Council Agenda 27 August 2025

Meeting will be held at Council Chambers, Lvl 2 Philip Laing House, Rattray Street, Dunedin and live streamed at ORC YouTube Channel

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

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

27 August 2025 01:00 PM

Agenda Topic

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1. WELCOME

2. APOLOGIES

3. PUBLIC FORUM

Upper Clutha Angling Club: Simon Gibb and Spiro Anatasiou regarding Lake Hāwea water levels.

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

There are currently no presentations scheduled for this meeting.

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Confirming the minutes of 23 July 2025 as a true and accurate record.

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10.1 Outram Floodbank Stability Assessment Outcomes 30

The purpose of this report is to inform Council of the outcome of the Outram Floodbank Stability Assessment completed in November 2024.

10.1.1 Outram Floodbank Stability Assessment - BECA Ltd November 2024

This document can be read on the ORC website linked here and the Diligent Resource Centre.

10.2 Lower Taieri Flood Protection Scheme Project Budget Revisions 37

The purpose of this report is to communicate and seek approval for project budget revisions arising from project progression and priority across the Lower Taieri Flood Protection Scheme.

10.3 Liaison Groups in the Lower Clutha and Tokomairiro Areas 41

To seek endorsement of a proposed draft terms of reference and approach to establish the Lower Clutha/Mata Au Flood Protection and Drainage Scheme Liaison Group and the Tokomairiro Drainage Scheme Liaison Group.

10.3.1 Draft Terms of Reference Lower Clutha Mata Au 49

10.3.2 Draft Terms of Reference Tokomairiro 53

10.4 Total Mobility 58

To seek direction from Council on options for managing expenditure for Total Mobility services.

10.5 Amendment to the Water Plan to give effect to legislative change to the Resource Management Act 1991 66

The purpose of this paper is to provide Otago Regional Council (Council or ORC) with a summary of the recent changes to the Resource Management Act 1991 (RMA) and Regional Plan: Water for Otago (Water Plan) introduced by the Resource Management (Consenting and Other System Changes) Amendment Act 2025.
These changes extend the expiry date of certain water permits in Otago and override, amend and revoke specific provisions in the Water Plan.

10.5.1 Excerpts of the Resource Management (Consenting and Other System Changes) Amendment Act 71

10.5.2 Changes to the Regional Plan Water 81

10.6 Jobs for Nature Projects Update 100

This report provides the final summary on two Jobs for Nature projects that Council has been involved in over the last four years. These projects are the Ministry for the Environment (MfE) funded Toitū Te Hakapupu/Pleasant River Catchment Restoration project (July 2021 – June 2025) and the Department of Conservation (DOC) funded Maintaining the Gains project (December 2021 – March 2025).

10.6.1 Toitū Te Hakapupu Pleasant River Catchment Action Plan July 2025 117

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10.6.8 Appendix 5 Landscape Context Te Hakapupu Pleasant River Catchment 386

10.6.9 Appendix 6 Planning Context & Consenting Requirements Te Hakapupu Pleasant River Catchment December 2024 391

10.6.10 ORC BECA Nature Based Solutions for Flood Resilience Engagement Study July 2025 400

10.7 Annual Returns of Inactive Subsidiaries 427

To pass resolutions in lieu of holding annual general meetings for Council's three wholly owned inactive subsidiaries. The resolutions are to not hold an annual general meeting and to not appoint an auditor for each company.

11. NOTICES OF MOTION

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

12. RESOLUTION TO EXCLUDE THE PUBLIC 430

Recommendation that the public be excluded from the following parts of the meeting, namely:
1.1 Confidential Minutes of Council 23 July 2025
3.1 Decision on Electric Charging Depot in Queenstown
3.2 Update on the Proposed Otago Regional Policy Statement

12.1 Public Excluded Postamble 2025.08.27 430

13. CLOSURE

Otago Regional Council

Council
MINUTES

Minutes of an ordinary meeting of the Otago Regional Council held in the Council Chamber, Waitaki District Council, 20 Thames Street, Ōamaru, on Wednesday 23 July 2025, at 10:00 am.

https://www.youtube.com/live/J6J2-OMKfn8?si=NehAoFrkfW86VCiH

PRESENT

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

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1. WELCOME

Mayor Kircher welcomed Otago Regional Council Councillors, members of the public and staff to the meeting at 10:00 am at the Waitaki District Council, in Ōamaru. The mayor wished the ORC well in its focus of ensuring that all Otago communities get what they need. Staff present included Richard Saunders (Chief Executive), Anita Dawe (GM Regional Planning and Transport) online, Nick Donnelly (GM Finance), Tom Dyer (GM Manager Science and Resilience) online, Joanna Gilroy (GM Environmental Delivery), Tami Sargeant (GM People and Corporate), Amanda Vercoe (GM Strategy and Customer, Deputy CE), Kylie Darragh (Governance Support), Brett Paterson (Manager Engineering), Ian Telfer (Manager Partnerships and Engagement) and online Warren Hanley (Senior Resource Planner Liaison), Tanith Robb (Senior Policy Analyst), Fleur Matthews (Manager, Policy and Planning), Lorraine Cheyne (Manager Transport).

2. APOLOGIES

There were no apologies for this meeting.

3. PUBLIC FORUM

Pierre Marasti spoke on behalf of Extinction Rebellion. There was an opportunity for questions and Chair Robertson thanked Pierre for attending.

Jim Thomson spoke as an ORC ratepayer. There was an opportunity for questions, Chair Robertson thanked Mr Thomson for attending.

Ash Muston, online, and Mark Smith, both from the Public Service Association, in room, spoke on the Living Wage Accreditation. There was an opportunity for questions and Chair Robertson thanked Ms Muston and Mr Smith 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 a correction to matter 10.3 CM25-161 of the minutes to be amended, with that noted it was moved:

Resolution: Cr Kelliher Moved, Cr Laws Seconded

That the minutes of the (public portion of the) Council meeting held on 25 June 2025 be confirmed as a true and accurate record.

MOTION CARRIED

7. ACTIONS (STATUS OF COUNCIL RESOLUTIONS)

Open actions from resolutions of the Committee were reviewed.

8. CHAIRPERSON AND CHIEF EXECUTIVE REPORTS

8.1. Chief Executive's Report

Richard Saunders, Chief Executive, was available to respond to questions on the report.

Resolution: Cr McCall Moved, Cr Somerville Seconded

That the Council:

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

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2) ***Notes*** *that no additional funding is required in the 2025/26 annual plan for the delivery of an investigation into using funds from the managed fund to increase ORC's contribution to pest management and control.*

MOTION CARRIED

8.2. Chairperson's Report

Chair Robertson and Cr Wilson gave updates on their attendance at the Local Government New Zealand Conference and Regional Sector Tour (hosted by the West Coast Regional Council).

Chair Robertson also responded to questions on the report.

Resolution: Cr Weir Moved, Cr Kelliher Seconded

That the Council:

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

MOTION CARRIED

Cr Wilson left the meeting at 12:03 pm.

Cr Wilson returned to the meeting at 12:07 pm.

9. MATTERS FOR CONSIDERATION

9.1. ORC Submission on Proposed Changes to National Direction

[YouTube 2:07:27] This paper sought approval of the Council's submissions on the four packages of new and amended national direction under the Resource Management Act (RMA). Warren Hanley (Senior Resource Planner) online, Fleur Matthews (Manager Policy and Planning) online, Tom De Pelsemaeker (Team Leader Freshwater and Land) online, and Anita Dawe (GM Regional Transport and Planning) online, were available to respond to questions on the report. Each package was reviewed separately.

At 12:23 pm it was moved Chair Robertson, seconded Cr Kelliher:

That *Council adjourn until 1:00 pm.*

MOTION CARRIED

On commencement at 1:00 pm the motions below were put forward:

Resolution CM25-172: Cr Wilson Moved, Cr Forbes Seconded

That the Council:

1) ***Notes*** *this report.*
2) ***Approves*** *the draft Council submissions on packages 1, 2 and 3 of national direction.*
3) ***Delegates*** *to the Chair to provide the final sign off on the Council submissions, including any minor or editorial changes.*
4) ***Directs*** *staff to engage with Otago's territorial authorities on package 4 and finalise the ORC submission through the existing submission working group process.*
5) ***Delegates*** *to the Chair to provide final sign off on any Council submission on package 4 following input from the submissions working group.*
6) ***Delegates*** *authority to the CEO to sign off on behalf of Council the ORC staff submissions.*
7) ***Notes*** *the Council submissions and the staff submissions will be lodged by the submission due dates.*

MOTION CARRIED

At 1:12 pm Cr Laws left the meeting.

At 1:56 pm Cr Laws returned to the meeting.

9.2. Revised Charter for Te Rōpū Taiao Murihiku

[YouTube 3:44:50] This paper sought Council approval for the Otago Regional Council to sign the revised Charter of Understanding, He Huarahi mō Ngā Uri Whakatupu, confirming its commitment to ongoing cooperation with tangata whenua of Murihiku Southland alongside other Otago and Southland councils. Ian Telfer (Manager Partnerships and Engagement), Sarah Martin (Senior Advisor Iwi Partnerships and Engagement) online, and Amanda Vercoe (GM Strategy and Customer) were available to respond to questions on the report.

Resolution CM25-173: Cr Weir Moved, Cr Forbes Seconded

That the Council:

***1) Notes** that the Charter of Understanding between local authorities and tangata whenua of Murihiku Southland has been reviewed and updated through a regionally coordinated process, with input from all signatory parties.*

BY DIVISION

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

MOTION CARRIED

Resolution CM25-174: Cr Weir Moved, Cr Forbes Seconded

That the Council:

***2) Agrees** to endorse the revised Charter of Understanding, He Huarahi mō Ngā Uri Whakatupu, and delegates to the Chief Executive and Chairperson to agree any minor editorial changes, and then delegates to the Chairperson to sign.*

BY DIVISION

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

MOTION CARRIED

9.3. Flood Recovery Update 3

[YouTube 4:52:50] This paper provided an update on the progress of repairs to flood damaged sites from the three open flood recovery programmes arising from the 2022, 2023 and 2024 events. Brett Patterson (Manager Engineering) and Tom Dyer (GM Science and Resilience) online, were available to respond to questions on the report.

Resolution CM25-175: Cr Somerville Moved, Cr Noone Seconded

That the Council:

***1) Receives** this report.*

***2) Notes** the progress of the flood damage repairs.*

***3) Notes** the updated cost estimates and financial implications of flood damage repairs.*

MOTION CARRIED

9.4. South Dunedin Future – Programme Update and Community Engagement Results
[YouTube 5:10:18] The purpose of the paper was to present the key findings from the recent community engagement activities relating to the South Dunedin Risk Assessment and seven Potential Adaptation Futures for South Dunedin; and to provide an outline of the workplan and schedule through to completion of the South Dunedin Future programme, in December 2026. Jonathan Rowe (Programme Manager) Anita Dawe (GM Regional Planning and Transport) online, and Tom Dyer (GM Science and Resilience) online, were available to respond to questions on the report.

Resolution CM25-176: Cr Weir Moved, Cr Somerville Seconded
That the Council:

1) ***Notes*** *the South Dunedin Future Engagement Report – Stage 4 Engagement: 7 Potential Adaptation Futures for South Dunedin*.
2) ***Notes*** *the community engagement results will be combined with further technical and economic analysis to assess the 7 Potential Adaptation Futures for South Dunedin, to produce an initial shortlist of futures for further investigation*.
3) ***Notes*** *a fully developed shortlist of potential adaptation futures for South Dunedin is expected to be completed in late-2025 and presented to Councils in early-2026*.
4) ***Notes*** *the work plan and schedule for the final two phases of the South Dunedin Future programme, which is expected to be completed by December 2026*.

MOTION CARRIED

9.5. Update to the Regional Coast Plan to Reflect Changes to Aquaculture Settlement Areas off the Otago Coast
[YouTube 5:31:00] This paper sought Council approval for an amendment to the Regional Plan: Coast for Otago (Amendment 2), which introduced a new Plan map identifying Aquaculture Settlement Areas within Otago's Coastal Marine Area (CMA), as required under section 85AA of the Resource Management Act 1991 (RMA), and to make consequential alterations. Fleur Matthews (Manager Policy and Planning) online, and Anita Dawe (GM Regional Transport and Planning) online, were available to respond to questions on the report.

Resolution CM25-177: Cr Wilson Moved, Cr Noone Seconded
That the Council:

1) ***Notes*** *this report*.
2) ***Approves*** *Amendment 2 to the Regional Plan: Coast for Otago in attachment 1 to this report*.
3) ***Approves*** *the further minor and consequential changes to the Regional Plan: Coast for Otago in attachment 2 to this report*.
4) ***Affixes Council's*** *seal to Amendment 2 to the Regional Plan: Coast for Otago*.
5) ***Resolves*** *to make Amendment 2 and the further minor and consequential changes operative from 1 August 2025, and publicly notify these amendments and their operative date on 31 July 2025*.

MOTION CARRIED

At 3:02 pm it was moved Chair Robertson, seconded Cr Wilson:
That *Council adjourn for 15 minutes*.
MOTION CARRIED

9.6. Prioritisation of Improvement Areas Identified in Te Korowai Evaluation Report
[YouTube 5:51] This report responded to Council's 19 February 2025 resolution that:
'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'. Jasmin Lamorie (Senior Corporate Planner) online, and Amanda Vercoe (GM Strategy and Customer) were available to respond to questions on the report. The recommendations were amended in the meeting.

Resolution CM25-178: Cr Laws Moved, Cr Malcolm Seconded
That the Council:
***1) Notes** this report.*
***2) Notes** the list of operational improvement items and the planned approach to addressing these points (attachment one).*
***3) Request** that staff prepare a report on the prioritisation of the Te Korowai actions to be presented to Council in the new triennium.*
MOTION CARRIED

9.7. Living Wage Accredited Employer
[YouTube 6:05] This report outlined the opportunities and risks associated with ORC becoming a Living Wage Accredited Employer. Tami Sargeant (GM People and Corporate) and Richard Saunders (Chief Executive) were available to respond to questions on the report.

Resolution CM25-179: Cr Somerville Moved, Cr Weir Seconded
That the Council:
***1) Notes** this report.*
MOTION CARRIED

Resolution: Cr Somerville Moved, Cr Weir Seconded
That the Council:
***1) Initiates** the process for ORC's application for living wage accreditation.*
BY DIVISION

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

MOTION FAILED

Resolution CM25-180: Cr Weir Moved, Cr Wilson Seconded
That the Council:
***1) Directs** staff to report back to council with a draft implementation plan for living wage accreditation for council to discuss, including cost estimates for meeting the necessary criteria.*
BY DIVISION

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

MOTION CARRIED

9.8. Remuneration Authority Determination 2025/2026

[YouTube 6:48] This paper noted the 2025/26 Local Government Members Remuneration Determination, and adopt the 2025 Councillor Expenses, Reimbursements and Allowances Policy. Amanda Vercoe (GM Strategy and Customer) and Richard Saunders (Chief Executive) was available to respond to questions on the report.

Resolution CM25-181: Cr Wilson Moved, Cr Weir Seconded

That the Council:

***1) Receives** this report.*

***2) Notes** the updated remuneration rates for local authority members.*

***3) Approves** the 2025 ORC Councillor Expenses, Reimbursements and Allowances Policy.*

MOTION CARRIED

9.9. Update on Unit 3 School Services

[YouTube 7:00] This paper sought to approve the extension of Unit 3 (Dunedin Network) targeted school routes until a new Unit 1 contract begins. Jack Cowie (Transport Planner), Julian Phillips (Implementation Lead - Transport), and Lorraine Cheyne (Manager Transport) online, were available to respond to questions.

Resolution CM25-182: Cr Wilson Moved, Cr Somerville Seconded

That the Council:

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

***2) Agrees** to extend the targeted services in Unit 3 (routes 40, 95, and 96) until September 30, 2026.*

***3) Notes** that route 96 (Dunedin North Intermediate to Pine Hill) is expected to be withdrawn once the route 5 timetable is amended to provide better after-school service. In this case, better means departure times that align with end of school time.*

***4) Notes** that future service reviews will include consideration of whether school travel patterns served by these routes can be integrated into the core network.*

***5) Notes** that the cost of the services is included in the 2025/2026 Annual Plan.*

MOTION CARRIED

10. NOTICES OF MOTION

No Notices of Motion were submitted.

11. RESOLUTION TO EXCLUDE THE PUBLIC

Resolution: Cr McCall Moved, Cr Mepham Seconded:

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

1. Confidential Minutes of Council 20 February 2025

3.1 Unit 1 and 2 Tender

3.2 Award of Lake Whakatipu Ferry Service Contract

3.3 Chief Executive Annual Performance Review and KPI's for 2025/2026

It was also moved that:

Andrew Wilson from Spatial Ascent Ltd (Unit 1 and 2 Tender)

Rachel Pinn from RS Pinn Consultants Ltd (Whakatipu Ferry Services Contract)

Doug Craig from RDC (for Chief Executive Performance Review)

be permitted to remain at this meeting, after the public was excluded, because of their knowledge of the respective reports. This knowledge, which was of assistance in relation to the matters to be discussed, and relevant to those matters because of their expertise.

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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
1.1 Confidential Minutes of Council 20 February 2025	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.
3.1 Unit 1 and 2 Tender	To enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities – Section 7(2)(h)	Section 48(1)(a); Subject to subsection (3), a local authority may by resolution exclude the public from the whole or any part of the proceedings of any meeting only on 1 or more of the following grounds: (a)that the public conduct of the whole or the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding would exist.
3.2 Award of Lake Whakatipu Ferry Service Contract	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	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

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	carry out, without prejudice or disadvantage, commercial activities – Section 7(2)(h) To enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations) – Section 7(2)(i) To prevent the disclosure or use of official information for improper gain or improper advantage – Section 7(2)(j)	information for which good reason for withholding would exist.
3.3 Chief Executive Annual Performance Review and KPI's for 2025/2026	To protect the privacy of natural persons, including that of deceased natural persons – Section 7(2)(a)	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.

12. CLOSURE

There was no further business and Chairperson Robertson declared the meeting closed at 4:29 pm.

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Chairperson Date

Meeting Date	Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
19-03-2025	Council Meeting - 19 March 2025	GOV2521 ORC Review of Committee Structure, Terms of Reference, Delegations	Completed	CM25-146 Considers the discussion on delegations for committees and: 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. 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.	Chairperson, Chief Executive, Executive Assistant - Corporate Services, Manager Executive Advice	14/05/2025 Governance Support Officer The committee Terms of Reference and Delegations have been updated. The new committee structure is in place. 21/08/2025 Governance Support Officer Please refer to Action CM25-145	1-09-2025
27-05-2025	Finance Committee - 27 May 2025	GOV2557 Annual Plan 2025-26 Deliberations and Recommendations	Completed	Resolution FIN25-110: 3) Directs Council staff on any changes required to the draft financial forecasts 2025-26 and work programme for inclusion in Annual Plan 2025-26, to be presented for Council adoption at its 25 June 2025 meeting including: f. Agrees to fully fund a Wānaka/Upper Clutha public transport business case, to be funded from general rates at a cost of $250,000.	Executive Assistant - Regional Planning and Transport, General Manager Planning and Transport	17/07/2025 General Manager Strategy and Customer Funding was incorporated into the Annual Plan and will be reported on as part of the work plan delivery.	8-08-2025
29-05-2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	In Progress	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 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. 09/06/2025 General Manager Finance Covered in Workshop on 30-Oct-2024. Not reviewing PT rates in Annual Plan 2025-26 and will look at reviewing and consulting outside of Annual Plan for potential changes if any in Year 3 or next LTP.	1-12-2025
29-05-2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	In Progress	FIN24-120: 44) Requests staff undertake a review of all flood and drainage schemes to inform rate allocation and report back to Council on the Terms of Reference and timing for this review	Executive Assistant, Operations, 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. 31/03/2025 Executive Assistant, Operations Review planned to be completed by the 2027 Long Term Plan. 18/06/2025 Governance Support Officer 18/06/2025 Work has commenced 16/07/2025 Governance Support Officer 16/07/2025 – The review of the Lower Clutha Flood and Drainage scheme has begun. Staff have begun to pull together Information to inform community engagement (late 2025) and decision making (early 2026). Work to review the Lower Taieri Flood and Drainage Schemes will follow throughout 2026.	1-12-2025
29-05-2024	Finance Committee LTP Deliberations - 29&30 May 2024	CS2421 Long-Term Plan 2024-2034 Deliberation	In Progress	FIN24-149: 50) Requests that staff research and report on alternative community ownership models for flood and drainage schemes as a way of addressing financial unsustainability.	General Manager Finance, General Manager Science and Resilience	16/10/2024 General Manager Finance Underway. Staff are considering the best approach for this work and will report back to Council early in 2025 along with FIN24-120. 31/03/2025 Executive Assistant, Operations Staff will bring an update to Council mid 2025.	27-06-2025

Meeting Date	Document	Item	Status	Action Required	Assignee/s	Action Taken	Due Date
19-03-2025	Council Meeting - 19 March 2025	GOV2521 ORC Review of Committee Structure, Terms of Reference, Delegations	In Progress	CM25-145 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 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.	Executive Assistant - Strategy and Customer, General Manager Strategy and Customer	04/06/2025 General Manager Strategy and Customer Preliminary discussion at Mana to Mana on 20 May, and a follow up letter is planned to seek input. 20/08/2025 General Manager Strategy and Customer On agenda for Mana to Mana on 26 August for further discussion.	1-09-2025
9-04-2025	Council Meeting - 9 April 2025	GOV2544 Waitaki Update	In Progress	CM25-150 Requests that staff provide an update to all parties who have been involved in this project to date on the decision made by ORC and next steps in the process.	Executive Assistant - Regional Planning and Transport, General Manager Planning and Transport	04/06/2025 General Manager Planning and Transport The working group is developing joint messaging to go to all parties involved to date.	30-06-2025
27-05-2025	Finance Committee - 27 May 2025	GOV2557 Annual Plan 2025-26 Deliberations and Recommendations	In Progress	Resolution FIN25-108: 3) Directs Council staff on any changes required to the draft financial forecasts 2025-26 and work programme for inclusion in Annual Plan 2025-26, to be presented for Council adoption at its 25 June 2025 meeting including: d. Requests that staff prepare a work plan that addresses any Health and Safety issues arising from the previously completed bus stop audit for delivery in the 2025/26 year	Executive Assistant - Regional Planning and Transport, General Manager Planning and Transport	15/07/2025 Governance Support Officer An update is scheduled for the Public & Active Transport Committee Meeting 3 September 2025.	8-08-2025
25-06-2025	Council Meeting - 25 June 2025	STG2503 Draft ORC Indigenous Biodiversity Strategy	In Progress	Resolution CM25-164: Notes the designed version of the Strategy will be circulated to councillors, prior to public consultation commencing.	Executive Assistant - Strategy and Customer, General Manager Strategy and Customer	17/07/2025 General Manager Strategy and Customer Likely circulation date November 2025.	1-12-2025
23-07-2025	Council Meeting - 23 July 2025	GOV2554 Prioritisation of Improvement Areas Identified in Te Korowai Evaluation Report	In Progress	CM25-178 Request that staff prepare a report on the prioritisation of the Te Korowai actions to be presented to Council in the new triennium.	General Manager Strategy and Customer		28-02-2026
23-07-2025	Council Meeting - 23 July 2025	CS2528 Living Wage Accredited Employer	In Progress	CM25-180 Directs staff to report back to council with a draft implementation plan for living wage accreditation for council to discuss, including cost estimates for meeting the necessary criteria.	Executive Assistant - Finance, General Manager People and Corporate		31-08-2025

9.2. Chief Executive's Report

Prepared for:	Council
Activity:	Governance Report
Author:	Richard Saunders, Chief Executive
Date:	27 August 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] Work programmes as outlined in the 2025/26 Annual Plan are well underway, and project planning has commenced for the 2026/27 Annual Plan.

[3] Customer satisfaction remains high at 95%, with the Customer Experience team handling 6,299 enquiries during the month of July.

[4] The preliminary EOY financial report, and preliminary EOY performance reporting will be presented to the Finance Committee on 28 August 2025.

[5] Government recently announced a legislative 'fix' to address matters of concern arising from the legislation introduced in October 2024 which prevented the notification of the draft Land and Water Regional Plan (LWRP). The amendment provides some short-term certainty for the Otago community, ensuring unnecessary costs and regulation are avoided until new national freshwater rules are in place.

RECOMMENDATION

That the Council:

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

DISCUSSION

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

[6] Work is well underway to deliver on objectives and projects as outlined in the 2025/2026 Annual Plan.

[7] Planning for the 2026/27 has commenced. A draft project plan will be presented to Council in due course.

Customer Experience

[8] The Customer Experience team handled 6,299 enquiries during the month of July, above the 12-month average of 5,939 customer contact points (see Attachment 1). Customer satisfaction increased to 95%, up from 91% in June (92%).

[9] As shown in Figure 1, most interactions occurred over the phone (2,252), followed by through social media (1,641), email (1,528), reception (532) or via the afterhours service (346).

