for community wellbeing, recreation, biodiversity, and the environment.

SOUTH DUNEDIN FUTURE
WORKSTREAM 4: ADAPTATION
STAGE 3:
POTENTIAL ADAPTATION FUTURES

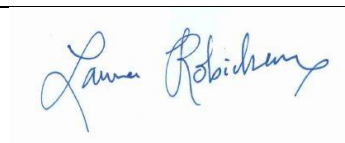
BACKGROUND CONTEXT TO SUPPORT MICRO-BUSINESS CASES

3 March 2025

SOUTH DUNEDIN FUTURE

POTENTIAL ADAPTATION FUTURES – CONTEXT SUMMARY

REV	DATE	DETAILS
0.9	7/10/24	Draft for peer review
1.0	2/12/24	Draft final
1.1	20/12/24	Final, pending final risk assessment
1.2	17/02/2025	Draft final
1.3	03/03/2025	Final

	NAME	DATE	SIGNATURE
Prepared by:	Carlos Carvajal, Julia Moyle, Sarah Shabahang, Nola Smart	03/03/2025	
Technical Reviews by:	Laura Robichaux, Liam Foster	03/03/2025	
Technical Approval by:	Cushla Loomb	03/03/2025	
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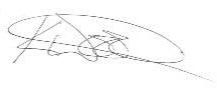
Approved for release by:	Kevin Wood	03/03/2025	

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Renders/visuals presented are artist impressions, created for illustrative purposes only and do not incorporate any engineering input. They serve as conceptual representations and may not accurately depict the final engineered design or construction details.

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A: Decision Making Framework

B: Adaption options not included in the Potential Adaptation Futures

C: Glossary/acronyms

1 Introduction

1.1 Programme Overview

Adapting to our changing climate is a big challenge with increasing severe weather events such as the heavy rain that occurred in October 2024 placing strain on the stormwater and water supply infrastructure of South Dunedin and elsewhere. Emergency management and welfare services implemented recovery and support measures for the affected areas. This event underscored the community's vulnerability and the urgency to act, as outlined in the ongoing South Dunedin Future Programme.

South Dunedin Future is about understanding how the environment is changing, considering how that will affect us, and looking at what we can do about it. The five stages of this programme are summarised in the ribbon below and the relevant components of the Adaptation workstream (Workstream 4) are expanded on below.

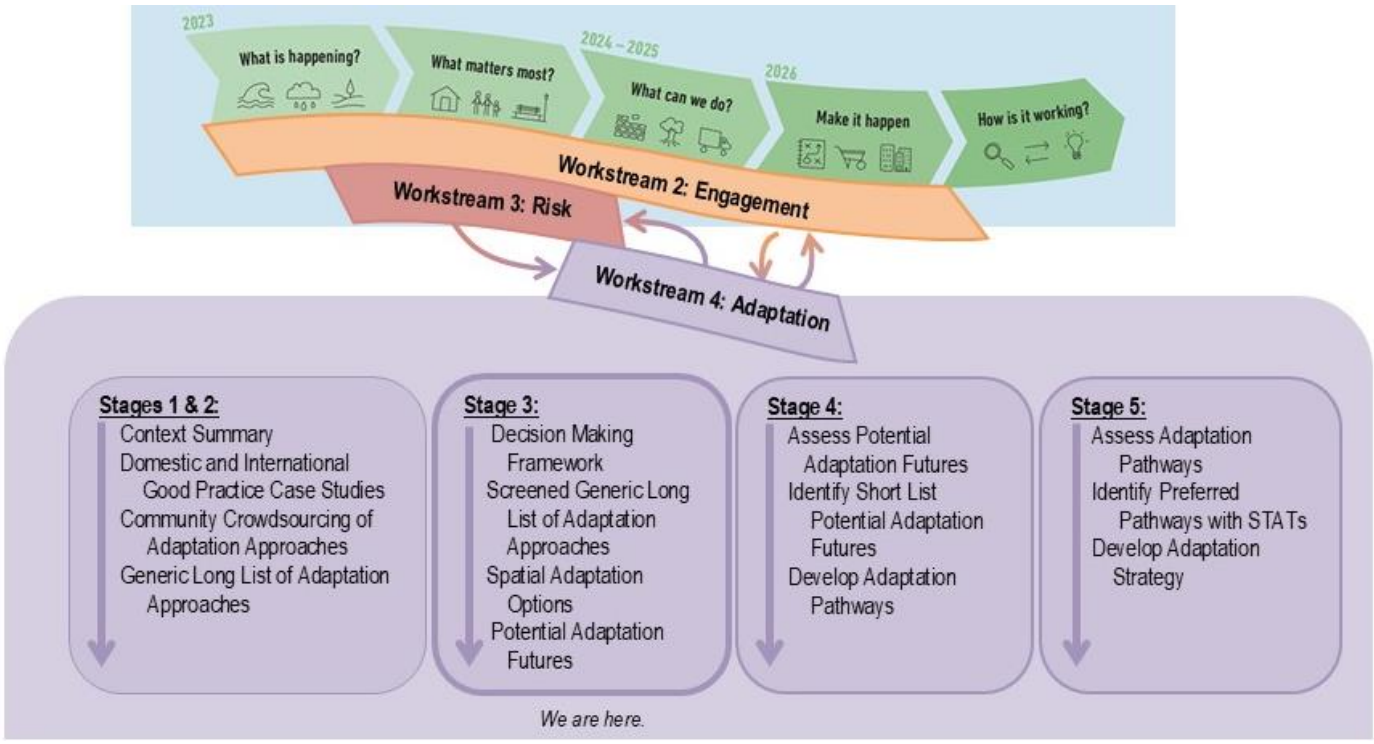

Figure 1: Programme Overview (note STATs in Workstream 4 are signals, triggers, and adaptation thresholds)

The programme follows the five main questions that reflect the 10-step decision cycle for adaptation planning provided in the Ministry for the Environment Coastal Hazards and Climate Change Guidance (2024). The steps allow for both short- and long-term planning via adaptive pathways and decision-making for South Dunedin.

The five main questions in the 10-step cycle are:

- What is happening?
- What matters most?
- What can we do about it?
- How can we implement the strategy? (Make it Happen)
- How is it working?

It is noted that this Context Report reflects the current stage in the process, which is the third of five iterations of the "what can we do about it" stage. In the fourth and fifth iterations, additional analysis, detail and short-, medium-, and long-term pathways of shortlisted and preferred futures will be provided. The following describes how answers to the key questions are reflected in this stage.

What is happening?

The South Dunedin risk assessment summarises the natural hazards affecting South Dunedin and outlines how these are expected to change over time, including in response to climate change. The risk assessment also considers South Dunedin's exposure to these changing hazards, analysing the resulting risk now and in future.

What matters most?

The risk assessment sets a baseline, outlining the risks faced by communities within the South Dunedin study area and the associated consequences for people, places, and assets that are important. This baseline has allowed a consideration of the residual risk that may remain for each Adaptation Future. This is a picture of what could happen if appropriate action is not taken in response to the escalating hazards. However, there are many things that can be done to mitigate and manage risk, including reducing both the likelihood of those risks occurring and the consequences should they occur.

Community engagement (Workstream 2), along with the visions and objectives documented in relevant strategic documents, has been used in the micro-business case evaluations to assess the potential Adaptation Futures against what matters most. For example, during this stage high level costs and benefits of each Adaptation Future have been provided (see Table 8, Section 6 of this report). These high-level evaluations will become progressively more detailed as we move into future stages and adaptation pathways preferred by the community are narrowed down. The Adaptation Futures developed during this stage will be used through Workstream 2 to continue discussions with the community around what matters most to them and the level of risk and associated implications with each to allow that narrowing down in focus.

What can we do?

There are many things that can be done to manage and mitigate the risk affecting South Dunedin. This could include infrastructure protections like pumps and pipes or parks and wetlands, property-based interventions like raising or water-proofing houses, changing plans and rules to avoid building in risky places, and retreating or relocating to move people and property out of harm's way.

In December 2023, councils released a list of sixteen approaches for helping South Dunedin adapt to flooding and future climate change. The list was made by merging around 280 ideas crowd-sourced from the community and stakeholders and informed by the best approaches from around the world. The sixteen approaches were presented for feedback from the community in March and April 2024. Community feedback has helped refine the approaches and test how they could be combined in different ways to manage and mitigate flood risk in South Dunedin. This has resulted in the Potential Adaptation Futures in Stage 3 (see Section 1.2). They include a 'status quo' future - essentially the path we're currently on if we do not change anything - and six other futures representing a spectrum of responses, with a focus on infrastructure at one end and land use change at the other.

Figure 2: Sixteen approaches to manage risks in South Dunedin

Mana Whenua partnership and collaboration

Both councils have Māori partnership and collaboration commitment policies. A Mana Whenua Panel (the 'Panel') has been formed to provide Kāi Tahu inputs and oversight to the programme on behalf of rūnaka.

Te Taki Haruru – the DCC's Māori Strategic Framework – was utilised to guide how inputs and direction from the Mana Whenua Panel could be incorporated into the programme, including both the risk assessment and adaptation options planning workstreams. Initial engagement with the mana whenua panel involved formulating a cultural values framework that aligned with the four principles of Te Taki Haruru. These values provided the basis for the Panel and Aukaha to define mana whenua specific risks within the South Dunedin Futures Programme area, and to define vulnerability rating statements using the same scale as used in the main risk assessment (very low risk, low risk, moderate risk, high risk, extreme risk).

The 'very low vulnerability' statements for each Te Taki Haruru value were then translated across to the adaptation planning workstream as the Best Outcome Statements for each of the seven potential adaptation futures. These inputs have been incorporated into the evaluation criteria presented in Appendix A.

Based on the cultural values framework and a subsequent assessment of risk from a mana whenua perspective, each of the seven potential futures were evaluated through this lens by Aukaha with Panel input and direction. These evaluations have been incorporated into the overall

micro-business case evaluations to ensure they capture rūnaka values, associations and aspirations for the programme area.

Throughout the assessments, a number of te reo words and concepts are used. These have been included in Appendix C - Glossary and include:

- Wai - water
- Moana - ocean
- Mahika kai - food and resource gathering sites and practices
- Mauri - life force and vitality
- Te Mana o Te Wai - concept that protecting the health and mauri of water bodies is paramount to the health of wider natural ecosystem environment and health of people
- Ki Uta Ki Tai - a holistic, inter-connected and or catchment-wide approach to natural resource management
- Marae - meeting area hosted by mana whenua in front of a wharenui (meeting house), also used to refer to surrounding land and buildings
- Kaitiakitaka – exercise of guardianship by mana whenua
- Hauora – health and wellbeing.

1.2 Adaptation Stage 3 Introduction

This report presents the methodology and outputs of Stage 3 - developing spatial potential adaptation futures. This report builds on the draft South Dunedin Futures Risk Assessment Report (February 2025) and the previous generic longlist of approaches. The purpose of this report is to provide context to Dunedin City Council and Otago Regional Council readers on the methodology used in Stage 3 and to document decisions made as background to the microbusiness cases of potential adaptation futures delivered under Workstream 4 in this stage (Stage 3). As shown in Figure 3, Adaptation Futures will be continuously refined over the course of the programme, including considering options over different timescales, to allow more detailed assessment and ultimately recommend preferred adaptation futures and pathways.

The report provides the following:

1. Methodology for screening the generic longlist of adaptation options to identify the spatial options and Potential Adaptation Futures for South Dunedin
2. Brief description of spatial adaptation options in the context of South Dunedin
3. An introduction and description of “Potential Adaptation Futures” for South Dunedin.
4. Next steps.

Adaptation Planning Steps 1-5
Research and development of 16 adaptation approaches

The diagram to the right outlines how the SDF programme is moving through the five steps of "What can we do?" on the way to producing an Adaptation Strategy for South Dunedin.

Steps 1 & 2
Research on climate adaptation around the world was combined with ideas crowd-sourced from the community and stakeholders to develop 280 options consolidated into a list of 16 generic adaptation approaches. Community engagement on the 16 approaches occurred in early-2024.

Step 3: 7 Potential Adaptation Futures (Longlist)

The 16 adaptation approaches have been refined and categorised as shown in the diagram on the next page, following community feedback and further technical analysis, then combined in different ways to form seven potential adaptation futures. Each of the seven possible adaptation futures represents what South Dunedin could look like in 75 years (the year 2100), noting that as conditions change over time, these futures could be realised earlier or later than 2100. Community engagement on the seven futures is planned for early-2025.

Step 4: 3-4 potential adaption futures and pathways (Shortlist)

Feedback from community engagement, and further technical and economic analysis, will be used to refine the seven potential adaptation futures into a shortlist. Each of the shortlisted futures will include pathways showing what changes could look like at 2050, 2075, 2100 and beyond with more detailed information regarding the useful life for adaptation actions over time. New actions along the pathway begin when conditions signal the need for change. Community engagement on the shortlisted futures and pathways is planned for early-2026.

Step 5: Preferred adaptation futures and pathways

Feedback from community engagement and a final round of technical and economic analysis will be used to refine the shortlist into a preferred adaptation future and pathway. As shown, the other pathways still remain "on the table" if the climate or communities change in unexpected ways. Community engagement is planned for late-2026. The final version of the preferred adaptation future and pathway will be presented in an Adaptation Strategy for South Dunedin, which is expected by the end of 2026.

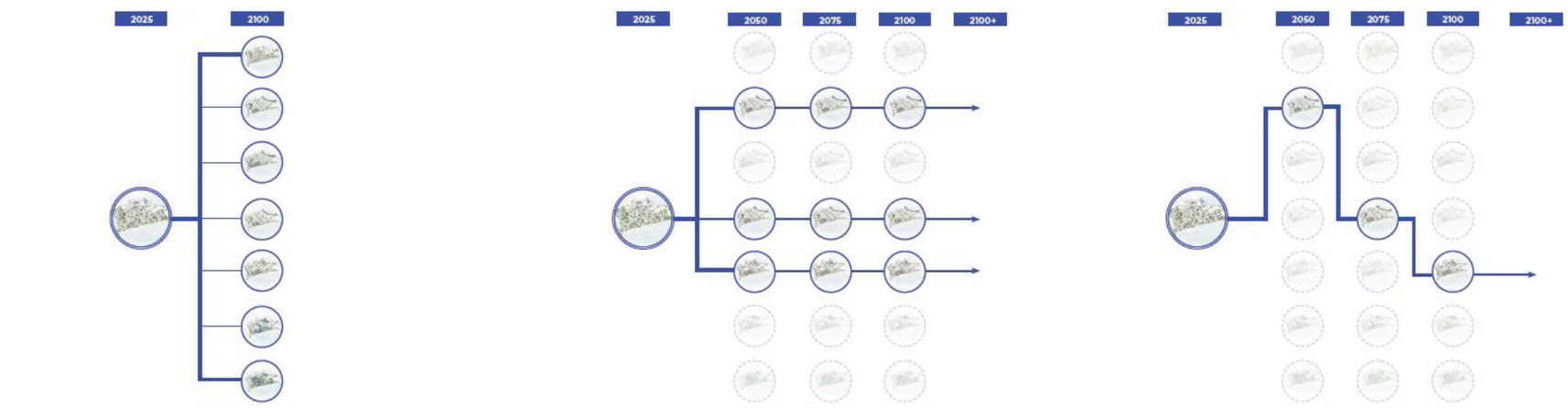

Figure 3: Adaptation planning steps 1 to 5 show how the South Dunedin Futures programme is moving through the five stems of "What can we do?" on the way to predicting an Adaptation Strategy for South Dunedin.

2 Overview of risk assessment

2.1 Integration of risk and adaptation

Within the wider programme context, the purpose of the South Dunedin Risk Assessment is to "assess the potential for elements at risk (people, places, assets) to be negatively affected by pluvial flooding, coastal inundation, coastal erosion, groundwater, landslide and liquefaction natural hazards in South Dunedin". This is required to support two aims:

- Outline the case for change - The baseline risk profile illustrates the consequences of a 'status quo' or 'do nothing' scenario.
- Spatial adaptation planning - Spatial risk quantification helps identify locations where adaptation measures are more likely required to reduce risk. The changing risk profiles over time helps inform when adaptation may be required. The risk profile for South Dunedin provides a baseline against which the merits of potential risk mitigations (e.g. adaptation options) can be assessed.

The risk assessment and adaptation planning workstreams have been deliberately designed with integration in mind. Places and spaces of importance from the risk assessment will be considered as adaptation planning continues to understand how the community will need to transform over time retaining the functionality of these places and spaces of importance. The risk assessment ultimately forms the "case for change" and an understanding of the potential impacts of continuing down current path.

The potential adaptation futures in the longlist phase of developing the adaptation strategy present what South Dunedin could look like in late century with a range of combinations of adaptation actions. These futures are assessed using the same categories as within the risk assessment – medium term (2060-2070) and long-term (2100) timeframes using two greenhouse gas emissions scenarios representing mid-range (SSP2-4.5) and high end (SSP5-8.5) projections - at a high level to begin to better understand residual risk associated with each future. This understanding can aid discussions around risk appetite and enable decisions to be made considering costs, risk reduction and wider environmental, social and cultural considerations.

2.2 Overview of risks

The South Dunedin Risk Assessment (Kia Ropine, 2025) examined the hazard scape affecting South Dunedin to assess the direct physical risks for a range of 'elements' - including people, places and assets. The risk assessment also examined how these risks might change over time, moving from a present-day assessment to mid-century and end-of century climate scenarios.

At present, risk across South Dunedin is driven largely by groundwater and pluvial flooding. Approximately 60% of buildings within South Dunedin are rated medium to high risk due to at least one of the assessed hazards but < 1% are at medium to high risk to three or more hazards. At the coastal edge, erosion poses a medium to high risk to parks. More broadly, the roads and wastewater assets have the highest proportion of assets rated at high risk.

- 35% of roads are subject to groundwater levels requiring unsustainable maintenance.

- 50% of wastewater pipes are leaky and past their useable life, resulting in reduced level of service.

Many of these risks are realised day-to-day across South Dunedin, such as shallow groundwater reducing the liveability of residential properties and negatively affecting the level of service of roads, stormwater, and wastewater. They are also occurring periodically, such as the heavy rainfall events in June 2015 and October 2024, which caused widespread pluvial flooding and damaged buildings and infrastructure across South Dunedin. There are a range of cascading risks and impacts that result from these direct physical risks, many of which are observable at present day. For example, flood damage negatively impacts housing quality, insurability, and market value, and costs of flood repairs can increase cost of living, affect mental health, and increase inequality.

At mid-century, significant increases in medium to high risk arise in sports fields due to coastal erosion (increase from 0% at present day to 20% at mid-century), buildings due to groundwater (increase from 23% at present day to 71%-78% at mid-century) and contaminated land due to groundwater (19% at present day to 36%-60% at mid-century).

At mid-century, approximately 20% of South Dunedin buildings are rated medium or high risk arising from a single hazard and 60% from at least two hazards, but < 1% are at medium to high risk to three or more hazards. The chronic effects of high groundwater will cause increasingly widespread decline in building condition, stability, and healthiness, sports fields, and roads, as well as reduction in level of service of stormwater and wastewater systems. Increased spread of contaminants is likely as a result of these risks as well as due to the effect of high groundwater on large number of contaminated sites. Increased event-based impacts will result in damage to increased numbers of buildings. These increasing risks carry cascading impacts, including health risks, environmental damage, significant reduction in sports field area, decline in building performance and increased road maintenance.

At late century, risk arising from groundwater coastal inundation and pluvial flooding is widespread, with 69-84% of all buildings at high risk to these hazards. Additionally, most other elements at risk have a high percentage of assets that are at high or medium risk to these hazards. Approximately 90% of South Dunedin buildings are rated at medium or high risk due to one or more hazards. In the case of groundwater, 80-84% of buildings will be subject to medium or high risk, where widespread emergent groundwater could cause instability to foundations, increase dampness and mould, and reduce level of service of stormwater, wastewater, and other utilities servicing these properties. As the number and severity of risks increase, the functionality or level of service of the places and assets within South Dunedin will decline. This will bring complex and interrelated cascading impacts on the social, economic, and environmental systems in South Dunedin. Many of these impacts will affect broader Dunedin city and wider region, given the interconnected nature of activities, services, and infrastructure in South Dunedin (e.g. the majority of Dunedin's wastewater is treated in South Dunedin).

Analysis in the risk assessment shows that South Dunedin has high exposure to natural hazards and a correspondingly high baseline risk profile. Anticipated changes in climate and associated increases in exposure to natural hazards are expected to materially increase risk across all elements assessed in the risk assessment. As this exposure and direct physical risk increases, the adverse consequences for South Dunedin's buildings, infrastructure, and communities also increase to a point where much of the key infrastructure, functions, and services experience declining functionality, loss of service, or complete failure. These risks will have significant adverse effects on the South Dunedin community, Dunedin city, and the economy unless appropriate risk mitigation is employed.

While further work is planned on determining risk tolerance and thresholds, community reactions to floods in June 2015 and October 2024, and public and official discourse surrounding these events indicates this level/frequency of flooding is likely intolerable - and that change is required. The next phase of engagements around possible adaptation futures will assist in further confirming the current level of community risk tolerance.