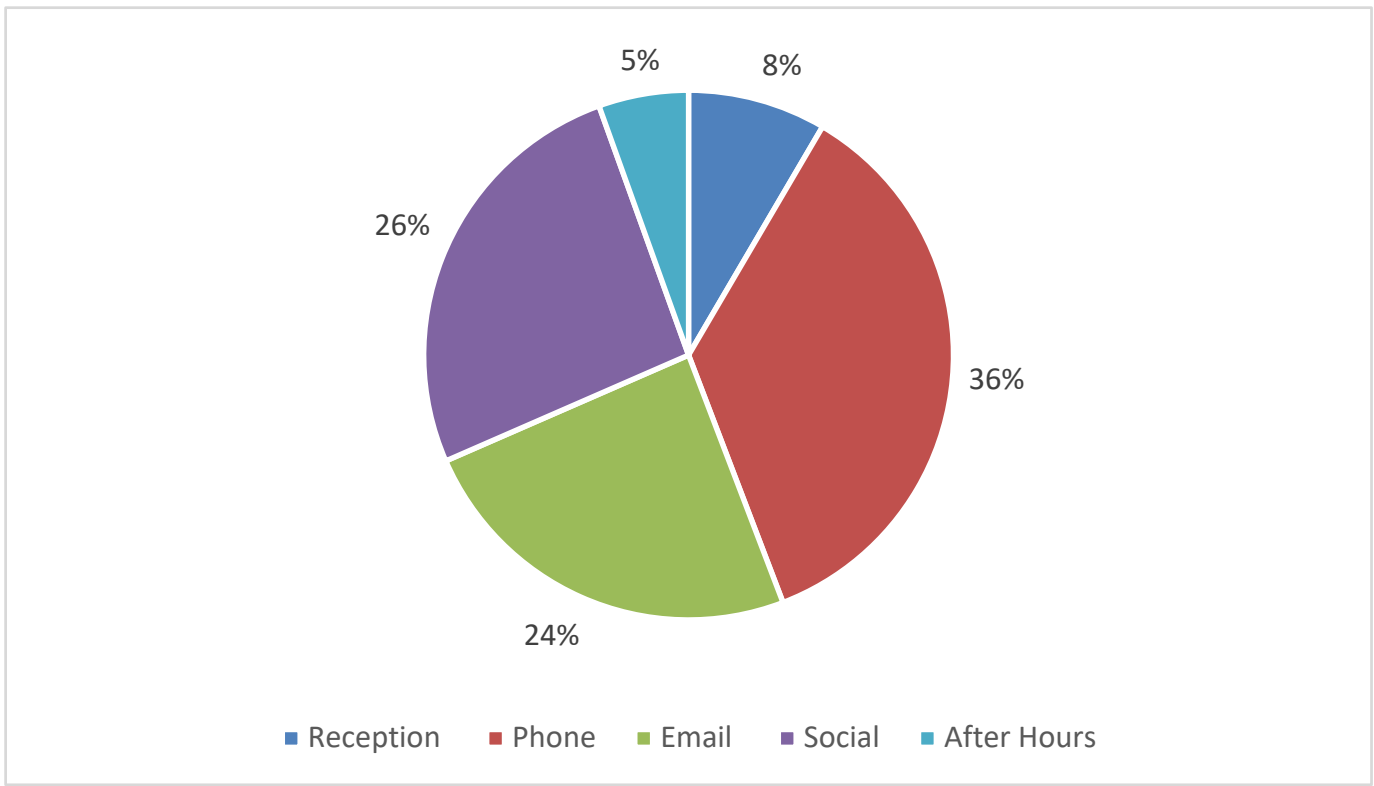


Figure 1: Customer Experience Interactions by Type – July 2025

[10] The most common customer contact points in July were rates enquiries, new users of the Mosgiel On-Demand public transport service, transport route changes, the rook's social media story and elections.

Financial and Non-Financial Performance

[11] A list of the non-financial levels of service confirmed through the long-term plan are included as Attachment 2. Monitoring against these will commence at the end of August and be included in September's report.

[12] The statement of comprehensive revenue and expenditure is included as Attachment 3 and the statement of financial position is included as Attachment 4.

Land and Water Regional Plan

[13] On 20 August 2025, a Resource Management (Consenting and Other System Changes) Amendment Act 2024 was passed into law. The Act extends the duration of short-term water permits and require Council to make specific changes to its operative Water Plan.

[14] A previous legislative change—the Resource Management (Freshwater and Other Matters) Amendment Act 2024, enacted in October 2024—prevented Council from notifying a new regional planning framework for managing freshwater in Otago. This

meant that several previously identified issues with the current plan could not be resolved through the new framework.

[15] The inability to notify a new planning framework has resulted in uncertainty around achieving compliance with existing discharge rules, meaning many farmers would need to apply for resource consents. Water permit holders would also be faced with a complex planning regime when replacing expiring water permits.

[16] Council has worked closely with the Government to address these issues through legislative amendments. The result of this process is the Amendment Paper (new clause 44A). The legislative fix offers another short-term holding pattern to avoid the undesirable outcomes that would have arisen should no action have been taken. The amendment provides for the automatic extension of existing short-term water permits in Otago by five years.

[17] The Act also directs the Otago Regional Council to amend the Water Plan to:

a. Establish a simplified consent pathway for longer-term permits that may need to be replaced before the new regional planning framework is in place.
b. Revoke certain discharge provisions that are currently uncertain, unclear, and unenforceable.

[18] The required changes to the Water Plan will be implemented as soon as practicable.

OPTIONS

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

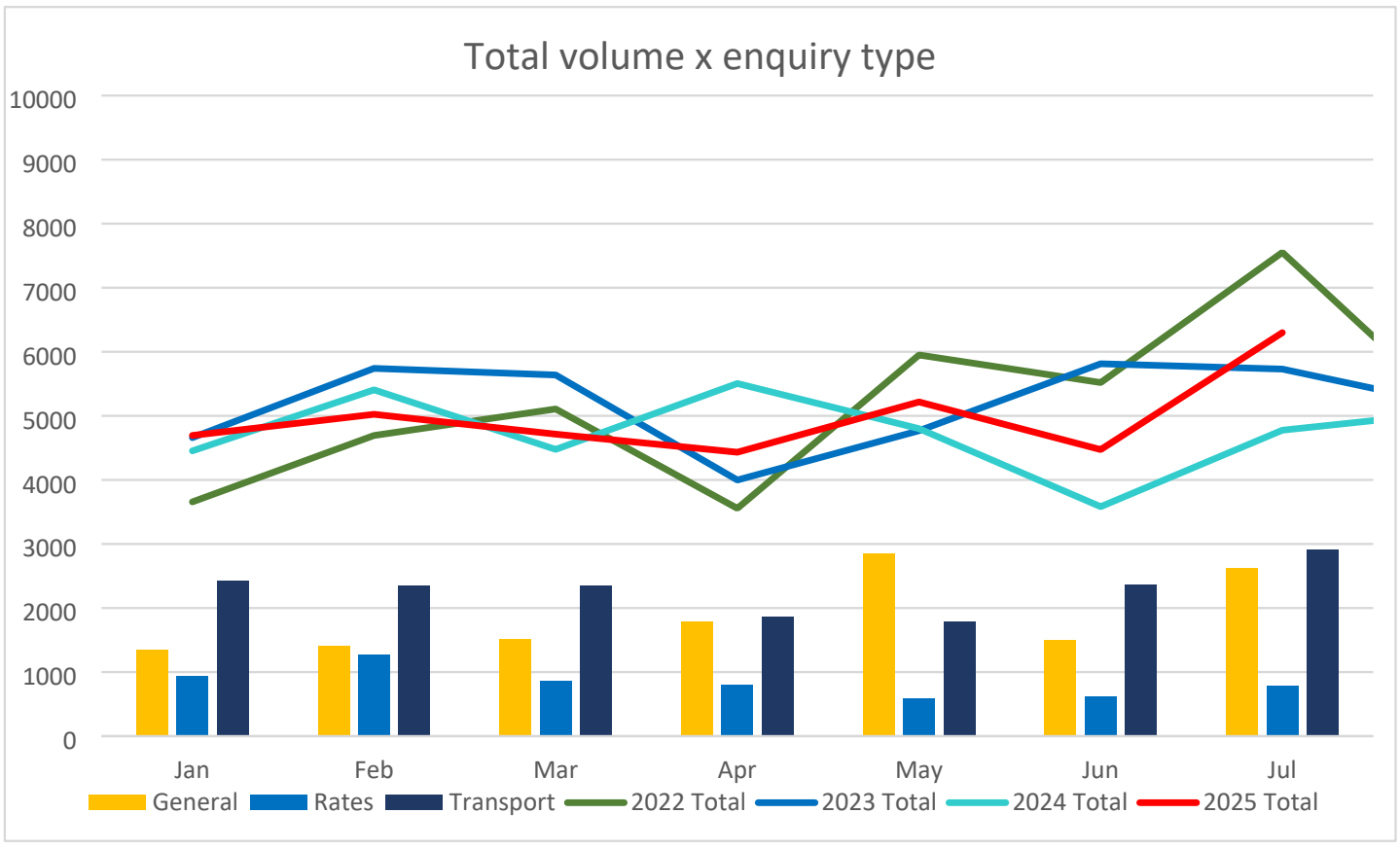
ATTACHMENTS

1. July 2025 Customer Report [**9.2.1** - 2 pages]
2. Performance Report for Yr 2 LTP final [**9.2.2** - 2 pages]
3. Statement of Comprehensive Revenue and Expense July 2025 [**9.2.3** - 1 page]
4. Balance sheet July 2025 [**9.2.4** - 1 page]

July 2025 Customer Report

Rolling 12-month customer interaction volume average is 5939 per month

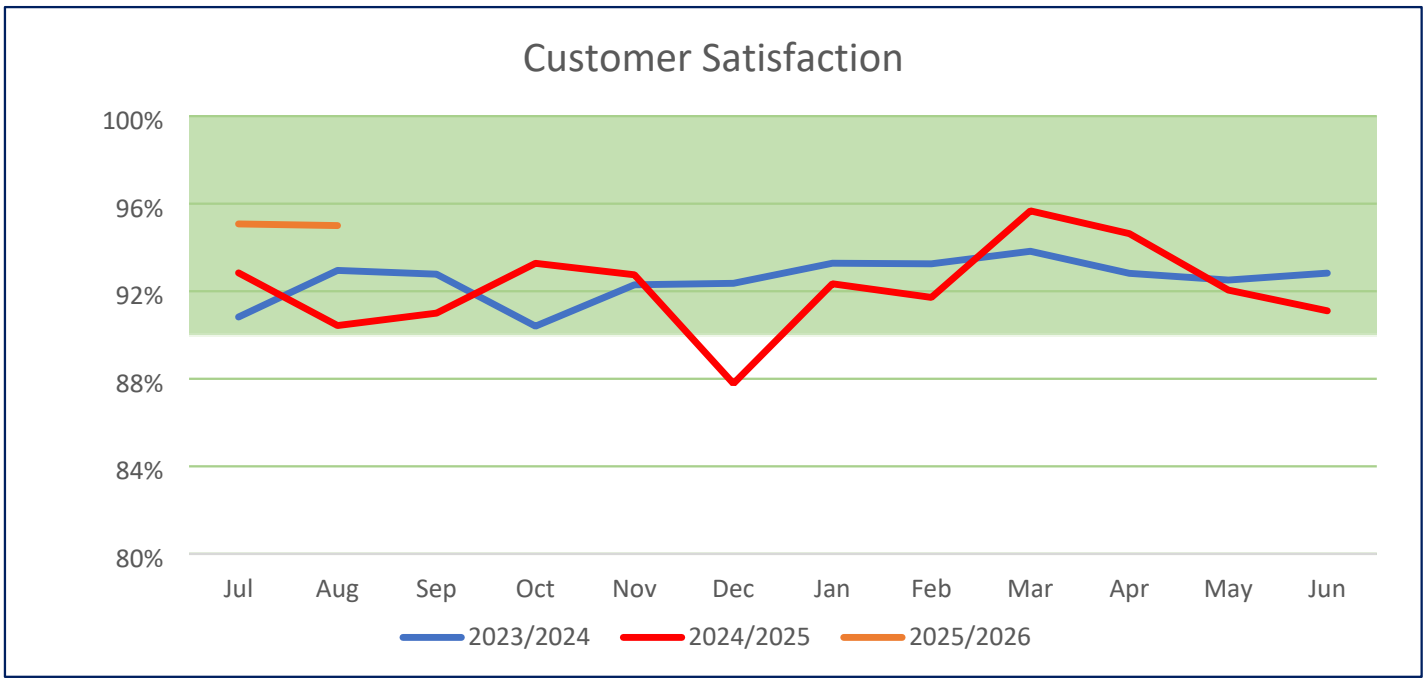
July customer volume total: **6299**
(reception = 532, phone = 2252, email = 1528, social 1641, afterhours = 346)



- Total customer interactions were up this month by 41% (1826) (up 34%/1523 on July 2024)
- Customer sentiment tracking was neutral/low
- Total service level for all calls static at 88%
- Total customer satisfaction rating increased to 95%

Enquiry themes:

- Rates - routine & balance enquiries.
- Mosgiel On Demand launch (1 July) new users
- Transport – route changes
- Rooks – Social media comments
- Elections campaign – social media comments


Customer Satisfaction
100%
96%
92%
88%
84%
80%
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2023/2024
2024/2025
2025/2026

Year 2 LTP PERFORMANCE REPORTING
Service Performance Measure and Target
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 2024
Deliver our Long-Term Plan, annual reviews of the LTP, and reporting of performance against plan as per the statutory requirements - Target: Council financial and activity performance against the Year 1 LTP 2024-34 reported to Council by October 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: Survey and action plan completed March 2026.
Customers express high levels of satisfaction with customer service provision - Target: Meet or exceed satisfaction target of 85%.
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: Maintain or increase numbers.
Regional Planning, Strategy & Urban Development
Develop a regional biodiversity strategy and implement ORC actions. Target: Regional biodiversity strategy is adopted by 30 June 2026.
Develop a Regional Air Quality Strategy and implement ORC actions. Target: Draft Air Quality Strategy revised following public consultation by 30 June 2026.
Develop a Regional Climate Change Strategy and implement ORC actions -Target: ORC actions from the Regional Climate Change Strategy are implemented.
Develop a Regional Climate Change Strategy and implement ORC actions -Target: The effectiveness of the strategy is monitored and reported to Council annually.
Regulatory
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: Annual self review is completed by ORC and Port Otago Ltd. (POL) and signed off by the chief executives.
The safety campaign for recreational 'boaters' is delivered - Target: Develop and deliver a recreational boating engagement plan.
Percentage of public enquiries for consent information completed within 10 working days - Target: 98%
ENVIRONMENT
Land and Water
Complete the Land and Water Regional Plan (LWRP) - Target: Review the draft LWRP against new national direction to freshwater.
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: At least 80% of project actions are progressed as scheduled.
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 2026.
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 2026.
Complete a review of the Regional Plan Coast. - Target: Issues and options papers developed and reported to Council by 30 June 2026.
Biodiversity & Biosecurity
Actions within the Biosecurity Operational Plan (BOP) are identified and progressed - Target: 100% of priority pest management actions are achieved.
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: At least one new project is developed and implemented with biodiversity forum partners
Joint projects are implemented against milestones - Target: At least 80% of project actions are progressed as scheduled.
Alignment between initiatives and deliverables receiving Council funding, and Council's strategic biodiversity strategic objectives - Target: All environemntal projects and initiatives are aligned to at least one of the Council's environmental strategic objectives.
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 on monitoring programme completed and reported to Council on 30 June 2026.

Actions within the Biosecurity Operational Plan (BOP) are identified and progressed - Target: 80% of non-priority pest management actions are achieved.
Air
Implement a regional air monitoring programme - Target: Annual report on monitoring programme of previous calendar year completed and reported to Council. Note: 95% = achieved
Complete review of the Regional Plan Air - Target: Complete a public engagement campaign and pre-notification consultation on draft Regional Plan- Air.
CLIMATE CHANGE AND RESILIENCE
Natural Hazards & Climate Change Adaptation
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. Partially achieved: 80-99% Not achieved: <80%
Percentage of flood warnings that are issued in accordance with the flood warning manual - Target: 100% Partially achieved: 80-99% Not achieved: <80%
Deliver a natural hazards management and adaptation work programme based in a new prioritisation process. - Target: Natural hazards prioritisation process as presented to the Safety and Resilience Committe in November 2024 is completed by June 2026.
Implement prioritised natural hazard risks adaptation works - Target: 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
Implement prioritised natural hazard risks adaptation works - Target: Phase 1 and 2 of the Clutha Delta natural hazards adaptation programme completed by 30 June 2026.
Flood protection & River Management
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
The flood repair programme is made available to affected communities within 3 months of the event. - Target: 100%.
Percentage of identified and reported issues that have been investigated and appropriate action determined and communicated to affected landholder within 20 working days. - Target: 98%
Emergency Management
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
The Regional Land Transport Plan (RLTP) is reviewed and submitted in line with the Land Transport Management Act 2003 and any guidance issued by the New Zealand Transport Agency. - Target: TLRP implementation progress reported annually to Regional Transport Committee.
Percentage of Whakatipu operated services departing Terminus on time. - Target: 90%
Percentage of Dunedin operated services departing Terminus on time. - Target: 90%
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 Whakatipu scheduled services delivered - Target: 95%
Percentage of Dunedin scheduled services delivered - 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 overall service of the Total Mobility scheme- Target: Maintain or increase 3 yr rolling average >=90%

On Track | At Risk | Off Track | Reporting Overdue | Not Measured

Otago Regional Council

STATEMENT OF COMPREHENSIVE REVENUE AND EXPENSE
FOR THE PERIOD ENDING 31 JULY 2025

	July 2025 Actual	July 2025 Budget	Variance Actual	2026 Forecast	2026 Budget	Variance Forecast
Revenue	Year to Date	Year to Date	Year to Date	Full Year	Full Year	Full Year
Revenue from non-exchange transactions						
Rates Revenue	5,706	5,706	0	68,467	68,467	0
Grant revenue and subsidies	1,336	2,097	(761)	25,162	25,162	0
Other Revenue non exchange	712	276	436	3,316	3,316	0
Revenue from exchange transactions						
Interest and investment revenue	728	508	221	6,090	6,090	0
Dividends	1,714	1,667	47	20,000	20,000	0
Other Revenue Exchange	544	1,114	(570)	13,371	13,371	0
Total Revenue	**10,740**	**11,367**	**(628)**	**136,406**	**136,406**	**0**
Expenditure						
Employee benefits expense	2,182	3,532	(1,350)	42,388	42,388	0
Depreciation and amortisation	313	256	57	3,075	3,075	0
Finance Costs	787	455	332	5,464	5,464	0
Other Expenses	5,323	7,476	(2,153)	89,708	89,708	0
Total Expenditure	**8,605**	**11,720**	**(3,114)**	**140,635**	**140,635**	**0**
Other gains/(losses)						
Other (gains)/losses	407	413	(6)	4,958	4,958	0
Total Other gains/(losses)	**407**	**413**	**4,677**	**4,958**	**4,958**	**0**
Operating Surplus/(deficit)	**2,541**	**61**	**2,481**	**729**	**729**	**0**
Fair value gain/loss on shares in subsidiary	0	0	0	29,649	29,649	0
Total Comprehensive Revenue and Expense	**2,541**	**61**	**2,481**	**30,378**	**30,378**	**0**
Operating Surplus/(deficit)- as per SCRE above	**2,541**	**61**	**2,481**	**729**	**729**	**0**
Less:						
Transport Rates Deficit - Dunedin	151	151	0	1,810	1,810	0
Transport Rates Deficit - Whakatipu	39	39	0	463	463	0
Underlying Surplus/(Deficit)	**2,352**	**(129)**	**2,481**	**(1,544)**	**(1,544)**	**0**

Otago Regional Council

STATEMENT OF FINANCIAL POSITION - ANNUAL REPORT

AS AT 31 JULY 2025

	July 2025 Actual $000s	June 2025 Prior Year Actual $000s	Year to Date Variance $000s	June 2026 Budget $000s
Assets				
CURRENT ASSETS				
Cash and cash equivalents	11,431	18,387	(6,956)	4,069
Trade and other receivables	13,059	16,054	(2,995)	18,812
Property held for sale	0	0	0	0
Current related party receivable	57,102	57,102	0	38,480
Other financial assets	30,210	29,892	318	31,619
Other Current Assets	1,566	1,281	285	3,350
Borrower Notes	125	125	0	0
Total Current Assets	**113,493**	**122,841**	**(9,348)**	**96,330**
NON-CURRENT ASSETS				
Shares in subsidiary	788,120	788,120	0	790,878
Property, plant and equipment	104,658	104,522	136	121,516
Intangible assets	134	157	(23)	0
Non current related party receivable	92,832	92,832	(0)	106,850
Investment Property	17,000	17,000	0	17,189
Borrower Notes	500	500	0	2,258
Total Non-current Assets	**1,003,244**	**1,003,131**	**113**	**1,038,691**
Total Assets	**1,116,737**	**1,125,972**	**(9,235)**	**1,135,021**
Liabilities				
CURRENT LIABILITIES				
Trade and other payables	15,626	20,636	(5,010)	21,278
Employee entitlements	3,681	4,623	(942)	2,628
Other financial instruments	155	154	(154)	0
Borrowings	67,166	67,288	(122)	48,355
Total Current Liabilities	**86,628**	**92,701**	**(6,228)**	**72,261**
NON-CURRENT LIABILITIES				
Non current borrowings and other financial liabilities	107,832	107,832	(0)	135,733
Total Non-current liabilities	**107,832**	**107,832**	**(0)**	**135,733**
Total Liabilities	**194,460**	**200,533**	**(6,228)**	**207,994**
NET ASSETS (Assets minus Liabilities)	**922,277**	**925,439**	**(3,007)**	**927,027**
Equity				
PUBLIC EQUITY				
Public Equity	110,961	114,123	(3,162)	131,473
Total Public Equity	**110,961**	**114,123**	**(3,162)**	**131,473**
RESERVES				
Reserves	811,316	811,316	0	795,554
Total Reserves	**811,316**	**811,316**	**0**	**795,554**
Total Equity	**922,277**	**925,439**	**(3,162)**	**927,027**

9.1. Chairperson's Report

Prepared for: Council

Author: Gretchen Robertson, Chairperson

Date: 27 August 2025

MEETINGS ATTENDED

Meetings attended during the period:

29 July - Waiwhakaata Interview – Queenstown
I was recently interviewed by Jana Davis of Te Tapu o Tāne for a video recording, which will form part of a series of oral histories associated with Waiwhakaata/Lake Hayes.

The case study and oral history project highlight the layered story of the Waiwhakaata catchment — a 42km system from Coronet Peak to the Kawarau River.

Waiwhakaata has ancestral and cultural importance to Kāi Tahu, particularly in relation to mahika kai, travel, and reflection. Alongside this, Lake Hayes is deeply valued by all for recreation — swimming, fishing rowing, water-skiing, and family gatherings.

The project establishes that these are not competing narratives but interwoven truths. The kaupapa of this project is to hold all memories together to build unity around restoration and the shared future of the lake. Jana spoke very positively of the work ORC is undertaking to support the community in catchment planning.

6 August - Whare Rūnaka - Internal Steering Group Meeting
Pleasing progress, building hand over date remains late November. There will be a staged organisation transition into the building and we're hopeful all staff can be onsite by about the end of March.

7 August – ORC Staff New Starters Induction
A regular event to welcome and induct new staff. I spoke as an elected member of ORC on the nature and value of democratic representation in local government and how council is structured to ensure good decision making.

7 August - Te Rōpū Taiao hui – Invercargill
Agenda covered: updating the charter, reflections from each organisation of the triennium and acknowledgement of those leaving, induction for new councils (individual and joint).

15 August - Regional Sector Meeting – Teams

- Commerce Commission presentation 'Working together as water regulators'. Andy Burgess, General Manager Infrastructure Regulation, Charlotte Reed, Head of Water Regulation, and Tim Hewitt, Principal Advisor Water Regulation.
- Wastewater performance standards. The Water Services Authority, Taumata Arowai: Alan Prangnell, Chief Executive, Michael Petherick, Senior Policy Advisor, and Tim Cadogan, Local Government Engagement Specialist.
- Engagement with the Minister for Regional Development Hon Shane Jons and Hon Mark Patterson. Hon Shane Jones agreed to meet with Regional Sector Chair Daran

Ponter on sector input into reform utilising the experience and goodwill conveyed by the Regional sector.

21 August - Public & Active Transport Group (PATAG) | ORC + QLDC – Queenstown
Yet to meet at writing of this paper.

22 August - Update from Southern Infrastructure on Cable Car proposal – Queenstown
Yet to meet at writing of this paper.

Correspondence

Outwards
18 August – Various Ministers/MPs -Follow up Concerns Regarding Increased Private Funding Requirements

Received
5 August – Min Chris Bishop - Private share targets for public transport

RECOMMENDATION
That the Council*:*

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

ATTACHMENTS
1. Follow up to Letter 9 July re Public Transport Fares August [**9.1.1** - 1 page]
2. PT Covid Recovery Infographics 2025 250815 a (1) [**9.1.2** - 3 pages]

Otago Regional Council

From the Office of the Chairperson

18 August 2025

Hon Erica Stanford, Minister of Education
Hon David Seymour, Associate Minister of Education
Hon Chris Bishop, Minister of Transport
Hon James Meager, Associate Minister of Transport
Parliament Buildings
WELLINGTON

via Email: Erica.Stanford@parliament.govt.nz, David.Seymour@parliament.govt.nz, Chris.Bishop@parliament.govt.nz, James.MeagerMP@parliament.govt.nz

Dear Ministers and Associate Ministers,

Subject: Concerns Regarding Increased Private Funding Requirements and their impact on children using public transport to attend school

You will recall that I wrote to you on 9 July, expressing concern on behalf of my Council, about potential unintended consequence of the requirements to increase private share revenue for public transport. ORC continues to have significant concerns that increasing fares for public transport will have a detrimental impact, on both patronage and revenue. We are also concerned about wider impacts on the community – additional barriers to accessing education, health, and social services as a result of higher bus fares. We thought it would be prudent to follow up and highlight the successful public transport story that Otago has. We have **attached some infographics** that set out these successes, and they also demonstrate what is at risk with increased fares.

While other regions may have faced patronage challenges since Covid, Otago's public transport community responded positively, and as a result the 2023/24 year had record growth in Dunedin, with patronage exceeding all previous years. Last year, 3.492 million trips were taken on our Dunedin network. Similarly in Queenstown, the 2024/25 year has seen record patronage, with 1.966 million trips, and an increase in patronage and revenue, on top of a 51% revenue increase in 2023/24 and a 51% revenue increase in 2022/23.

We urgently ask that you reconsider the position on private share. We would be happy to attend a meeting in Wellington to discuss further and would be equally happy to host you on one of our well supported buses across Dunedin or Queenstown.

Yours sincerely



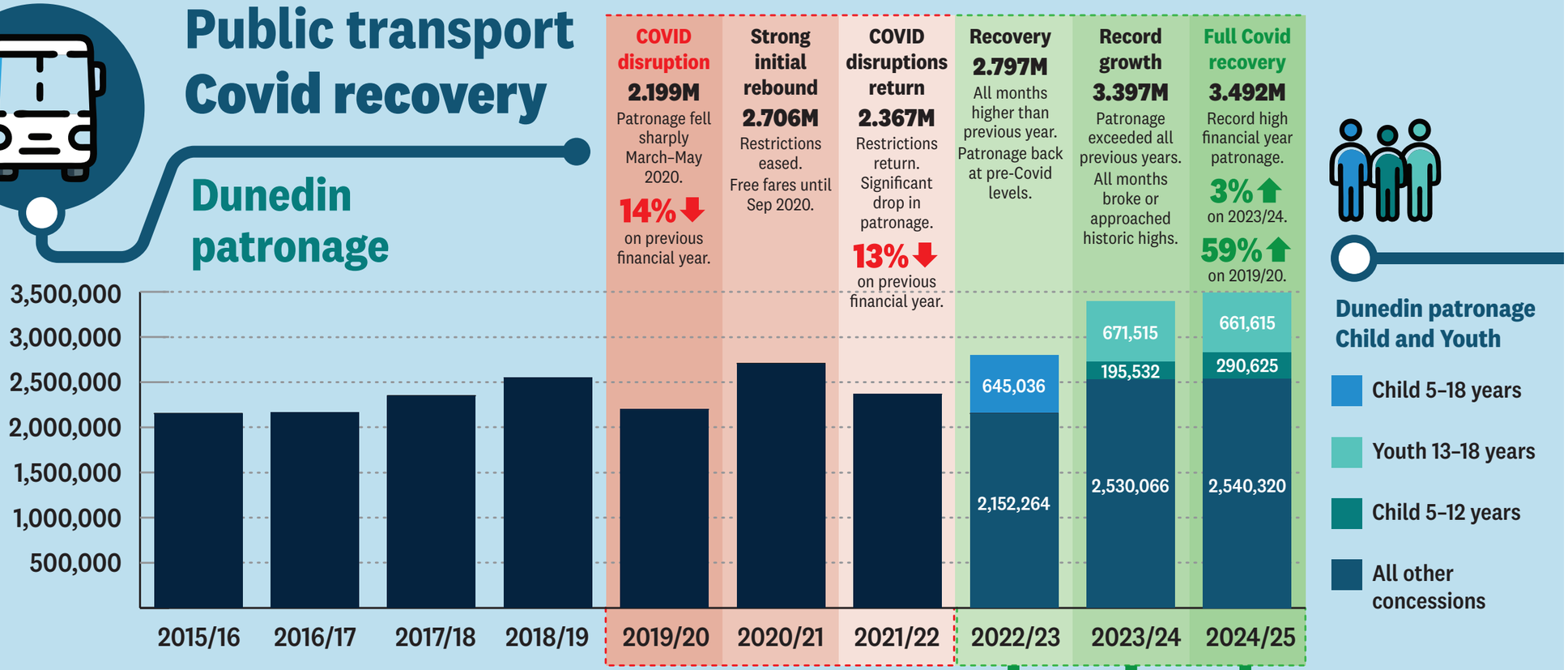
Cr Gretchen Robertson
Chairperson

cc: Joseph Mooney MP, Joseph.Mooney@parliament.govt.nz

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

Public transport Covid recovery

Dunedin patronage



COVID disruption
2.199M
Patronage fell sharply March–May 2020.
14% ⬇
on previous financial year.

Strong initial rebound
2.706M
Restrictions eased.
Free fares until Sep 2020.

COVID disruptions return
2.367M
Restrictions return.
Significant drop in patronage.
13% ⬇
on previous financial year.

Recovery
2.797M
All months higher than previous year.
Patronage back at pre-Covid levels.

Record growth
3.397M
Patronage exceeded all previous years.
All months broke or approached historic highs.

Full Covid recovery
3.492M
Record high financial year patronage.
3% ⬆
on 2023/24.
59% ⬆
on 2019/20.

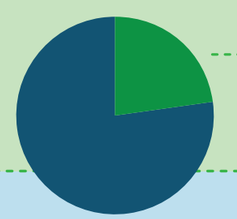
Dunedin patronage Child and Youth

- Child 5–18 years
- Youth 13–18 years
- Child 5–12 years
- All other concessions

2022/23

Child fares 5–18 years.

- Government scheme for half-price public transport fares in response to COVID-19 pandemic.
- Fares for a child 5–18 years were $0.60.

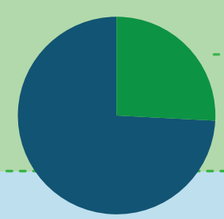


23%
of all Dunedin patronage

2023/24

Child fares 5–12 years and Youth 13–18 years.

- Community Connect extension.
- Free fares for children 5–12 years.
- Half-price fares for Youth 13–18 years ($0.60).

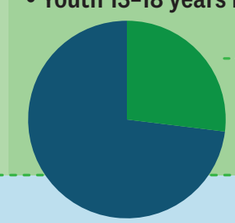


26%
of all Dunedin patronage

2024/25

Child fares 5–12 years and Youth 13–18 years.

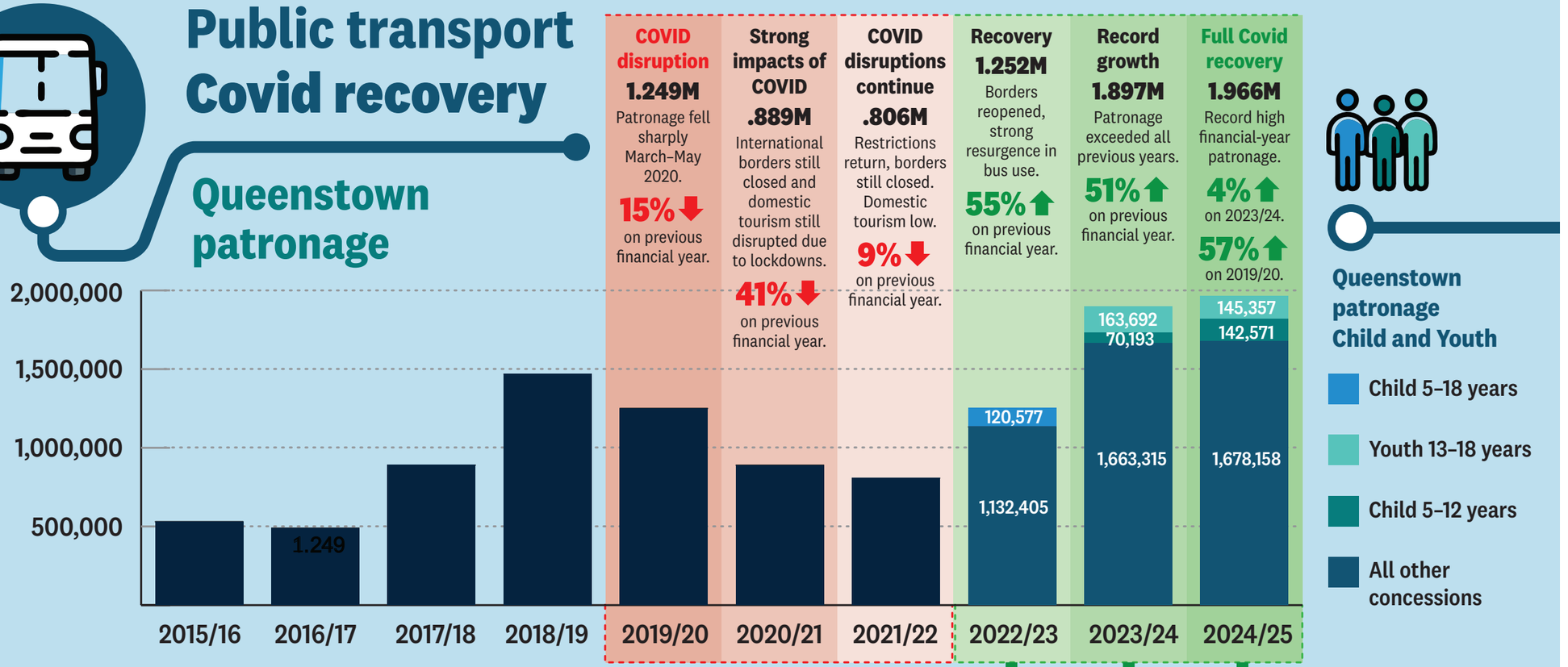
- Community Connect extension ended 1 May 2024.
- Council continued free fares for children 5–12 years.
- Youth 13–18 years reverted to full price ($1.20).



27%
of all Dunedin patronage

Public transport Covid recovery

Queenstown patronage



COVID disruption
1.249M
Patronage fell sharply March–May 2020.
15% ↓ on previous financial year.

Strong impacts of COVID
.889M
International borders still closed and domestic tourism still disrupted due to lockdowns.
41% ↓ on previous financial year.

COVID disruptions continue
.806M
Restrictions return, borders still closed. Domestic tourism low.
9% ↓ on previous financial year.

Recovery
1.252M
Borders reopened, strong resurgence in bus use.
55% ↑ on previous financial year.

Record growth
1.897M
Patronage exceeded all previous years.
51% ↑ on previous financial year.

Full Covid recovery
1.966M
Record high financial-year patronage.
4% ↑ on 2023/24.
57% ↑ on 2019/20.

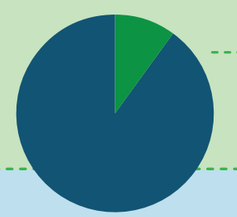
Queenstown patronage Child and Youth

- Child 5–18 years
- Youth 13–18 years
- Child 5–12 years
- All other concessions

2022/23

Child fares 5–18 years.

- Government scheme for half price public transport fares in response to COVID-19 pandemic.
- Fares for a child 5–18 years were $0.75.

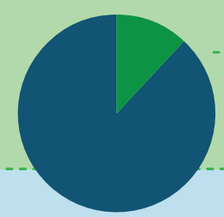


10% of all Queenstown patronage

2023/24

Child fares 5–12 years and Youth 13–18 years.

- Community Connect extension.
- Free fares for children 5–12 years.
- Half-price fares for Youth 13–18 years ($0.75).

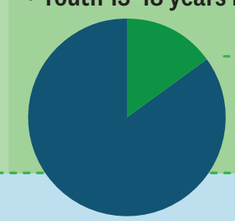


12% of all Queenstown patronage

2024/25

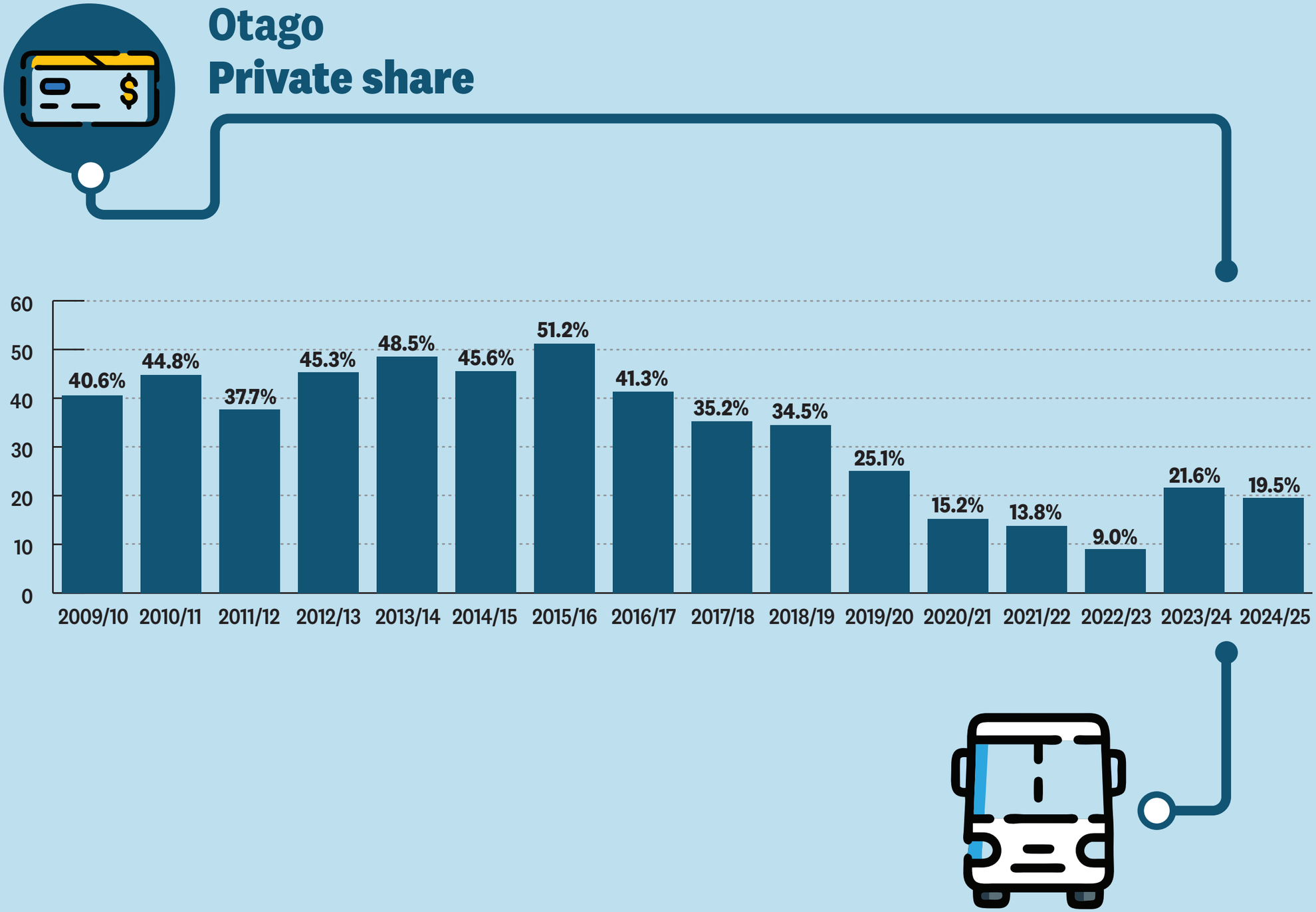
Child fares 5–12 years and Youth 13–18 years.

- Community Connect extension ended 1 May 2024.
- Council continued free fares for children 5–12 years.
- Youth 13–18 years reverted to full price ($1.50).



15% of all Queenstown patronage

Otago
Private share



10.1. Outram Floodbank Stability Assessment Outcomes

Prepared for:	Council
Report No.	ENG2501
Activity:	Flood Protection & Control Works
Author:	Pam Wilson, Infrastructure Engineering Lead Brett Paterson, Manager Engineering
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	27 August 2025

PURPOSE

[1] The purpose of this report is to inform Council of the outcome of the Outram Floodbank Stability Assessment completed in November 2024.

EXECUTIVE SUMMARY

[2] The *Taieri Flood Protection Scheme Floodbank Risk Assessment* (Tonkin & Taylor, November 2023) assessed the overall risk in relation to this section of floodbank as 'high', which is the product of a likelihood of failure of 'low-medium' and a consequence of 'catastrophic', noting that a detailed geotechnical assessment was not carried out to establish the likelihood of failure.

[3] A stability assessment was carried out on a 1.4-kilometre-long section of floodbank at Outram.

[4] The purpose of the assessment was to establish the stability of the floodbank and associated risk of failure, and to inform emergency response procedures. This in turn was intended to inform future work to improve the resilience of this portion of floodbank, if needed. This work forms part of the Outram Floodbank Resilience Improvements project in ORC's Infrastructure Strategy 2024-2054.

[5] The need for the assessment was identified due to the proximity of the floodbank to Outram, the age of the floodbank, observed instances of ponding on the landward side of the floodbank in past events, and an elevated risk due to the consequence of floodbank failure.

[6] Physical investigations were carried out to provide inputs to modelling and analyses of liquefaction, stability, breach and seepage. All of which contribute to ORC's understanding of stability under different scenarios.

[7] The outcome of the investigation is that the floodbank is deemed stable under expected flood and non-flood conditions. Under more extreme earthquake loadings the floodbank was assessed as being unstable due to the underlying soils potentially being liquefiable.

Under this scenario the potential modes of failure are slope instability and lateral spreading.

[8] During periods of high river levels in the Taieri River, seepage is unlikely to occur through the floodbank itself, noting that some areas may be more resistant to seepage than others if the water level is high enough.

[9] Seepage does occur beneath the floodbank through the naturally more permeable sands and gravels. High river levels coinciding with peak seasonal groundwater levels may subsequently lead to groundwater flooding in Outram.

[10] The report makes a number of recommendations to address the stability risks identified. Improvements range from operational recommendations through to physical improvements to the floodbank or underlying ground.

[11] It was concluded that making immediate improvements to the ground or floodbank are unlikely to yield short-term benefits. To mitigate the risk of liquefaction under more extreme earthquake loadings, reconstruction of the floodbank would be necessary and likely come at a very high cost. The proximity of existing housing and infrastructure on the landward side of the floodbank also results in limited space for any improvements.

[12] Within the lifetime of the Long-Term Plan 2024-2034 it is therefore not intended to progress any works to improve the stability and subsequent resilience of the floodbank. It is expected that the floodbank may need to be rebuilt should it be subject to loadings beyond those expected within the normal functioning of the floodbank and that focussing on improving ORC's knowledge of the likely impacts and response and recovery from these events is more prudent at this time.

[13] It is proposed to implement the operational recommendations as part of business-as-usual activities, including updating flood emergency response plans if needed, ongoing groundwater level monitoring, and preparation of repair guidance.

[14] The financial implications of not proceeding with physical works to improve the resilience of the floodbank will be addressed in the following paper, *Lower Taieri Flood Protection Scheme Project Budget Revisions.*

RECOMMENDATION

That the Council:

1) ***Notes*** *the report by Beca Limited; Outram Floodbank Stability Assessment, dated 21 November 2024.*
2) ***Approves*** *the proposal to remove further physical works from the Long-Term Plan to address the resilience of the floodbank at Outram and address operational recommendations as part of business-as-usual activities.*

BACKGROUND

[15] A stability assessment was carried out on a 1.4-kilometre-long section of floodbank near Outram, as shown in Figure 1.

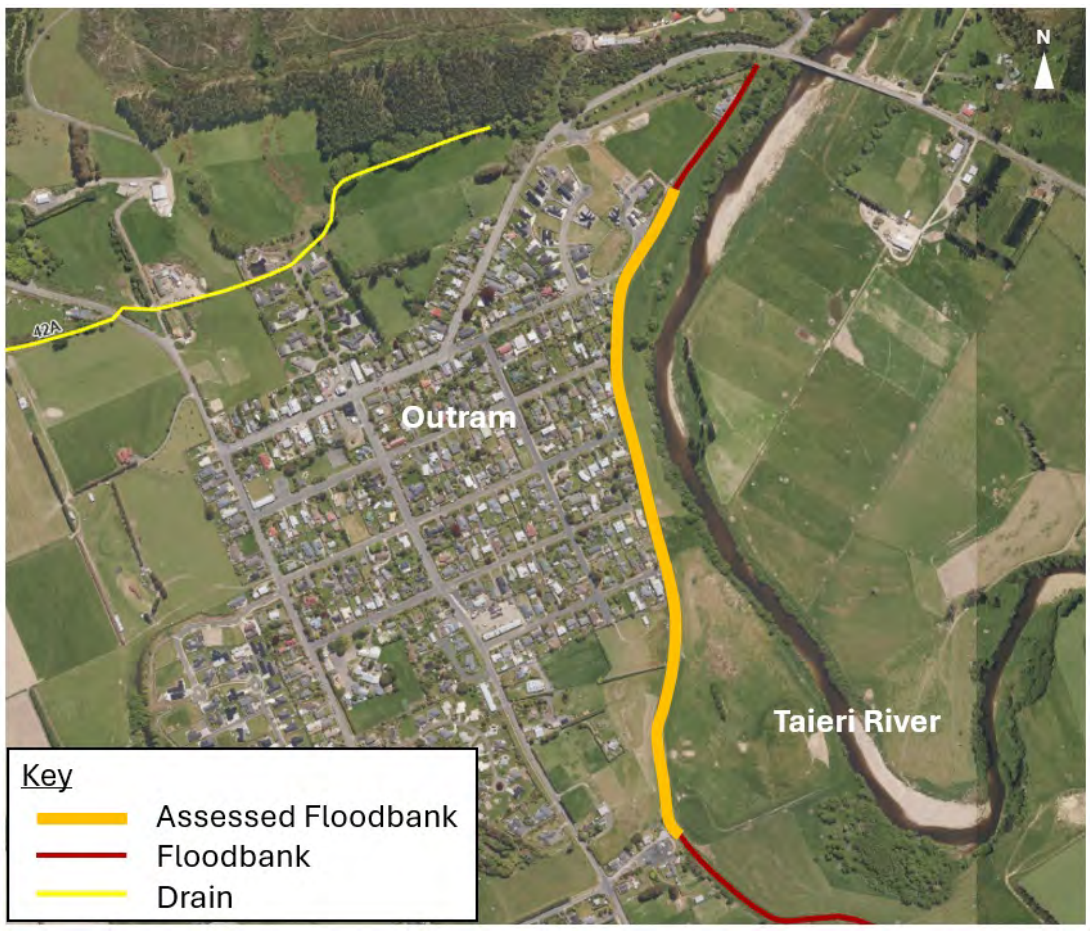


Figure 1 Overview map showing the proximity of the floodbank to Outram and length of floodbank that was assessed as part of the stability assessment.

[16] The assessment was deemed necessary due to:

a. The proximity of the floodbank to the township of Outram and the need to ensure its contribution to overall community safety and resilience.

b. The age of the Lower Taieri Flood Protection Scheme means that detailed records of the materials used in the construction of the floodbank are not available.

c. Observed instances of seepage in the July 2017 flood event and since. Note that observations of seepage in the southern portion of town, near Bell Street, have resulted in the weighting blanket being constructed.

d. The *Taieri Flood Protection Scheme Floodbank Risk Assessment* (Tonkin & Taylor, November 2023) assessed the overall risk in relation to this section of floodbank as 'high', which is the product of a likelihood of failure of 'low-medium' and a consequence of 'catastrophic', noting that a detailed geotechnical assessment was not carried out to establish the likelihood of failure.

[17] This work subsequently enables ORC to improve its asset records and utilise the information for more detailed assessments of stability and risk. It is also part of a broader programme of work focussed on parts of the Lower Taieri and Lower Clutha schemes that may be at higher risk of failure and/or are of high consequence.

[18] This work forms part of the Outram Floodbank Resilience Improvements project in ORC's Infrastructure Strategy 2024-2054.

DISCUSSION

Scope of Work

[19] Early stages of the investigation included a review of historical reports and outcomes of previous investigations by others, including flood history. A site walkover was also carried out to examine the current condition of the floodbank and obtain insights on past event behaviours from the Operations and Maintenance Team.

[20] Physical investigations were carried out at sites in and adjacent to the floodbank. These included cone penetrometer tests (CPTs) and boreholes to establish soil types and properties within and underlying the floodbank. This also included the installation of piezometers in some boreholes to monitor groundwater levels and subsequently inform groundwater modelling.