The risk assessment illustrates that flood events such as June 2015 and October 2024 are likely to become more frequent in South Dunedin. It also indicates these periodic floods will likely be more severe, due to the compounding effect of gradual onset hazards such as rising sea-levels and groundwater.

This paints a confronting picture of hazard, risk, and consequence for South Dunedin. The possible adaptation futures presented in this report illustrate a range of options for managing these risks across South Dunedin and reducing these to tolerable levels. However, it should be noted that each adaptation future addresses risks to certain levels and depending on the rate and scale of change in climatic conditions (i.e. the differing climate scenarios) some futures may reach the end of their range of effectiveness sooner than others. The report explores the merits of various adaptation options, the trade-offs involved, and the type of future they could lead to in South Dunedin. This is intended to enable partners, stakeholders, and affected communities to compare various options and discuss risk tolerance and favoured futures to allow a more detailed assessment of combinations of options in the short-listing stage.

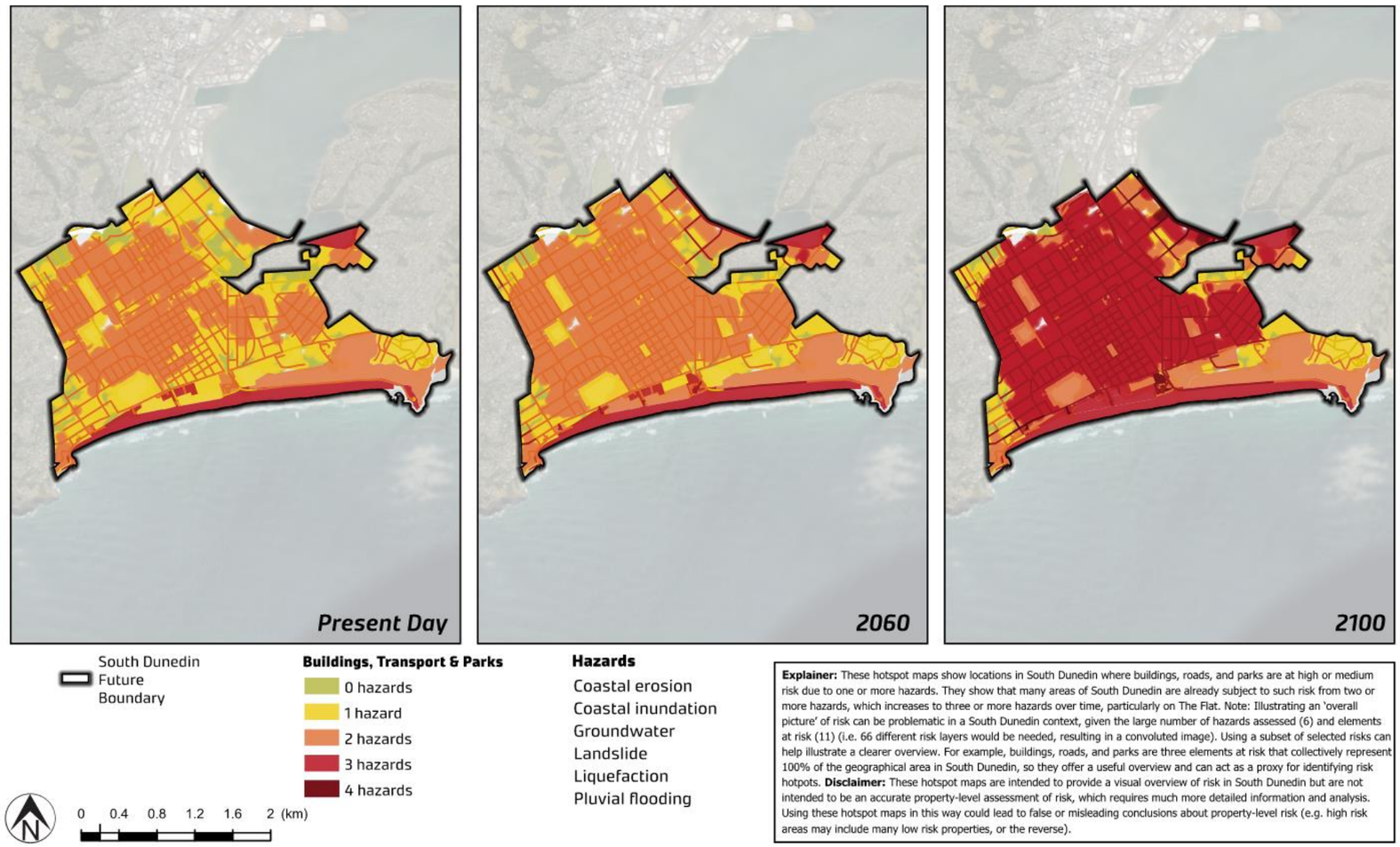

Figure 4 Summary of risks to South Dunedin, including buildings, transport and parks

3 Methodology

The section below presents the process for how the Kia Rōpine team shaped the sixteen adaptation approaches into seven potential adaptation futures. The seven potential adaptation futures for South Dunedin presented in this report reflect different ways to manage flood and other risks in South Dunedin. They include a 'status quo' future – essentially the path we are currently on if we do not change anything with a focus on individual actions by property owners – and six other futures representing a spectrum, with a focus on infrastructure at one end and land use change at the other.

Each of the seven potential adaptation futures represents a different combination of the approaches for helping South Dunedin adapt to flooding and future climate change. There are different costs and benefits associated with each future, and these are described as assessed in the micro business cases to support comparison. We note that these are only initial assessments with future detail to be provided in the shortlist and preferred stages.

3.1 Refining generic approaches to spatial options

First, the longlist of generic adaptation approaches was expanded to the forty-two individual options within the generic approaches to evaluate options through a cascading screening process. This process screened out options considered in a parallel process in St. Clair/St Kilda (e.g., dune management or reshaping) as well as options that presented significant technical or logistic challenges rendering them technically unfeasible (e.g., tidal barrier for coastal flood management). This process is shown in Figure 5.

The remaining options all provide some level of relevant and suitable risk management for places, spaces and assets within South Dunedin. To better reflect how these options would be implemented, they were categorised into the following:

1. Individual property or asset-level interventions that could be undertaken by individuals on a site-by-site basis to reduce risk
2. Existing or planned actions by local, regional or national government including regulatory frameworks, initiatives, or programmes which do not require new allocation of resources.
3. Short-term interventions that will require new allocation of resources and funding by Councils to support risk reduction.
4. Enabling actions that may be required to implement future adaptation options or pathways.
5. Viable large scale community interventions spatially distributed that require further technical assessment.

All categories of interventions are likely to be combined with other options to support reduction in risk. Groups 1-4 above represent actions that should be taken forward and incorporated into individual and Council actions moving forward as soon as practical as low-regrets short-term initiatives that will support long-term risk management.

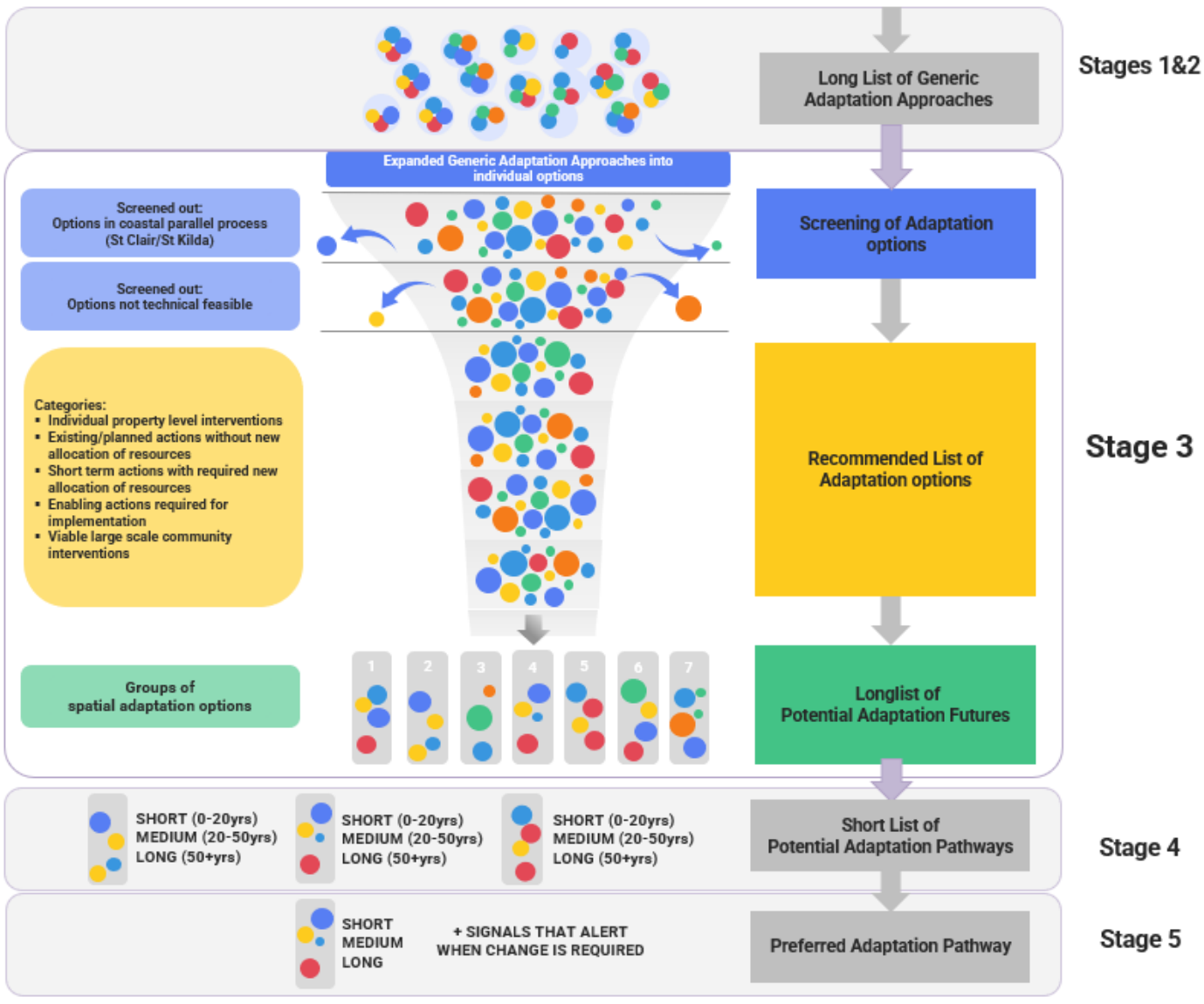

Figure 5: Screening of the expanded generic list of adaptation approaches to develop spatial adaptation options and Potential Adaptation Futures.

Due to the complexity and interconnection of hazards, their impacts, and local geography, various interventions will be needed to adapt in the future. Therefore, the viable large scale community options have been grouped into seven "potential adaptation futures" providing examples of what South Dunedin could look like in the late century (e.g. 2090-2100). These futures would be implemented gradually over time to reduce risk as climate change continues and would be supported by the other individual, existing, short-term and enabling actions as indicated in Groups 1-4. To do this, South Dunedin was divided into four “cells” that represent key areas of particular risks as presented in Section 5 to understand which community-scale options are most appropriate in which locations and the futures were developed to represent the variability of potential options across the cells.

3.2 Selecting a shortlist and preferred options

As the South Dunedin Future Programme continues, making transparent, repeatable decisions aligned with Council strategies and community aspirations is paramount. To support this, a decision-making framework was developed (Appendix A) in alignment with the strategic objectives presented in the November 2023 Generic Adaptation Approaches Context Summary.

The criteria were developed through distilling the Strategic Objectives into measurable components. It is recommended that potential adaptation futures should be assessed in two ways:

- Against individual criteria using rubrics (presented in the framework in Appendix A)
- Against overall objectives using a high-level assessment (presented micro-business cases)

Strategies, plans, and policies represent a selection of local, regional and central government direction to inform the rubrics for each criterion. These strategies are presented alongside the information gathered through community consultation to provide context for the assessment.

The seven potential adaptation futures will be assessed and scored from -3 to +3 using the decision-making framework at the start of the shortlisting phase (Stage 4), using a refined understanding from community feedback on the potential adaptation futures and their residual risk (which will guide an understanding of risk tolerance) determined from updated modelling (if available). These scores will then be combined using weighting methods and sensitivity testing to shortlist potential adaptation futures.

The 'potential adaptation futures,' presented in microbusiness cases, will serve as a tool for informed discussions with the community in this phase about how a combination of adaptation options may help reduce risk, as well as what residual risks remain and their likely implications.

To further develop the short list of potential adaptation futures, pathways will be developed with short-, medium- and long-term actions to enable the potential adaptation futures selected for the short list. Further community engagement will occur on these short-listed pathways (Stage 4) prior to selection of preferred pathways.

The additional short list criteria will be assessed at the preferred pathways phase (Stage 5), and scores will be updated using the refined understanding from community feedback. Finally, preferred pathways will be recommended based upon combined scoring.

Table 1: Strategic objectives with assessment criteria from Decision Making Framework

Objective	Criteria
<u>Sustainable Urban Development:</u> Urban development accounts for the changing environment in South Dunedin, providing better spaces for people, water, and wildlife.	Reduce emissions and waste*
	Well-functioning and liveable urban environment, including serviceable infrastructure and appropriate levels of service
	Promotes water sensitive urban design and enhances amenity
	Suitable phasing over time*
<u>Environmental and cultural restoration:</u> Restore and regenerate natural environment, renew urban spaces, and re-energise cultural connections to place.	Restore the natural environment
	Enhance mana whenua connections to place
	Aligns with Te Taki Haruru values (Autūroa, Auora, Autaketake, Autakata)
<u>Just transition:</u> Respond to climate change in ways that empower communities and promote fairness and equity.	Reflect community preference
	Minimise impacts on all vulnerable communities
	Empowers communities
	Vulnerable communities are not left behind
	Promotes intergenerational equity
<u>Social and economic resilience:</u> Strengthen communities and businesses so they are well-prepared for floods and other hazards, able to cope and bounce back	Preserve and enhance community cohesion and community values
	Minimises economic risk to communities
	Increases community adaptive capacity
	Minimises economic risk to individuals
	Minimises impacts to business
<u>Promote community safety:</u> Promote community safety in South Dunedin by reducing flood and other risks, despite increasing natural hazards.	Promote community wellbeing
	Promote community safety
	Reduced natural hazard risk*
*Criteria that contains measurements to only be assessed during the short list to preferred pathways stages	

4 Spatial longlist of adaptation options

The longlist of options identifies the interventions likely to reduce risk in South Dunedin. These options have been sourced through the previous Stages 1 & 2 Generic Long List of Adaptation approaches. Following the methodology presented above, the forty-two options within the sixteen generic approaches have been screened into the categories presented Figure 6.

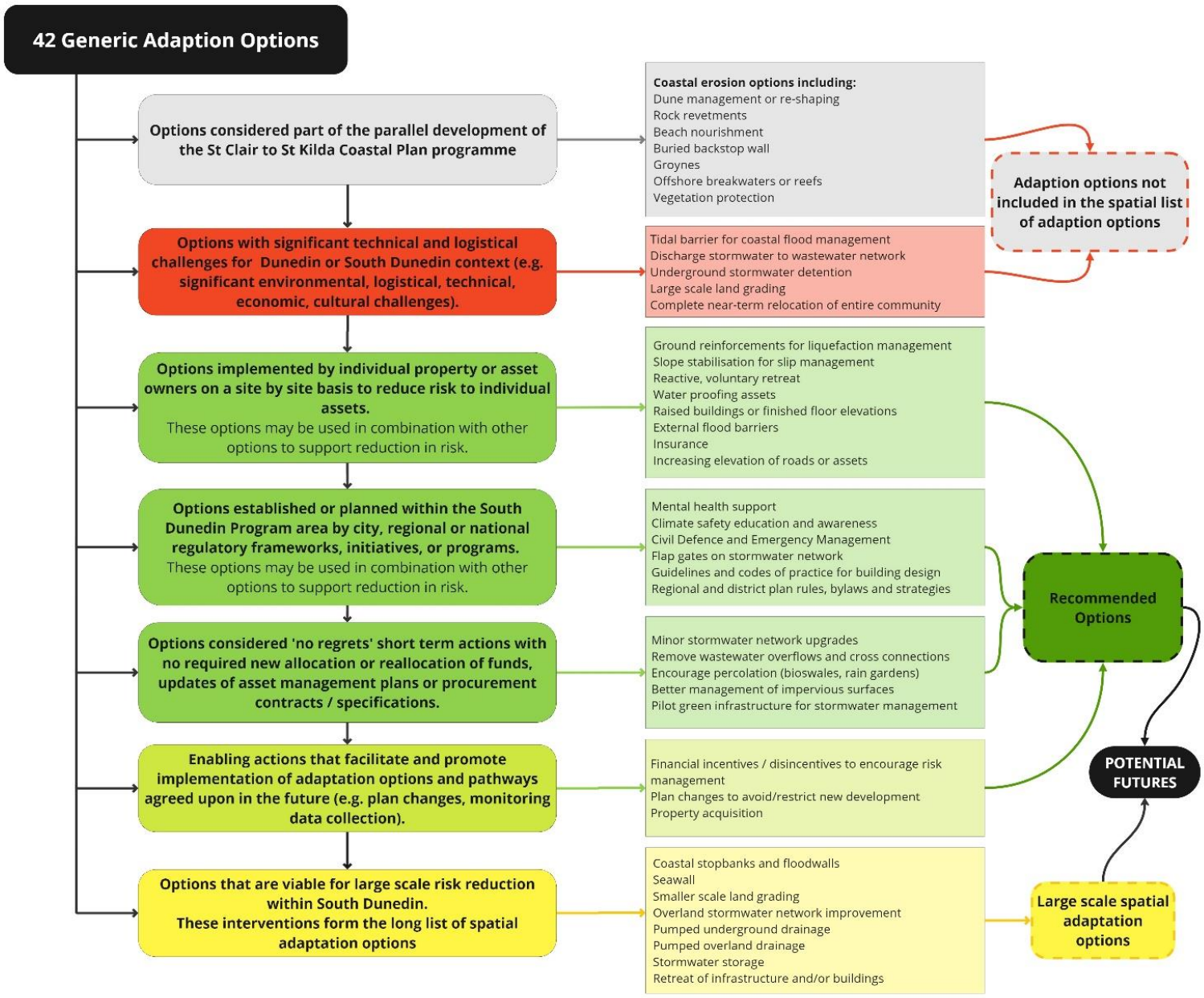

Figure 6: Assessment flow chart for screening expanded Longlist of Generic Approaches into spatial adaptation options for consideration in suggested futures.

Below, we present a description of all options taken forward and an explanation of their relevance for South Dunedin. For options not taken forward, including those considered through the St Clair to St Kilda Coastal Plan programme and those not technically feasible, an overview of these options is presented in Appendix B.

4.1 Recommended options

Recommended options are foundational actions that do not require additional assessment and should be incorporated by Council and communities into risk management moving forward, and that will, in combination, support the long-term Adaptation Strategy for South Dunedin. These range from interventions that individual owners can consider, existing interventions or options already planned or in progress, and short-term actions (no regrets) that provide significant benefits that require further or new investment.

While these options are presented separately from the possible adaptation futures, the scale, extents and efficacy of the options below will vary depending on which potential adaptation future is selected. For example, raising buildings on piles can reduce risk of pluvial or coastal flooding to the properties; however, without management of groundwater, the systems that property owners rely on (e.g. water network, road, etc.) will be increasingly difficult to use and maintain.

In areas where land is raised, raising buildings on piles would not be required but raising buildings that remain in the Flats may be advisable. Despite the uncertainty around scale, extend or efficacy, it is likely that in some form, the options below will be incorporated to adapt in the future.

Civil Defence Response and Readiness importantly will continue in all future scenarios, noting that where hazards are less well managed, more frequent and larger Civil Defence responses will be required.

INDIVIDUAL PROPERTY OR ASSET INTERVENTIONS

The following options are for individual asset, property and business owners to consider on a site-by-site basis to reduce risk to their assets. These options are a mix of engineering, financial, and social interventions that may be used in conjunction with other options to support reduction in hazard risk.

The following are options to be considered as site-specific interventions. These options have not been considered at the community scale due to the variability of site-specific characteristics of individual assets and to allow individual risk tolerance to dictate the need to undertake such measures.

As previously stated, these options are for property or asset owners to consider. It is acknowledged that this is a limitation for the South Dunedin community as there is a high proportion of renters in this area. As such, while property level interventions can meaningfully reduce impacts of hazards, without funding support, reliance on individual interventions is likely to increase inequity as those with ability to improve properties will adapt these measures and vulnerable populations may remain at risk.

Investments in publicly owned assets, like roads or pump stations, would need to be considered in a system view to understand functionality of those assets during hazard events.