[21] The potential impact of the following factors on the floodbank were modelled and assessed:

a. Liquefaction
b. Stability
c. Breach
d. Seepage

[22] The outcomes of the assessment were shared in the report and recommendations provided.

Assessment Outcomes

[23] The methodology followed in the assessment and subsequent outcomes are presented in the attached report – *Outram Floodbank Stability Assessment; Seepage, Slope Stability and Flood Modelling,* Beca Limited, November 2024.

[24] The assessment concluded that the visual condition of the floodbank appeared good and indicated that the floodbank consists of relatively consistent and suitable fill materials.

[25] The floodbank was assessed as being generally stable under expected flood and non-flood conditions.

[26] Under more frequent and less extreme earthquake loadings the floodbank is also likely to be stable and is unlikely to undergo liquefaction.

[27] Under less frequent and larger earthquake loadings the floodbank was assessed as being unstable with the potential modes of failure being slope instability and lateral spreading due to the underlying soils potentially being liquefiable.

[28] Breach analysis provided an indication of how a breach may develop, including water velocity, depth, and maximum water surface elevation and flood hazard. The results of this analysis may be useful to update and inform emergency response procedures.

[29] Seepage through the entire thickness of the floodbank is unlikely due to the presence of silts near the surface, noting that some areas may be more resistant to seepage than others if the water level is high enough.

[30] Seepage occurs beneath the floodbank through the naturally more permeable sands and gravels. This helps to reduce direct seepage around the toe of the floodbank, which may otherwise affect stability of the floodbank itself. However, high river levels coinciding with peak seasonal groundwater levels may subsequently lead to groundwater flooding in Outram.

Recommendations

[31] Due to the stability risks associated with normal, flood and earthquake loadings being assessed as low, the assessment concluded that implementing immediate improvements to the ground or floodbank are unlikely to yield short-term benefits.

[32] To mitigate the risk of liquefaction under more extreme earthquake loadings, reconstruction of the floodbank would be necessary. A range of potential mitigation measures were proposed, and a cost benefit analysis was recommended due to the likely very high costs associated with these works, noting also that the proximity of existing housing and infrastructure on the landward side of the floodbank results in limited space for any improvements.

[33] Improvements to conveyance and drainage across the paleo-channels within Outram were recommended to mitigate the risk of increased groundwater flooding related issues in Outram.

[34] It was recommended that a relief drain could be installed along the landward side of the floodbank to intercept any seepage water in a more controlled manner and convey it to a discharge point, however there is a low risk of seepage occurring directly through the floodbank. The proximity of existing housing and infrastructure to sections of the floodbank would also limit the space available to undertake this work.

[35] Several operational recommendations were made based on the findings of the assessment. The recommendations included:

a. Updating flood emergency management plans if needed.
b. Ongoing monitoring of groundwater level data to better understand seasonal trends and inform future analyses.
c. Development of a repair guidance document to document the type, amount, and location of any labour plan, and materials required to make reactive repairs.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[36] 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 communities (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.

Financial Considerations

[37] The financial implications of not proceeding with physical works to improve the resilience of the floodbank will be addressed in the following paper, *Lower Taieri Flood Protection Scheme Project Budget Revisions.*

Significance and Engagement

[38] Staff will communicate changes to the work programme with affected communities.

Legislative and Risk Considerations

[39] The nature and setting of this infrastructure are such that they always remain vulnerable to damage due to future flood events. This is a cost risk for ORC.

Climate Change Considerations

[40] Climate change considerations for the Lower Taieri Flood Protection Scheme are being investigated by ORC as part of a separate programme of work.

Communications Considerations

[41] The Outram Floodbank Stability Assessment (Beca Limited, November 2024) was shared with the Lower Taieri Liaison Group at their meeting on 28 May 2025.

[42] The Lower Taieri Liaison Group will be kept informed of work programmes through future meetings of the Group and the upcoming Taieri Community Drop-In Session to be held in September.

NEXT STEPS

[43] It is proposed to implement the following as part of business-as-usual activities. This includes:

a. Updating flood emergency response plans if needed.

b. Ongoing monitoring of groundwater levels to build a longer record of groundwater behaviour and use this to inform future analyses if required.

c. Preparation of repair guidance, including details of the type, amount, and location of any labour, plant and materials.

[44] Within the lifetime of the Long-Term Plan 2024-2034 it is not intended to progress any works to improve the stability of the floodbank.

[45] It is expected that the floodbank may need to be rebuilt should it be subject to loadings beyond those expected within the normal functioning of the floodbank, and that focussing on improving ORC's knowledge of the likely impacts and response and recovery from these events is more prudent at this time.

[46] The financial implications of not proceeding with resilience improvements at this location will be addressed in the following paper titled *Lower Taieri Flood Protection Scheme Project Budget Revisions.*

ATTACHMENTS

1. Outram Floodbank Assessment Report - Revision 3 [**10.1.1** - 219 pages]

10.2. Lower Taieri Flood Protection Scheme Project Budget Revisions

Prepared for:	Council
Report No.	ENG2502
Activity:	Flood Protection & Control Works
Authors:	Pam Wilson, Infrastructure Engineering Lead Brett Paterson, Manager Engineering
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	27 August 2025

PURPOSE

[1] The purpose of this report is to communicate and seek approval for project budget revisions arising from project progression and priority across the Lower Taieri Flood Protection Scheme.

EXECUTIVE SUMMARY

[2] Two projects in ORC's Infrastructure Strategy 2024-2054 have recently been reprioritised.

[3] Investigations have concluded in relation to the Outram Floodbank Resilience Improvements and no immediate improvements are deemed necessary at this time. As such, the remaining budget for completing feasibility work and undertaking construction is no longer required. The remaining budget for this work, as budgeted in the Long-Term Plan 2024-2034 over Years 2 to 8, is $5,503,000.

[4] The Silver Stream Capacity Maintenance project is of high priority to the community and a contract has recently been awarded for the first stage of physical works to commence this financial year. The cost to undertake this work has increased due to a higher volume of material requiring removal, and escalating construction costs. The original budget for this work was $829,000 spread over Years 1 to 4 of Long-Term Plan 2024-2034. $82,000 was spent in Year 1 to prepare for these works, with the total cost remaining to be spent over Years 2 to 3 now expected to be $1,839,000.

[5] It is proposed to reallocate $1,092,000 from the Outram Floodbank Resilience Improvements project to the Silver Stream Capacity Maintenance project.

[6] It is proposed that the remaining budget of the Outram Floodbank Resilience Improvements project is resolved through Annual Plan 2026/27 and Long-Term Plan 2027-2037.

RECOMMENDATION

That the Council:

1) ***Notes** this report.*
2) ***Approves** the reallocation of $1,092,000 from the Outram Floodbank Resilience Improvements project to the Silver Stream Capacity Maintenance project.*
3) ***Notes** that the remaining budget of $3,564,000 from the Outram Floodbank Resilience project will be resolved through the Annual Plan 2026/27 and Long-Term Plan 2027-2037.*

BACKGROUND

Outram Floodbank Resilience Improvements

[7] ORC's Infrastructure Strategy 2024-2054 identified the Outram Floodbank Resilience Improvements as a project for completion from Years 1 to 8 of the current Long-Term Plan. The project consisted of two phases, with the feasibility phase to be completed in Years 1 and 2 and the construction phase to be completed in Years 3 to 8.

[8] The investigation phase of this project concluded with the completion of the *Outram Floodbank Resilience Assessment* (Beca Limited, 2024) and the previous paper, *Outram Floodbank Stability Assessment Outcomes.*

[9] The outcome of this work is that the risk of floodbank failure is lower in this location than previously believed, and that construction of any immediate improvements to floodbank resilience is not necessary at this time.

[10] The budget of $5,403,000 for completing the feasibility phase and undertaking construction works associated with resilience of the floodbank near Outram is therefore no longer required over Years 3 to 8 of the current Long-Term Plan.

Silver Stream Capacity Maintenance

[11] ORC's Infrastructure Strategy 2024-2054 identified Silver Stream Capacity Maintenance as a project over Years 1 to 4 of the current Long-Term Plan. This project is intended to improve the current capacity of the Silver Stream due to gravel accumulation in the reaches at and downstream of Mosgiel.

[12] The undertaking of this work is of high priority and has subsequently been planned and scoped, with a tender for the first stage of works being awarded in June 2025 with a contract value of $645,899.76.

[13] $829,000 was allocated to this work over Years 1 to 4 of the current Long-Term Plan, however the volume of material requiring removal is greater than originally expected. The cost to undertake the physical works is also greater with escalating construction costs impacting the market.

[14] There is now a higher degree of confidence in the total cost and timing of this work, with the total expenditure for the work is now expected to be $1,921,000 over Years 1 to 3.

DISCUSSION

[15] The budgets and timings of the Outram Floodbank Resilience and Silver Stream Capacity Maintenance projects were allocated in the Long-Term Plan 2024-2034 as follows in Table 1.

Table 1 Expenditure originally proposed in Long-Term Plan 2024-2034 for the Outram Floodbank Resilience Improvements and Silver Stream Capacity Maintenance projects.

	Expenditure ($,000)								
Project	**Y1** (24/25)	**Y2** (25/26)	**Y3** (26/27)	**Y4** (27/28)	**Y5** (28/29)	**Y6** (29/30)	**Y7** (30/31)	**Y8** (31/32)	**Total**
Outram Floodbank Resilience Improvements	100	103	524	1,071	1,094	1,117	912	582	**5,503**
Silver Stream Capacity Maintenance	200	205	210	214	-	-	-	-	**829**
Total	**300**	**308**	**734**	**1,285**	**1,094**	**1,117**	**912**	**582**	**6,332**

[16] It is proposed that the budgets and timings of these projects are updated to reflect changing priorities as follows in Table 2. This includes actual costs realised in Year 1.

Table 2 Proposed changes to the expenditure for the Outram Floodbank Resilience Improvements and Silver Stream Capacity Maintenance projects.

	Proposed Expenditure ($,000)								
Project	**Y1** (24/25)	**Y2** (25/26)	**Y3** (26/27)	**Y4** (27/28)	**Y5** (28/29)	**Y6** (29/30)	**Y7** (30/31)	**Y8** (31/32)	**Total**
Outram Floodbank Resilience Improvements	100	-	-	-	-	-	-	-	**100**
Silver Stream Capacity Maintenance	82	1,177	662	-	-	-	-	-	**1,921**
Total	**182**	**1,177**	**662**	**-**	**-**	**-**	**-**	**-**	**2,021**

[17] Note that ongoing maintenance of the capacity of Silver Stream is currently incorporated as a routine activity in maintenance activity budgets from Year 5 onwards.

[18] It is proposed that the remaining budget from the Outram Floodbank Resilience works be resolved through Annual Plan 2026/27 and Long-Term Plan 2027-2037.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[19] 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 *communities (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

[20] Staff will communicate changes to the work programme with affected communities.

Legislative and Risk Considerations

[21] The nature and setting of this infrastructure are such that they always remain vulnerable to damage or compromised performance due to future flood events. This is a cost risk for ORC.

Climate Change Considerations

[22] Climate change considerations for the Lower Taieri Flood Protection Scheme are being investigated by ORC as part of a separate programme of work.

Communications Considerations

[23] The Lower Taieri Liaison Group will be kept informed of work programmes through future meetings of the Group and the upcoming Taieri Community Drop-In Session to be held in September.

NEXT STEPS

[24] Proceed with the Silver Stream Capacity Maintenance works with the reallocation of budget proposed in this paper.

[25] Share the revised programme and budget with the community in the Taieri Community Drop-In-Session scheduled for September.

ATTACHMENTS

Nil

10.3. Liaison Groups in the Lower Clutha and Tokomairiro Areas

Prepared for:	Council
Report No.	ENG2504
Activity:	Community: Governance and Community
Authors:	Kirsten Tebbutt (Principal Strategic Advisor), Brett Paterson (Manager Engineering)
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	27 August 2025

PURPOSE

[1] To seek endorsement of a proposed draft terms of reference and approach to establish the Lower Clutha/Mata Au Flood Protection and Drainage Scheme Liaison Group and the Tokomairiro Drainage Scheme Liaison Group.

EXECUTIVE SUMMARY

[2] This paper sets out a proposal to establish two Liaison Groups, one relating to the Lower Clutha/Mata Au Flood Protection and Drainage Scheme, and one relating to the Tokomairiro Drainage Scheme. It includes a Draft Terms of Reference for each group for the Council's consideration.

[3] The paper also recommends an approach for establishing membership of both proposed liaison groups.

RECOMMENDATION

That the Council:

1) ***Endorses*** *the approach and scope outlined to establish Otago Regional Council Liaison Groups for Flood Protection and Drainage schemes.*
2) ***Endorses*** *the draft terms of reference for discussion at the first meeting of the Liaison Groups.*
3) ***Notes*** *the staff recommendation to establish Liaison Groups for Flood protection and Drainage Schemes covering Lower Clutha/Mata Au and Tokomairiro Schemes with the priority being the establishment of the Lower Clutha/Mata Au Liaison Group in the 2025 calendar year.*
4) ***Notes*** *the staff recommendation to establish the community representative members of Liaison Groups through a General Meeting of Scheme Ratepayers.*
5) ***Notes*** *that reports will be prepared for future meetings to seek a nominated Councillor for the groups and to approve the final terms of reference.*

BACKGROUND

[4] The Council owns and manages three flood protection schemes and three drainage schemes as well as a combined flood protection and drainage scheme. These include:

Scheme	Comment
Lower Clutha Flood Protection and Drainage Scheme	Liaison Group establishment the subject of this paper.
Tokomairiro Drainage Scheme	Liaison Group establishment the subject of this paper.
Lower Taieri Flood Protection Scheme	Lower Taieri Liaison Group set up in late 2024.
West Taieri Drainage Scheme	Lower Taieri Liaison Group set up in late 2024.
East Taieri Drainage Scheme	Lower Taieri Liaison Group set up in late 2024.
Lower Waitaki River Control Scheme	Owned by the ORC but external management is commissioned for parts of this Scheme. A Lower Waitaki Liaison Group is administered by Environment Canterbury for this Scheme.
Stoney Creek Flood Protection Scheme	Maintained under river management, provides a function to reduce flows and catch debris flow. No Liaison Group is recommended for this Scheme.
Lower Shotover Training Line	Maintained under river management, and provides a function to reduce flows, catch debris flow and direct river flows to reduce erosion and sedimentation effects. No Liaison Group is recommended for this asset.
Alexandra Flood Protection Scheme	No Liaison Group is recommended for this Scheme.
Leith Flood Protection Scheme	No Liaison Group is recommended for this Scheme.

Table 1 ORC owned and/or controlled Schemes across Otago.

[5] The majority of the schemes were initially built to provide protection to local communities and agriculture on the adjacent floodplains. These benefits include access to key transport infrastructure such as State Highways and protection of critical lifeline networks such as electricity substations. The schemes are essential to managing risks to communities associated with natural hazards, empowering economic prosperity and contributing to community resilience and well-being.

[6] Central Government investment into flood protection and drainage projects ceased after the 1989 local government reforms, leaving it up to local ratepayers to develop and maintain the schemes. The schemes developed and constructed prior to this were largely funded by central government. There remains an ongoing need to operate and maintain these assets, ensuring the benefits they provide remain to be utilised.

[7] The following table (from the LTP 2024 – 2026) outlines the rates allocation for each flood protection, drainage or river control scheme.

Scheme	Rate Allocation	
	General	Targeted
Lower Clutha Flood Protection and Drainage Scheme	Flood: 20% Drainage: 10%	Flood: 80% Drainage: 90%
Tokomairiro Drainage Scheme	20%	80%
Lower Taieri Flood Protection Scheme	20%	80%
East Taieri Drainage Scheme	10%	90%
West Taieri Drainage Scheme	10%	90%
Lower Waitaki River Control Scheme (established and managed by Environment Canterbury)	Rated as part of 'River Management – Waitaki' (100% targeted).	
Stoney Creek Flood Protection Scheme	Rated as part of 'River Management – Queenstown Lakes' (100% targeted).	
Alexandra Flood Protection Scheme	20%	80%
Leith Flood Protection Scheme	20%	80%

[8] There are several targeted rating schemes that may benefit from a liaison group however, the initial approach agreed by the Council in August 2024 was to establish the Lower Taieri and Lower Clutha/Mata Au Liaison Groups. The Lower Taieri Liaison Group was established in late 2024, and this paper seeks to confirm the establishment of the Lower Clutha/Mata Au and Tokomairiro Liaison Groups.

History of Liaison Groups at ORC

[9] There were previously two liaison groups; the Lower Clutha Liaison Group and the West Taieri Drainage Liaison Group, and these were disestablished in October 2014. The purpose of those groups was to provide ratepayer representation, liaison and input into the scheme management. Ratepayer representation was predominately by rural landowners within the schemes, and the membership included Territorial Authority (Lower Clutha only), Councillors, ORC and landowners from respective 'sub-groups' across the schemes. The membership did not include mana whenua, large infrastructure providers or Community Board representatives.

[10] The Lower Waitaki River Control Scheme has a liaison group. It is represented by rural landowners. The liaison group holds annual meetings held generally in December. Attendance to the meetings includes representation from rural landowners, urban landowners, Environment Canterbury (ECan), ORC, both ORC and ECan Councillors, Meridian Energy and the Department of Conservation and others. The meeting discusses the annual plans, budgets, progress and issues.

[11] In its decisions on the 2024-2034 Long-Term Plan, the ORC determined that liaison groups should be re-established. The Lower Taieri Liaison Group was established in late 2024, and has established a regular meeting cycle of at least twice-yearly meetings. The paper to the Regional Leadership Committee meeting in August 2024 to confirm the Terms of Reference that supports the Lower Taieri Liaison Group identified that the

Lower Clutha/Mata Au and Tokomairiro Groups would be established in the 2025/26 year.

DISCUSSION

The case for Liaison Groups

[12] From approximately 2019 onwards, following the discontinuation of previous liaison groups, the Council has been undertaking annual drop-in sessions in Balclutha, Mosgiel and Outram to engage with the community on activities undertaken across the schemes. While this has had some success, the approach has had some limitations. The drop-in style sessions were originally designed to provide the community with access to relevant functional delivery across the schemes, such as capital project updates, operational maintenance, and to gather feedback on concerns and/or challenges the community may have. Feedback from the community identified the limitation of this format as it does not provide an opportunity to discuss in detail the expenditure and decisions on some work programmes for both capital and operational work or have input into future work programmes.

[13] Re-establishment of the liaison groups in todays' environment with a fit for purpose framework enables the strengthening of the Council's relationship with the community, improves the community's connection with and understanding of the Council's infrastructure and opens a discussion regarding the significant issues the provision of optimal flood protection and land drainage schemes present.

[14] The key for the success of the group is to ensure appropriate and inclusive representation from the wider community and stakeholders. To ensure appropriate representation and encourage meaningful outcomes that align with the objectives set out in the Terms of Reference, the group should be a representative group that encompasses different ratepayer interest groups, land uses activities, and rating categories, and which recognises the geographical extent of the schemes. The potential to have other key infrastructure owners, and/or lifeline utilities as members of the liaison groups or as standing attendees will ensure a diverse consideration of the multiple beneficiaries of the schemes.

Purpose of Liaison Groups with Council in current environment

[15] As set out in the August 2024 paper, the role of the liaison groups is to discuss capital and operating matters, funding, strategic issues and future work programmes relating to the schemes. Liaison groups provide an effective communication forum between scheme ratepayers, stakeholders, and the ORC. The Terms of Reference are crucial to the success of a liaison group as these set out the key principles and appropriate way of operating between community and Council. A proposed draft Terms of Reference for each of the Lower Clutha/Mata Au and Tokomairiro Liaison Groups is attached to this paper.

[16] At the August 2024 meeting, the Regional Leadership Committee confirmed that liaison groups will be formed as informal bodies, and that they would have no statutory powers or functions. They are not delegated any functions or powers of the Council in relation to flood protection and/or drainage. Instead, the liaison groups facilitate a connection between the community and Council to work on management of scheme assets, which

enables a collaborative approach on the significant issues which have been identified in the Infrastructure Strategy.

[17] The establishment of liaison groups will not preclude ORC staff undertaking occasional/as required engagement on specific topics and matters that are relevant to the scheme communities.

Mana whenua involvement

[18] Staff will engage with Aukaha and Te Ao Marama Incorporated to ensure that mana whenua are included in the formation of the Lower Clutha/Mata Au and Tokomairiro Liaison Groups should that be preferred. Alternatively, mana whenua may seek to engage in the planning and delivery of flood and drainage infrastructure via alternative means.

Which Schemes need Liaison Groups

[19] At the August 2024 meeting, staff set out the key factors for consideration in the establishment of liaison groups. This included:

- The scale of the scheme (i.e. its key infrastructure and the number of Council-owned assets across the scheme)
- The targeted rate base around that scheme
- The criticality of the infrastructure associated with that scheme
- The community feedback received for the reinstatement or formation of the Liaison Groups.

[20] At that meeting, the Council confirmed the establishment of the Lower Taieri Liaison Group in 2024, and that the Lower Clutha/Mata Au and Tokomairiro Liaison Groups should be established in the 2025/26 year. Of note, these schemes comprise the following:

Scheme	No. of Targeted Rate Payers*	Liaison Group consideration	Infrastructure Assets
Lower Clutha Flood Protection and Drainage Scheme	2,572	Scheme has a large number of critical infrastructure. The scheme is active with operational function and weather/flood response. Liaison Group would strengthen the knowledge between both ORC and community.	Floodbanks: 110 km Open Drains: 153 km Pump Stations: 5 Culverts: 189 Bridges: 4
Tokomairiro Drainage Scheme	1,216	Scheme has drainage network and complex interfaces with coastal and inland waterbodies. Liaison Group could strengthen the knowledge on this scheme for the Clutha District Council and community.	Open Drains: 110 km Culverts: 74 Bridges: 17

*No. of rate payers not the number of rating units.

Table 2 Liaison Group consideration with asset portfolio summary for flood protection and drainage schemes across Otago.

Establishment of Liaison Groups

[21] It is proposed to establish the Lower Clutha/Mata Au Flood Protection and Drainage Liaison Group and the Tokomairiro Drainage Liaison Group in the 2025/26 financial year. The Lower Clutha/Mata Au Liaison Group is proposed to be established in the 2025 calendar year, and the Tokomairiro Liaison Group will be established in early 2026.

[22] As for the Lower Taieri Liaison Group, it is proposed that liaison group decision making will not be final or binding for ORC. The liaison groups' inputs will be incorporated into Annual and Long-Term Planning processes with final decision-making sitting with Council. This is due to the risks associated with flood and drainage assets. Staff recommend that final decisions on investment and management of these critical assets remain the responsibility of the Council.

[23] The Lower Taieri Liaison Group was established using a process where nominations from ratepayers were called for in advance of a general meeting of scheme ratepayers. A voting process was used at the meeting to confirm membership of the group. This methodology was successful, and it is proposed that a similar methodology be employed for the election of the Lower Clutha/Mata Au and Tokomairiro Liaison Groups.

[24] It is anticipated that ORC will provide administrative assistance for these liaison groups. Any additional resources required by the groups will be subject to operating budgets approved through the annual plan process.

OPTIONS

[25] There are three options available for the establishment of liaison groups.

a) Option A recommended by staff is to prioritise the establishment of the Lower Clutha/Mata Au Liaison Group in 2025 with the establishment of the Tokomairiro Liaison Group occurring in the first half of 2026.
b) Option B is not to endorse the establishment of further liaison groups.
c) Option C is to endorse the establishment of liaison groups on a different timeframe to that recommended by staff.

Liaison Group Establishment Process

[26] The options to consider for the process to establish liaison groups are:

a) Option A recommended by staff is to call a general meeting of scheme ratepayers, seek nominations and call a vote to establish liaison group membership (if necessary).
b) Option B is to seek nominations from scheme ratepayers and appoint a committee to select final membership. This committee could be made up selected Councillors.
c) Option C is that the Committee recommends an alternative method for seeking community members for the liaison group.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[27] The liaison groups will serve as a tactical communication plan for achieving the ORC's strategic directions.

Financial Considerations

[28] The costs of establishing a supporting the liaison groups is expected to be met within approved budgets.

[29] In time it will be expected that the financial impacts are minimal as the meetings become a part of annual work programme cycles. Once the liaison groups are established, it is expected that staff time associated with preparing for and attending meetings will not be significant.

Significance and Engagement

[30] The endorsement of the establishment of the liaison groups does not trigger any engagement requirements under Councils Significance and Engagement Policy.

Legislative and Risk Considerations

[31] There are no statutory obligations to be considered in the endorsement of the liaison groups by Council.

[32] Infrastructure resilience has been identified as a Strategic Risk for ORC. The establishment of liaison groups supports the communication and awareness of this risk through the groups.

Climate Change Considerations

[33] Climate change considerations have been discussed in the Infrastructure Strategy 2024-2054. The development of the liaison groups will enable oversight and community engagement in respect of managing the effects of future climate change on the ORC's assets in respect of flood risk, land drainage, and river management infrastructure.

Communications Considerations

[34] The establishment of the liaison groups will require assistance and support from the ORC Communications team to ensure initial meetings are well publicised.

[35] The information relating to the establishment and operation of liaison groups will be made publicly available on ORC's website. Additional communication will be undertaken at the recommendation of the liaison group.