Table 2: Individual property or asset interventions that are recommended options

Generic approach	Individual Interventions	Description
Ground Reinforcement	*Ground reinforcements*	Property owners can consider different types of ground reinforcements (e.g., piles, stone columns, grouting, etc.) to prevent settlement and other types of damages caused by

Generic approach	Individual Interventions	Description
	for liquefaction management Hazard: Liquefaction	liquefaction. The effectiveness of ground reinforcements depends on the specific site conditions, including soil type, groundwater levels, and seismic activity. This sort of intervention is a long-term, significant modification, likely constructed for new physical works or when significant modifications are underway for other purposes.
Ground reinforcement	*Slope stabilisation for slip management* Hazard: Slips	Slope stabilisation can help prevent slips in areas where steep slopes and unstable soils can pose significant risks. This could look like planting, soil nailing or retaining walls. by reinforcing slopes and improving their stability, individual owners can reduce the likelihood of slips and protect valuable infrastructure and property. Examples of this intervention can already be seen across South Dunedin in the hilly parts of the catchment like along the bank at the southern end of esplanade at St Clair.
Reactive retreat	*Reactive, voluntary retreat* Hazard: All hazards	Reactive or voluntary retreat involves residents making a voluntary decision to relocate themselves or their assets away from vulnerable areas to safer locations. This intervention is often considered when the risks of flooding, erosion, or other hazards become too severe to justify continued development or occupation. currently this is the most seen intervention in South Dunedin as renters retreat from impacted areas following major floods. When homes are red or yellow stickered or even when in proximity, some residents reach the limits of their risk tolerance and may opt to move outside of the flood prone area. This process is effectively reactive, voluntary retreat and will likely occur more frequently in the future without substantial intervention.
Property level interventions	*Water proofing assets* Hazard: Pluvial and coastal flooding	Water proofing assets include a variety of techniques and materials depending on the specific asset and the nature of the water exposure. The aim is to enhance the durability of new and existing buildings or structures, making them more resistant to flood damage and potentially extending their lifespan. For example, this could include waterproof first floors, installing pumped drainage systems around basements, or floodable asset design to allow for fast recovery post an event. These sorts of interventions build resilience and allows people to stay in their homes for longer, maintaining a sense of place. Many residents of South Dunedin already have small pumps to dewater their yards.

Generic approach	Individual Interventions	Description
Property level interventions	*Raised buildings or finished floor elevations* Hazard: Pluvial and coastal flooding	Individual property owners may opt to raise their houses, businesses, or assets to reduce in-situ consequences from flooding. This intervention is on a property level, as each property would need a feasibility assessment to test viability to be raised. However, raising homes can happen relatively quickly and is a tangible solution for residents that considerably reduces their risk of future flooding. This improves individual properties level of resilience to maintain a sense of place while improving living conditions. For example, following the 2015 flood, new minimum floor levels for new builds based on measured water levels during that event were imposed for all construction from that date. However elevated buildings may not reduce the risk of flooding for services, utilities, and amenities that property owners rely on in the community (NIWA, 2023). Depending on how buildings are raised, there can be negative impacts for neighbours if water is just shifted onto their properties. To avoid cases like these, this could be supported by a measure like Tauranga Plan Change 27 which does not allow properties to impact stormwater flow beyond their property without resource consent authorisation.
Property level interventions Readiness and response	*External flood barriers* Hazard: Pluvial and coastal flooding	External flood barriers are physical structures or barriers placed around a house to protect it from flooding. These barriers can be temporary or permanent, designed to divert water away from the building or prevent it from entering. This type of intervention is relatively simple, quick to implement, and renter friendly. Temporary barriers such as sandbags are commonly used across South Dunedin during high rain event warnings. More significant moveable barriers or gates are used beyond South Dunedin to prevent flood waters from entering buildings.
Behavioural and societal changes	*Insurance* Hazard: All hazards	Insurance services involve individual property owners paying insurance premiums to receive compensation for damages from their insurance after a hazard event. For instance, after the 2015 flood, 1200 homes and businesses were affected, with insurance payouts reaching $28 million (Mitchell, 2019). This insurance payout offset the cost to individuals to repair their properties, and insurance would continue to support residents in funding repairs post-flood event. However, affordability of premiums can affect disproportionally vulnerable socio-economic residents

Generic approach	Individual Interventions	Description
		resulting in sales of property. Further, renters may not have contents insurance and therefore can be disproportionately affected during flood events. The risk of insurance retreat due to repeated events or flood risk more generally becoming uninsurable could mean that property owners in South Dunedin are no longer able to access funds for mortgages. Considerations related to long-term provision and affordability of insurance should be included within adaptation planning.
Land grading Property / Asset level interventions	*Increasing elevation of roads or assets* Hazard: Pluvial and coastal flooding	This intervention involves raising a road level or other asset level to reduce flooding during heavy rainfall. Benefits of this intervention is that people and assets are removed from the floodplain, increasing safety and community confidence. For South Dunedin, increasing elevation of roads or assets is only considered at the individual asset level due to potential for wider impacts. While assets like roads could be elevated, doing this in isolation may "protect" the transport network but it is likely that there would be flow on impacts to properties and without building-level interventions, impacts would continue, this could be useful for smaller infrastructure like pump stations.

EXISTING OR PLANNED INTERVENTIONS

These approaches have been established and planned within the South Dunedin Programme area by city, regional or national regulatory frameworks, initiatives, or programmes. These interventions do not require policy changes or significant new investment allocations and can support risk reduction in combination with other adaptation approaches. As such, these approaches are applicable across all potential adaptation futures and scenarios. They provide a foundation that supports various adaptation strategies. The following are approaches considered part of the foundational actions. Depending on the reliance on these interventions to manage risks, more funding may be required in the future; for example, without action to reduce flood risk, more frequent Civil Defence response and therefore funding will likely be required.

Table 3: Existing or planned interventions

Generic approach	Existing or Planned Intervention	Description
Behavioural and societal changes	*Mental health support*	This is an essential aspect of hazard risk response and proactive adaptation intervention, providing individuals and communities with the resources they need to cope

Generic approach	Existing or Planned Intervention	Description
	Hazard: All hazards	with the psychological impacts. This support can help people manage stress, anxiety, depression, and other mental health challenges that often arise during and in the aftermath of disasters and community interventions, overall increasing community wellbeing. Currently, Dunedin City Council (DCC) has online resources directing individuals to the health system in New Zealand and the medical services in Dunedin (Dunedin City Council , 2024). Additionally, DCC offers grants to groups providing activities and facilities for the well-being of the residents. Te Whatu Ora Southern offers a range of services to support community members through short-term assistance and ongoing care (Te Whatu Ora , 2024).
Behavioural and societal changes	*Climate safety education and awareness* Hazard: All hazards	Education and awareness of climate hazards and their impacts are part of multigenerational efforts with the South Dunedin community led by DCC and ORC. These efforts include working with schools, community groups, and organisations, providing them with environmental lessons and digital tools that suit individuals, businesses, and communities. DCC and ORC have provided community events and online resources devoted to informing the community about the science behind South Dunedin. Benefits of this include increasing community resilience and preparedness, and evidence of this was seen during the October 2024 floods where in an interview with RNZ, a woman remarked that her son learned about flooding in South Dunedin at school and made her aware of this risk.
Readiness and response	*Civil Defence and Emergency Management* Hazard: All hazards	Civil defence and emergency management are coordinated by local, regional, and national organisations often involving collaboration with community organisations, businesses, and individuals. These activities include: • Readiness: Planning for and preparing for potential emergencies, such as developing emergency plans, training personnel, and stockpiling supplies via Emergency Management Otago (EMO). • Response: Coordinating and managing emergency response activities, including search and rescue, evacuation, and disaster relief. EMO's website has information about online media channels during a disaster and evacuation plans. Readiness and response activities help minimise injury, loss of life, and property damage during an event whilst also supporting recovery after an event. The Civil Defence Response during the October 2024 floods provided ongoing communications, sandbags, an

Generic approach	Existing or Planned Intervention	Description
		evacuation shelter and other support services to the community to minimise impacts.
Water flow improvements	*Flap gates on stormwater network* Hazard: Pluvial flooding	Flap-gates on outlets control the flow of water reducing backflow. These gates are typically hinged at the top and are designed to automatically open or close based on water pressure. When the water level upstream exceeds the downstream level, the flap gate opens to allow discharge. Stormwater outfalls in South Dunedin already have flap gates. The existing flap gates reduce "backflow" of seawater into the stormwater network. These should be maintained in the future.
More restrictive building or development standards	Guidelines and codes of practice for building design Hazard: All hazards	Guidelines and codes of practice are essential tools for helping buildings in South Dunedin be designed and constructed to withstand present and future challenges posed by natural hazards. These documents provide current requirements and recommendations for building design, construction, and maintenance including, for example: • Building Code of New Zealand (BCNZ): This is the primary building code for New Zealand, covering a wide range of building types and construction methods. It includes provisions for hazard mitigation, such as earthquake and flood resistance. • New Zealand Standards: Various standards that provide specific guidance on building design and construction, these include structural design for timber, concrete, and steel building including for earthquakes (NZS 3604, NZS 3605, NZS3606) and stormwater drainage and management (NZS 1160). • Dunedin City Council: Council introduced minimum floor levels (MFL) for mainly residential buildings, including new homes, house extensions, rest homes, schools and halls across several low-lying parts of the city. Compared to most other areas of the city, South Dunedin has specific methods to establish MFLs which involve historic flood water levels (2015).
More restrictive building or development standards	Resource management policies, regional and district plan rules, bylaws and strategies	Regional and district plans, bylaws, and strategies are important tools for managing land use and development in South Dunedin, particularly in relation to flood risk. These documents provide guidelines and regulations for land use development and sub-division, as well as infrastructure development.

Generic approach	Existing or Planned Intervention	Description
	Hazard: All hazards	These include rules for housing density, building in hazard areas, site coverage, impermeable surfaces and setbacks. Examples include: • New Zealand Coastal Policy Statement 2010: national policy requiring identification of areas in the coastal environment that are potentially affected by coastal hazards over at least a 100-year planning horizon and requires a precautionary approach to the management of coastal hazards. • The Regional Plan - Coast for Otago (the Coast Plan): regional policy promoting the sustainable management of resources in the coastal marine area through a regional policy framework. • 2nd Generation District Plan (2GP): district plan providing a framework for using, managing, or protecting land and its natural and physical resources. These include regulations for density housing, building codes, or setback rules. • Future Development Strategy (FDS) for Dunedin: primary document promoting long-term strategic planning for the next 30 years. The next FDS review will integrate the South Dunedin Futures Project results. • DCC 3-Waters Integrated Systems Planning: Currently under development, strategy setting the vision of how water infrastructure will be managed by council over the next 50 years. This provides an opportunity to align the needs of South Dunedin regarding water infrastructure and services.

SHORT-TERM INTERVENTIONS

These options are considered 'no regrets' interventions that will require additional allocation of resources and funding by local and regional councils to support hazard risk reduction. These interventions may require update of asset management plans, procurement contracts and specifications. For certain locations, such actions may be the short-term actions (present to 20 years) to begin progress towards the selected future. The following are options considered part of the foundational actions and implementation of these could begin as soon as practicable. Some of these interventions may be beyond the geography of South Dunedin but could have material impacts on the risks within the project area, particularly as South Dunedin is the "bottom" of many stormwater and wastewater catchments where slowing, capturing or diverting flows in the upper part of the catchment could reduce impacts downstream.

Table 4: Short-term interventions

Generic approach	Short-term Interventions	Description
Water flow improvements	*Minor stormwater network upgrades (e.g. check valves, removing bottlenecks*) Hazard: Pluvial flooding	Minor stormwater network upgrades include upgrades and maintenance of gutters, mud tanks, pipes, manholes, pump stations, detention ponds, stormwater reserves, inlet and outlet structures and some watercourses. The aim of network upgrades is to reduce the frequency, duration, and volume of stormwater runoff, mitigating the risks of nuisance flooding and moderate post-development flows to watercourse. These minor upgrade approaches are conventional and as such, this are likely a palatable option as they are well known by Dunedin residents with various three waters upgrades happening in areas across the city. Previous assessments have identified specific locations where increasing capacity could relieve known bottlenecks or other minor upgrades, noting however that these minor upgrades would be helpful for improving performance of the stormwater system in frequent events but may provide limited benefits in more severe rainfall events.
Removal of wastewater network overflows and cross connections	Remove wastewater network overflows and cross connections Hazard: Pluvial flooding	Measures to remove wastewater overflows include fixing cracked pipes or manholes as well as removing cross connections. Removing wastewater network overflows and cross connections would avoid wastewater spilling out from gully traps, manholes, or engineered / constructed overflow points when the network has reached full capacity protecting people from health risks associated with flooding. As well as supporting people's health and safety, the communities' cultural and recreational connections with natural water bodies and natural heritage are maintained. Linkages between the stormwater and wastewater networks in South Dunedin as well as in Kaikorai Valley are suspected to contribute to flooding issues in South Dunedin. There has been wet-weather overflow from the wastewater networks in Surrey Street.
Increasing permeability	Encourage percolation (bioswales, rain gardens, permeable surfaces) Hazard: Pluvial flooding	Encouraging percolation involves implementing measures to assist the movement of water through soil. Methods include bioswales which are shallow vegetated channels designed to capture, treat, and infiltrate stormwater runoff allowing the delay of stormwater runoff and treatment of the water quality. Rain gardens are another means of encouraging percolation, they help remove pollutants, slow stormwater flow and filter contaminants. Additionally, increased permeable spaces can enhance local biodiversity, which not only supports ecological function but fosters cultural wellbeing, and can promote greater access to green and blue spaces which offer mental health and wellbeing benefits and

Generic approach	Short-term Interventions	Description
		recreational opportunities. The imperviousness of the South Dunedin catchment is a major influence on the quantity of runoff generated and the contaminants carried. Encouragement of percolation through measure like bioswales, raingardens, and permeable surfaces will help to address the issue of stormwater runoff in South Dunedin. This is most relevant in elevated parts of South Dunedin where there is not already groundwater near the surface. If measures to capture rainfall were implemented at a community scale particularly in the upper catchment beyond South Dunedin, this could slow the flow of water in regular rainfall events but would be less effective during extreme storms.
Increasing permeability	Better management of impervious surfaces (rain tanks, green roofs*)* Hazard: Pluvial flooding	Managing impervious surfaces involves improving the environment's ability to absorb excess rainwater, which reduces the volume and rate of runoff going into the stormwater network. Managing impervious surfaces can be achieved through methods like introducing more rain tanks to capture rainwater, to reduce the flow into the stormwater network. Another method is introducing green roofs, which allow water to be stored by the substrate to then be absorbed by the plants. This allows for a reduction of water entering the stormwater network and at a delayed rate, therefore collectively referred to as components of a Sponge City. These components not only increase absorption capacity for stormwater but can also increase local biodiversity through providing habitat, improve air quality by removing pollutants therefore improving public health outcomes, and act as carbon sinks by absorbing carbon dioxide. Slowing the flow of runoff to the stormwater network, particularly in the upper catchment that flows into South Dunedin could improve system performance during regular rainfall events but would be less effective during extreme storms. While tanks could be at the property scale, high uptake would be required for a meaningful reduction in risk.
Stormwater storage	*Pilot green infrastructure for stormwater management* Hazard: Pluvial flooding	Stormwater storage includes permanent (wetlands, ponds) and temporary (parks, other floodable infrastructure) areas for intentional water detention that is connected to the pumped drainage network for discharge following rainfall events. There are also currently regulatory tools in place to protect areas of flood protection vegetation under the ORC Flood Protection Management Bylaw. Permanent green

Generic approach	Short-term Interventions	Description
		infrastructure for stormwater management requires a large land area which would reduce the area of public space available for other activities. A pilot on existing Council owned land, such as Forbury Park, could provide the opportunity to develop and test stormwater storage in blue-green spaces so that communities can provide feedback on the usability of these spaces while also providing flood risk reduction benefits.

ENABLING ACTIONS FOR FUTURE IMPLEMENTATION OF ADAPTATION OPTIONS

These actions will facilitate and promote the implementation of the adaptation options and pathways agreed upon in the future. They require local, regional and/or central government support by allocating resources and funding and hence don't appear on the short-term interventions list, despite them being no regrets options. The following options could be considered part of the foundational actions and internal investigations required for adaptation pathways and therefore DCC and ORC should begin to evaluate and plan for these enabling actions.

Table 5: Enabling actions for future implementation of adaptation options

Generic approach	Enabling Actions	Description
Behavioural and societal changes	Financial incentives or disincentives to encourage risk management Hazard: All hazards	For South Dunedin, these can be applied to motivate individuals, businesses, and communities to adopt measures that reduce their vulnerability to hazards, such as flooding. For instance, incentives such as subsidies for floodproofing or penalties/fines for individuals or businesses that violate risk reduction regulations. Using a combination of incentives and disincentives, local government can encourage individuals and businesses to take proactive steps to manage risks and reduce their vulnerability to hazards.
More restrictive building or development standards	*Plan changes to avoid/restrict new development* Hazard: All hazards	These interventions refer to changes made to land use plans or zoning regulations to prevent or limit new construction in areas considered at high risk. These could help avoid increasing risks for the South Dunedin community and promote new development in safer locations. There are future intensification areas outlined in Dunedin's Future Development Strategy of which South Dunedin is not included. However, currently there are also no restrictions for development in this area.
Managed relocation	Property acquisition Hazard: All hazards	Managed relocation could involve the planned and gradual acquisition of property as required to directly or indirectly support risk reduction and adaptation actions. Acquired property could be utilised for a

Generic approach	Enabling Actions	Description
		range of purposes, including: to limit or avoid maladaptive activity, as a strategic hold or revenue generating asset (until risk becomes intolerable), to enable new or upgraded infrastructure, to facilitate temporary or permanent land use change (e.g. intensification or deintensification/retreat). For South Dunedin, this intervention would be a strategy to reduce the risk by purchasing properties in high hazard zones which can then be used for other adaptation approaches such as increasing permeability. Purchase must occur alongside this in low hazard zones to enable intensification or in areas to make space for risk management infrastructure. For example, Carlton Hill, Concord, Corstorphine, and Andersons Bay are currently named in the Dunedin Future Development Strategy to intensify which would contribute to the success of this approach. While it is unclear what scale of property acquisition will be required, a minimum level of buyout will be required to make space for Council infrastructure like pump stations. Under more transformative futures, neighbourhood scale property acquisition could be required to enable retreat.

VIABLE LARGE-SCALE INTERVENTIONS

These interventions form the longlist of adaptation options that have been evaluated during this phase of work for South Dunedin due to their potential efficacy in reducing risks associated with coastal hazards and pluvial and groundwater flooding on a large scale[1]. These interventions would not be deployed uniformly across South Dunedin but rather in specific zones or cells.

The following are the individual approaches included in the potential adaptation futures.

Table 6: Viable large-scale interventions

Generic approach	Viable large-scale interventions	Description
Coastal protection	*Coastal stopbanks and floodwalls* Hazard: Coastal flooding	Coastal stop banks and floodwalls provide a coastal inundation defence to manage flood risk to communities. For this option, an inland alignment is considered to protect South Dunedin from flooding via the harbourside as an alternative to a seawall exposed to frequent wave action. It would be designed to keep seawater out and would include mechanisms for discharge of stormwater through the coastal defences. This would be designed to mitigate the 1% AEP likelihood of a high-emission scenario coastal inundation event to 2150 risk of a coastal flood in 2150 but could be constructed in stages. This option would

[1] There are many other risks present within South Dunedin including those related to tsunami, liquefaction and landslips. These can be addressed by property level or other targeted interventions as described in the above sections.

Generic approach	Viable large-scale interventions	Description
		not manage risk arising from groundwater or pluvial flood and would not address coastal inundation hazard on the seaward side of the floodwall. There is residual risk due to over-design events or failure. There is also added complexity when considering the interface with work happening outside SDF project area, particularly the St Clair – St Kilda Coastal Plan.
Coastal protection	*Seawall* Hazard: Coastal flooding	A seawall is a coastal defence which is designed to experience wave action and manages risk of erosion and flooding. They are designed to stabilise a shoreline as well as to be an impermeable structure to keep floodwaters out (e.g. not a rock revetment). This would be designed to prevent coastal inundation in the 1% AEP likelihood of a high-emission scenario coastal inundation event to 2150 but could be constructed in stages. A seawall could provide coastal inundation protection to South Dunedin from harbourside coastal inundation. Sea walls are a feasible option in South Dunedin as they provide large scale risk reduction. However, a seawall would not protect from groundwater risks, pluvial flooding, and landslide hazards. Further, loss of connection to the coast could result in negative social, cultural, and ecological outcomes and may also exacerbate flood hazard, predominantly in the Andersons Bay catchment. The seawall would require extension beyond the South Dunedin boundary to tie in with raised land and would need to coordinate with work outside the SDF project area.
Land grading	*Neighbourhood scale land grading* Hazard: All hazards	Neighbourhood scale land grading involves building up blocks of land / elevating land through placement of fill material to raise ground levels above future flood level and groundwater elevations. This could be designed to varying elevations to mitigate the risk of a coastal flooding over time. The option could allow for increased housing density, which responds to a key objective for the area. It also reduces pluvial flood, coastal inundation, and groundwater risk to raised land. Overall, the option could produce a large-scale risk reduction. However, smaller scale land grading does not provide a risk reduction for land that has not been raised and may exacerbate flood risk to adjacent land that has not been raised by reducing the floodplain area. Residual risk remains due to potential over-design events. There is potential complexity when interfacing with services of areas that are not raised.
Stormwater overland network improvements	*Overland flow improvement* Hazard: Pluvial flooding	Overland drainage involves improvement / strategic management of above ground drainage networks when drainage capacity is exceeded. This may involve re-contouring to enable overland flows and may include depressed crown streets which provide overland flow and temporary storage capacity during low frequency events.