NEXT STEPS

[36] Subject to the Council noting this report staff will begin to prepare the framework for the establishment of the Lower Clutha/Mata Au Liaison Group and the Tokomairiro Liaison Group, and will progress the Draft Terms of Reference.

[37] Work with the Communications team to establish a communication plan and online presence to inform relevant rate payers for the liaison groups.

[38] Hold a community meeting before end of calendar year 2025 to socialise the establishment of the Lower Clutha/Mata Au Liaison Group and establish the community representatives.

[39] Hold a community meeting before end of the 2025/26 financial year to socialise the establishment of the Tokomairiro Liaison Group and establish the community representatives.

[40] Subject to the noting of this paper staff will prepare a paper in 2026 to seek Councillor representation for both the Lower Clutha/Mata Au Liaison Group and the Tokomairiro Liaison Group.

ATTACHMENTS

1. Draft Terms of Reference Lower Clutha Mata Au [**10.3.1** - 4 pages]
2. Draft Terms of Reference Tokomairiro [**10.3.2** - 5 pages]

Terms of Reference

Lower Mata Au Liaison Group
Flood Protection & Drainage Scheme

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
Balclutha	1
Paretai	1
Barnego	1
Inch Clutha	1
Kaitangata	1
Contact Energy Limited	1
ORC Councillor	1
Clutha District Councillor	1
Mana whenua	2
Total	10

Terms of Reference

Tokomairiro Liaison Group Drainage Scheme

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.

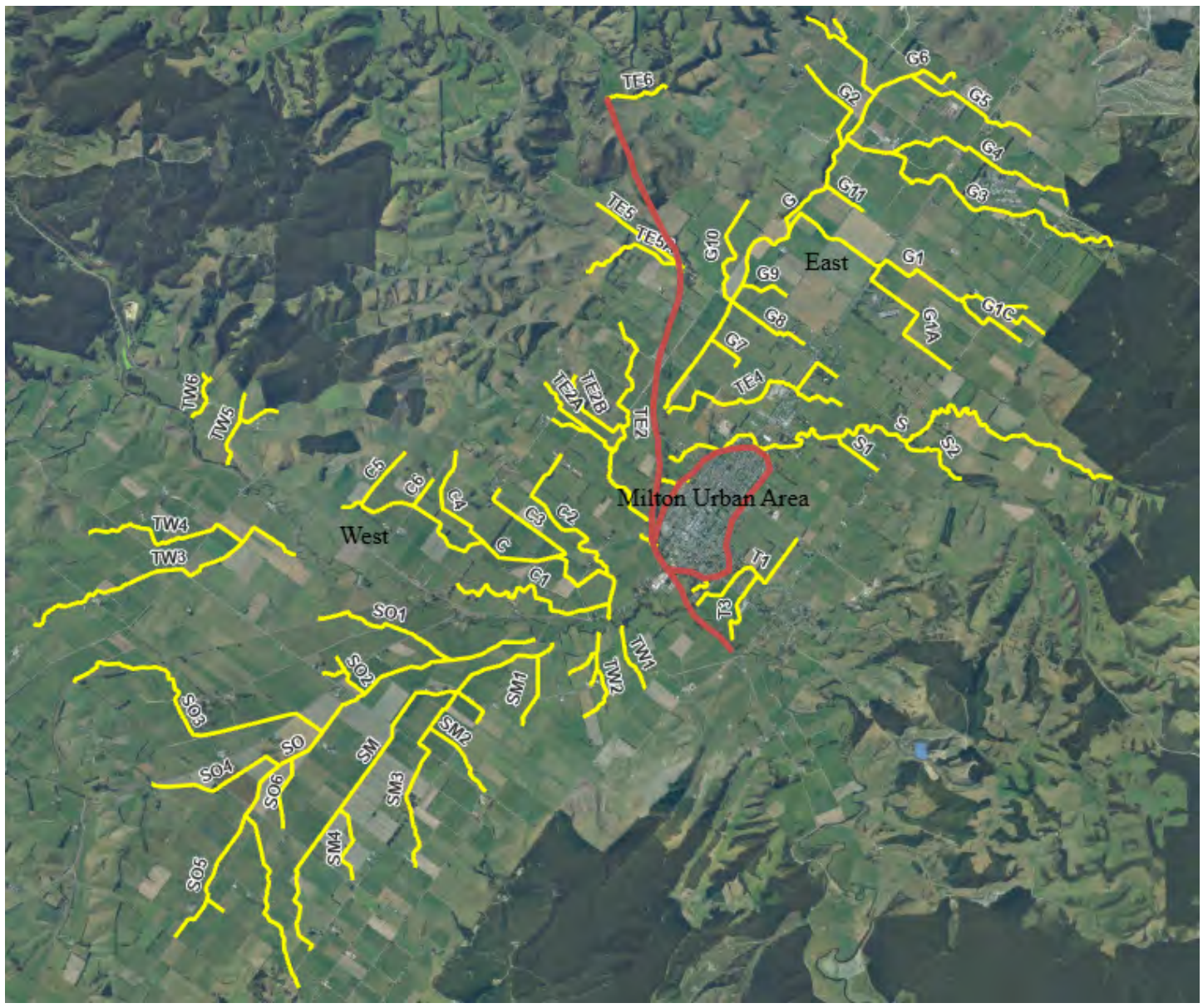
Otago Regional Council

Attachment A: Table of proposed future minimum representation

Party	Minimum Representation across Parties
East of Tokomairiro East Branch	2
West of Tokomairiro East Branch	2
Milton Urban	1
ORC Councillor	1
Clutha District Councillor	1
Mana whenua	1
Total	8

Otago Regional Council

Attachment B: Approximate geographic breakdown for representation



10.4. Total Mobility

Prepared for: Council

Report No. GOV2593

Activity: Transport: Transport Planning

Author: Laura Faulkner, Community Transport;

Endorsed by: Anita Dawe, General Manager Planning and Transport

Date: 27 August 2025

PURPOSE

[1] To seek direction from Council on options for managing expenditure for Total Mobility services.

EXECUTIVE SUMMARY

[2] Since the introduction of the 75% subsidy in 2022, Total Mobility services across New Zealand have seen significant increases in usage and user behaviour. Consequently, there has been an increased demand and increased costs incurred.

[3] In March this year, as a result of a report on over expenditure for Total Mobility, Council directed staff to report back with a plan to manage Total Mobility services within approved budgets, noting that over expenditure for the 2024/25 financial year was addressed by bringing forward funding from Years 2 and 3 of the LTP cycle.

[4] Based on existing expenditure, across the three-year LTP and RLTP period (from 1 July 2024 - 30 June 2027), staff forecast total over-expenditure in Total Mobility services of approximately $2,875,000 by the end of June 2027.

RECOMMENDATION

That the Council:

1) ***Notes*** *this report.*
2) ***Notes*** *the forecast expenditure for Total Mobility services for the 2025/26 and 2026/27 financial years.*
3) ***Directs*** *staff continue to provide Total Mobility service provision, in accordance with Option 2 for Q 1 and 2 2025/26.*
4) ***Directs staff*** *to Investigate and provide Council with recommendations on levers (b) and (e) (provided below as per Option 4) to implement in Q 3 and 4 of 2025/26, subject to final sign-off by Council.*

BACKGROUND

[5] Total Mobility services have been provided in Otago for 40 years and enable access to subsidised taxi services for those with long-term impairments that are unable to use

conventional public transport. Total Mobility has three components that make up the service offering – installation of hoists, hoist taxi trips, and non-hoist taxi trips. The Total Mobility services enable access to subsidised taxi services for those with long-term impairments that are unable to use conventional public transport.

[6] The role of regional councils in Total Mobility is to both administer and co-fund the scheme. It is a nationwide scheme that is currently 75% funded for users up to a regionally set cap, set by Public Transport Authorities (PTA's). For ORC the current fare cap is set at $50.00, which enables a maximum $37.50 subsidy. Across the country the level of Total Mobility subsidy varies significantly – from $60 maximum capped fare in Auckland to $7.50 in Horizons (Rangitīkei district).

[7] Total Mobility services are provided by Council contracting approved taxi companies to provide subsidised door to door transport. Contracts are monitored and managed through purpose-built software called 'Ridewise', which is additionally used to manage assessments of potential users, and review existing users, as stipulated by NZTA.

[8] Since a government funded 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).



Figure 1: Total Mobility trips by year and month, highlighting the growth currently being experienced (source NZTA)

[9] Otago has also seen a significant increase in the number of Total Mobility users. The growth in eligible Total Mobility customers is in part due to the aging population. There are other contributing factors such as increased operational costs and raised fares that also contribute to the additional costs.

[10] Staff brought a paper to Council in March this year that identified over expenditure for the (now) previous financial year, sought authorisation for that over expenditure, and committed to reporting back with a plan for managing the budget across the balance of the three-year funding cycle.

[11] The challenge being faced in Otago is not unique, and NZTA are now developing guidance for PTAs to manage Total Mobility expenditure. It is anticipated this may provide additional levers to enable better oversight and management of Total Mobility, including options for fare caps and changes in subsidy levels, while limiting the impact on card holders as much as possible.

[12] Additionally, the Ministry of Transport is conducting a review of the Total Mobility scheme, which we anticipate will include a review of funding mechanisms. This review is expected by the end of 2025.

DISCUSSION

[13] Of the three component parts of Total Mobility – the area where the financial challenges have realised is in the non-hoist, subsidised taxi rides. The three-year budget (from 1 July 2024 to 30 June 2027 for non-hoist Total Mobility trips is budgeted at $4,667,547, which is a combination of local (rates) share, and Government subsidy.

Three Year Funding for Non-Hoist Trips	**NZTA**	**ORC**	**TOTAL**
1 July 2024 – 30 June 2027	$2,802,340	$1,865,207	$4,667,547
Year 2 funding	$936,803	$617,627	
Year 3 funding	$ 721,507[1]	$691,558	

Figure 1: Total Mobility funding for 2024/25 – 2026/27

[14] In addition to this, for the last financial year, all PTA's also received CERF[2] funding, which for ORC was $857,348. At the time of writing, whether CERF funding will be provided, and the quantum is not known so this report has assumed no CERF funding will be received. Any funding will obviously offset the projected over expenditure noted in this paper.

[15] Assuming Year 2 to have similar, static demand as year 1 (which generated costs of $2.80 million), staff note a significant funding shortfall, of $1,245,674 in Year 2, and $1,387,039 in Year 3, along with the existing shortfall of $242,705 in Year 1. In practice this would mean that there would be no funding for Total Mobility services in Year 3 of the current LTP cycle and reductions in Total Mobility spending would be required in the current financial year.

2024/25	NZTA Grant – Actual Claimed ($)	NZTA – CERF claimed ($)	ORC rates ($)	ORC deficit funded	Total Mobility Total
Actual	1,144,029[3]	857348	556,022	242,705	**$2,800,104**
Budget	858,484	857348	556,022		**$2,271,854**

Figure 2: Total Mobility expenditure on non-hoist trips, in Otago in 2024/25, compared to budget

[1] The Year 3 NZTA Grant funding is reduced, due to bringing forward funding to cover the additional costs in year 1.
[2] CERF = Climate Emergency Response Fund
[3] This figure has increased to cover the increased NZTA share, pulled forward from Year 3 funding. This explains the difference between budget and actual grant claim.

[16] Staff anticipate the shortfall across the three-year cycle to be $2,875,419 if the current level of service uptake remains static and taking into account the current subsidy levels. However as there is no cap on scheme usage it could be higher. This number would be reduced if CERF funding is provided for the current and next financial year. Staff have been advised by NZTA that CERF funding is likely[4], but no indication of quantum has been provided. The funding shortfall, if no additional NZTA grant is available, would need to be fully funded by ORC.

[17] The majority of Total Mobility expenditure is on subsidising passenger trips, with approximately 5% of the budget covering internal charges and resourcing. This means that budget savings have to come from addressing users demand and possibly operator supply.

[18] The current financial pressure faced by ORC is reflected nationally. Collectively PTAs have had ongoing conversations at national forums and with NZTA regarding limitations of the scheme, primarily the limited national funding pool given that there are no restrictions on usage if people can afford to pay. Several PTAs are pushing for Ministry of Transport to reduce the 75% subsidy back down to 50% to enable continued service provision.

[19] Advice from NZTA indicates their expectation is that ORC will manage within the three-year approved funding allocation, and they cannot guarantee additional funding will be available. While that means future years' funding could be brought forward and used to fund this year's grant shortfall, as noted above, doing so reduces future levels of grant funding and compromises service delivery.

[20] There are policy constraints around how the service is provided and limited levers to reduce expenditure. Challenges include:

- The minimum 50% subsidy level is determined by Ministry of Transport and the increase to 75% also means that the total ORC share increases as more trips are made.
- The eligibility criteria to access the scheme is set by NZTA policy.
- There are no restrictions on journey purpose.
- Total Mobility card holders do not have a trip limit for how many times they can use the scheme, with NZTA policy encouraging PTAs to consider individual user needs, Council budget constraints and alignment with other regions' approach.
- Available levers such as changing the fare cap would require a significant reduction to impact local share expenditure. The Q2 2024/25 average total fare was $30, significantly below the $50 fare cap.

OPTIONS

[21] There are four primary options available to Council:

Option 1 is to maintain business as usual until the outcomes of the MoT review, and the guidance from NZTA are released, noting that there will be a funding shortfall in Years 2 and 3. Provided the NZTA guidance is received early enough in this current financial

[4] We have a budget assumption for CERF of $564,951 for Year 2 and 3 of the current LTP cycle. Should that be realised, the forecast over expenditure of $2,882,124 would be reduced by $1,129,902.

year, it may leave sufficient time to understand budget shortfalls or implement available levers to better manage budget. This option is unlikely to enable a fully funded service, even if we are able to reduce subsidies and fare caps.

Option 2: Maintain business as usual for Total Mobility operations and plan to increase rates in the Year 3 budget to cover both ORC and NZTA expenditure, to ensure the Total Mobility services are fully provided for. This is likely to be in the order of $2.87 million, less any CERF funding received and would likely be general rates funded.

Option 3: ORC investigates medium and long-term levers. We anticipate further levers could be identified with NZTA and other PTAs. The challenge with this option is that even if we were able to reduce funding, the reductions would need to be significant to free up funding for Year 3 and impact Year 2. Depending on the levers which are pulled, there could still be a funding shortfall.

Option 4: Investigate and provide Council with recommendations on levers b and e (provided below) to implement in Q 3 and 4 of 2025/26. This would aim to provide Otago with the most equitable outcomes and limit the impact on the most vulnerable users, while ensuring the Total Mobility scheme is more sustainable by reducing the budget shortfall anticipated by the end of year 3.

[22] Staff's immediate recommendation to Council is option 2 - continue the provision of Total Mobility services and plan to incur some over expenditure in year 3 through rates. However, this is unsustainable, and it is proposed to consider levers to reduce overall spending.

[23] While we propose to pursue option 3 in parallel with option 2 our concern is that option 3 will not progress in a timely manner. Therefore, the preliminary view of staff is that the combination of levers as per Option 4 are preferable, even if only for consideration for Q3 and Q4.

[24] A review of the Council Total Mobility operation would enable both user and budgetary impacts to be better quantified, and levers for change thoroughly assessed. Our view is that Council will need to establish a maximum Total Mobility budget and actively manage to it.

[25] There are several levers which have been identified for consideration by another PTA, who undertook an independent review of Total Mobility services:

a. Reduction of the maximum capped fare from $50 across the whole region to a lower level (to be determined).
b. Retention of the maximum capped fare of $50 for lower income groups[5], such as people with Community Services Card, and reducing it for everyone else.
c. Reduction of the maximum capped fare from $50 in the main urban areas of Dunedin and Queenstown but retaining it in other areas. The rationale for this would be that urban centres tend to have more options, and potentially more competitive pricing, and also often have shorter trips than rural areas.

[5] Current data shows that 73% of card holders are superannuates; and 19% are beneficiaries, meaning potentially 92% of TM customers would maintain access to full subsidies.

d. Reduction of the total public subsidy paid for each trip from 75% to 50% by withdrawing from the Community Connect scheme. This would need to be done in conversation with Ministry of Transport (MoT) and NZTA.
e. Limitations of trip frequency by introducing a maximum number of subsidised trips per year, whilst retaining some flexibility to meet the spirit of the NZTA policy.

[26] Levers (a) to (d) all focus directly on the price paid by users, and propose various ways of increasing the price, making travel more expensive to reduce demand:

- Lever (a) is the simplest (administratively) to introduce but is something of a blunt instrument and could affect those who can least afford it the most. However, those people who travel shorter distances are less likely to be affected. It also makes no differentiation between where the user is located, or their ability to pay.
- Lever (b) would address the issue of affecting those who can least afford it by retaining the maximum capped fare for the least well off. The practicalities of administering this proposal would need to be thought through. The impact of this option may be limited, as 73% of current card holders are superannuates, and 19% of card holders receive some form of benefit. Council would need to determine what a lower income group or person is.
- Lever (c) recognises that major urban areas such as Dunedin and Queenstown may not require a large maximum capped fare as many journey distances could be shorter and therefore less expensive for the user. Those who travel greater distances would be affected, but perhaps would sometimes have more options to reduce their trip length. The higher capped fare could then be retained for people in smaller areas who need to travel further. However, administering such as scheme has proven very challenging in regions such as Waikato where there are cross boundary trips between districts with different maximum capped fares. Additionally, there would be associated operational costs to implement including additional administration costs, that is, could not be implemented with current level of in-house staff and would require additional operational costs to the platform provider. Currently average fares across TM services in Otago are well below the $50 capped amount.
- Lever (d) could be implemented by Council withdrawing from the Community Connect scheme and mandating that users now pay 50% of the fare rather than 25%. The aim is to dampen user demand back in line with pre-2022 levels which then requires Council to subsidise fewer trips in total. Noting the significant increase in card holders over the last three years (over 130%) will likely mean usage could not be fully returned to 2022 levels. This option would need to be discussed and agreed with MoT and NZTA if their policy is to retain the subsidy rate at 75%.
- Lever (e) could be effective if there is evidence that people are travelling more often because each individual fare is currently cheaper under the 75% subsidy (and if this level is retained in future). Setting a fixed Total Mobility budget would enable Council to potentially justify a cap on the total number of trips for individual users in a month or year, by stating that the policy has been introduced to manage expenditure. Restricting trip frequency does not prevent people from travelling; just from claiming the current 75% discount beyond their allocated number of trips. Setting a trip number limit by month could possibly enable any surplus trips (from people who don't use their full quota) to be distributed to those who can make a case for needing more trips (meeting the

NZTA flexibility policy). However, administration of such a proposal would need to be simple, as this is not guaranteed.

[27] It is possible to use these levers individually, or in any combination, to address the current budget challenges. Lever (d) would probably be introduced before lever (e) as it might reduce trip frequency and make a limit unnecessary. Irrespective of how many levers are pulled, impacts of policy and scheme changes on people who are often amongst the most vulnerable in society will need careful comparison to the cost savings to Council. A scheme review will be able to assess these matters.

[28] There is no strong evidence to suggest that the increase in Total Mobility users and hence costs is being driven by people who are not eligible to participate; or that scheme assessors are approving applications when they shouldn't be. The level of resource that would be necessary to investigate these matters is likely to be out of proportion to any savings made.

[29] Equally there are also other subsidised mobility schemes available in New Zealand which could be better promoted as alternatives to Total Mobility:

- Te Whatu Ora health shuttles, help patients travel to medical appointments and are typically free and available for those needing transport to outpatient and inpatient appointments at hospitals.
- Accident Compensation Corporation (ACC): support for travel and transport costs for injuries where there is a need to travel for treatment or rehabilitation.
- National Travel Assistance (NTA): helps people who need to travel long distances or frequently for specialist medical treatment.
- Specialised School Transport Assistance (SESTA): Provided by Ministry of Education helps children who have mobility or safety needs that prevent them from travelling independently to school.

[30] However, people cannot be forced to use another means of travel in preference to Total Mobility. Additionally, there may be a need to provide more comprehensive information which will enable people to assess the most appropriate travel option for the journey, and that may not be Total Mobility. Council staff are currently not well placed to produce and disseminate this advice directly, and there could be some, albeit hopefully minor reputational impact on ORC. However, this is something that staff could work with colleagues on at the sector level.

[31] Total Mobility is popular with users, because it is financially generous and relatively easy to join / use, once eligibility has been established and approved. Benefits to scheme users are considerable and it changes people's lives for the better. However not everyone in the region benefits from Total Mobility and therefore it is appropriate that staff review efficiency and effectiveness of the various policy levers and longer-term service provision.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[32] 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

[33] The year-to-date expenditure has financial implications for ORC, with NZTA funding contributions from years 3 brought forward to cover shortfalls in 2024/2025, with a projected minimum estimated shortfall of $2.87m by end of June 2027.

Significance and Engagement Considerations

[34] Changes to the Total Mobility subsidy would impact access to the provision of transport services for some 8,660 currently eligible Total Mobility customers.

Legislative and Risk Considerations

[35] Total Mobility fulfils ORC's responsibility to 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

[36] Not directly relevant to this paper.

Communications Considerations

[37] ORC would need to communicate a decision to existing card holders and service providers and would need to update its website and other information sources about any operational changes to the scheme.

NEXT STEPS

[38] Council to provide direction on Total Mobility expenditure for year 3 from the options provided.

ATTACHMENTS

Nil

10.5. Amendment to the Water Plan to give effect to legislative change to the Resource Management Act 1991

Prepared for:	Council
Report No.	POL2508
Activity:	Governance Report
Author:	Tom De Pelsemaeker, Team Leader Freshwater and Land Sam Walton, Senior Policy Analyst Freshwater and Land
Endorsed by:	Anita Dawe, General Manager Planning and Transport
Date:	27 August 2025

PURPOSE

[1] The purpose of this paper is to provide Otago Regional Council (Council or ORC) with a summary of the recent changes to the Resource Management Act 1991 (RMA) and Regional Plan: Water for Otago (Water Plan) introduced by the Resource Management (Consenting and Other System Changes) Amendment Act 2025.

[2] These changes extend the expiry date of certain water permits in Otago and override, amend and revoke specific provisions in the Water Plan.

EXECUTIVE SUMMARY

[3] In March 2025, Council agreed for ORC staff to request that the Government undertake a legislative amendment to address the consequences of the legislation preventing the notification of the draft Land and Water Regional Plan (LWRP).

[4] The Resource Management (Consenting and Other System Changes) Amendment Act received Royal Assent on 20 August 2025, and commenced on 21 August. The Amendment Act introduces various amendments to the RMA and subordinate regulations on a broad range of matters, including amendments relating to infrastructure and energy, housing growth, farming and the primary sector, natural hazards and emergencies, and system improvements.

[5] The Amendment Act also addresses some of the consequences of delayed notification of the LWRP by making changes to the RMA and amending the Water Plan. Specifically, the changes extend the expiry date of most water permits in Otago granted since March 2020 by five years and amend the Water Plan by:

a. Amending the provisions in Chapter 10A of the Water Plan to allow water permits that are not eligible for a five-year extension and are still to be replaced to have a simpler consent pathway; and
b. Removing the provisions for managing diffuse rural discharges from the Water Plan that would have required most farmers and growers in Otago to apply for a consent after 1 April 2026.

[6] The legislative changes have the effect of amending the plan on the day after Royal Assent and Council must provide public notice of the amendments within 20 working days after commencement of the new legislation.

RECOMMENDATION

That the Council:

1) ***Notes*** *the amendments to the Regional Plan: Water for Otago made by the Resource Management (Consenting and Other System Changes) Amendment Act 2025.*
2) ***Directs*** *that public notice of the amendments made by the Resource Management (Consenting and Other System Changes) Amendment Act be given on 1 September 2025.*

BACKGROUND

[7] In December 2019, following Professor Peter Skelton's review of ORC's planning functions, a work programme was agreed between ORC and the previous Minister for the Environment, Hon David Parker. The agreed work programme involved three sequential steps:

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 were set, in line with the requirements in the relevant NPSFM at that time;
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], the development and notification of a new LWRP for Otago.

[8] 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' and existing water permits to take and use surface water that expire prior to 31 December 2025.

[9] 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 in 2014. Two rules introduced by Plan Change 6A were intended to come into force in April 2020. However, due to issues associated with interpreting and implementing these rules, Plan Change 6AA was developed. This plan change, which became operative in April 2020, amended the date these rules were to come into effect, to April 2026, by which time a new LWRP was expected to be in place.

[10] Following these plan changes, work commenced on the draft LWRP, as agreed by Council in response to the Minister's direction. A Council decision on whether to notify the new LWRP was scheduled for the 23 October 2024 Council meeting.

[11] Legislation passed in October 2024 prevented ORC from notifying its draft LWRP, instead requiring it to continue to rely on the current planning framework for managing rural

diffuse discharges and water quantity in Otago. This has created several consequences for ORC in performing its functions under the Act.