Generic approach	Viable large-scale interventions	Description
		To effectively manage stormwater, these improvements will likely require pumping. The approach addresses pluvial flooding risks in South Dunedin. Works are also confined to the road corridor and therefore are unlikely to negatively impact private property. Overland stormwater improvements may interrupt existing transport routes. Lowering roads also increases the risk from groundwater hazard. The approach does not address coastal inundation, groundwater, or liquefaction and may not effectively reduce flooding on private properties, particularly on flat or depressed areas. It may also result in increased flood frequency of the road, leading to disruptions for users. This option could provide a large-scale risk reduction for the South Dunedin area but should be considered alongside the "preparedness and response", "dedicated water storage" and "floodable infrastructure" approaches.
Water flow improvements	*Pumped underground drainage* Hazard: Groundwater and pluvial flooding	Pumped underground drainage involves an underground drainage network which may be via pipes or permeable underground layers to encourage drainage. To adequately manage groundwater and stormwater in low lying parts of the catchment, the network will require pumping. This approach reduces nuisance flooding (associated with 10% AEP events), results in some reduction in pluvial flood hazard, reduces groundwater hazard, and produces co-benefits like reducing the potential increased future liquefaction potential. Other benefits also include a maintained sense of place. However, the option is likely to require extensive spatial coverage to be effective at lowering groundwater (on its own). It may require alignment through private properties to lower groundwater to the necessary level. In addition, groundwater drainage systems tend to have relatively high maintenance requirement and relatively short useable life due to clogging and (20-year replacement cycle). This approach could provide large scale risk reduction for South Dunedin.
Water flow improvements	*Pumped overland drainage* Hazard: Groundwater and pluvial flooding	Pumped overland drainage involves implementing an above-ground drainage network, which may be via canals, streams (e.g., daylighting of streams), or lined channel layers to encourage drainage. This approach requires pumping to manage groundwater and stormwater in low lying parts of a catchment. Pumped overland drainage reduces pluvial flood hazard and groundwater hazard. Daylighting streams involves identifying where pipes have replaced historic streams, removing the pipes and restoring the historic, naturalised flow of water. For this to provide functionality in South Dunedin, it is likely that pumping would be required to improve the flow of water.

Generic approach	Viable large-scale interventions	Description
		There are also likely co-benefits achieved in reducing the potential for increased future liquefaction potential that would otherwise occur with rising groundwater. The channel corridor within South Dunedin would require land area, this would either remove access (if confined within the road corridor) or require private property acquisition.
Dedicated water storage and groundwater management	*Stormwater storage* Hazard: Groundwater and pluvial flooding	Stormwater storage involves implementing permanent and temporary (parks or other floodable infrastructure) areas for intentional water detention connected to the pumped drainage network for discharge following rainfall events. The approach reduces pluvial flood hazard, groundwater hazard, and it is likely that co-benefits are achieved in reducing the potential for increased future liquefaction potential that would otherwise occur with rising groundwater. The large area required would mean reduced area of public space for other activities, including use of the recreation facilities in South Dunedin. This approach would mean the potential for a change in recreation in the area. Water storage alone is unlikely to reduce pluvial flood hazard across all exposed areas of South Dunedin.
Managed relocation, under retreat	*Retreat of infrastructure and/or buildings in areas of unmanageable risk* Hazard: All hazards	Retreat of infrastructure and/or buildings involves strategic acquisition of property or removal of assets, communities, and infrastructure from areas of unmanageable risk. This assumes the ability to compensate property owners and the ability for residents to relocate nearby. Moving exposed assets, people and places from natural hazard risk can be a highly effective way of reducing risk to the community. However, the retreat process can be very complex and have significant challenges (economic, social, cultural) for all partners and stakeholders to result in a just transition. Should retreat not be via strategic, proactive acquisition, this may disproportionately impact vulnerable populations who lack the means or resources to effectively adapt or recover. There is significant complexity in establishing alternative land areas for development (e.g. for housing).

5 Spatial Cell Definition

The following section outlines the use of defined cells to identify potential management areas for particular risks for adaptation planning purposes. By dividing the SDF Programme area into smaller, manageable units (termed “cells” for this programme), climate impacts and adaptation options can be reviewed at an appropriate level of detail. This prevents a one-size-fits-all approach and could support the delivery of targeted interventions (as described in Section 4) tailored to the specific conditions of each cell. Presently, there is uncertainty relating to the efficacy of these interventions at this point of the overall SDF study area.

Working with the wider SDF Programme team, these cell definitions are translated into a spatial representation to describe which longlist options are relevant in each cell. The Detailed Risk Assessment report has guided the transition areas between the cells, as shown in Figure 7. The characteristics of the areas in the cells are recorded below:

- Cell 1 – represents the land parcels and road segments that are identified to be exposed to at least a medium risk of groundwater emergence (levels with 0.5m of the surface) for the 2060 SSP5-8.5 scenario that show a broadly similar pattern to the pluvial exposure – to represent the potential areas that would likely require specific similar options to address both these hazards.
- Cell 2 – covers the remaining area within the SDF project area that is lower than the water level of the 2100 SSP5-8.5 scenario (1.1m of sea level rise) and 1% coastal AEP event – to represent the maximum identified area of exposed area to coastal inundation mapped.
- Cell 3 – is represented by all other areas within the SDF project area higher than the level set for Cell 2.
- Cell 4 – is the area to the seaward side of the southernmost key road that traverses the SDF programme area, from the intersection of Bedford St & Beach St, along Victoria Road, Tahuna Road and through to Tomahawk Road, representing that this area is aligned to an adaptation planning process for the St Clair to St Kilda Coastal Plan.

Table 7 below includes a summary view of the type of interventions taken from the recommended list of adaptation options and incorporated within each of the identified Potential Adaptation Futures. The table shares how the recommended adaptation options could be included within each of the defined spatial cells. These were identified based upon local knowledge, previous assessments and understanding of which the most significant hazards were to be managed and functionality of large-scale adaptive actions.

Over time, the proportion of land contained within each of these cells would change in line with the potential options and futures invested in as the risk profiles change, with options that include land raising taking land from Cells 1 or 2 into Cell 3. This shift in risk profiles shows the outcome from the investment made to raise land which also enables identified mixed-use neighbourhoods to establish within South Dunedin providing greater housing choice and opportunities for residents to relocate within South Dunedin itself.

Table 7: Spatial longlist of interventions by cell and potential adaptation future

Potential Adaptation Futures	Cell 1	Cell 2	Cell 3
Potential Adaptation Future 1			
Potential Adaptation Future 2			
Potential Adaptation Future 3			
Potential Adaptation Future 4			
Potential Adaptation Future 5			
Potential Adaptation Future 6			
Potential Adaptation Future 7			

Key:

- Overland flowpath
- Sub-surface drainage
- Inland coastal defences
- Storage
- Land grading
- Retreat
- Coastal protection
- Pump
- Open channels
- Civil Defence and Emergency Preparedness
- Better management of impervious surfaces
- Property-level intervention
- Minor stormwater network upgrades

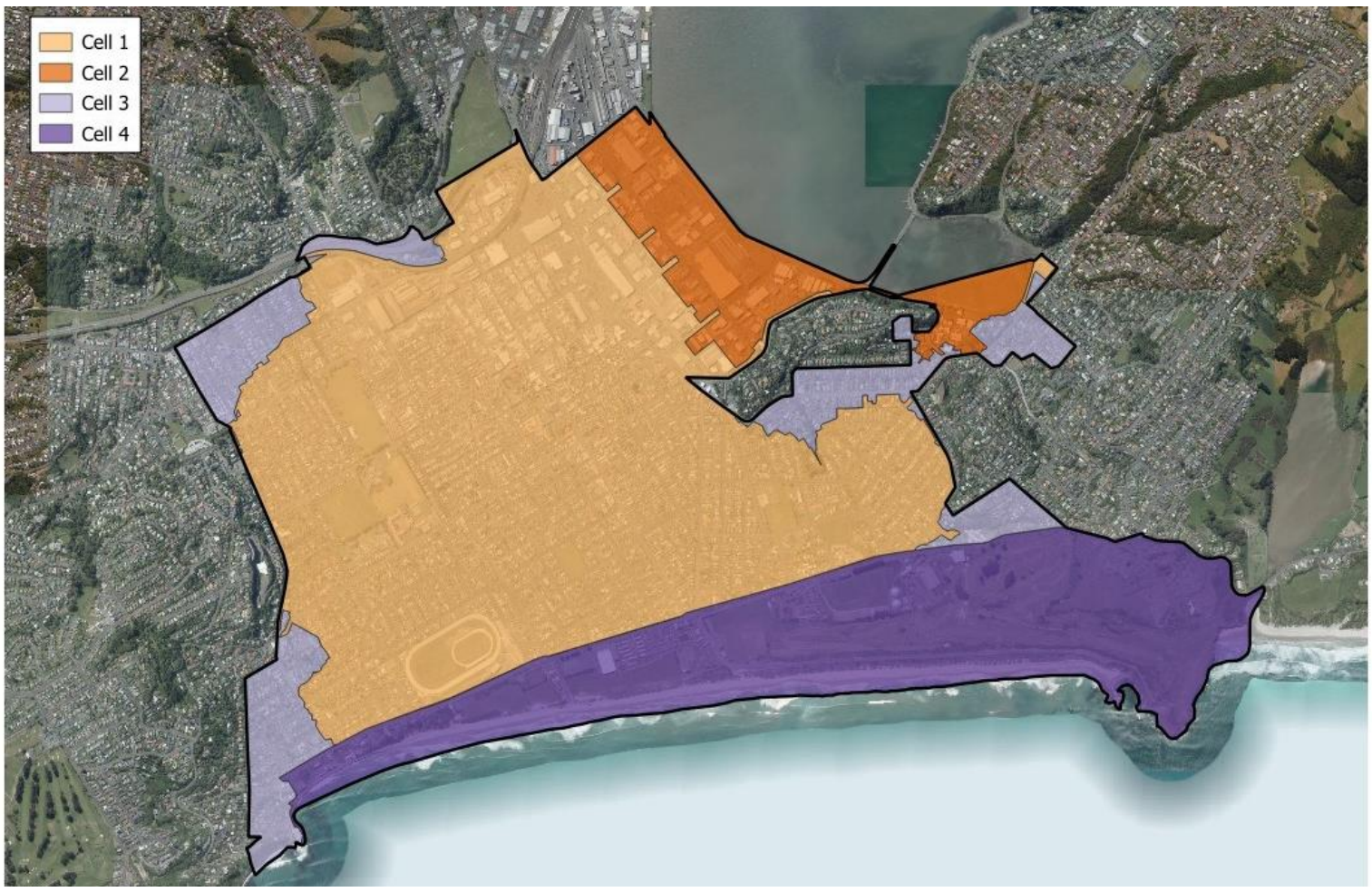

Figure 7: Spatial cells for South Dunedin Future project area to support adaptation programme activities.

6 Potential Adaptation Futures

The complexity and interconnection of hazards, their impacts, and local geography means that individual options need to be evaluated in an integrated way. Combining these large-scale interventions into Potential Adaptation Futures is a way to consider combinations of interventions to the multi-hazard environment of South Dunedin. The technical impact assessment and descriptions of these grouped interventions as Potential Adaptation Futures are presented as microbusiness cases in Appendix A.

The spatial longlist of recommended adaptation options presented above identifies the types of interventions that are likely to reduce risk in South Dunedin. The "Potential Adaptation Futures" provide examples of what South Dunedin could look like in the late century (e.g. 2090-2100) which are combinations of the spatial longlist of viable large-scale options presented in Section 4. These potential adaptation futures will serve as the foundation for community engagement. The graphics and information provided in the micro-business cases have been specifically prepared to inform consideration of the implications associated with each potential adaptation future. Ultimately, these potential adaptation futures will be shortlisted to allow for additional detailed assessments of the pathways of options (short-, medium- and long-term), including their associated impacts and benefits. The futures that are not shortlisted do remain "on the table" but are not considered likely or recommended based upon present understanding.

These futures would be implemented gradually over time with incremental change to reduce risk as the climate continues to change, and the approach would include watching for signals to avoid adapting too early, unnecessarily or too late, resulting in significant damage/impacts. These potential adaptation futures are not an "end state" but rather a stop along the way as South Dunedin will continue to change over time, as shown in Figure 8, which may be accelerated (e.g. happen sooner) or slowed (not be required until later) to respond as conditions change.

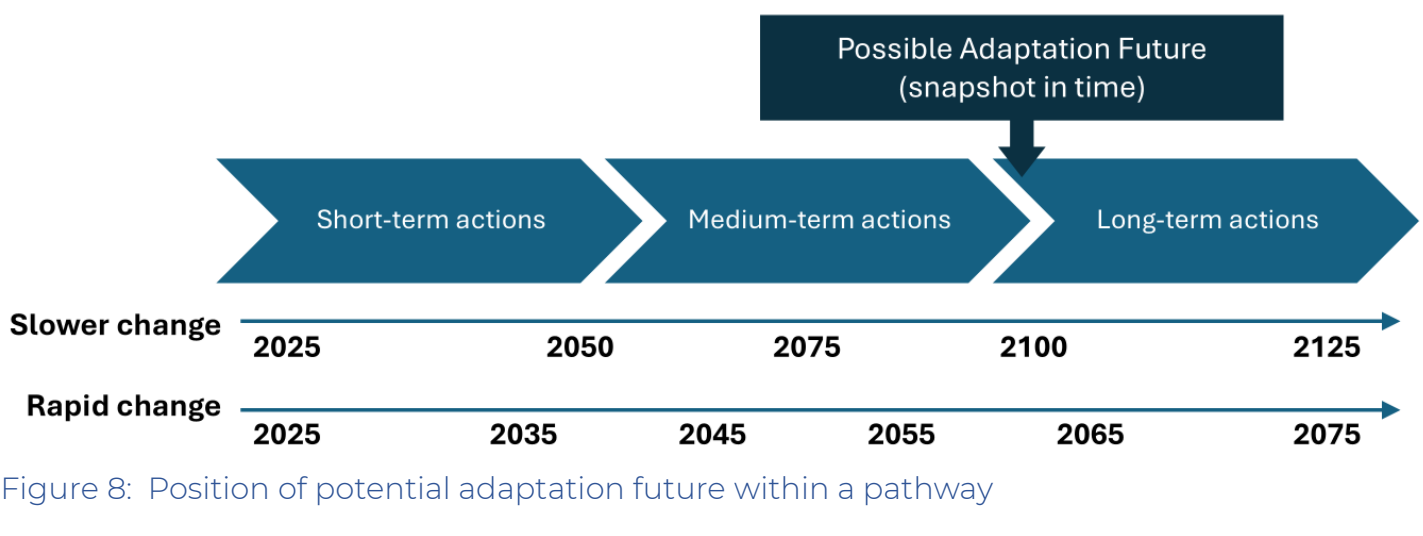

Figure 8: Position of potential adaptation future within a pathway

Each potential adaptation future has a different level of residual risk associated. With these futures, there will be increasing residual risk over time, requiring additional action in response. To respond to these escalating risks, actions over time will be taken to move towards one or more of these futures based upon risk appetite of communities, affordability of actions as well as willingness to pay, and other factors.

The visualisations of each of the seven potential adaptation futures is intended to show how South Dunedin *could* look in 75 years (the year 2100) to assist in engagement with the community on the

potential futures. The illustrations are indicative and high-level and are based on best available information and expert analysis to date and offer a good early indication of where change might be required and what it could look like. However, more detailed work is required to confirm exact locations and timing of any future changes. This work is planned over the next two years as the South Dunedin Future Programme team works towards producing an adaptation strategy for South Dunedin.

The six potential adaptation futures and a "Future 1" are presented below. Future 1 essentially represents continuing without significant further intervention and so is considered the 'status quo'. The potential adaptation futures give examples of a snapshot in time, and there are infinite combinations between these futures where there are shifts in the balance between water and people along a continuum to capture the range of options available.

Alignments of options (e.g. seawalls, inland defences, waterways, elevated areas) have not been designed but are presented based on a high-level understanding of geography, hazards and land use in South Dunedin. The hazards, risks and consequences are not uniform across South Dunedin, but vary spatially; therefore, the adaptation options need to as well.

Adaptation of urban environments for climate or flooding related events is difficult to achieve due to institutional and governance challenges, social and equity considerations and the existing fabric and value of property and assets across the urban environment. While a range of benefits can be quantified (and can be more definitively refined with further investigations on the efficacy of the short-listed options), there are a number of non-quantifiable benefits. This is typical for a long-list potential adaptation futures phase.

6.1 Estimates of costs and benefits

Costs and benefits have been provided in the micro business cases to enable consideration of the possible implications of each potential adaptation future. The costs are based on a spatial mapping exercise undertaken to create one potential visualisation of the Potential Future scenarios presented in the microbusiness cases – noting that each 'Future' consists of multiple Adaptation Options. The identified options / assets incorporated within each potential future are one possible version of the quantity and type of options / assets included, their alignments, and locations. These have been utilised to create the quantities of each type of option (intervention) and the totals presented as the likely costs for each potential future.

The costs are high-level estimations and are intended to be comparative only at this long-list stage of the SDF Programme given the high associated uncertainty, particularly in relation to the pathways of short-, medium- and long-term options that may combine as part of each scenario. The cost estimates will become more accurate as the project progresses as options are further refined.

Each cost estimate is based on a typical detail for that option, calculated in accordance with available rates from a range of similar projects across New Zealand. The cost estimates follow established good practice methodologies adopted in Better Business Case processes in New Zealand. Costs are assumed to occur within the near future, with the costs presented at 2024 present values.

Costs include:

- Construction capital costs – a build-up of costs per option included within each potential future. The costs include for demolition and site clearance, utility services replacement and reinstatement.
- Construction preliminaries.
- Operation and maintenance costs.
- Professional and internal fees.
- Contingency and optimism bias.
- Acquisition of properties - landholdings and buildings purchase.

Capital costs have been adjusted including an optimism bias for a non-standard civil engineering project at this stage in accordance with Better Business case practice. Given the nature of this work and the early stage in an investment cycle, an upper bound for this bias range has been applied. This increases the expected net costs by 66% . This is in line with Treasury advice for projects at this stage of development and this factor can be progressively reduced.

Exclusions at this stage of development include GST, contaminated waste disposal, unexpected ground conditions, rebuild of existing properties in new location, escalation or operational costs/downtime due to operations.

Unit costs do not reflect the potential opportunities to offset costs, for example through property acquisition via renting or through selling land suitable for intensification after elevating it. For this phase of the study, the costs provided are those that are likely to be funded through Council (or rather through 'public funding'), although alternative funding mechanisms could be put in place as opportunities are captured into the future. The cost estimates do not include costs borne by individual property owners to reduce risk.

Failing to adapt will result in widening inequalities, with Potential Adaptation Future 1, showing a future where responses are primarily driven by individual actions and responses with minimal planned Council (or public) investment. This has been estimated to result in a $2 billion cost when accounting for damage to properties (insured and uninsured), lost productivity, work to fix infrastructure, etc. Notably, it is expected that the costs will climb higher still once social costs including stress suffered by affected residents and business owners are factored in, or in response to major weather events where the costs of recovery could be substantially higher still. Estimated loss of income is related to the number of displaced houses over the same period.

It is worth noting that economic assessments of benefits and costs are one method for evaluating potential benefits and disbenefits of actions, but given the complexities associated with changing urban environments, benefit cost ratios of 0.8 are generally accepted as being a good return on investment (based on experience from other jurisdictions and New Zealand). Additionally, other benefits that are traditionally hard to monetise could easily add further impetus to one of the potential adaptation futures.

The PV was calculated as the discounted sum of the annual average damages over the project horizon, where: ·

- The discount rate applied is 2%, consistent with the social rate of time preference (SRTP) as prescribed by the New Zealand Treasury for cost-benefit analysis purposes.
- The project horizon applied is 75 years.

The identified cost profiles for Potential Adaptation Futures 2 to 7 range from $2 billion to $10 billion. The scale of the intervention options included within each Potential Adaptation Future explains why the range is so large, with those that include land raising accounting for the higher estimates and uncertainties. The range is influenced by the status of the work, given that the location and scale estimated to date of each of the potential options applied in each Potential Adaptation Future could change. The costs would be further refined during future stages of the project as more certainty in the efficacy, scale and possible layout/location of the options is identified for the masterplan.

Table 8 below shares the ranges of costs and benefits for these options with a wider range allowed for those that involve land raising due to the uncertainties around scale of earthworks and the source of material to be utilised for raising ground. Similarly, the potential range of benefits for these futures are wider because of removing properties from the hazard zone (lower elevation land) and the potential for raising the land to support the future transformation of South Dunedin.

The main sources of benefits are monetised and grouped broadly as follows:

- Benefits associated with avoided fatalities
- Avoided residential and commercial property damages
- Avoided trauma
- Improved water quality
- Ecosystem Services benefits
- The value of new open spaces created
- Hedonic analysis – changes in property values and redevelopment premia within South Dunedin
- Avoided income loss from displacement
- Avoided emergency services costs.

Each potential adaptation future will have a different mix and makeup of the above monetised benefits, but the benefits are measured using the same methodology between the potential adaptation futures to ensure comparability between the scenarios.

Irrespective of which potential adaptation future pathway is followed, these additional costs represent a considerable future delivery challenge for the local market when contrasted with the current Dunedin City Council capital delivery budget of $200m per annum for the entire city. If these costs were spread evenly over the next 50 years, the additional capital investment would be between $50m to $220m per annum within South Dunedin only.

Table 8 Potential Adaptation Futures and Council costs for implementation over 75 years (e.g., individual owner costs excluded)

Potential Adaptation Future	Estimated Benefits (2024 PV)	Estimated Cost (2024 PV)	Estimated Benefit Cost Ratio
Future 1: Status Quo	$0.2b ($0.1b - $0.3b)	$2b ($1.5 - 2.5b)	0.05 - 0.2

Future 2: Keep the land dry - pipes and pumps	$2.3b ($1.5b - $2.5b)	$3.2b ($2.5b - $4.0b)	0.3 – 1.0
Future 3: Keep the land dry with raised land	$3.8b ($3.5b - $4.5b)	$5.8b ($5.0b - $8.0b)	0.4 - 0.8
Future 4: Space for water - waterways and wetlands	$2.8b ($2.5b - $3.5b)	$2.8b ($2.0b - $4.0b)	0.6 – 1.6
Future 5: Space for water - waterways and raised land	$4.5b ($4.0b - $5.5b)	$7.1b ($6.0b - $10.0b)	0.4 - 0.9
Future 6: Let water in - some retreat and raised land	$3.7b ($3.5b - $5.5b)	$6.8b ($6.0b - $10.0b)	0.3 - 0.9
Future 7: Large scale retreat	$3.7b ($3.5b - $4.5b)	$5b ($4.5b - $8.0b)	0.4 - 1.0

ESTIMATED BENEFIT TO COST RATIO – 'BCR'

For each of the seven potential adaptation futures, costs and benefits have been estimated based on present value (PV) in '$ billions of dollars'. This helps understand the 'estimated benefit to cost ratio' (BCR), whereby a BCR of zero or just above that is not viable and not likely to be funded, and a BCR close to 1 or more demonstrates more positive outcomes and as such more likely to be funded. Notably, it is acknowledged that the BCR should not be 'the' determining factor in the options selection process. Rather, it is one of the factors informing the evaluation of options through a multiple criteria assessment (MCA) exercise. BCR focuses on quantifiable costs and benefits. It may not capture important qualitative factors like environmental impact, social equity, or strategic alignment.

In summary, the BCR is a valuable tool for evaluating the financial viability of projects and decisions. However, it should be used in conjunction with other analyses and a thorough consideration of qualitative factors to make informed and well-rounded decisions.

Going forward, potential futures with a stronger performing BCR could be further refined through participatory public engagement and consideration of potential value uplift opportunities.

7 Properties potentially affected

The ‘properties potentially affected’ information presented on the dashboard represents the number of properties likely to be part of a managed relocation effort to enable reduction of risk to the surrounding area.

We have based our analysis on GIS overlays for residential and commercial property boundaries provided by Dunedin City Council. Overall, it has been assessed that there a total of 5,800 residential properties within South Dunedin (within the study area). For Potential Future 1, we have assumed that some 2,500 residential properties may need to be retreated with the total number of properties likely affected overall exceeding 5,000 properties. For Potential Futures 2 – 7 involving interventions, we have assessed the indicative number of properties likely to be part of a managed relocation effort to enable reduction of risk to the surrounding area. These are shown as follows:

- Potential Future 2: 700 – 900 properties
- Potential Future 3: 800 – 950 properties
- Potential Future 4: 600 – 700 properties
- Potential Future 5: 800 – 950 properties
- Potential Future 6: 2500 – 3000 properties
- Potential Future 7: 3500 – 4000 properties

We note that some of the affected properties may intersect with an identified option such as a potential wetland or a potential blue green corridor. An intersection may require relocation to enable the option to be delivered.

Ultimately, the true number of properties to be affected will only be known later once efficacy studies undertaken to test the place, size and number of adaptation options required. This will also determine the efficacy of the interventions and enable the benefits to be firmed up.

8 Next steps

The Potential Adaptation Futures presented in the micro-business cases provide an initial assessment to inform the shortlisting process. Immediate next steps include continuing engagement with Rūnaka and local communities on the Potential Adaptation Futures.

This engagement will include the ability to comment on potential adaptation futures and specific questions where community feedback will be incorporated into the assessment of futures in the decision-making framework. During this same engagement period, engagement on thresholds and risk tolerance will occur to inform when actions will be required over time. At a high level, next steps are expected to involve:

- Stage 4: Shortlist of adaptation pathways
  - Assessment of Potential Adaptation Futures using community feedback and scoring metrics in the Decision-Making Framework alongside more detailed technical and economic analysis.
  - Identification of shortlist of Potential Adaptation Futures and refinement of adaptation options following community feedback.
  - Development of short-, medium- and long-term spatial pathways for each of the shortlisted potential adaptation futures.
- Stage 5: Preferred pathways
  - Assessment of short-, medium- and long-term pathways for the shortlisted futures using the Decision-Making Framework and community feedback.
  - Identification of the preferred pathway.
  - Development of an Adaptation Strategy for South Dunedin with signals, triggers, and adaptation thresholds, expected by mid-2026.

In refining the seven Potential Adaptation Futures to a short-list of futures, the options presented in this report will become increasingly specific and targeted to the needs of South Dunedin, culminating at the end of the process in a recommended (preferred) adaptation pathway.

Working in parallel with the ongoing South Dunedin Future Programme to develop an adaptation plan, there are several ‘no regrets’ interventions, that can reduce present risk and help prepare for future adaptation. The following short-term interventions require prompt consideration and where practical, implementation, to support risk reduction for South Dunedin Communities:

- Minor stormwater network upgrades (e.g. check valves, removing bottlenecks)
- Remove wastewater network overflows and cross connections
- Encourage percolation (bioswales, rain gardens, permeable surfaces)
- Better management of impervious surfaces (rain tanks, green roofs)
- Pilot green infrastructure test site for stormwater storage.

Developing the adaptation plan, including the signal and triggers associated with adaptation pathways, will require consideration of the time needed for implementing enabling actions (e.g., financial incentives, plan changes to avoid/restrict new developments, property acquisition) for as these may be complex processes requiring iwi, local, regional and central government support as well as additional technical investigation and regulatory processes. National direction on land-use planning for hazard prone areas and a national adaptation framework are anticipated in 2025 and will likely inform the implementation of these enabling actions.

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APPENDIX A: Decision Making Framework

South Dunedin Future: Decision-making Framework

This document provides guidance to inform assessment of adaptation options at the long list and short list phases. Subject matter experts from Kia Rōpine, Aukaha, Dunedin City Council and Otago Regional Council will assess options against the criteria presented herein considering a whole of life approach – e.g. from option construction through to use and ultimately demolition or removal.

How were criteria developed?

The criteria were developed through segmenting the Strategic Objectives into measurable components. This provides detail for a robust, transparent, repeatable assessment but does risk losing the overarching understanding of how the option performs across the objectives. Therefore, we recommend assessing options in two ways:

- Against individual criteria using rubrics (presented in this framework)
- Against overall objectives using a high-level assessment

This allows consideration of how the detail of how options perform against objectives while also providing a simple sense check.

Strategies, plans and policies herein represent a selection of local, regional and central government direction to inform the rubrics for each criteria. These strategies are presented alongside what we have heard from communities during recent engagement events. The team has tried to balance usability with detail, and therefore we recommend reviewing scoring options using the rubric provided with the context of the strategies, plans, and community feedback presented.

Pending confirmation from the Rūnaka advisory panel, criteria related to mana whenua connections to place as well as mana whenua aspirations as it relates to other criteria have been included in the decision-making framework below.

How is this decision-making framework used?

To use this decision-making framework, we have created a spreadsheet for tallying scores, and we recommend including comments with each score providing rationale. Kia Rōpine subject matter experts will work with identified Council subject matter experts to score the criteria relevant to their expertise, with subject matter experts (SMEs) presented alongside an overview of the criteria on the next page. We have also identified communities as the 'SMEs' to score particular criteria as presented. The process for scoring is:

- Review the community sentiments and strategic objectives to understand the context of the assessment.
- Assess the individual option against the rubric, assign a score and document rationale.

These scores have been collated in three ways:

- All criteria have equal weighting.
- All objectives have equal weighting, and criteria equal weighting within objectives.
- All criteria can be assigned a weighting and a weighted average is determined.

This provides a mechanism for sensitivity testing – e.g. are the options with the highest overall scores consistent regardless of weightings or will the preferred option likely change as weightings shift?

This scoring methodology can also be combined with a 1000minds approach whereby individuals can assign their own weightings and scores so that various assessments can be compared and/or combined. This alternative is under consideration by the DCC and ORC.

We recommend that there is consideration of how we can build a collective understanding with community members of why SMEs are scoring the way that they did and provides an opportunity for community members to identify where SMEs may not be fully appreciating some facet of the community and how it may be impacted.

When is this decision-making framework used?

The decision-making framework is used to scope the information provided in the micro-business cases for the spatial long list. This enables the South Dunedin Future team to implicitly begin to assess the long list against these criteria and to present a clear, repeatable understanding of the relative benefits and disbenefits of various options.

The spatial long-list will be scored against the decision-making framework at the start of the short listing phase, using a refined understanding from community feedback and updated modelling (if available). These scores will then be combined via the various weighting methods to enable sensitivity testing to identify the short list.

The additional short list criteria will be assessed at the start of the preferred pathways phase, and scores will be updated using the refined understanding from community feedback. These scores will then be combined via the various weighting methods to enable sensitivity testing to identify the preferred pathways.

Objective	Criteria	Measurements	SME
Sustainable Urban Development: Urban development accounts for the changing environment in South Dunedin, providing better spaces for people, water, and wildlife.	Reduce emissions and waste	Carbon emissions (of option itself) Circularity / waste reductions Planetary boundaries*	Decarbonisation and circular economy specialists, urban designer
	Well functioning and liveable urban environment	Provides for a well functioning, compact urban form including provision of functional infrastructure Provides places and spaces that are liveable, walkable with good connectivity	Urban designer, urban economist
	Promotes water sensitive urban design and enhances amenity	Alignment to Development plans and strategies	Urban designer, landscape architect
	Suitable phasing over time	How it functions as a pathway system or process*	Urban designer, urban economist, water engineer
Environmental and cultural restoration: Restore and regenerate natural environment, renew urban spaces, and re-energise cultural connections to place	Restore the natural environment	Connectivity and scale of green spaces Level of disturbance to existing ecological biodiversity	Ecologist, landscape architect
	Aligns with Te Taki Haruru values (Autūroa, Auora, Autaketake, Autakata)	Rakatirataka fully realised, community empowered and resilient Mauri flourishes, ki uta ki tai approach embedded Tikaka and Kawa are embedded into social structure and used to restore and maintain balance Past/future connections to place strengthened & celebrated	Aukaha
	Enhances cultural connections to place	Impacts to heritage sites /features Impacts to community cultural hubs	Risk specialist, urban designer
Just transition: Respond to climate change in ways that empower communities and promote fairness and equity.	Reflect community preference	Community preferences	Communities
	Minimise impacts on all vulnerable communities, with vulnerable communities not left behind	Community access to education, quality and affordability of housing	Social impact specialist, urban designer
	Empowers communities	Having choices Enables access beyond / within South Dunedin	Communities
	Vulnerable communities not left behind	Impacts to disabled communities, elderly communities, low-income groups, culturally and linguistically diverse communities, refugees, and Pacific Communities	Social impact specialist
	Promotes intergenerational equity	Benefits and costs are shared equitably across generations	Social impact specialist
Social and economic resilience: Strengthen communities and businesses so they are well-prepared for floods and other hazards, able to cope and bounce back	Preserve and enhance community cohesion and community values	Impacts to social networks measured through accessibility (walking/cycling/public transport/) Exposure of community features	Risk specialist, social impact specialist, urban designer
	Minimises economic risk to communities	Cost of options versus benefits provided	Economist
	Increases community adaptive capacity	Contributes to wider community knowledge and understanding of risk	Social impact specialist
	Minimises economic risk to individuals	Ability to access funding/debt	Economist
	Minimises impacts to business	Exposure of commercial and industrial buildings to hazards/stressors	Risk specialist
Promote community safety: Promote community safety in South Dunedin by reducing flood and other risks, despite increasing natural hazards.	Promote community wellbeing	Community concerns	Communities
	Promote community safety	Exposure of roads to climate hazards/stressors Exposure of critical infrastructure and lifelines facilities	Risk specialist
	Reduced natural hazard risk	Exposure of residential buildings to climate hazards/stressors Cross cell impacts*	Risk specialist, economist
	Promote community health	Contributes to healthy living and working social conditions Impact to health and health services	Social impact specialist, economist, public health specialist (UoO)

Note:

* Items are proposed to only be assessed from short list to preferred pathways.

All criteria align with feedback, plans, strategies and policies presented.

Objective: Sustainable urban development

Description	Criteria	Measurement
Urban development accounts for the changing environment in South Dunedin, providing better spaces for people, water, and wildlife.	**Reduce emissions and waste**	**Carbon emissions (of option itself)** **Circularity / waste reductions** **Planetary boundaries***
	Well-functioning and liveable urban environment	Provides for a well functioning, compact urban form including provision of functional infrastructure Provides places and spaces that are liveable, walkable with good connectivity
	Promotes water sensitive urban design and enhances amenity	Alignment to Development plans and strategies
	Suitable phasing over time	How it functions as a pathway system or process*

*Assessed at short list only

Assessment requirement aligned with:

Community feedback:

Community feedback commented on the 'sustainability' of options – e.g. "it's important to think more about sustainability, not just protection."

Dunedin Waste Management Plan (2020) vision and targets:

Vision: The project is actively committed to zero waste inclusive of a circular economy to enhance the health of the environment and people by 2040.

- Reduce the municipal solid waste generation per capita by at least 15% by 2030 compared to 2015.
- Reduce the amount of municipal solid waste disposed to landfill and incineration by at least 50% by 2030 compared to 2015.
- Increase the diversion rate away from landfill and incineration to at least 70% by 2030.

Dunedin City Emissions Management and Reduction Plan (2022):

- NetZero emissions of all greenhouse gasses other than biogenic methane by 2030
- 24-47% reduction below 2017 biogenic methane by 2050
- Emissions reductions consistent with achieving Science Based Targets consistent with limiting warming to 1.5°C (as in the Compact of Mayors coalition commitments)

Ōtepoti donut (2023):

- Supports effort to reduce water consumption
- Influences better decisions through the power of art and culture
- Supports businesses to quantify and achieve environmental targets
- Enables parks and recreation to drive ecological outcomes

2nd Generation Dunedin City District Plan Objectives (2018):

Dunedin reduces its environmental costs and reliance on non-renewable energy sources as much as practicable, including energy consumption, water use, and the quality and quantity of stormwater discharge, and is well equipped to manage and adapt to changing or disrupted energy supply by having:

- Increased local renewable energy generation
- Reduced reliance on private motor cars for transportation
- Housing that is energy efficient

Criteria from Waka Kotahi Resource Efficiency Guide:

- >10% reduction in whole-of-life emissions from base case
- >10% reduction in energy use across construction and operational phases
- >10% use of materials with recycled content

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Achieves a substantial reduction in whole of life emissions and energy use across construction and operational, while also incorporating a significant amount of recycled materials or minimising material demands.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Sustainable urban development

Description	Criteria	Measurement
Urban development accounts for the changing environment in South Dunedin, providing better spaces for people, water, and wildlife.	Reduce emissions and waste	Carbon emissions Circularity / waste reductions Planetary boundaries*
	Well functioning and liveable urban environment	**Provides for a well functioning, compact urban form** including provision of functional infrastructure **Provides places and spaces that are liveable, walkable with good connectivity**
	Promotes water sensitive urban design and enhances amenity	Alignment to Development plans and strategies Enhances amenity with space for water
	Suitable phasing over time	How it functions as a pathway system or process*

*Assessed at short list only

Assessment requirement aligned with:

Community feedback:

Respondents noted that connections to parks, shops and schools from homes were important. Engagement identified key walkways as places of importance and disability representatives highlighted public transport as a key connector to the rest of Dunedin. Another comment noted that it is the South Dunedin facilities and land that make it attractive to many age groups and abilities, and how they don't want to 'drive people away from this awesome place'.

Future Development Strategy – Strategic Directions for Ōtepoti Dunedin (2023)

- Is a compact and accessible city.
- Maintains and enhances its vibrant and welcoming [...] suburban and town centres.
- Neighbourhoods are attractive and support resilient and healthy communities.

2nd Generation Dunedin City District Plan Objectives (2018):

- Dunedin stays a compact and accessible city with resilient townships based on sustainably managed urban expansion.
- Urban expansion only occurs if required and in the most appropriate form and locations.
- The multi-modal land transport network, including connections between land, air and sea transport networks operates safely and efficiently.

National Adaptation Plan (2022)

- Achieve compact urban form that is well linked to public transport and jobs (NAP).
- New and existing places are planned and managed to minimise risks to communities from climate change.

National Policy Statement on Urban Development (2020)

- Help to achieve a well-functioning urban environment by enabling intensification in areas with good accessibility to services and amenities
- Homes, buildings and infrastructure are climate resilient and meet social and cultural needs.

New Zealand Urban Design Protocol

- Make New Zealand town and cities more successful through quality urban design.
- Proponent of the 7Cs: Context, Character, Choice, Connections, Creativity, Custodianship and Collaboration.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Provides an excellent support for well-functioning and liveable urban environment with a compact, functional urban form where it is safe and comfortable to walk and cycle, with easy access to public transport, community and commercial services and jobs. An urban environment that has vibrant town centres with high quality urban spaces that incentivise the establishment of a diversity of economic and community activities, and promotes social interaction.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Sustainable urban development

Description	Criteria	Measurement
Urban development accounts for the changing environment in South Dunedin, providing better spaces for people, water, and wildlife.	Reduce emissions and waste	Carbon emissions Circularity / waste reductions Planetary boundaries*
	Well functioning and liveable urban environment	Provides for a well functioning, compact urban form including provision of functional infrastructure Provides places and spaces that are liveable, walkable with good connectivity
	Promotes water sensitive urban design and enhances amenity	**Alignment to Development plans and strategies** **Enhances amenity with space for water**
	Suitable phasing over time	How it functions as a pathway system or process*

*Assessed at short list only

Assessment requirement aligned with:

Community feedback:

Community feedback raised that solutions that reinvigorate the natural environment while helping the urban environment are preferable, with a comment on the chance to "beautify our urban places". As part of this people valued making South Dunedin more vibrant and less of a 'grey' built environment.

Future Development Strategy – Strategic Directions for Ōtepoti Dunedin (2023)

- Protects its landscapes, natural features and wāhi tūpuna from harmful development.
- Celebrates its relationship with the Otago Harbour.
- Neighbourhoods are attractive and support resilient and healthy communities.

Draft wellbeing outcomes and indicators (Council meeting 25 September 2023)

- Environmental: People enjoy, connect to and celebrate the natural world – proportion of population living within 300m of park space or green space at least 1 hectare in size.

Te Ao Turoa | The Natural World: Dunedin's Environment Strategy 2016-2026

- Give Dunedin people every opportunity to feel connected to and look after the environment.

ORC Natural Hazards Plan (2014)

- Principle 2: Create communities in which people can live, work and use the land without undue stress or fear of natural hazards.
- Principle 7: New development and hazard-management measures will not exacerbate the risks or effects of natural hazards elsewhere. This applies at all scales, from localised 'property to property' effects, through to the community or catchment scale.