[12] At the Council meeting on 19 March 2025, staff presented a paper to Council outlining some of the consequences of continuing to rely on the Water Plan and presenting options to address these consequences.[1] At the meeting Council agreed to:

a. Request that Central Government undertake a legislative amendment to address the unintended consequences of delaying the notification of the LWRP; and
b. Direct staff to work with officials at the Ministry for the Environment to identify the necessary legislative amendments.[2]

[13] In the months following this ORC staff worked with Government officials to develop a pragmatic "legislative fix" to address these unintended consequences.

DISCUSSION

Summary of changes

[14] The Resource Management (Consenting and Other System Changes) Amendment Act, which came into force on 21 August, introduced a new section 127C to the RMA, extending the expiry date of certain water permits in Otago that authorise the take or use of water by five years.

[15] The Amendment Act also introduced specific sections that override, amend and revoke certain provisions in the Water Plan that manage water quantity and rural diffuse discharges. The changes to the Water Plan are:

a. For managing rural diffuse discharges: specific policies, rules and schedules that would have required most farmers and growers in Otago to apply for a consent after 1 April 2026, have now been revoked.
b. For replacing water permits:
    i. Specific rules in Chapter 10A have been amended to allow water permits that are still to be replaced to have a simpler consent pathway; and
    ii. Policies in the Water Plan relating to consent duration of water permits have been overridden by a new section 127B of the RMA which sets out that any water permit authorising the take and use of water granted under the Water Plan must not exceed a term of six years.

[16] Excerpts of the Amendment Act showing the relevant sections that extend the expiry date of certain water permits in Otago and override, amend and revoke specific provisions in the Water Plan are shown in Attachment 1 to this report. The full text of the relevant changes introduced by the Amendment Act to the Water Plan is in Attachment 2.

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[1] Council Agenda 19 March 2025. 10.3. Report on implications of changes to the RMA in relation to Land and Water. Report No. GOV2466 https://www.orc.govt.nz/media/eudkuksv/20250319-council-agenda.pdf

[2] Resolution CM25-139. Minutes of an ordinary meeting of the Otago Regional Council held in the Queenstown Lakes District Council Chamber, 10 Gorge Road, Queenstown on Wednesday 19 March 2025, at 9:03 AM. https://www.orc.govt.nz/media/vpun2ky3/20250319-council-minutes.pdf

Updating water permit expiry dates

[17] New section 127C of the RMA extends the expiry date of most water permits in Otago granted since March 2020 by five years.

[18] This extension applies to approximately 400 water permits granted since March 2020. Staff are working on a plan for rolling out the updates to water permits. This is an administrative task that does not impose any direct cost on a water permit holder or require them to do anything.

[19] The expiry date of a water permit that meets the criteria is automatically extended by the Amendment Act. The permit does not need to be updated for this extension to take effect. However, the Amendment Act requires ORC to carry out the administrative task of updating each water permit expiry date that was extended by section 127C with the new expiry date for the permit within two years.

Amendments to the Water Plan

[20] The legislative changes have the effect of amending the plan on the day after royal assent. Staff have updated the Water Plan to incorporate the amendments made by the legislative changes.

[21] When the amendments commenced, consequential corrections were required to the Water Plan, including updates to the table of contents and cross-referencing. These changes were made under Schedule 1, clause 20A of the RMA under delegated authority. Notes have also been included in the Water Plan to direct users of the plan to sections 127A to 127C of the RMA that will now also apply in relation to consent duration.

Public notification of changes to Water Plan

[22] Under section 90 of the Resource Management (Consenting and Other System Changes) Amendment Act, ORC must provide public notice of the amendments within 20 working days after commencement of the new legislation. However, a failure to comply with this requirement does not affect the validity of the amendments made by section 89.

[23] Staff recommend providing public notice of the amendments on 1 September 2025.

OPTIONS

[24] There are no options presented in this paper, as the new legislation amended the Water Plan on the day after royal assent and requires the Council to give public notice of the amendments within a specified timeframe, so there are no decisions for Council to make.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[25] The amendments to the Water Plan address the unintended consequences of the legislation preventing the notification of the LWRP.

Financial Considerations

[26] Implementation of the legislative changes, including the amendments to the Water Plan, will be funded from existing budgets that had been allocated for the LWRP. The cost of

implementation is limited to activities associated with raising awareness about these changes among farmers and growers, water permit holders and other interested parties, and administration associated with issuing the water permits with revised expiry dates.

Significance and Engagement Considerations

[27] The legislative changes do not trigger any need to consult or engage with the public in terms of the *He Mahi Rau Rika: the Otago Regional Council Significance, Engagement and Māori Participation Policy*.

Legislative and Risk Considerations

[28] The legislative changes have the effect of amending the Water Plan on the day after royal assent.

Climate Change Considerations

[29] The legislative changes, including the amendments to the Water Plan, do not have any direct implications in terms of climate change.

Communications Considerations

[30] Following the introduction of the Amendment Paper to the Resource Management (Consenting and Other System Changes) Amendment Bill, ORC staff have taken steps to inform stakeholders, farmers and growers and consent holders about the implications of the new legislation. This has included:

a. A media release
b. An update to the ORC website with frequently asked questions on the changes
c. Emails and letter to key stakeholders and water permit holders in Otago
d. Specific communications with Aukaha and Te Ao Marama

[31] It is proposed that a public notice will be uploaded to the ORC website and published in the Otago Daily Times on 1 September 2025, notifying the public of the amendments to the Water Plan.

NEXT STEPS

[32] The next steps are to provide public notice of the amendments on the ORC website and in the Otago Daily Times on 1 September 2025.

ATTACHMENTS

1. Excerpts of the Resource Management (Consenting and Other System Changes) Amendment Act [**10.5.1** - 10 pages]
2. Changes to the Regional Plan Water [**10.5.2** - 19 pages]

ATTACHMENT 1:
Excerpts of the Resource Management (Consenting and Other System Changes) Amendment Act

No 347

House of Representatives

Amendment Paper

Resource Management (Consenting and Other System Changes) Amendment Bill

Proposed amendments for the consideration of the Committee of the whole House

Key:

- **<u>this is inserted text</u>**
- **~~this is deleted text~~**

Note: This Amendment Paper shows amendments to the Bill that are being proposed by the Minister for the purposes of consideration in Committee of the whole House. This document does—

- **NOT have official status in terms of unamended text**
- **NOT have the status of an as-reported version of the Bill.**

Explanatory note

This Amendment Paper amends the Resource Management (Consenting and Other System Changes) Amendment Bill (the **Bill**). The Bill amends the Resource Management Act 1991 (the **RMA**).

Thermal electricity generation activities

This Amendment Paper amends the definition of a specified energy activity in *clause 4* of the Bill to include the establishment, operation, maintenance, or upgrade of thermal electricity generation facilities. *New section 88BA* inserted by the Bill requires consent authorities to process resource consent applications for specified energy activities or wood processing activities within 1 year of lodgement.

Hearing and notification of plans to cease unless exempted

This Amendment Paper inserts *new clause 14A*, which inserts *new section 58JA*, *new clauses 18B and 18C*, which amend sections 79 and 80A, and *new clause 23A*, which inserts *new subpart 5B of Part 5*. The amendments implement a policy intended to ensure that local authorities do not expend resources unnecessarily between the time when *new subpart 5B of Part 5* comes into force and legislation to replace the RMA comes into force by stopping parts of the plan-making process. This policy is intended to achieve greater efficiency for local authorities in view of the changes expected to be in force by the end of 2027. The policy affects proposed plans and policy statements, changes to plans and policy statements, and any variations of those. Where a proposed planning instrument has already been notified and heard (in whole or in part), the plan stop will not apply. Where the proposed planning instrument has been notified but not been heard or has a hearing set to begin more than 5 days after commencement of *new subpart 5B of Part 5*, the instrument must be withdrawn unless an exemption applies. After commencement, no new planning instruments may be notified unless an exemption applies. This policy also pauses the mandatory and discretionary directions regarding national planning standards and pauses the need for local authorities to review plans and policy statements.

Removal of heritage protection for Gordon Wilson Flats

This Amendment Paper inserts *new clauses 23B and 82 to 86*, which insert provisions removing heritage protection for the Gordon Wilson Flats from the Wellington City district plan and proposed plan.

Water permits granted under Otago Regional Plan

This Amendment Paper inserts *new clauses 44A and 87 to 90* to—

- provide that the duration of new water permits authorising the taking or use of water granted under the Regional Plan: Water for Otago must not exceed 6 years; and
- extend the duration of certain existing water permits granted under that plan by a period of 5 years; and

- amend the plan so that applicants seeking to replace an existing water permit that expires after 31 December 2025 may have the benefit of a controlled activity pathway; and
- revoke certain provisions of the plan.

Restrictions on review of conditions of coastal permits extended by section 165ZFHC

The Amendment Paper inserts *new subpart 1AB* into Part 7A of the RMA. That subpart applies until 3 September 2030 to a coastal permit extended by section 165ZFHC of the RMA. The effect of that subpart is that the scope of any review of the conditions of the coastal permit under section 128(1) of the RMA is restricted to only the following:

- a review under section 128(1)(ba):
- a review of the conditions only for the purpose of an adaptive management approach as authorised by the permit.

To avoid doubt, the above restrictions do not affect a review under section 128(2) of the RMA.

Assessment of effects for notice of requirement

This Amendment Paper corrects errors in *clauses 50 and 51* of the Bill in relation to what is required in an assessment of the effects of a proposed activity for a notice of requirement. If a requiring authority has an interest in land sufficient for undertaking the work, the assessment must include a description or information on alternatives only if the work is likely to result in any significant adverse effect.

Regulations may modify or remove provisions of policy statement or plan

This Amendment Paper inserts *new clause 69A* into the Bill, which inserts *new sections 360I to 360O* into the RMA, to provide a regulation-making power to modify or remove provisions of a policy statement or plan.

Before recommending that regulations to this effect be made, the Minister must—

- comply with the requirements of *new sections 360J to 360L*; and
- be satisfied that specified criteria are met.

New sections 360J to 360L include requirements for the Minister to—

- investigate and prepare a report; and
- provide the report to the relevant local authority; and
- publish the report; and
- consider any response by the local authority; and
- consult any parties likely to be affected by any modification or removal of provisions recommended by the report; and
- consider the outcomes of the consultation.

If regulations are made, the local authority must give public notice about the regulations and update the policy statement or plan.

New sections 360I to 360O are repealed on the close of 31 December 2027.

Requirements for Auckland Council to opt out of MDRS

The Bill, as reported back by the Environment Select Committee, enables Auckland Council to opt out of the Medium Density Residential Standards (**MDRS**) if the Council meets certain requirements. This Amendment Paper amends *Schedule 1* of the Bill to alter those requirements, so that Auckland Council may opt out of the MDRS only if it amends the Auckland Unitary Plan to enable building heights of at least—

- 15 storeys (rather than 6 storeys) within a walkable catchment of the Maungawhau (Mount Eden), Kingsland, and Morningside railway stations; and
- 10 storeys within a walkable catchment of the Baldwin Avenue and Mount Albert railway stations.

The Amendment Paper also makes various policy and workability changes to the process by which Auckland Council may opt out of the MDRS, including—

- changing the time frame by which Auckland Council may opt out of the MDRS, so that Auckland Council may withdraw its MDRS plan change and seek a direction from the Minister to progress a replacement plan change (an **Auckland housing planning instrument**) no later than 10 October 2025, but does not need to notify an Auckland housing planning instrument by that date; and
- enabling Auckland Council to vary an Auckland housing planning instrument; and
- providing Auckland Council with simpler evaluation requirements for existing qualifying matters.

Minor and technical changes

This Amendment Paper also makes minor and technical corrections to the Bill.

Departmental disclosure statement

The Ministry for the Environment is required to prepare a disclosure statement to assist with the scrutiny of this Amendment Paper. It provides access to information about any material policy changes to the Bill and identifies any new significant or unusual legislative features of the Bill as amended.

A copy of the statement can be found at http://legislation.govt.nz/disclosure.aspx?type=ap&subtype=government&year=2025&no=347&

The Honourable Chris Bishop, in Committee, to propose the amendments shown in the following document.

Ngā Hapū o Ngāti Porou Act 2019, or the Marine and Coastal Area (Takutai Moana) Act 2011.

43 Section 125 amended (Lapsing of consents)

(1) In section 125(1)(a), after "area", insert "or does not authorise a renewable energy activity".

(2) After section 125(1)(b), insert:

(c) 10 years after the date of commencement if the consent authorises a renewable energy activity.

(3) After section 125(1A)(b), insert:

(c) in the case of a consent authorising a renewable energy activity, the consent authority decides at the consent holder's request to shorten the period after which the consent lapses under **subsection (1)(c)**.

44 Section 127 amended (Change or cancellation of consent condition on application by consent holder)

(1) In section 127(3)(a), after "activity", insert "(but *see* **subsection (3B)**)".

(2) After section 127(3A), insert:

(3B) Subsection (3)(a) does not apply if—

(a) the application relates to an aquaculture activity; and

(b) a provision in a national environmental standard—

(i) applies to applications of that kind; and

(ii) states that an application by a consent holder to change or cancel consent conditions must be treated as an application for a resource consent for a controlled or restricted discretionary activity.

44A New sections 127A to 127C inserted

After section 127, insert:

127A Interpretation of sections 127B and 127C

In **sections 127B and 127C**—

commencement date means the day after Royal assent of the Resource Management (Consenting and Other System Changes) Amendment Act **2024**

Regional Plan: Water for Otago or **plan** means the plan of that name dated 3 September 2022.

127B Duration of new water permits under Regional Plan: Water for Otago must not exceed 6 years

(1) The duration of a water permit authorising the taking or use of water granted on and after the commencement date under the Regional Plan: Water for Otago must not exceed 6 years.

(2) If the water permit replaces a deemed permit or water permit, this section applies regardless of the expiry date of the permit being replaced.

(3) However, this section does not apply if—

(a) the water permit replaces a deemed permit associated with hydro-electricity generation infrastructure listed in Schedule 10A.5.1 of the plan on the terms specified in Rule 10A.3.1B of the plan; and

(b) the applicant takes practicable steps to remedy or mitigate any adverse effects on the environment arising from the activity.

(4) This section overrides any provision in the plan that applies to the duration of a water permit authorising the take or use of water.

(5) In this section, **deemed permit** means a mining privilege that is a deemed permit under section 413.

127C Extension of certain existing water permits under Regional Plan: Water for Otago

(1) The expiry date of a water permit authorising the taking or use of water granted under the Regional Plan: Water for Otago is extended by a period of 5 years after the date on which the permit would otherwise expire if—

(a) the permit was granted—

(i) on or after 18 March 2020; and

(ii) for a duration of no more than 6 years; and

(b) the permit is valid on the commencement date.

(2) A water permit is valid on the commencement date if, on the commencement date, the permit—

(a) has not expired, or has expired but the holder is continuing to operate under the permit under section 124; and

(b) has not lapsed under section 125; and

(c) has not been cancelled under section 126; and

(d) has not been surrendered under section 138.

(3) The conditions applying to each water permit that is extended under this section continue to apply, unless a change to a condition is required as a consequence of extending the duration of the permit.

(4) Otago Regional Council must, within 2 years after the commencement date, update each water permit extended under this section to reflect the new expiry date for the permit.

45 Section 128 amended (Circumstances when consent conditions can be reviewed)

(1) After section 128(1)(a), insert:

Amendments to Regional Plan: Water for Otago

87 Interpretation

In **sections 88 to 90**, **Regional Plan: Water for Otago** means the plan of that name dated 3 September 2022.

88 Principal legislation

Section 89 amends the Regional Plan: Water for Otago.

89 Regional Plan: Water for Otago amended

(1) In rule 10A.3.1.1(b), delete "where that water permit expires prior to 31 December 2025".

(2) In rule 10A.3.1A.1(b), delete "where that water permit expires prior to 31 December 2025".

(3) In rule 10A.3.2.1(b), delete "where that water permit expires prior to 31 December 2025".

(4) Revoke—

(a) policy 7.D.2:

(b) rule 12.C.1.1(g):

(c) rule 12.C.1.1A:

(d) rule 12.C.1.3:

(e) Schedule 16.

90 Otago Regional Council must notify amendments

(1) Otago Regional Council must give public notice of the amendments made by **section 89** within 20 working days after the commencement of that section.

(2) A failure to comply with this section does not affect the validity of the amendments made by **section 89**.

ATTACHMENT 2:

Changes to the Water Plan introduced by the Resource Management (Consenting and Other System Changes) Amendment Act

This attachment includes the provisions of the Water Plan that will be amended by the Resource Management (Consenting and Other System Changes) Amendment Act on the day after the Amendment Act receives royal assent.

The amendments that will be made are shown in red ~~strikethrough~~ and underline.

Chapter 7 Water Quality

7.D Policies for discharges of water and contaminants, excluding those discharges provided for in 7.C

7.D.1 Encourage innovation in management practices and the sharing of information, including by:

(a) Council:

(i) Providing and facilitating the sharing of information on water management and plan implementation including through fora, field days and brochures; and

(ii) Supporting landholders in measuring or assessing contaminants in discharges; and

(iii) Supporting the development of means to measure or assess contaminants in discharges; and

(iv) Monitoring progress towards achievement of water quality objectives and Schedule 15 limits and targets, and making this information available on the Council website.

(b) Landholders:

(i) Implementing practices that reduce the level of contaminants in discharges; and

(ii) Providing relevant information to support the catchment or aquifer studies undertaken by Council; and

(iii) Working as a group to achieve Good Quality Water.

~~**7.D.2 Schedule 16 discharge thresholds apply to permitted activities, from 1 April 2026, at or below the reference flows set in Schedule 16B based on median flows.**~~

Chapter 10A
Objective, Policies & Rules for Replacement Water Take & Use Permits

10A.3 Rules

10A.3.1 Controlled activity: Resource consent required

10A.3.1.1 Despite any other rule or rules in this Plan:

(a) Any activity that is currently authorised under a Deemed Permit; or

(b) The take and use of surface water (including groundwater considered as surface water under Policy 6.4.1A (a), (b) and (c) of this Plan) that is currently authorised by an existing water permit ~~where that water permit expires prior to 31 December 2025~~,

is a *controlled* activity provided the following conditions are met:

(i) The consent duration sought is no more than six years; and

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

(iii) The application demonstrates that the total land area under irrigation does not exceed the maximum area irrigated in the period 1 September 2017 to 18 March 2020, if the abstracted water is used for irrigation except where:

(a) 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

(iv) Except where (vii) applies, the rate of take shall be no more than the rate of take limit recorded during the water years (1 July to 30 June) for which water meter data is available up until 30 June 2020, as calculated in accordance with the methodology in Schedule 10A.4; and

(v) Any existing residual flow, minimum flow, or take cessation condition (whichever is applicable) on the expiring Deemed Permit or water permit is included in the application for resource consent; and

(vi) Except where (vii) applies, the volume of water taken shall be no more than the daily volume limit, and monthly volume limit, and annual volume limit (whichever one or more are applicable) recorded during the water years (1 July to 30 June) for which water meter data is available up

until 30 June 2020, as calculated in accordance with the methodology in Schedule 10A.4; and

(vii) For takes authorised by a Deemed Permit or water permit where metering is not required by condition of resource consent or by the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010, the rate of take and the volume of water sought is no more than the existing consented instantaneous rate of take and volumes; and

(viii) Where the application is to replace an Upstream Deemed Permit that was subject to a Downstream Permit with a Higher Right of Priority, the applicant proposes a condition:

(a) To cease taking water when:

(1) There is insufficient flow at the point of take of the Downstream Permit with a Higher Right of Priority; and

(2) Notice has been given by the holder of the Downstream Permit with a Higher Right of Priority; and

(b) Requiring the provision of a Contact Management Plan to the Consent Authority.

The Council reserves control over the following matters:

(a) In accordance with historical use and existing water permit conditions, the volume and rate of water taken, dammed, discharged or diverted; and

(aa) Where (iii)(a) applies, the maximum size of the additional area to be irrigated, and use of good management practices on the additional area; and

(b) Any existing consent conditions concerning operating procedures administered through a water allocation committee that exists for the catchment; and

(c) Any other conditions on the expiring permit to be replaced, where those matters are not otherwise addressed by the entry conditions of this rule or matters of control; and

(d) A condition may be imposed requiring the holder of an Upstream Replacement Water Permit:

(i) To cease taking water when:

(1) There is insufficient flow at the point of take authorised by a Downstream Permit with a Higher Right of Priority; and

(2) Notice has been given by the holder of the Downstream Permit with a Higher Right of Priority; and

(ii) Requiring the provision of a Contact Management Plan to the Consent Authority; and

(e) Review conditions; and

(f) Compliance monitoring; and

(g) The point and method of measurement and the method for transmitting recorded data to Council.

Pursuant to sections 95A and 95B of the RMA, an application for resource consent under this rule will be processed and considered without public or limited notification.

10A.3.1A Restricted discretionary activity: Resource consent required

10A.3.1A.1 Despite any other rule or rules in this Plan:

(a) Any activity that is currently authorised under a Deemed Permit; or

(b) The take and use of surface water (including groundwater considered as surface water under Policy 6.4.1A (a), (b) and (c) of this Plan) that is currently authorised by an existing water permit ~~where that water permit expires prior to 31 December 2025~~,

is a *restricted discretionary* activity providing the following conditions are met:

(i) The activity meets Conditions (i), (ii), (iii), (v), and (viii) of Rule 10A.3.1.1 but does not meet Conditions (iv) and (vi); and

(ii) Where the activity does not meet (iv) and (vi) of Rule 10A.3.1.1 a water meter for the take has been installed, or an exemption under the Resource Management

(Measurement and Reporting of Water Takes) Regulations 2010 from water metering has been granted.

The Council will restrict its discretion to the following matters:

(a)

(i) Whether the water meter data in combination with other relevant methods and data accurately represents historical use; and

(ii) Whether the volume and rate taken, dammed, discharged or diverted is in accordance with the historical rate of take and volume and within existing water permit conditions; and

(1) For community water supplies, within existing water permit volume and rate limits, the extent to which there is a need to provide for

population growth within the term of the consent; and

(2) Where 10A.3.1.1 (iii)(a) applies, the maximum size of the additional area to be irrigated and use of good management practices on the additional area; and

(b) Any existing consent conditions concerning operating procedures administered through a water allocation committee that exists for the catchment; and

(c) Any other conditions on the expiring permit to be replaced, where those matters are not otherwise addressed by the entry conditions of this rule or matters of discretion; and

(d) A condition may be imposed requiring the holder of an Upstream Replacement Water Permit:

(i) To cease taking water when:

(1) There is insufficient flow at the point of take authorised by a Downstream Permit with a Higher Right of Priority; and

(2) Notice has been given by the holder of the Downstream Permit with a Higher Right of Priority; and

(ii) Requiring the provision of a Contact Management Plan to the Consent Authority; and

(e) Review conditions; and

(f) Compliance monitoring; and

(g) The point and method of measurement and the method for transmitting recorded data to Council.

Pursuant to sections 95A and 95B of the RMA, an application for resource consent under this rule will be processed and considered without public or limited notification.

...

10A.3.2 Non-complying activity: Resource consent required

10A.3.2.1 Despite any other rule or rules in this Plan:

(a) Any activity that is the replacement of an activity authorised under a Deemed Permit; or

(b) The take and use of surface water (including groundwater considered as surface water under Policy 6.4.1A (a), (b) and (c) of this Plan) that is the replacement of a take and use authorised by an existing water permit ~~where that water permit expires prior to 31 December 2025~~,

that does not meet any one or more of the conditions of:

(i) Rule 10A.3.1.1 (excluding Conditions (iv) and (vi));

(ii) Rule 10A.3.1A.1;

(iii) Rule 10A.3.1B.1,

is a *non-complying* activity.

Chapter 12 Rules: Water Take, Use and Management

12.C Other discharges

…

12.C.1 Permitted activities: No resource consent required

12.C.1.1 The discharge of water or any contaminant to water, or onto or into land in circumstances which may result in a contaminant entering water, is a *permitted* activity, providing:

(a) The discharge does not result in flooding, erosion, land instability or property damage; and

(b) There is no discharge of water from one catchment to water in another catchment; and

(c) The discharge does not change the water level range or hydrological function of any Regionally Significant Wetland; and

(d) When the discharge, including any discharge from a drain or water race, enters water in any lake, river, wetland or the coastal marine area; the discharge:

(i) Does not result in:

(1) A conspicuous change in colour or visual clarity; or

(2) A noticeable increase in local sedimentation,

in the receiving water (*refer to Figure 5*); and

(ii) Does not have floatable or suspended organic materials; and

(iii) Does not have an odour, oil or grease film, scum or foam; and

(e) When the discharge enters water in any drain[1] that goes to a lake, river, wetland, or the coastal marine area, the discharge:

(i) Does not result in:

(1) A conspicuous change in colour or visual clarity; or

(2) A noticeable increase in local sedimentation,

in the lake, river, wetland or the coastal marine area (*refer to Figure 6*); and

(ii) Does not result in the production of conspicuous floatable or suspended organic materials in the drain at the first of:

(1) The downstream boundary of the landholding where the discharge occurs; or

[1] In Rules 12.C.1.1 and 12.C.1.1A, ‘drain’ includes any system of drains that goes to a lake, river, wetland or the coastal marine area.