Te Mana o te Taiao – Aotearoa New Zealand Biodiversity Strategy 2020

- Enables community driven restoration projects.
- Communities are connected with nature and supports and actively contributes to protection and restoration.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Promotes using natural systems and water sensitive design as a key component of its land-use/ infrastructure planning. It provides easy access to green and blue spaces to provide strong connections between communities and the natural environment.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Sustainable urban development

Description	Criteria	Measurement
Urban development accounts for the changing environment in South Dunedin, providing better spaces for people, water, and wildlife.	Reduce emissions and waste	Carbon emissions Circularity / waste reductions Planetary boundaries*
	Well functioning and liveable urban environment	Provides for a well functioning, compact urban form including provision of functional infrastructure Provides places and spaces that are liveable, walkable with good connectivity
	Promotes water sensitive urban design and enhances amenity	Alignment to Development plans and strategies Enhances amenity with space for water
	Suitable phasing over time	**How it functions as a pathway system or process***

*Assessed at short list only

Assessment requirement aligned with:

Community feedback:

Community feedback recognised that timing choices for options can cause more or less disruption and so is an important consideration. In particular, some options were identified as being more challenging due to the phasing required. Some approaches were noted as being suitable as 'backstops', others suitable for implementing 'over time' and some 'too slow'. As part of this, the community were interested in the pace of change and understanding the implications of options on future adaptation (e.g. "what approaches does a hard engineering tactic exclude from future adaptation"). There was an identified need for a combination of adaptation options rather than a single approach.

Future Development Strategy – Strategic Directions for Ōtepoti Dunedin (2023)

- Protects its landscapes, natural features and wāhi tūpuna from harmful development.
- Maintains and enhances its vibrant and welcoming [...] suburban and town centres and celebrates its relationship with the Otago Harbour.

ORC Natural Hazards Plan (2014)

- Principle 4: Adopt a broad scale, adaptive approach over the long term. The ability to respond to changes in the nature and extent of risk, ease of transitions and provide the level of safety desired by the community is essential.
- Principle 5: It is important to address the entire risk spectrum when managing the effects of natural hazards. This principle recognises that whatever event is planned for, there will be a larger, major event. The risk from these major events also needs to be recognised and managed.
- Principle 7: New development and hazard-management measures will not exacerbate the risks or effects of natural hazards elsewhere. This applies at all scales, from localised 'property to property' effects, through to the community or catchment scale.
- New and existing places are planned and managed to minimise risks to communities from climate change.
- Adaptation planning requires a flexible approach that can accommodate change but keep us moving in the right direction. Inevitably, actions in the later years of this plan are less clearly defined.
- Actions will also ensure we do not lock in or exacerbate future impacts on communities, such as accessibility issues, and that we manage potential impacts of regulatory change.

National Policy Statement on Urban Development (2020)

- Help to achieve a well-functioning urban environment by enabling intensification in areas with good accessibility to services and amenities.
- New and existing places are planned and managed to minimise risks to communities from climate change.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Pathway system/process is highly efficient with minimal impact transitions between options and resilience.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Environmental and cultural restoration

Description	Criteria	Measurement
Restore and regenerate natural environment, renew urban spaces, and re-energise cultural connections to place	**Restore the natural environment**	**Connectivity and scale of green spaces** **Level of disturbance to existing ecological biodiversity** RR
	Aligns with Te Taki Haruru values (Autūroa, Auora, Autaketake, Autakata)	Rakatirataka fully realised, community empowered and resilient Mauri flourishes, ki uta ki tai approach embedded Tikaka and Kawa are embedded into social structure and used to restore and maintain balance Past/future connections to place strengthened & celebrated
	Enhances cultural connections to place	Impacts to community cultural hubs RR Impacts to heritage sites /features RR

Assessment requirement aligned with:

Community feedback:

Community respondents valued approaches that benefit biodiversity and the natural environment, and this was a key theme from the engagement. There was strong support for green spaces and ecological values with the potential for "the greening of South Dunedin". Reference was also made to opportunities for wildlife like sea lions and eels.

Te Ao Turoa | The Natural World: Dunedin's Environment Strategy 2016-2026

- Draw on science, mātauraka Māori and good environmental practice
- Identify and protect areas of ecological significance, establish biodiversity and ecosystem health measures and establish integrated planning for key environmental areas including air, water and soil standards.
- Work with landowners to integrate biodiversity into productive environments and to help sustain ecosystem services.
- Objectives: sustain ecosystem services, increase indigenous biodiversity, restore areas of ecological value by:
    - safeguard the life-supporting capacity (mauri) of indigenous and taoka species' habitats
    - protect important ecological areas
    - protect areas of importance to Kāi Tahu
    - take a landscape-scale approach to protecting ecosystems and increasing biodiversity

Future Development Strategy – Strategic Directions for Ōtepoti Dunedin (2023)

- Protects its landscapes, natural features and wāhi tūpuna from harmful development.
- Protects and prioritises the mauri and health of water bodies, including coastal waters, with mana whenua exercising their role as kaitiaki.

Otago Regional Council Strategic Directions

- Protect and enhance biodiversity and ecosystems.
- Protect our land, water and coast from inappropriate activities.

2nd Generation Dunedin City District Plan Objectives (2018):

- Dunedin's significant indigenous biodiversity is protected or enhanced, and restored; and other indigenous biodiversity is maintained or enhanced, and restored; with all indigenous biodiversity having improved connections and improved resilience.
- Dunedin's outstanding and significant natural landscapes and natural features are protected.
- The natural character of the coastal environment is preserved or enhanced.
- Policies, planning and regulation should protect, enhance and restore nature, and any impacts on nature should be mitigated as much as possible.
- Ecosystems are healthy and connected where biodiversity is thriving.

Te Mana o te Taiao – Aotearoa New Zealand Biodiversity Strategy 2020

- Protecting, maintaining and restoring biodiversity, including requiring councils and landowners to consider creating ecological corridors.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Maximizes protection and restoration of indigenous biodiversity, substantially improves ecosystem connectivity, providing a network of protected areas for important species and habitats, and safeguarding areas of importance to Kāi Tahu.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Environmental and cultural restoration

Description	Criteria	Measurement
Restore and regenerate natural environment, renew urban spaces, and re-energise cultural connections to place	Restore the natural environment	Connectivity and scale of green spaces Level of disturbance to existing ecological biodiversity [RR]
	Aligns with Te Taki Haruru values (Autūroa, Auora, Autaketake, Autakata)	**Rakatirataka fully realised, community empowered and resilient** **Mauri flourishes, ki uta ki tai approach embedded Tikaka and Kawa are embedded into social structure and used to restore and maintain balance** **Past/future connections to place strengthened & celebrated**
	Enhances cultural connections to place	Impacts to community cultural hubs [RR] Impacts to heritage sites /features [RR]

Assessment requirement aligned with:

Community feedback:

A member of the community remarked – ""Māori understand this best. What would their solution be?"

Future Development Strategy – Strategic Directions for Ōtepoti Dunedin(2023)

- The mauri and health of water bodies are protected and prioritized, with ana whenua exercising their role of kaitiaki.

Te Taki Haruru (2023)

- Future for mokopuna based in vitality and abundant wellbeing.
- Mana whenua are leaders, influencers and partners.
- The mauri of Ōtepoti is restored and enhanced.
- Balance is restored, and the future of our people and resources is protected.
- The traditional authority of mana whenua in Ōtepoti is recognised through partnerships based on reciprocity and respect.

Te Ao Turoa | The Natural World: Dunedin's Environment Strategy 2016-2026

- Purpose: Improve and maintain the health of Dunedin's natural environment.
- Enjoy, connect to and celebrate the natural world by honouring and supporting the kaitiaki role of Kai Tahu.
- Improve access to our special places and spaces.

2nd Generation Dunedin City District Plan Objectives (2018):

- Kāi Tahu can exercise kaitiakitaka over resources within their takiwā.
- Kāi Tahu can occupy, develop and use land in areas originally set aside for that purpose, in accordance with their culture and traditions and economic, social and cultural aspirations.
- Wāhi tūpuna (including wāhi tapu and wāhi taoka) and their relationship with Kāi Tahu is acknowledged and protected.

Te Mana o te Taiao – Aotearoa New Zealand Biodiversity Strategy 2020

- Treaty partners, whānau, hapū, iwi and Māori organisations are leading the way as rangatira and kaitiaki and are ensuring the restoration of mātauranga Māori.

National Adaptation Plan (2022)

- Support kaitiaki communities to adapt and conserve taonga/cultural assets.
- Uphold Te Tiriti o Waitangi, work in partnership with Māori to address climate risk, maximise opportunities and avoid disproportionately affecting Māori or locking in existing inequities.
- Māori connections to whenua and places of cultural value are strengthened through partnerships.
- Threats to cultural heritage arising from climate change are understood and impacts are minimised.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Rakatirataka fully realised, community empowered and resilient. Mauri flourishes, ki uta ki tai approach embedded. Tikaka and Kawa are embedded into social structure and used to restore and maintain balance. Past/future connections to place strengthened & celebrated.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Environmental and cultural restoration

Description	Criteria	Measurement
Restore and regenerate natural environment, renew urban spaces, and re-energise cultural connections to place	Restore the natural environment	Connectivity and scale of green spaces Level of disturbance to existing ecological biodiversity RR
	Aligns with Te Taki Haruru values (Autūroa, Auora, Autaketake, Autakata)	Rakatirataka fully realised, community empowered and resilient Mauri flourishes, ki uta ki tai approach embedded Tikaka and Kawa are embedded into social structure and used to restore and maintain balance Past/future connections to place strengthened & celebrated
	Enhances cultural connections to place	**Impacts to heritage sites /features** RR **Impacts to community cultural hubs** RR

Assessment requirement aligned with:

Community feedback:

Community engagement highlighted that they value South Dunedin as being "very historical" with architectural features and heritage places of importance like the facades on the main street, Mayfair theatre, gasworks, and dinosaur park. Engagement highlighted concerns over future hazard impacts causing rapid deterioration of important cultural locations. Community spaces were considered important both for culture and recreation. Comments included considerations of how the community could get more involved in adaptation measures and options could act as a 'catalyst for community cohesion'. Respondents noted "people are wanting a sense of community now more than ever".

A Heritage Strategy for Dunedin City (2007)

- Retention of Dunedin's heritage is integral to the character and identity of Dunedin
- By encouraging and providing for the adaptive reuse, and therefore economic viability of, heritage buildings they can be sustainably managed and retained for future generations
- Work in partnership with New Zealand Historic Places Trust, Kai Tahu ki Otago, property owners and community organisations to identify heritage items that need protection, and co-ordinate resources to give effect to that protection
- Promote and facilitate the continuing sustainable use of heritage items, as well as sympathetic design and development within townscape precincts

Draft wellbeing outcomes and indicators (Council meeting 25 September 2023)

- Cultural: Dunedin has inclusive and connected communities that actively engage people in cultural activities and experiences – sense of belonging in adults and youth; number of DCC places and open spaces which can be used as cultural spaces

Dunedin Social Wellbeing Strategy (2013)

- Priority 1.1: Dunedin people feel included in their local communities and wider city
- Priority 2.2: Dunedin celebrates its identity and cultural diversity.

2nd Generation Dunedin City District Plan Objectives (2018):

Dunedin's heritage is central to its identity and is protected and celebrated as a core value of the city, through the heritage conservation and retention of important heritage items, and the maintenance and active use of built heritage.

National Adaptation Plan (2022)

- Conserve cultural heritage
- Enable communities to maintain and protect their taonga and assets
- Threats to cultural heritage arising from climate change are understood and impacts are minimised.

Migrant Settlement and Integration Strategy (INZ)

- Participation and Inclusion: recent migrants and their families are welcomed and have a strong sense of belonging and acceptance in their communities and in Aotearoa New Zealand. They feel confident and safe to participate in different aspects of their lives.
- Housing: recent migrants and their families live in homes and in communities that meet their long-term needs and goals.
- Education, Training and English Language: recent migrants and their families achieve their education, training and English language goals.

Ministry of Pacific Peoples Strategic Intentions (2023)

- Thriving Pacific languages, cultures and identities
- Prosperous Pacific communities
- Resilient and healthy Pacific peoples.
- Confident, thriving and resilient Pacific young people.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Significantly improves or enhances heritage sites or features and cultural hubs, reducing risk and ensuring their preservation for future generations. Increases the resilience of cultural heritage, implementing measures to protect against natural disasters, climate change, and other threats.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Just transition

Description	Criteria	Measurement
Respond to climate change in ways that empower communities and promote fairness and equity.	**Reflect community preference**	**Community preferences**
	Minimise impacts on vulnerable communities	Community access to education and quality and affordability of housing
	Empowers communities	Having choices
	Vulnerable communities are not left behind	Impacts to disabled communities, elderly communities, low-income groups, culturally and linguistically diverse communities, refugees, and Pacific Communities
	Promotes intergenerational equity	Benefits and costs are shared equitably across generations

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Strongly aligns with community preferences, incorporating feedback and input from diverse community members. Reflects a clear understanding of community needs and desires.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Note: We suggest this criteria is assessed by members of the community where they indicate how well the option does or does not align with their individual preference as well as if they believe the option reflects a clear understanding of community needs and desires.

<u>Assessment requirement aligned with:</u>

Community feedback:

The engagement clearly identified that communities want their needs to be reflected in the design of South Dunedin's future, particularly with regards to how they might be able to get involved. Engagement to date has highlighted several elements communities like/dislike about each adaptation approach.

DCC Significance and Engagement Policy (2024) considers engagement based upon:

- Importance to Dunedin levels of service, long term impacts and opportunity costs
- Community interest related to the number of individuals, business, groups, communities and sectors affected by or interested in the matter
- Consistency with existing policy related to community outcomes, Strategic Framework priorities and policies.
- Impacts on Council finances, capability and capacity.

2nd Generation Dunedin City District Plan Objectives (2018):

- There is a range of housing choices in Dunedin that provides for the community's needs and supports social well-being.

National Adaptation Plan (2022)

- Adapt in partnership with iwi, hapū, Māori and all New Zealanders.
- Enable communities to prepare for the unique risks and opportunities they face, and tailor interventions to the local situation.
- All critical and supporting actions are current, which means they have funding and mandate.

Objective: Just transition

Description	Criteria	Measurement
Respond to climate change in ways that empower communities and promote fairness and equity.	Reflect community preference	Community preferences
	Minimise impacts on vulnerable communities	**Community access to education** **Quality and affordability of housing**
	Empowers communities	Having choices
	Vulnerable communities are not left behind	Impacts to disabled communities, elderly communities, low-income groups, culturally and linguistically diverse communities, refugees, and Pacific Communities
	Promotes intergenerational equity	Benefits and costs are shared equitably across generations

Assessment requirement aligned with:

Community feedback:

Cost to community was a clear fear identified in the engagement process to date. This centred around the cost of adaptation approaches (or lack of adaptation) as well as the associated implications on affordability, rates and property values. At a wider scale, living conditions were a key consideration for many respondents, referencing housing quality as well as access to schools, work, healthcare, churches, community activities, and businesses. As part of this, there was commentary on how this is amplified for vulnerable communities and making sure costs aren't pushed on to future generations.

Future Development Strategy – Strategic Directions for Ōtepoti Dunedin(2023)

- Ōtepoti Dunedin has a range of quality housing choices that provides a home for everyone

Draft wellbeing outcomes and indicators (Council meeting 25 September 2023)

- Social: People experience a reasonable standard of living and quality of life – DCC surveyed question re: ability to cover costs of everyday needs
- Social: People life in affordable and healthy homes – DCC surveyed questions re: if home is suitable, affordable, and damp
- Social: The quality of physical & mental health, education and social services is maintained and approved – DCC surveyed question

Dunedin Social Wellbeing Strategy (2013)

- Priority 3.1: All people have good access to health services.
- Priority 5.1: Dunedin people live in warm and healthy homes
- Priority 5.2: Affordable housing options are available to all.

ORC Our Lands and Water Regional Proposed Plan (2023)

- Recognising the need for transitions in the use of resources over time and to manage the impacts of these transitions on communities.
- Strategic Policy Direction: Prioritise the health and well-being of water bodies and freshwater ecosystems in all decision-making, to restore and preserve the balance between the water, the wider environment, and the community.

ORC Natural Hazards Plan (2014)

- Principle 2: Create communities in which people can live, work and use the land without undue stress or fear of natural hazards.
- Principle 3: Create and maintain a including infrastructure and lifelines, which takes into account the risks from natural hazards so that it can operate effectively while still being affordable.
- Understand where our most vulnerable people are and what they need and value, and provide them with support, knowledge and resources.

National Policy Statement on Urban Development (2020)

Have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantially improves community access to quality education, and housing.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Just transition

Description	Criteria	Measurement
Respond to climate change in ways that empower communities and promote fairness and equity.	Reflect community preference	Community preferences
	Minimise impacts on vulnerable communities	Community access to education and quality and affordability of housing
	Empowers communities	**Having choices**
	Vulnerable communities are not left behind	Impacts to disabled communities, elderly communities, low-income groups, culturally and linguistically diverse communities, refugees, and Pacific Communities
	Promotes intergenerational equity	Benefits and costs are shared equitably across generations

<u>Assessment requirement aligned with:</u>

Community feedback:

Feedback highlighted interest in community involvement in adaptation so as to "build community skills". This allows for people to "help in [their] our own way". Furthermore, comments referred to taking a "whole of community approach where landowners can contribute and be empowered in the process".

Dunedin Social Wellbeing Strategy (2013)

- Priority 4.2: Dunedin people can afford to exercise genuine choices.

ORC Natural Hazards Plan (2014)

- Principle 8: Increasing community awareness is essential to assist people in taking natural-hazard risks into account when undertaking development.

National Adaptation Plan (2022)

- Set clear, stable policies that provide predictability for communities and businesses, allowing them time to plan, respond and seize opportunities.
- Support workers to adapt by transitioning to quality jobs at lower risk from the effects of climate change.
- Adapt in partnership with iwi, hapū, Māori and all New Zealanders.
- Enable communities to prepare for the unique risks and opportunities they face, and tailor interventions to the local situation.
- Use the best available evidence including science, data, local knowledge and māturaka Māori.
- Support asset owners to evaluate, understand and manage the impacts and risks of climate change on their physical assets and the services they provide.
- Understand where our most vulnerable people are and what they need and value, and provide them with support, knowledge and resources.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Enables communities to have the knowledge and resources to have and make individual choices to reduce climate risk in accordance with their personal risk tolerances from a range of options.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Note: We suggest this criteria is assessed by members of the community where they indicate whether they feel that the option enables them to make choices for themselves in the future.

As an alternative, we could ask a similar question in every engagement moving forward to measure whether communities feel empowered to contribute to and influence the SDF programme to track empowerment.

Objective: Just transition

Description	Criteria	Measurement
Respond to climate change in ways that empower communities and promote fairness and equity.	Reflect community preference	Community preferences
	Minimise impacts on all vulnerable communities	Community access to education and quality and affordability of housing
	Empowers communities	Having choices
	Vulnerable communities are not left behind	**Impacts to disabled communities, elderly communities, low-income groups, culturally and linguistically diverse communities, refugees, and Pacific Communities**
	Promotes intergenerational equity	Benefits and costs are shared equitably across generations

<u>Assessment requirement aligned with:</u>

Community feedback:

Community feedback raised fears around the future of South Dunedin leaving 'only the vulnerable behind' and reiterated the need to consider vulnerable groups (including elderly, disabled people, pregnant women, young children and people with less socio-economic means to recover from climate risks) in adaptation planning. Disability representatives further reinforced that the most vulnerable groups must be a high priority for emergency management and adaptation. This included considering access and accessibility for all approaches.

Dunedin Social Wellbeing Strategy (2013)

- Priorities: Dunedin people feel included in their local communities and wider city

National Adaptation Plan (2022)

- Work inclusively with affected groups to understand their need
- Take opportunities to reduce inequalities and support communities and regions to promote resilience in line with local objectives
- Prioritise support to those most affected and least able to adapt, particularly lower income households
- Adapting our homes and buildings to be resilient, be fair, equitable and inclusive and helps our most vulnerable communities thrive.
- Consider the needs of all groups who may be disproportionally impacted by climate change, or who are least able to adapt. These include Māori, people of lower socio-economic status, disabled people, women, older people, youth and migrant communities.
- Understand where our most vulnerable people are and what they need and value, and provide them with support, knowledge and resources.

Further plans, strategies and policies related to specific vulnerable groups are presented on the next page.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantially improves quality of life and resilience of vulnerable communities through design of adaptation which improves accessibility.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Disability Strategy – Office for Disability Issues (2016)

- Principles: Ensure disabled people are involved in decision-making that impacts them
- Principles: Take a whole-of-life and long-term approach to social investment
- Respect for inherent dignity, individual autonomy including the freedom to make one's own choices, and independence of persons
- Provides for full and effective participation and inclusion in society
- Respect for difference and acceptance of disabled people as part of human diversity and humanity
- Provides equality of opportunity and accessibility
- Respect for the evolving capacities of disabled children and respect for the right of disabled children to preserve their identities.
- Provides a twin track approach to support services providing for universal design and reasonable accommodation
- Enables working with the Disability Support Network to enable disabled people to participate in emergency recovery and adaptation planning

Better Later Life Strategy – Office for Seniors (2019)

- Value people as they age, keep people safe, recgonise diversity, take a whole of life and whanau centred approach to ageing, and take a collective responsibility to plan and act for later in life.
- Consider older people, diversity and flexibility when designing – recgonising potential for co-design
- Provide functional, affordable housing options with good access to transport and services and universal design
- Provide accessible built environments and community spaces to address loneliness and social isolation
- Provide safe transport options including age friendly spaces, improved public transport and safe footpaths, cycle lanes and crossings.