(2) Immediately before the drain enters a river, lake, wetland or the coastal marine area; and

(iii) Does not have an odour, oil or grease film, scum or foam; and

(f) When the discharge enters water in any water race[2] that goes to a lake, river, wetland, or the coastal marine area, the discharge

(i) Does not result in:

(1) A conspicuous change in colour or visual clarity; or

(2) A noticeable increase in local sedimentation,

in the water race (*refer to Figure 7*); and

(ii) Does not result in the production of conspicuous floatable or suspended organic materials in the race at the first of:

(1) The downstream boundary of the landholding where the discharge occurs; or

(2) Immediately before the race enters a river, lake, wetland or the coastal marine area; and

(iii) Does not have an odour, oil or grease film, scum or foam; and

~~(g) From 1 April 2026, the discharge also complies with 12.C.1.1A.~~

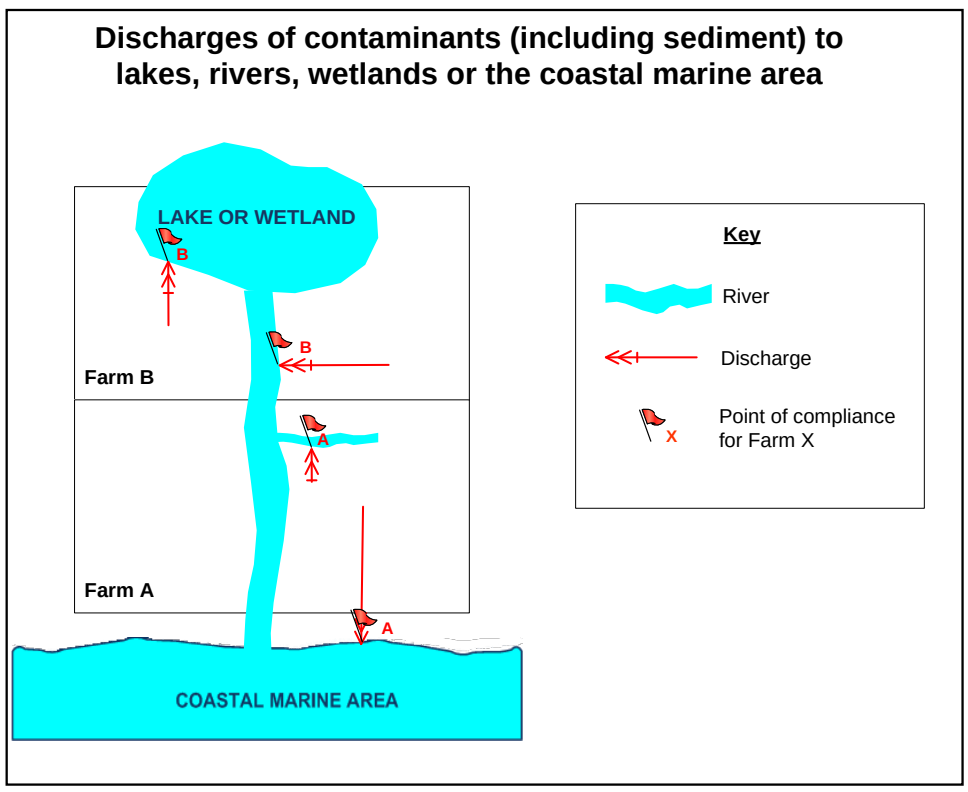


Figure 5: Implementation of Rule 12.C.1.1(d)(i)

[2] In Rules 12.C.1.1 and 12.C.1.1A, 'water race' includes any system of water races that goes to a lake, river, wetland or the coastal marine area.

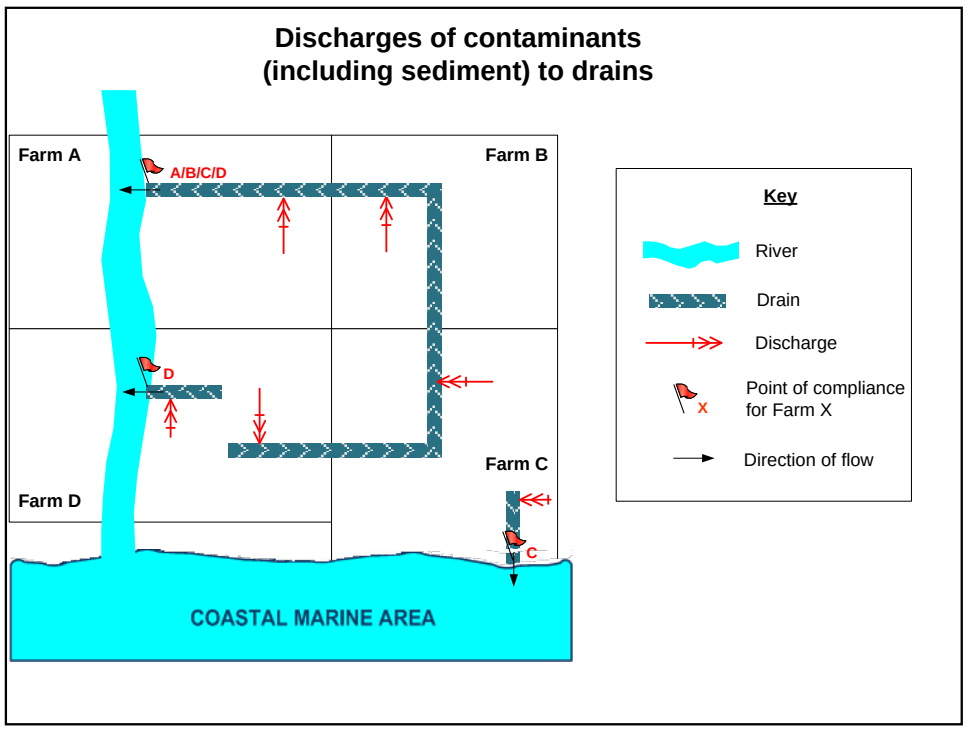


Figure 6: Implementation of Rule 12.C.1.1(e)(i)

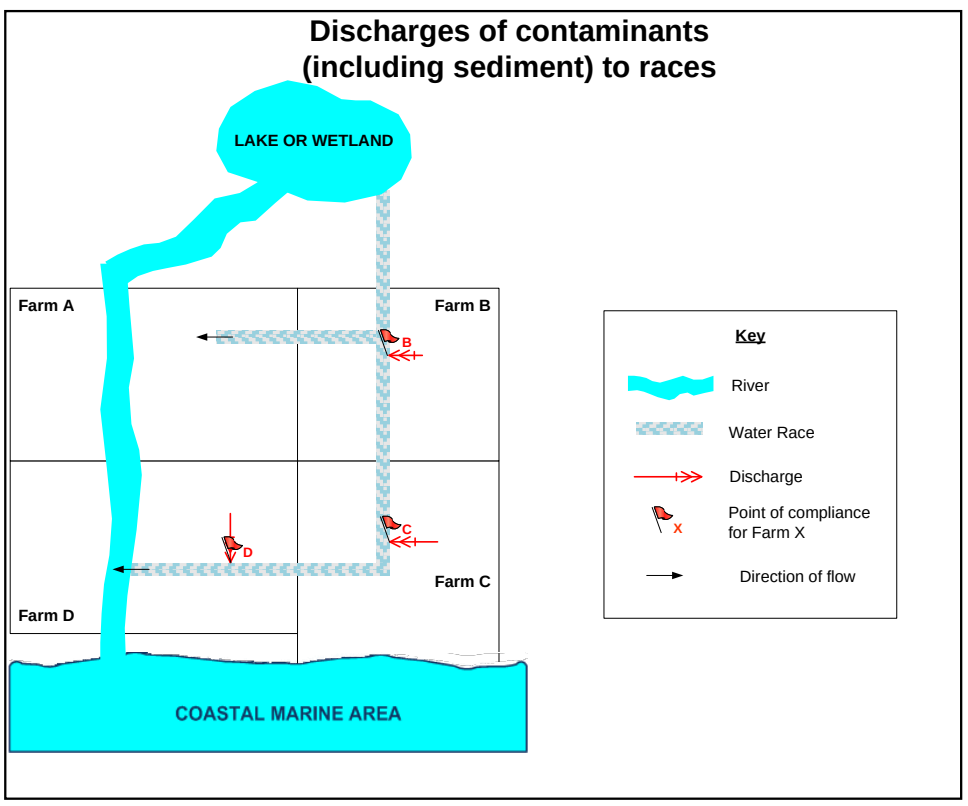


Figure 7: Implementation of Rule 12.C.1.1(f)(i)

~~12.C.1.1A From 1 April 2026, in addition to Rule 12.C.1.1, when the water flow at the relevant representative flow monitoring site is at or below the reference flow in Schedule 16B, the following conditions apply:~~

~~(a) (i) If the discharge causes contaminants to first enter water in any lake, river, wetland, or the coastal marine area, the discharge does not exceed any of the thresholds in Schedule~~

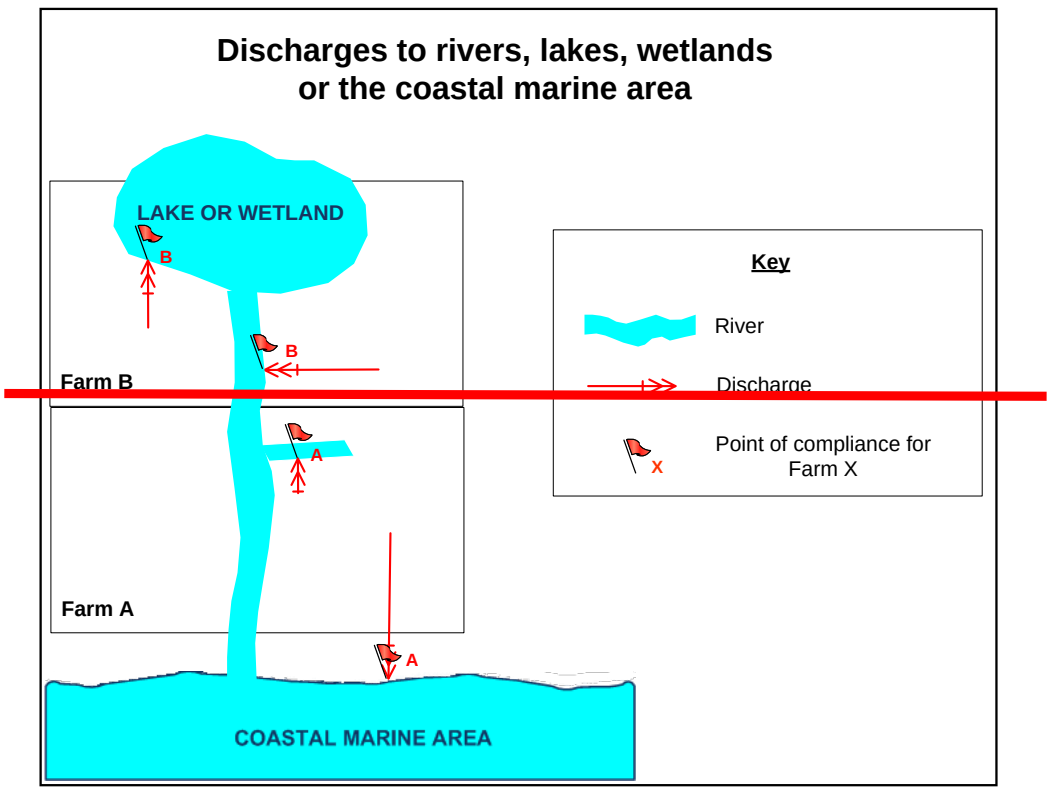
~~16A immediately before entering a river, lake, wetland or the coastal marine area (refer to Figure 8),~~

~~except:~~

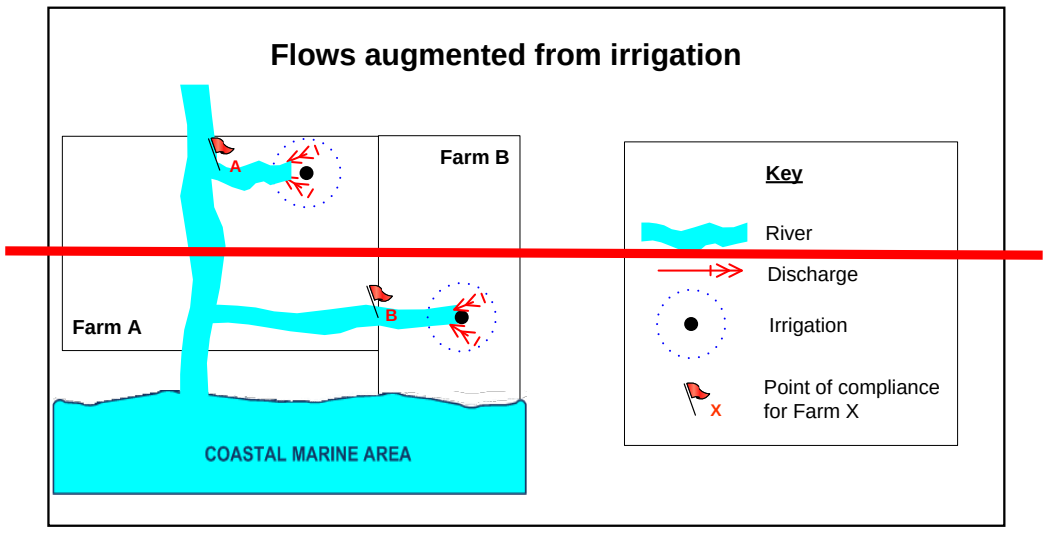
~~(ii) If the discharge causes contaminants to first enter water in a river which originates in the landholding where the discharge occurs and which conveys irrigation runoff, then the discharge does not result in the exceedance of any of the thresholds in Schedule 16A at the first of:~~

~~(1) The downstream boundary of the landholding where the discharge occurs; or~~

~~(2) Immediately before the river joins another river, lake, wetland or the coastal marine area (refer to Figure 9); or~~



~~**Figure 8: Implementation of Rule 12.C.1.1A(a)(i)**~~



~~**Figure 9: Implementation of Rule 12.C.1.1A(a)(ii)**~~

~~(b) If the discharge causes contaminants to first enter water in a drain that goes to a lake, river, wetland or the coastal marine area, then:~~

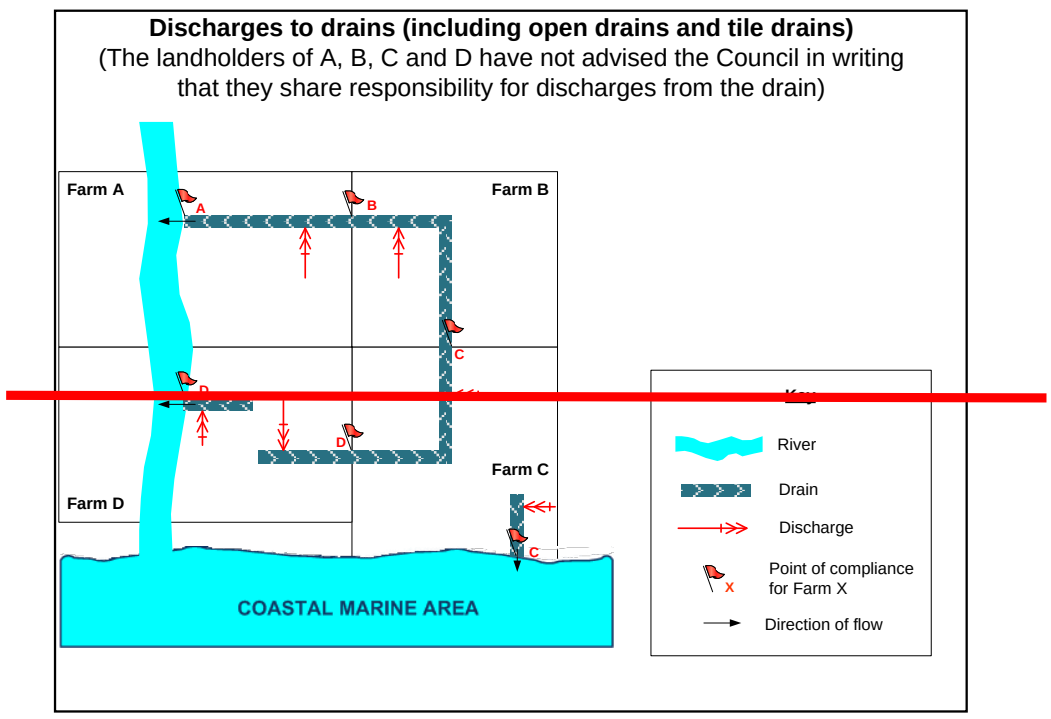
~~(i) The discharge does not result in the exceedance[3] of any of the thresholds in Schedule 16A within the drain at the first of:~~

~~(1) The downstream boundary of the landholding where the discharge occurs; or~~

~~(2) Immediately before the drain enters a river, lake, wetland or the coastal marine area (*refer to Figure 10*),~~

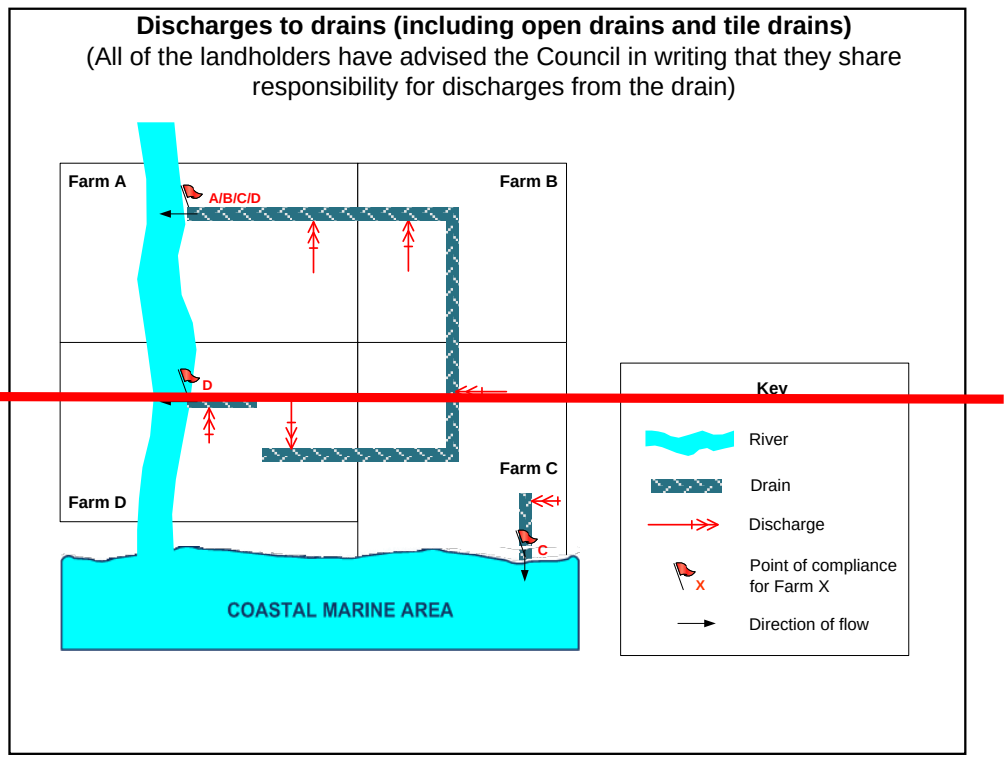
~~except:~~

~~(ii) If all of the dischargers to the drain have advised the Council in writing that they share responsibility for discharges from that drain, contaminants in the drain do not exceed any of the thresholds in Schedule 16A immediately before the drain enters a lake, river, wetland or the coastal marine area (*refer to Figure 11*); or~~



~~**Figure 10: Implementation of Rule 12.C.1.1A(b)(i)**~~

~~[3] In determining whether the discharge results in the exceedance of any of the thresholds in Schedule 16A, the concentration of contaminants at the upstream boundary of the landholding where the discharge occurred shall be excluded.~~



~~Figure 11: Implementation of Rule 12.C.1.1A(b)(ii)~~

~~(c) If the discharge causes contaminants to first enter water in a water race that goes to a lake, river, wetland or the coastal marine area then:~~

~~(i) (1) Any measurable discharge does not exceed any of the thresholds in Schedule 16A immediately before entering the water race; and~~

~~(2) The cumulative contaminant discharge into the water race between the upstream boundary of the landholding where the discharge occurs and the first of:~~

~~(a) The downstream boundary of the same landholding; or~~

~~(b) Immediately before the water race enters a river, lake, wetland or the coastal marine area (*refer to Figure 12*),~~

~~does not exceed any of the thresholds in Schedule 16A,~~

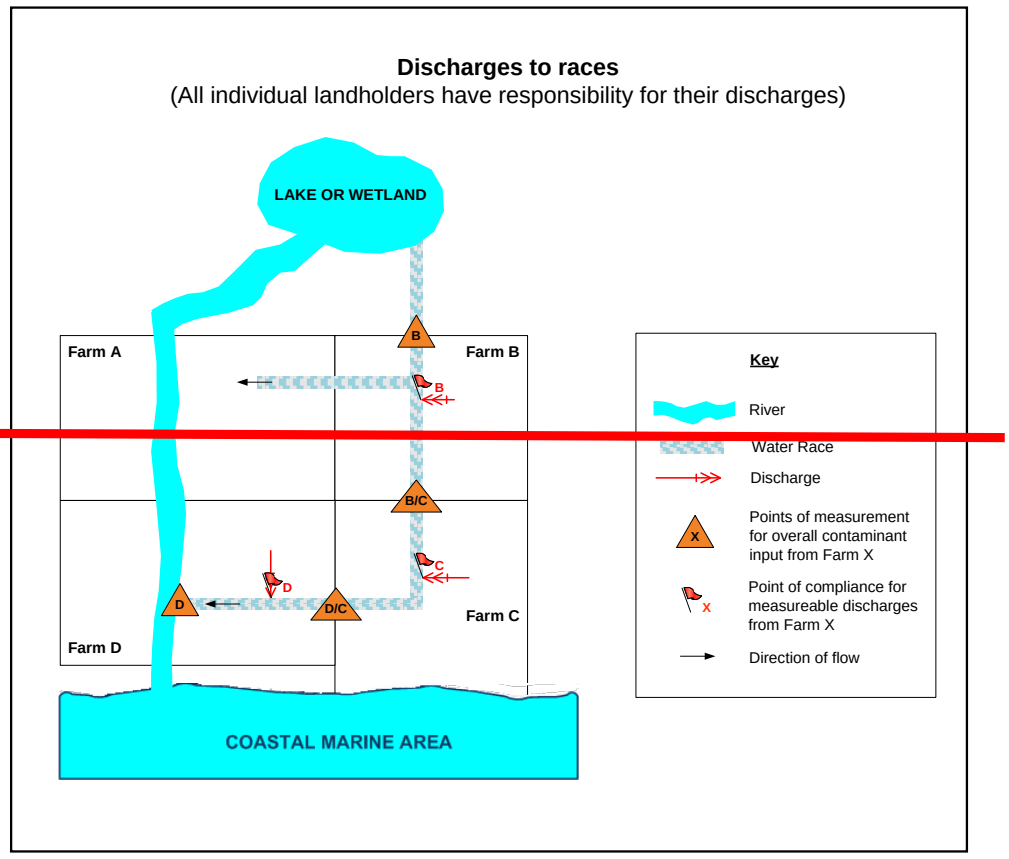
~~except:~~

~~(ii) If the race operator has advised the Council in writing that it takes responsibility for discharges to the race from specified landholdings:~~