Migrant Settlement and Integration Strategy (INZ)

- Participation and Inclusion: recent migrants and their families are welcomed and have a strong sense of belonging and acceptance in their communities and in Aotearoa New Zealand. They feel confident and safe to participate in different aspects of their lives.
- Housing: recent migrants and their families live in homes and in communities that meet their long-term needs and goals.
- Health and Wellbeing: former refugees and their families achieve their health and wellbeing goals and thriving in their lives
- Education, Training and English Language: recent migrants and their families achieve their education, training and English language goals.
- Employment and Self-Sufficiency: Former refugees and their families achieve their employment and self-sufficiency goals, building on their skills and experiences.

Objective: Just transition

Description	Criteria	Measurement
Respond to climate change in ways that empower communities and promote fairness and equity.	Reflect community preference	Community preferences
	Minimise impacts on all vulnerable communities	Community access to education and quality and affordability of housing
	Empowers communities	Having choices
	Vulnerable communities are not left behind	Impacts to disabled communities, elderly communities, low-income groups, culturally and linguistically diverse communities, refugees, and Pacific Communities
	Promotes intergenerational equity	**Benefits and costs are shared equitably across generations**

Assessment requirement aligned with:

Community feedback:

When discussing the programme with children, they want everyone to consider impacts on their futures.

A guide to just transitions for communities in Aotearoa New Zealand (MBIE, 2023)

- A just transition can restore and rejuvenate mauri life force to bring social, economic and environmental systems and supports into balance.
- It addresses injustices. It is inclusive and based on shared principles, values and visions. Its outcomes support oranga wellbeing for all.

Bringing an intergenerational perspective into policy (NZ Treasury, 2023)

- Te Tai Waiora also outlines how future New Zealanders will inherit relatively high and growing stocks of physical capital, human capability, and social cohesion. However, New Zealand has tended to build these aspects of wealth through activities that depleted our natural environment. Environmental deterioration cannot continue indefinitely without posing major risks to future wellbeing.
- If tipping points in the climate trigger irreversible changes, future generations may be prevented from accessing the wealth of past and present generations.
- The economic and social impacts of climate change also create pressures for government spending. The Treasury estimates that more frequent droughts, storms and flooding will add around 4% of net debt to GDP over the next 40 years. The compounding effects of the increasing frequency and severity of events are expected to put further pressure on our fiscal resilience
- How we respond to a changing climate will have impacts across generations. For example, New Zealand faces choices around how – including how quickly – we transition to a low emissions economy. Evidence suggests that reducing emissions earlier is likely to reduce overall transition costs by avoiding the need for more dramatic reductions later. Similarly, wise investments in building climate resilience now may avoid costs of damage from extreme weather in the future.
- One of the most important things we can all do for current and future generations is to improve the performance of our public systems.
- More work is needed to ensure that intergenerational equity is considered in policy advice. While a couple of agencies have medium- and long-term service and infrastructure plans, we urgently need to build more systematic long-term planning for services and infrastructure at an agency level. By planning for the big trends we face, and linking this to performance and funding cycles, we can collectively as a country think about, and plan for, future generations as well as our own.
- 'Titiro Whakamuri, Haere Whakamua – Let us walk into the future, with our eyes open to the past'.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Long term benefits and costs are shared equitably across generations.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Social and Economic Resilience

Description	Criteria	Measurement
Strengthen communities and businesses so they are well-prepared for floods and other hazards, able to cope and bounce back	**Preserve and enhance community cohesion and community values**	**Impacts to social networks measured through accessibility (walking/cycling/public transport/)** [RR] **Exposure of community features** [RR]
	Minimises economic risk to communities	Cost of options versus benefits provided
	Increases community adaptive capacity	Contributes to wider community knowledge and understanding of risk
	Minimises economic risk to individuals	Ability to access funding/debt
	Minimises impacts to business	Exposure of commercial and industrial buildings to hazards/stressors [RR]

Assessment requirement aligned with:

Community feedback:

Adaptation options were identified as a possible “catalyst for community cohesion”. Engagement identified several community features or places of importance that contribute to their sense of belonging/place.

Draft wellbeing outcomes and indicators (Council meeting 25 September 2023)

- Economic: People have access to essential infrastructure that meet their needs – DCC measures average travel time by bus/car on key urban routes

Dunedin Social Wellbeing Strategy (2013)

- Priority 1.2: Dunedin communities are connected to the places they need to go by safe, affordable and user-friendly transport options.

2nd Generation Dunedin City District Plan Objectives (2018):

> The elements of the environment that contribute to residents' and visitors' aesthetic appreciation for and enjoyment of the city are protected and enhanced.

ORC Natural Hazards Plan (2014)

- Principle 2: Create communities in which people can live, work and use the land without undue stress or fear of natural hazards.

National Adaptation Plan (2022)

- Set clear, stable policies that provide predictability for communities and businesses, allowing them time to plan, respond and seize opportunities.
- Understand where infrastructure assets and their services are exposed and vulnerable to climate impacts.
- Build community resilience through social cohesion

National Policy Statement on Urban Development (2020)

- Have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantially reduces risk to social networks and community features.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Social and Economic Resilience

Description	Criteria	Measurement
Strengthen communities and businesses so they are well-prepared for floods and other hazards, able to cope and bounce back	Preserve and enhance community cohesion and community values	Impacts to social networks measured through accessibility (walking/cycling/public transport/) RR Exposure of community features and areas of significance RR
	Minimises economic risk to communities	**Cost of options versus benefits provided**
	Increases community adaptive capacity	Contributes to wider community knowledge and understanding of risk
	Minimises economic risk to individuals	Ability to access funding/debt
	Minimises impacts to business	Exposure of commercial and industrial buildings to hazards/stressors RR

Assessment requirement aligned with:

Community feedback:

Engagement feedback noted large investments need to be "worth the greater cost" particularly by considering benefits for future generations.

DCC Stormwater Integrated Catchment Management Plan Objectives (2017)

- Affordability – meet strategic objectives while limiting cost increases to current affordability levels where practical.

2nd Generation Dunedin City District Plan Objectives (2018):

- Public infrastructure networks operate efficiently and effectively and have the least possible long term cost burden on the public.

Dunedin Economic Development Strategy (2013)

- Infrastructure should support business growth and adaptability.
- Dunedin should use its industrial and research strengths to develop alliances to build commercial opportunities and drive innovation.
- Investment should create job and training opportunities for youth, reduce economic inequality, retain skilled students as workers, attract migrants to Dunedin, maintain the relatively high knowledge and skills base that exists, and encourage our labour force to continually up-skill.
- Actions should attract investment, make better international connections through our diaspora, link Dunedin internationally, and play our part in supporting the wider South Island.
- We should maintain a high quality of life, including ensuring environmental sustainability. It also means leveraging our sport, public art, cultural, leisure and recreational amenities to improve wellbeing and attract visitors, residents and commercial opportunities.

Treasury Background Paper for the 2021 Statement on the Long-term Fiscal Position (2021)

- To support intergenerational wellbeing, fiscal strategy choices must be both sustainable and equitable. Consider the likely impact of fiscal strategy on present and future generations.
- Achieve and maintain prudent public debt levels.
- Ensure that, on average, total operating expenses do not exceed total operating revenues.
- Achieve and maintain total net worth at levels that provide a buffer against future changes.
- Manage fiscal risks facing the government prudently.
- When formulating revenue strategy, have regard to efficiency and equity, including the predictability and stability of tax rates.

Treasury Climate and Fiscal Assessment (2023)

- There will be large economic and fiscal costs. The choices governments, businesses and households make today will influence how prepared we are to manage the impact of climate change.
- The scale, nature and complexity of these costs [of climate change] highlight the need to be flexible and manage our public finances prudently.
- The overall cost of climate change will be influenced by how flexible and adaptable both the economy and decision-makers are.
- The costs from the increased severity and frequency of natural hazards due to climate change are likely to increase over time, expanding New Zealand's already significant natural hazard risk profile.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Benefits substantially outweigh the costs of the option.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Social and Economic Resilience

Description	Criteria	Measurement
Strengthen communities and businesses so they are well-prepared for floods and other hazards, able to cope and bounce back	Preserve and enhance community cohesion and community values	Impacts to social networks measured through accessibility (walking/cycling/public transport/) Exposure of community features and areas of significance to hazards/stressors RR
	Minimises economic risk to communities	Cost of options versus benefits provided
	Increases community adaptive capacity	**Contributes to wider community knowledge and understanding of risk**
	Minimises economic risk to individuals	Ability to access funding/debt
	Minimises impacts to business	Exposure of commercial and industrial buildings to hazards/stressors RR

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantial increases the understanding of risk and options to enable individual planning and decision making.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Assessment requirement aligned with:

Community feedback:

Engagement feedback valued building community skills as part of adaptation measures so that the community are involved in the change. Feedback noted that this would create a stronger, closer community who can 'look out for each other'.

Dunedin Social Wellbeing Strategy (2013)

- Priority 2.3: Dunedin communities are resilient and have good access to information and resources
- Priority 1.4: Dunedin people have access to lifelong learning opportunities.

National Adaptation Plan (2022)

- Raise awareness of climate hazards to make emergency preparedness apart of everyday life.
- Provide access to the latest climate projections data to give New Zealanders the information they need to assess climate risk.
- Build community resilience through social cohesion

Objective: Social and Economic Resilience

Description	Criteria	Measurement
Strengthen communities and businesses so they are well-prepared for floods and other hazards, able to cope and bounce back	Preserve and enhance community cohesion and community values	Impacts to social networks measured through accessibility (walking/cycling/public transport/) [RR] Exposure of community features and areas of significance to hazards/stressors [RR]
	Minimises economic risk to communities	Cost of options versus benefits provided
	Increases community adaptive capacity	Contributes to wider community knowledge and understanding of risk
	Minimises economic risk to individuals	**Ability of community members to access funding/debt (e.g. mortgage / loans)**
	Minimises impacts to business	Exposure of commercial and industrial buildings to hazards/stressors [RR]

Assessment requirement aligned with:

Community feedback:

Feedback included concerns on self-funded adaptation options, and individuals having the ability to source funding to complete activities. Insurance availability or affordability was highlighted as a key threshold for when major future change may be needed. Some noted that insurance premiums are already unaffordable. Climate risks were also flagged to have other implications for people's finances including unhealthy, deteriorating housing and inability to grow own food.

Draft wellbeing outcomes and indicators (Council meeting 25 September 2023)

- Economic: People can meet their daily needs and are free from economic deprivation – monthly and annual data available for Deposit Affordability Indicators, Mortgage Serviceability Indicators, and Rent Affordability Indicators, insurance premiums.

National Adaptation Plan (2022)

- Develop options for home flood insurance.
- Reduce and manage the impacts of climate hazards on homes and buildings.
- Explore co-investment for flood resilience. A resilient financial system underpins economic stability and growth. Participants can identify, disclose and manage climate risks
- Insurance access and affordability is understood and managed.

Insurance Council of New Zealand's views on climate change and the role of local government (2021)

- ICNZ and its members have been seeing the impacts of climate change and how this affects people, businesses and communities for some time.
- We also have a keen interest given our knowledge and experience when it comes to identifying and engaging with climate change risks and risk management, the role insurance plays in this context, and our desire to ensure this remains available and affordable (including to support lending).
- We advocate local governments take a long-term view and act in a proactive, coordinated and resilient manner when it comes to climate change, with regard to risk mitigation, adaptation, risk transfer options and setting appropriate risk signals. Particular attention should be had to avoiding developments in areas vulnerable to flooding, rising sea levels or coastal erosion.
- Local government must adopt a holistic and flexible approach when working through these matters, leveraging a risk management framework and an adaptive pathways approach.
- Ensure buildings are resilient to climate change impacts, specifically making sure that any new building work approved contributes to reducing emissions and is more resilient to climate change impacts alongside other natural hazard risks.
- Support vulnerable groups or areas particularly adversely impacted climate change, including potentially subsidising resiliency improvements or managed retreat, noting that climate change has the potential to exacerbate existing inequalities.
- If proactive action to reduce risk occurs, this will
    - Ensure that insurance remains available and affordable for people and businesses within your community.
    - Avoid a situation where climate change related risks become too great to be transferred to insurers and must be self-insured instead. This would put considerable strain on people, businesses and/or local and central government, particularly when financial resources are already stretched. This may also involve situations when the burden of covering losses falls with local and central government (and in turn ratepayers and taxpayers generally), because the specific people and businesses impacted lack sufficient resources to cover these losses themselves.
- There is asymmetry in the term of lending (several decades) and insurance (annually and can be withdrawn if risk is too high). If the risk of insurance withdrawal increases, lenders may require higher deposits and reduce loan terms therefore restricting growth and devaluing property.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Option enables members of communities to access debt such as mortgages and commercial loans.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Social and Economic Resilience

Description	Criteria	Measurement
Strengthen communities and businesses so they are well-prepared for floods and other hazards, able to cope and bounce back	Preserve and enhance community cohesion and community values	Impacts to social networks measured through accessibility (walking/cycling/public transport/) [RR] Exposure of community features and areas of significance to hazards/stressors [RR]
	Minimises economic risk to communities	Cost of options versus benefits provided
	Increases community adaptive capacity	Contributes to wider community knowledge and understanding of risk
	Minimises economic risk to individuals	Ability to access funding/debt
	Minimises impacts to business	**Exposure of commercial and industrial buildings to hazards/stressors [RR]**

Assessment requirement aligned with:

Community feedback:

The community raised concerns around impacts to businesses, including access to businesses and loss of income. Engagement feedback considered this would most impact those working and owning businesses in the area. Feedback valued protecting homes and businesses, as well as suggesting that businesses can help lead adaptation efforts alongside local and central government.

Draft wellbeing outcomes and indicators (Council meeting 25 September 2023)

- Economic: Number of applications for opening and closing of businesses in South Dunedin (tracked by DCC)

DCC Stormwater Integrated Catchment Management Plan Objectives (2017)

- Development – Adapt to fluctuations in population while achieving key levels of service and improving the quality of stormwater discharges, Ensure new development provides a 1 in 10 year level of service, avoids habitable floor flooding during a 1 in 50 year event.
- Natural hazards – Ensure there will be no increase in the numbers of properties at risk of flooding from the stormwater network.

ORC Natural Hazards Plan (2014)

- Principle 2: Create communities in which people can live, work and use the land without undue stress or fear of natural hazards.
- Principle 5: It is important to address the entire risk spectrum when managing the effects of natural hazards. This principle recognises that whatever event is planned for, there will be a larger, major event. The risk from these major events also needs to be recognised and managed.
- Principle 7: New development and hazard-management measures will not exacerbate the risks or effects of natural hazards elsewhere. This applies at all scales, from localised 'property to property' effects, through to the community or catchment scale.

National Adaptation Plan (2022)

- Sectors, businesses and regional economies can adapt. Participants can identify risks and opportunities and take action.
- A resilient financial system underpins economic stability and growth. Participants can identify, disclose and manage climate risks.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantially reduces risk to commercial and industrial buildings.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Promote community safety

Description	Criteria	Measurement
Promote community safety in South Dunedin by reducing flood and other risks, despite increasing natural hazards.	**Promote community wellbeing**	**Community concerns**
	Promote community safety	Exposure of roads to climate hazards/stressors [RR] Exposure of critical infrastructure and lifelines facilities [RR]
	Reduced natural hazard risk	Exposure of residential buildings to climate hazards/stressors [RR] Cross cell impacts*
	Promote community health	Contributes to healthy living and working social conditions Impact to health and heath services

**short list only*

Assessment requirement aligned with:

Community feedback:

Community feedback commented on destabilisation of everyday life from climate risks having a significant impact on mental wellbeing "of family and wider community and negative effect on children's ability to take part in education and play". Some adaptation approaches were noted to be able to provide possible community wellbeing benefits while others commented on options causing a lot of stress and trauma.

Draft wellbeing outcomes and indicators (Council meeting 25 September 2023)

- Social: People are safe and feel safe in their homes, neighbourhoods and public places (surveyed by DCC)

Dunedin Social Wellbeing Strategy (2013)

- Priority 3.3: People are safe and feel safe in their homes, neighbourhoods and public places

Living Standards Framework, individual and collective wellbeing (2021)

- Health - Being in good mental and physical health and exhibiting health-related behaviours and lifestyles that reduce morbidity and mortality, such as eating well and keeping active.
- Knowledge and skills - Having knowledge and skills appropriate to one's life stage and continuing to learn through formal and informal channels.
- Cultural capability and belonging - Having the language, knowledge, connection and sense of belonging necessary to participate fully in one's culture or cultures, and helping others grow their cultural capability and feel a sense of belonging.
- Work, care and volunteering - Directly or indirectly producing goods and services for the benefit of others, with or without compensation.
- Engagement and voice - Participating in democratic debate and governance at a national, regional or local level, such as through membership of a charitable society, political party or school board.
- Income, consumption and wealth - Using income or in-kind transfers to meet today's needs and save for future needs, as well as being protected from future shocks by adequate wealth, private insurance and public insurance (the social safety net).
- Housing - Having a place to call home that is healthy, suitable, affordable and stable.
- Environmental amenity - Having access to and benefiting from a quality natural and built environment, including clean air and water, green space, forests and parks, wild fish and game stocks, recreational facilities and transport networks.
- Leisure and play - Using free time to rest, recharge and engage in personal or shared pursuits.
- Family and friends - Loving and supporting close friends, family and community members, and being loved and supported in turn.
- Safety - Being safe from harm and the fear of harm and keeping oneself and others safe from harm.
- Subjective wellbeing - Being satisfied with one's life overall, having a sense of meaning and purpose, feeling positive emotions, such as happiness and contentment, and not feeling negative emotions.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Addresses nearly all community concerns related to climate hazards and associated disruptions. Substantially improves wellbeing.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Note: this element will be scored by members of communities.

Objective: Promote community safety

Description	Criteria	Measurement
Promote community safety in South Dunedin by reducing flood and other risks, despite increasing natural hazards.	Promote community wellbeing	Community concerns
	Promote community safety	**Exposure of roads to climate hazards/stressors** RR **Exposure of critical infrastructure and lifelines facilities** RR
	Reduced natural hazard risk	Exposure of residential buildings to climate hazards/stressors RR Cross cell impacts*
	Promote community health	Contributes to healthy living and working social conditions Impact to health and heath services

**short list only*

Assessment requirement aligned with:

Community feedback:

Community feedback raised fears about the impact of climate change and adaptation approaches on their ability to reach the services they want and need. There was a clear requirement that chosen adaptation options must take a safety first approach and work for the South Dunedin context.

DCC Stormwater Integrated Catchment Management Plan Objectives (2017)

- Development – Adapt to fluctuations in population while achieving key levels of service and improving the quality of stormwater discharges, Ensure new development provides a 1 in 10 year level of service, avoids habitable floor flooding during a 1 in 50 year event.
- Natural hazards – Ensure there will be no increase in the numbers of properties at risk of flooding from the stormwater network.

ORC Natural Hazards Plan (2014)

- Principle 1: Prevent death or injury from natural hazards, ensure public health.
- Principle 3: Create and maintain a including infrastructure and lifelines, which takes into account the risks from natural hazards so that it can operate effectively while still being affordable.
- Principle 5: It is important to address the entire risk spectrum when managing the effects of natural hazards. This principle recognises that whatever event is planned for, there will be a larger, major event. The risk from these major events also needs to be recognised and managed.
- Principle 7: New development and hazard-management measures will not exacerbate the risks or effects of natural hazards elsewhere. This applies at all scales, from localised 'property to property' effects, through to the community or catchment scale.

National Adaptation Plan (2022)

- Strengthen resilience – this means taking action that strengthens the way people and systems cope with immediate climate impacts, as well as building capacity for learning and transformational adaptation.
- Prioritise the risk management of assets so that services can continue if disruption occurs.
- Ensure communities can continue to access the healthcare services they need, even in the face of climate change adversity.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantially reduces risk to roads, critical infrastructure and lifeline facilities.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Promote community safety

Description	Criteria	Measurement
Promote community safety in South Dunedin by reducing flood and other risks, despite increasing natural hazards.	Promote community wellbeing	Community concerns
	Promote community safety	Exposure of roads to climate hazards/stressors RR Exposure of critical infrastructure and lifelines facilities RR
	Reduced natural hazard risk	**Exposure of residential buildings to climate hazards/stressors RR** **Cross cell impacts***
	Promote community health	Contributes to healthy living and working social conditions Impact to health and heath services

**short list only*

Assessment requirement aligned with:

Community feedback:

Community responses with regards to acceptability thresholds included that 'people should not live in locations which frequently put them in danger during daily life" alongside support for protecting homes and being able to remain in South Dunedin by managing risk in place. Community feedback placed importance on protecting public health and putting safety first, including through measures like reducing house dampness and preventing wastewater contamination.

Dunedin Social Wellbeing Strategy (2013)

- Priority 1.2: Dunedin people are connected to the places they need to go by safe, affordable and user-friendly transport options.

DCC Stormwater Integrated Catchment Management Plan Objectives (2017)

- Development – Adapt to fluctuations in population while achieving key levels of service and improving the quality of stormwater discharges, Ensure new development provides a 1 in 10 year level of service, avoids habitable floor flooding during a 1 in 50 year event.
- Natural hazards – Ensure there will be no increase in the numbers of properties at risk of flooding from the stormwater network.

2nd Generation Dunedin City District Plan Objectives (2018):

- The risk to people, communities, and property from natural hazards, and from the potential effects of climate change on natural hazards, is no more than low.
- The risk to people's health and safety from contaminated sites, hazardous substances, and high levels of noise or emissions is minimised

ORC Natural Hazards Plan (2014)

- Principle 1: Prevent death or injury from natural hazards, ensure public health.
- Principle 3: Create and maintain a including infrastructure and lifelines, which takes into account the risks from natural hazards so that it can operate effectively while still being affordable.
- Principle 5: It is important to address the entire risk spectrum when managing the effects of natural hazards. This principle recognises that whatever event is planned for, there will be a larger, major event. The risk from these major events also needs to be recognised and managed.
- Principle 7: New development and hazard-management measures will not exacerbate the risks or effects of natural hazards elsewhere. This applies at all scales, from localised 'property to property' effects, through to the community or catchment scale.

National Adaptation Plan (2022)

- Strengthen resilience – this means taking action that strengthens the way people and systems cope with immediate climate impacts, as well as building capacity for learning and transformational adaptation.
- Work with community housing providers to enable effective climate hazard responses.
- Homes and buildings are climate resilient, and meet social and cultural needs.
- New and existing places are planned and managed to minimise risks to communities from climate change.
- Ensure all new infrastructure is fit for a changing climate.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantial reduces risk to residential buildings. Enhances performance of actions in other cells.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

Objective: Promote community safety

Description	Criteria	Measurement
Promote community safety in South Dunedin by reducing flood and other risks, despite increasing natural hazards.	Promote community wellbeing	Community concerns
	Promote community safety	Exposure of roads to climate hazards/stressors [RR] Exposure of critical infrastructure and lifelines facilities [RR]
	Reduced natural hazard risk	Exposure of residential buildings to climate hazards/stressors [RR] Cross cell impacts *
	Promote community health	**Contributes to healthy living and working social conditions** **Impact to health and heath services**

**short list only*

Assessment requirement aligned with:

Community feedback:

Concerns were also raised regarding the mental health and wellbeing implications if adaptation is not well managed, particularly in how this may result in stress, anxiety and "feelings of abandonment, anger". Community feedback placed importance on protecting public health and putting safety first, including through measures like reducing house dampness and preventing wastewater contamination.

ORC Natural Hazards Plan (2014)

- Principle 1: Prevent death or injury from natural hazards, ensure public health.
- Principle 3: Create and maintain a including infrastructure and lifelines, which takes into account the risks from natural hazards so that it can operate effectively while still being affordable.

National Adaptation Plan (2022)

- Objective: Health sector is prepared and can support vulnerable communities affected by climate change.
- Objective: Homes and buildings are climate resilient, and meet social and cultural needs
- Understand where our most vulnerable people are and what they need and value, and provide them with support, knowledge and resources.

New Zealand Health Strategy (2023)

- Conceptual framework to addressing individual and community determinant of health.
- Priority 2: linking services that support people's wider wellbeing and contribute to housing and good employment, such as Individual Placement and Support
- Priority 5: A resilient and sustainable system: timely access to health care that is responsive to the needs of older people and focused on building and maintaining people's physical and mental function.

Pae Tū: Hauora Māori Strategy (2023)

- Priority 4: Enabling culturally safe, whānau centred and preventive primary care
- Priority 5: Ensuring accountability for system performance for Māori

Te Mana Ola: The Pacific Health Strategy (2023)

- Priority 2: Te pāruru'anga, te apii'anga, e te akateretere'anga no te ora'anga meitaki - Disease prevention, health promotion and management for good health
- Priority 3: Soalaupule | Autonomy and determination - The health system better understands the needs and aspirations of Pacific peoples and communities and enables them to exercise authority over their health and wellbeing.
- Priority 4: Haitiaaga moui malolo | Access. The health system ensures that timely, high-quality services are reaching Pacific peoples, wherever they live

Health of Disabled People Strategy (2023)

- Priority 2: Ensure the health system is designed by and accessible for disabled people and their whānau, and provides models of care that suit their needs

Women's Health Strategy (2023)

- Priority 3: Better outcomes for mothers, their whānau (families) and future generations.
- Priority 4: Living well and ageing well.

Rating Scale						
Based on the measurement criteria, to what extent do you agree or disagree that the adaptation option aligns with the following best outcome statement?						
Best-outcome statement: Substantially enhances health of living and working conditions; reduces the risk to climate-related diseases; and decreases the impact to health services for Māori, Pacific communities, disabled people, and women.						
Agree very strongly	Agree Strongly	Agree	Neutral	Disagree	Disagree strongly	Disagree very strongly
+3	+2	+1	0	-1	-2	-3

APPENDIX B: Adaption options not included in the spatial longlist of recommended adaption options

OPTIONS UNDER COASTAL PARALLEL PROCESS

The following coastal options are considered part of the parallel development of the St Clair to St Kilda Coastal Plan programme. These options aim to reduce the risks associated with coastal hazards along the South Coast, such as coastal flooding via waves, sea level rise and storm surge as well as coastal erosion. Along the harbourside, the primary coastal hazards are related to flooding rather than erosion due to the sheltered nature of the harbour. Therefore, these coastal erosion management options are less relevant for the harbourside. All options presented below were included in the coastal protection generic approach.

DUNE MANAGEMENT OR RE-SHAPING

Dune management involves altering or protecting existing sand dunes to enhance their ability to withstand coastal erosion. This approach can be particularly effective in areas with sandy coastlines, like St Clair and St Kilda. Dunes are natural barriers against waves reducing the impact of coastal erosion on infrastructure and properties. This option has not been taken forward as part of SDF because there are not natural dune features along the harbourside to manage, enhance or re-shape.

ROCK REVETMENTS

Rock revetments are structures used to dissipate wave energy to prevent erosion and fix the shoreline location. They are sloped walls made from large rocks or boulders place along a shoreline. This option is not suitable to manage flooding along the harbourside, as they are typically permeable structures. This means that coastal flooding can flow through revetments (without a substantial, impermeable core) rendering it ineffective for flood risk management.

BEACH NOURISHMENT

Beach nourishment involves the addition of sediment within a coastal system. This approach replaces sand lost through erosional processes and is most useful for high energy sandy coastlines such as St Clair and St Kilda. Beach nourishment is not relevant to the harbourside area as its primary aim is to protect against erosion and improve the amenity value of beaches, and erosion risk along the harbourside is limited.

BURIED BACKSTOP WALL

Buried backstop wall is a partially or entirely buried wall designed to prevent erosion and stabilise soil. It is unsuitable for the harbour given the limited erosion risk.

GROYNES

Groynes are hard structures extending perpendicular to the shoreline, to protect against erosion by trapping sediment from longshore drift and reducing the energy of waves hitting the shore. Groynes are unsuitable for the harbour given the limited erosion risk.

OFFSHORE BREAKWATERS OR REEFS

Offshore breakwaters or reefs are coastal structures designed to protect shorelines from erosion, through sediment accumulation, and absorption and dissipation of wave energy. The option was not relevant to the South Dunedin area and was more suited to the high energy, erosive coastal environments of St Clair / St Kilda than the harbour area.

VEGETATION PROTECTION

Vegetation protection involves utilising vegetation for erosion control by attenuating waves and currents and resulting in sedimentation. Vegetation protection is not relevant as there is limited erosion risk along the harbourside.

OPTIONS NOT TECHNICALLY SUITABLE

Options considered within the South Dunedin Future Programme were assessed for technical suitability. If the adaption option presented significant technical and logistical challenges, the option was excluded from consideration. The following are options not considered further in the process.

TIDAL BARRIER FOR COASTAL FLOOD MANAGEMENT

Tidal barriers are structures designed to control water flow protecting communities and infrastructure from elevated water levels. They are sometimes used in coastal areas prone to flooding from storm surges or high tides. During extreme weather events or high tides, the barrier can be closed to prevent seawater from entering the protected area. When the threat of flooding has passed, the barrier can be opened to allow normal water flow. This option was part of the longlist of adaptation options for coastal protection. In the South Dunedin context, this tidal barrier would likely be placed near the opening of the Ōtākou harbour with movable gates that would close during elevated tidal conditions.

Tidal gates are used overseas to close off channels or inlets and “shorten the line of defence”. Large tidal barrages like the Thames Barrier (London, United Kingdom), Maeslantkering (Rotterdam, Netherlands) or the tidal barriers in New Orleans can function within shipping channels remaining open most of the time but closing to protect against extreme sea levels. In these cases, they defend against several meters of storm surge and are used infrequently. These examples cost more than $1B to construct in today’s dollars and protect large ports and economic centres.

The coastal hazardscape in Dunedin is different than the UK, Dutch or US Gulf Coast examples because of the relatively small storm surge elevation (est. 1m in a 1% AEP event) versus the tidal range (1.5-2m) in Dunedin, whereas in the areas where tidal barriers have been constructed, the tidal range can be an order of magnitude more or less than an extreme storm surge.

The challenges with South Dunedin’s flooding are less so due to the catastrophic effects of extreme high water and more so due to the ongoing, increasingly nuisance flooding that will occur as sea levels rise. This would mean that the tidal gates would need to close daily to stop high tide at the coast from flowing into the harbour, significantly disrupting the natural system and still would not protect from rising pluvial and groundwater compound flooding exposure across South Dunedin.

The size of Ōtākou harbour would require a combination of sector gates or similar structures that open to allow ships to pass and smaller sluice gates that can open and close as required. The system would cost billions of dollars and provide limited benefits that could not be provided by a seawall while significantly disrupting the natural and economic systems within the harbour. In comparison, the cost of the seawall to protect South Dunedin against a similar event is less than

20% of the cost of tidal gates, noting however that tidal gates would protect the entire inner harbour shoreline.

These tidal gates would negatively impact coastal and marine biodiversity, mana whenua values, mahika kai, and industries relying on shipping through Port Otago by changing flow patterns and potentially restricting access. Tidal gates are complex, expensive solutions, and these factors coupled with economic and environmental impacts mean that this option is technical unsuitable for South Dunedin.

DISCHARGE STORMWATER TO WASTEWATER NETWORK

In a combined sewer system, wastewater, and stormwater flow into the same pipe. This option was considered as part of the longlist of adaptation options for water flow improvements. Cities all over the world use combined sewers, typically due to legacy infrastructure from prior to the 1970s. By 2005, the US Environmental Protection Agency deemed that blending stormwater, and wastewater was likely to have unacceptable environmental and public health outcomes due to the risks associated with wet weather overflows. The US government spent an estimated $50B over 20 years to upgrade infrastructure either by decoupling the wastewater and stormwater systems or constructing large scale water treatment facilities to handle the wet weather flows to an appropriate standard.

In South Dunedin, the wastewater network is already overwhelmed during wet weather conditions. Without significant upgrades to the wastewater pipe network, it would overload the sewage systems and treatment facilities, leading to increased flooding and pollution. A new wastewater treatment facility in Dunedin would likely cost on the order of $500M to $1B, and this is in addition to the $1.5B to upgrade and operate the pipe network.

To accommodate the volume of water required, both the pipe network and wastewater treatment facilities would require significant upgrades resulting in higher costs than upgrades to the stormwater network (which would provide for pipes but would not require the extensive treatment facilities) alone. Therefore, this option has not been taken forward.

UNDERGROUND STORMWATER DETENTION

Underground detention systems are used to hold and slowly release stormwater. This option was considered as part of the longlist of adaptation options for dedicated water storage.

Underground stormwater detention is used around the world from a large scale “floodwater cathedral” below Tokyo to smaller detention systems under roadways and carparks around New Zealand. These systems range significantly in cost depending on the scale of the system but are most equipped to handle high intensity rainfall, capturing flow, holding it until the peak passes and then discharging, typically via slow infiltration to the water table but sometimes via pumps.

Most of the smaller systems require groundwater deeper than 1m lower than the base of the underground detention system to encourage infiltration at a suitable rate. Given the high groundwater in South Dunedin, an underground detention system would need to be impermeable so that it would not fill with groundwater and pumped to facilitate drainage.

Further, the scale of system required would be significant as the stormwater that flows into South Dunedin from upper parts of the catchment is a key contributing factor to flooding. This means that in addition to a stormwater network managing the rain that falls directly on the area, it should also be able to handle incoming flows. The resulting underground tanks would be substantial and likely considerably more expensive to construct, operate and maintain than above ground detention ponds (which would still require pumping).

Therefore, underground stormwater detention was deemed technically unfeasible in the South Dunedin context as high groundwater levels in the area would fill tank systems if they were permeable reducing the capacity to store water during rainfall events. Due to the flat nature of Dunedin, to drain these tanks, pump stations would be required. The high groundwater significantly reduces the efficacy of these tanks and therefore this option has not been taken forward.

LARGE SCALE LAND GRADING

Land grading involves building up land to raise the ground above the floodplain. This option was part of the longlist of adaptation approaches for land grading.

Land grading across the entirety of South Dunedin to increase the project area to an elevation above a 2130 coastal flood would be prohibitively disruptive and expensive. It would require total buyout of South Dunedin, substantial earthworks, likely taking decades to complete, and would change South Dunedin likely beyond recognition.

Raising land across the entirety of South Dunedin was deemed technically unfeasible as it is an extremely high-cost and disruption. However, land grading on a smaller scale has remained a potential option to enable "low risk" development in South Dunedin.

COMPLETE NEAR-TERM RELOCATION OF ENTIRE COMMUNITY

Complete near-term relocation of the South Dunedin community involves the relocation of communities and assets from the area, to remove exposure to hazards. This option was considered as part of the longlist of adaptation approaches for managed relocation.

Relocation of entire communities is a costly, challenging process. To retreat 20-30 households on an island called Isle de Jean Charles in the United States to a lower risk area further inland cost more than $40M USD and has taken nearly a decade to reach agreements and construct the "New Isle". The process was hugely disruptive and had significant negative impacts on the community; however, remaining in place was no longer an option due to the life-threatening flooding from hurricanes on nearly an annual basis and the increasingly disrupted access as the road connecting the island to the mainland was under water regularly due to high tides.

Relocation of Matata due to risk to live was approximately 40 households, took several years of contested processes and had significant social impacts due to the uncertainties of where to move and how the community cohesion would be retained.

Requiring relocation of South Dunedin in its entirety within the next 20 years would likely significantly fracture the community, would disrupt the City's housing market, and would have severe negative consequences on vulnerable populations due to the pace and scale of retreat.

This option is not technically feasible due to the significant costs involved, including social, cultural, and financial, to relocate an entire community in the short-term. Longer term retreat from the areas of highest risk however provides time to plan and change gradually over time to minimise impacts on communities.

Appendix C: Glossary/acronyms

Term / Acronym	Definition
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.
Climate Adaptation (also referred to as Adaptation)	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.
Climate Change	Climate change refers to a change in the state of the climate that can be identified (for example, 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. Climate change includes natural internal climate processes or 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.
DCC	Dunedin City Council
Element at Risk	People, places, assets within South Dunedin that are potentially vulnerable or exposed to hazards.
Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC, 2021).
Flooding	The covering or submergence of an area of land below water. In this report, flooding includes coastal flooding (temporary submergence during storm events), coastal inundation (when sea levels rise and the land is now intertidal or permanently submerged), surface or pluvial flooding (caused by rainfall events), and groundwater flooding (when groundwater rises and emerges above the surface). The report does not include riverine or fluvial flooding due to geography of South Dunedin.
Hauora	Health and wellbeing
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.
Impacts	The consequences of realized risks on natural and human systems. Where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure (IPCC, 2021).
Kaitiakitaka	exercise of guardianship by mana whenua
Ki Uta Ki Tai	A holistic, inter-connected and or catchment-wide approach to natural resource management
Land use	Refers to the purpose or activity for which a particular area of land is utilised or managed. It describes how land is allocated and used by individuals, communities or institutions for various specific purposes.
Liquefaction	Liquefaction is a phenomenon that occurs in saturated, loose, or poorly compacted soil during seismic events, such as earthquakes. It refers to the transformation of solid soil into a liquid-like state, temporarily losing its strength and ability to support structures and foundations.
Mahika kai	Food and resource gathering sites and practices
Mana Whenua	Refers to the authority, power and connection to the land that Māori hold as traditional custodians.

Term / Acronym	Definition
Marae	Meeting area hosted by mana whenua in front of a wharenui (meeting house), also used to refer to surrounding land and buildings
Mauri	Life force and vitality
Moana	Ocean
ORC	Otago Regional Council
Pathways	Sequences of actions over time to reduce risk of climate change impacts
Physical risk	Risks that result from dynamic interactions between hazards with the exposure and vulnerability of the affected human or ecological system to the hazards (IPCC, 2021). In this project context, these are also called 'direct risks' and are those that may result from physical contact with the hazard.
Resilience	The capacity of social, economic, and environmental systems to cope with a hazardous event, trend or disturbance by responding or reorganising maintaining essential function, identity, and structure, while also maintaining capacity for adaptation, learning, and transformation.
Risk	The potential for adverse consequences for human or ecological systems (IPCC, 2021). Risk includes the following related concepts and terms: Physical risk: Risks that result from dynamic interactions between hazards with the exposure and vulnerability of the affected human or ecological system to the hazards (IPCC, 2021). In this project context, these are also called 'direct risks' and are those that may result from physical contact with the hazard. When realised, results in impacts.
Risk Assessment	The overall qualitative and/or quantitative process of risk identification, risk analysis and risk evaluation, with multiple entry points for communication and engagement and monitoring and reviews (AS/NZS ISO 31000:2009, Risk Management Standard).
SDF	South Dunedin Future programme
Sea Level Rise	Sea level rise refers to the long-term increase in the average global sea level relative to the land. It is primarily driven by two main factors: thermal expansion of seawater and the melting of land-based ice.
STAT	Signals, triggers and adaptation thresholds
Te Mana o Te Wai	Concept that protecting the health and mauri of water bodies is paramount to the health of the wider natural ecosystem environment and health of the people
Three waters	Refers to drinking water, wastewater and stormwater infrastructure.
Threshold	A critical limit where a system responds drastically when exposed to an external forcing, resulting in the system changing into a different state.
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 have many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour.
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
Wai	Water

11.1. Recommendations of Environmental Implementation Committee

Resolution

That the Council adopts the resolutions of the 5 March 2025 Environmental Implementation Committee.

Report	Resolution	Resolution #	Mover/Seconder
GOV2501 Integrated Catchment Management (ICM) Programme Update	*That the Environmental Implementation Committee recommends that Council:* *1. **Notes** this report and the progress made on the ICM programme in this quarter.* *2. **Notes** the evaluation report on the process for the pilot CAP and the steps to implement the recommendations from the evaluation.*	EIC25-101	**Cr Robertson Moved, Cr Forbes Seconded**
GOV2501 Integrated Catchment Management (ICM) Programme Update	*That the Environmental Implementation Committee recommends that Council:* *1. **Nominates** Cr Wilson to join the ICM Working Group for Taiari Catchment.*	EIC25-102	**Cr Robertson Moved, Cr Forbes Seconded**
GOV2518 Wilding Conifer Business Case	*1. **Recommends** that Council **Endorses Option 1 – Council continue to engage with other Regional Councils and Government Agencies to explore funding opportunities for Wilding Conifers which would support and enhance delivery of the existing programme in Otago.***	EIC25-103	**Cr Forbes Moved, Cr Malcolm Seconded**

11.2. Recommendations of the Public and Active Transport Committee

Resolution

That the Council adopts the recommendations of the 5 March 2025 Public and Active Transport Committee.

Report	Resolution	Res#	Mover/ Seconder
POL2502 Transport Operating Environment	2. The Public and Active Transport Committee **recommends that Council** write to the Minister of Transport seeking changes to legislation to give Public Transport priority on the roading network to improve the effectiveness and efficiency of substantial Government investment.	**PAT25-102**	**Cr Wilson Moved, Cr Noone Seconded**
POL2503 Updates on the Regional Public Transport Plan (2025-2035)	***3. Recommends*** *to the Council that the draft RPTP goes out for public consultation.* ***4. Recommends*** *to the Council that the composition of the Hearings Panel is solely Regional Councils and includes three Councillors.*	**PAT25-104**	**Cr Wilson Moved, Cr Weir Seconded**
GOV2527 Super Gold Concession on Route 1	***Recommends*** *to Council that the SuperGold Bee Card concession continue to apply on the afternoon service (not evening) from City–Palmerston and City–Warrington with a final decision to be made as part of decisions on the new Otago Regional Council RPTP.*	**PAT25-105**	**Cr Noone Moved, Cr Weir Seconded**