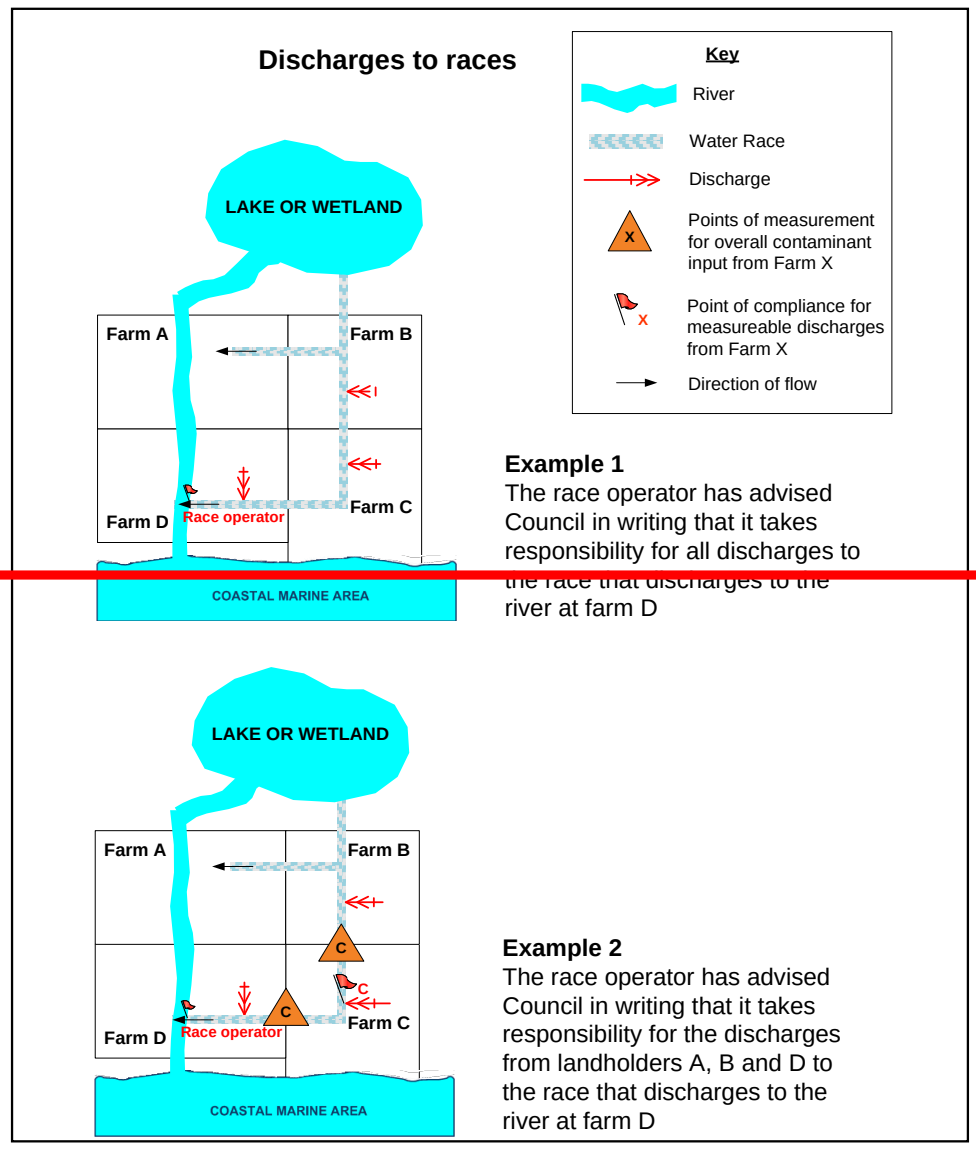
~~(1) Paragraph (i) does not apply to discharges from those specified landholdings; and~~

~~(2) Contaminants in the water race do not exceed any of the thresholds in Schedule 16A immediately before the race enters a lake, river, wetland or the coastal marine area (*refer to Figure 13*).~~

RULES: WATER TAKE, USE AND MANAGEMENT



~~**Figure 12: Implementation of Rule 12.C.1.1A(c)(i)**~~



~~**Figure 13: Implementation of Rule 12.C.1.1A(c)(ii)**~~

RULES: WATER TAKE, USE AND MANAGEMENT

…

~~12.C.1.3 The discharge of nitrogen[4] onto or into land in circumstances which may result in nitrogen entering groundwater, is a *permitted* activity, providing:~~

~~(a) From 1 April 2026, the nitrogen leaching rate does not exceed:~~

~~(i) 15 kgN/ha/year for the total area of land managed by a landholder that is located over the relevant Nitrogen Sensitive Zone identified in Maps H5 and H6; and~~

~~(ii) 20 kgN/ha/year for the total area of land managed by a landholder that is located over the relevant Nitrogen Sensitive Zone identified in Maps H1 to H4; and~~

~~(iii) 30 kgN/ha/year for the total area of land managed by a landholder that is located outside any Nitrogen Sensitive Zone identified in Maps H1 to H6,~~

~~as calculated using OVERSEER® version 6 by a Certified Nutrient Management Advisor in accordance with OVERSEER® Best Practice Data Input Standards; and~~

~~(b) (i) From 1 May 2014 to 31 March 2026, the landholder for outdoor pork, fruit (excluding grapes), berry and rotational vegetable production will keep a record of all inputs into the farm system and evidence that practices complied with the relevant industry good management practices and provide Council upon request with that information. From 1 April 2026, 12.C.1.3(b)(ii) will apply; and~~

~~(ii) From 1 May 2014, in all other cases, the landholder will:~~

~~(1) Maintain a record of all necessary data to run OVERSEER® version 6; and~~

~~(2) Provide Council upon request with:~~

~~(a) All necessary data to run OVERSEER® version 6; or~~

~~(b) Any available OVERSEER® version 6 output and input parameter report prepared by a Certified Nutrient Management Advisor in accordance with OVERSEER® Best Practice Data Input Standards.~~

~~[4] For the purpose of Rule 12.C.1.3, nitrogen comprises of organic nitrogen, ammoniacal nitrogen, nitrite nitrogen and nitrate nitrogen forms.~~

~~SCHEDULE 16: DISCHARGE THRESHOLDS~~

Schedules

~~16. Schedule of permitted activity discharge thresholds for water quality~~

~~Schedule 16 describes the thresholds that apply to discharges permitted under Rule 12.C.1.1A in the catchments of each discharge threshold area. Discharge Threshold Areas 1 and 2 catchments are shown on the J-series Maps.~~

~~16A Permitted activity discharge thresholds for water quality by discharge threshold area~~

~~Discharge Threshold Area 1 Catchments~~	~~Nitrate-nitrite nitrogen~~	~~Dissolved reactive phosphorus~~	~~Ammoniacal nitrogen~~	~~*Escherichia coli*~~
~~Timeframe~~	~~1 April 2026~~			
~~▪ Catlins ▪ Careys Creek ▪ Kaikorai ▪ Leith ▪ Mokoreta (within Otago) ▪ Owaka ▪ Pomahaka, downstream of Glenken ▪ Tahakopa ▪ Tokomairiro ▪ Tuapeka ▪ Waitahuna ▪ Waitati ▪ Waiwera ▪ Any unlisted tributary on the true right bank of the Clutha/Mata-Au, south of Judge Creek ▪ Any unlisted tributary on the true left bank of the Clutha/Mata-Au, south of the Tuapeka ▪ Any unlisted catchment that discharges to the coast, south of Taieri Mouth~~	~~3.6 mg/l~~	~~0.045 mg/l~~	~~0.2 mg/l~~	~~550 cfu/100 ml~~

SCHEDULE 16: DISCHARGE THRESHOLDS

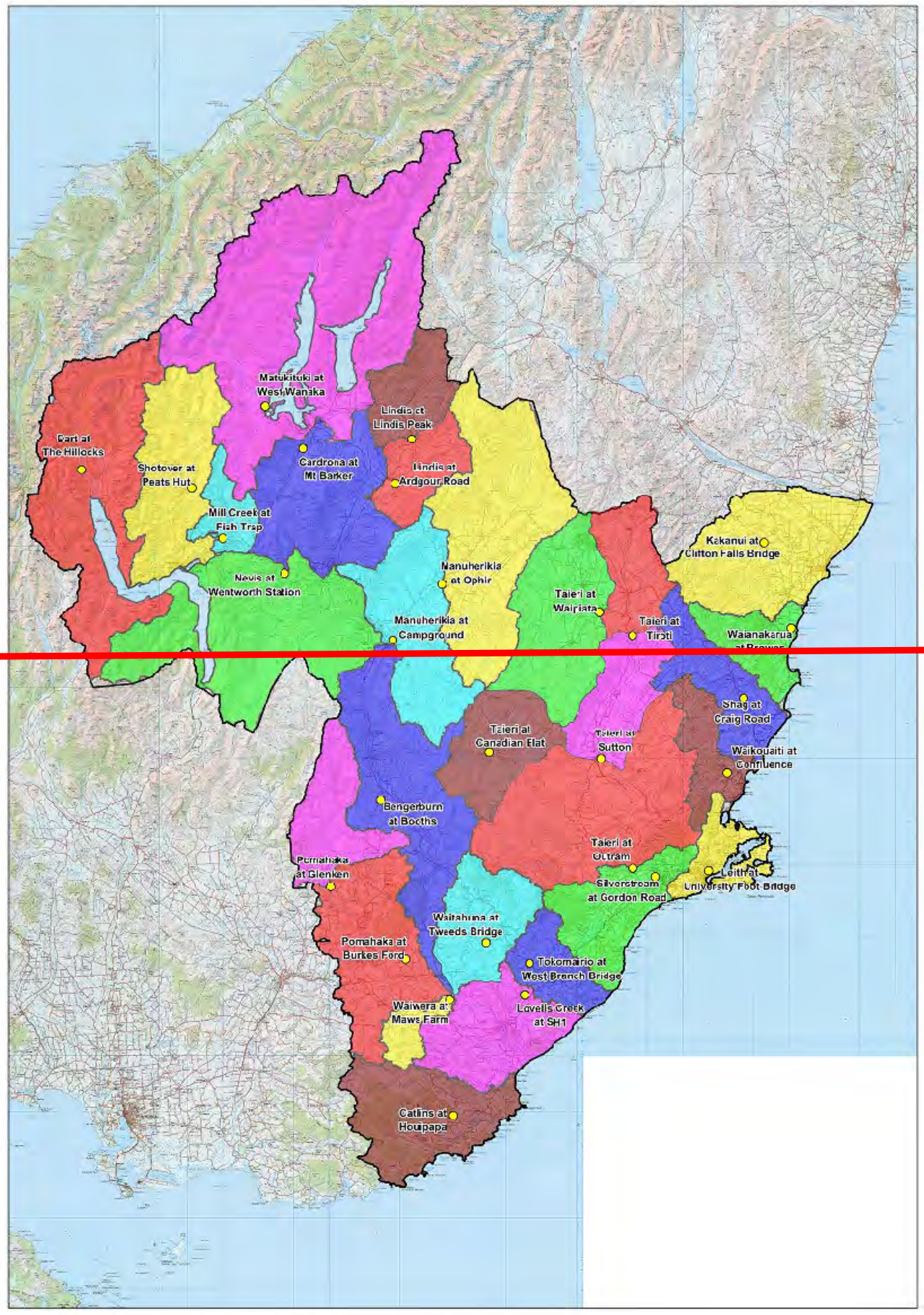
Discharge Threshold Area 2 Catchments	Nitrate-nitrite nitrogen	Dissolved reactive phosphorus	Ammoniacal nitrogen	*Escherichia coli*
Timeframe	1 April 2026			
▪ Cardrona ▪ Clutha/Mata-Au (above Luggate) ▪ Clutha/Mata-Au and any unlisted tributary (Luggate to mouth, including Lake Roxburgh, and excluding tributaries described in Discharge Threshold Catchment Area 1) ▪ Fraser ▪ Kakanui ▪ Kawarau ▪ Lake Dunstan ▪ Lake Hayes ▪ Lake Hawea and any tributary ▪ Lake Johnson ▪ Lake Onslow ▪ Lake Tuakitoto ▪ Lake Waipori & Waihola ▪ Lake Wakatipu and any tributary ▪ Lake Wanaka and any tributary ▪ Lindis ▪ Luggate ▪ Manuherikia ▪ Mill Creek (tributary to Lake Hayes) ▪ Pomahaka, upstream of Glenken ▪ Shag ▪ Shotover ▪ Taieri ▪ Trotters ▪ Waianakarua ▪ Waikouaiti ▪ Waipori ▪ Waitaki tributaries within Otago ▪ Any unlisted catchment that discharges to the coast, north of Taieri Mouth	1.0 mg/l	0.035 mg/l	0.2 mg/l	550 cfu/100 ml

mg/l = milligrams per litre
cfu/100 ml = colony-forming units per 100 millilitres

~~SCHEDULE 16: DISCHARGE THRESHOLDS~~

~~16B Representative flow monitoring sites and reference flows~~

~~Map 16B Representative flow monitoring sites for every part of Otago~~
~~Representative flow monitoring sites are shown on the Water Info website (http://water.orc.govt.nz/WaterInfo/Default.aspx).~~



SCHEDULE 16: DISCHARGE THRESHOLDS

Table 16B Reference flows at each representative flow monitoring site

Reference flows are fixed and have been calculated using median flow data from 01/01/2007 to 01/01/2013. River flows for Otago are available on the Water Info website (http://water.orc.govt.nz/WaterInfo/Default.aspx).

Monitoring Flow Site	Reference flow (cumecs)
Bengerburn at Booths	0.37
Cardrona at Mt Barker	1.95
Catlins at Houipapa	2.34
Dart at The Hillocks	51.49
Kakanui at Clifton Falls Bridge	1.29
Leith at University Foot Bridge	0.34
Lindis at Ardgour Road	3.50
Lindis at Lindis Peak	3.51
Lovells Creek at SH1	0.14
Manuherikia at Campground	11.60
Manuherikia at Ophir	8.01
Matukituki at West Wanaka	44.99
Mill Creek at Fish Trap	0.35
Nevis at Wentworth Station	7.25
Pomahaka at Burkes Ford	15.48
Pomahaka at Glenken	7.00
Shag at Craig Road	0.65
Shotover at Peats	18.12
Silverstream at Gordon Road	0.30
Taieri at Canadian Flat	2.45
Taieri at Outram	15.86
Taieri at Sutton	10.52
Taieri at Tiroiti	7.88
Taieri at Waipiata	6.02
Tokomairiro at West Branch Bridge	0.44
Waianakarua at Browns	0.78
Waikouaiti at Confluence	1.34
Waitahuna at Tweeds Bridge	1.55
Waiwera at Maws Farm	1.58

10.6. Jobs for Nature Projects Update

Prepared for:	Council
Report No.	GOV2567
Activity:	Governance Report
Authors:	Libby Caldwell (Manager Environmental Implementation), Sarah Irvine (Team Leader - Projects Delivery), Melanie White (Project Delivery Specialist - Freshwater and Biodiversity).
Endorsed by:	Joanna Gilroy, General Manager Environmental Delivery
Date:	27 August 2025

PURPOSE

[1] This report provides the final summary on two Jobs for Nature projects that Council has been involved in over the last four years. These projects are the Ministry for the Environment (MfE) funded Toitū Te Hakapupu/Pleasant River Catchment Restoration project (July 2021 – June 2025) and the Department of Conservation (DOC) funded Maintaining the Gains project (December 2021 – March 2025).

EXECUTIVE SUMMARY

[2] The Toitū Te Hakapupu/ Pleasant River Catchment Restoration project (Toitū Te Hakapupu) is a Council partnership project with Kāti Huirapa Rūnaka ki Puketeraki to improve water quality in Te Hakapupu/Pleasant River catchment

[3] The project was funded $5.0m through MfE's Essential Fresh Water Fund (EFF), Council contributed via an in-kind contribution and landowners contributed 25% of the value of the works on their property. A one-year project extension has been given to enable the project structure to support MfE funding of $80,000 for East Otago Catchment Group to develop a Pest Management Strategy, to complete a video story and a small amount of planting and fencing. All other deliverables have been completed on schedule.

[4] Maintaining the Gains was a Council partnership project with Queen Elizabeth II National Trust (QEII) and Aukaha to carry out pest plant control on QEII covenants and was funded through the Department of Conservation (DOC) Jobs for Nature fund.

[5] Council contributed project management support. The project started 31 December 2021 and was scheduled to be completed 31 December 2024. Council sought, and was granted, a project extension to 31 March 2025. No additional funds were sought or required.

RECOMMENDATION

That the Council:

1) ***Notes*** *this report.*
2) ***Notes*** *the work completed by all parties involved in these long-term projects and thanks them for their commitment to the projects and Otago's environment.*

DISCUSSION

Toitū Te Hakapupu

[6] The Toitū Te Hakapupu project was in the Te Hakapupu/Pleasant River catchment (Figure 1). The purpose of the project was to implement interventions to reduce excess sediment and nutrients deposited throughout the catchment and better safeguard the water resources from *ki uta ki tai* (mountains to the sea). These interventions have focused on improving ecosystem habitat and health, cultural values, and supporting recreation and amenity values.

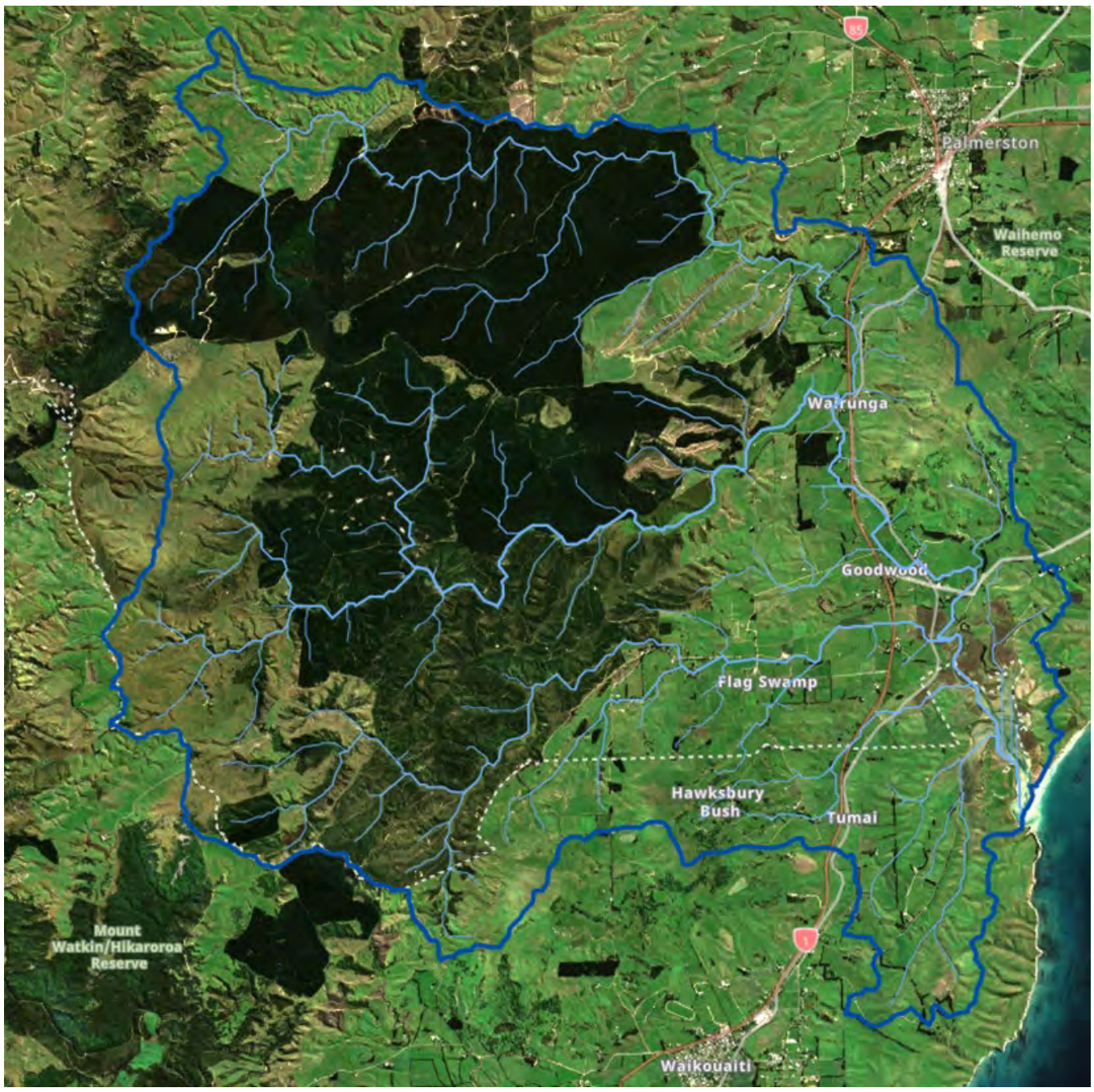


Figure 1: Satellite map showing catchment boundary (dark blue) and the three main waterways (light blue) leading into the estuary, Te Hakapupu (Pleasant River), Te Owhakaoho (Trotter) and Watkin.

[7] The interventions implemented throughout the Toitū Te Hakapupu project to protect or improve water quality are shown in Figure 2. The project has met or exceeded all Key Performance Indicators (KPIs). The main activities have been fencing waterways and wetlands (to exclude stock) and planting natives (trees, shrubs and wetland species).

Toitū Te Hakapupu – KPIs and other deliverables achieved		
Delivered	**KPI from funding deed**	**Achieved**
Requirement of funding deed		
Develop Partnership Group	1	successful
Cultural Health Monitoring Plan	1	1
Capability and Capacity Plan	1	1
Native plants in riparian and wetland areas	75,000	92,000
Fencelines to protect streambanks and wetland/estuarine areas	20 km	39 km
Landowners engaged with sediment controls completed	25	35
Fish Passage Assessment	1	1
Fish passage barrier improvement	3	5
Catchment Action Plan	1	complete
Forestry Action Plan	1	complete
Water quality monitoring	4 years	complete
Ecological baselines set	1	complete
Understand sediment movement	1	complete
Hotspots identified	1	complete
Other actions to improve water quality – unspecified in funding deed		
Sediment traps		10
Erosion planting		800 poplars
Willow removal and replanting		450 m
Kāti Huirapa Rūnaka ki Puketeraki activities		
Fish Passage Assessment	1	1
Cultural Health Monitoring Plan	1	1
Capability and Capacity Plan	1	1
Whitebait monitoring		1
Owhakaoho sand spit ecological survey		1
Hikaroroa Mahere whenua mahere mauka (Landscape Plan)		1

Figure 2: Toitū Te Hakapupu KPIs and deliverables achieved.

Planting

[8] A total of 92,000 native plants have been planted to stabilise eroding banks, provide habitat and increase biodiversity as part of the Toitū Te Hakapupu project. The location and extent of these is shown in Figure 3.

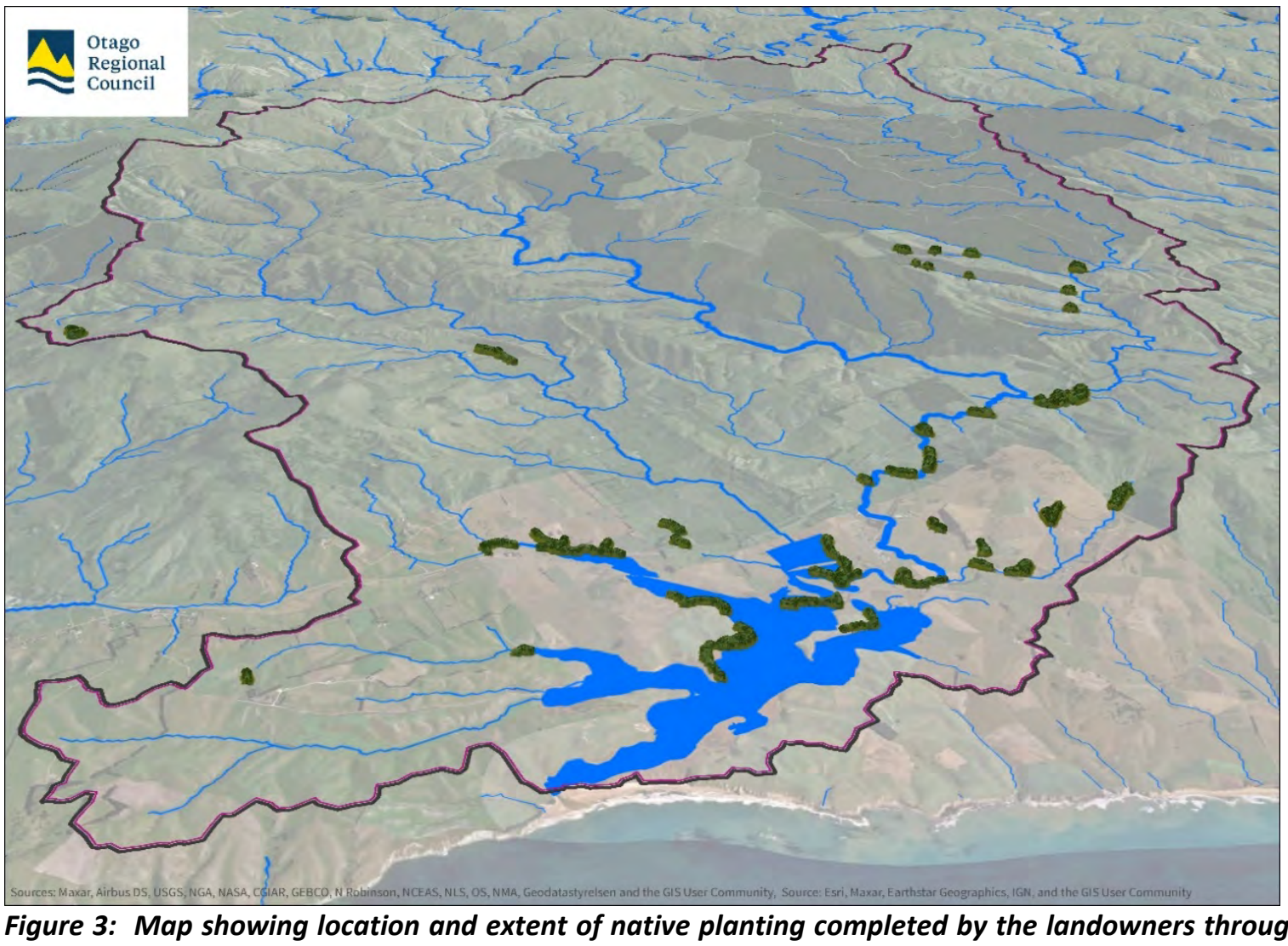


Figure 3: Map showing location and extent of native planting completed by the landowners through the project as green polygons.

Fencing

[9] A total of 39km of fencing has been installed to exclude stock from waterways and wetlands and protect water quality as part of the Toitū Te Hakapupu project. The location and extent of fencing is shown in Figure 4.

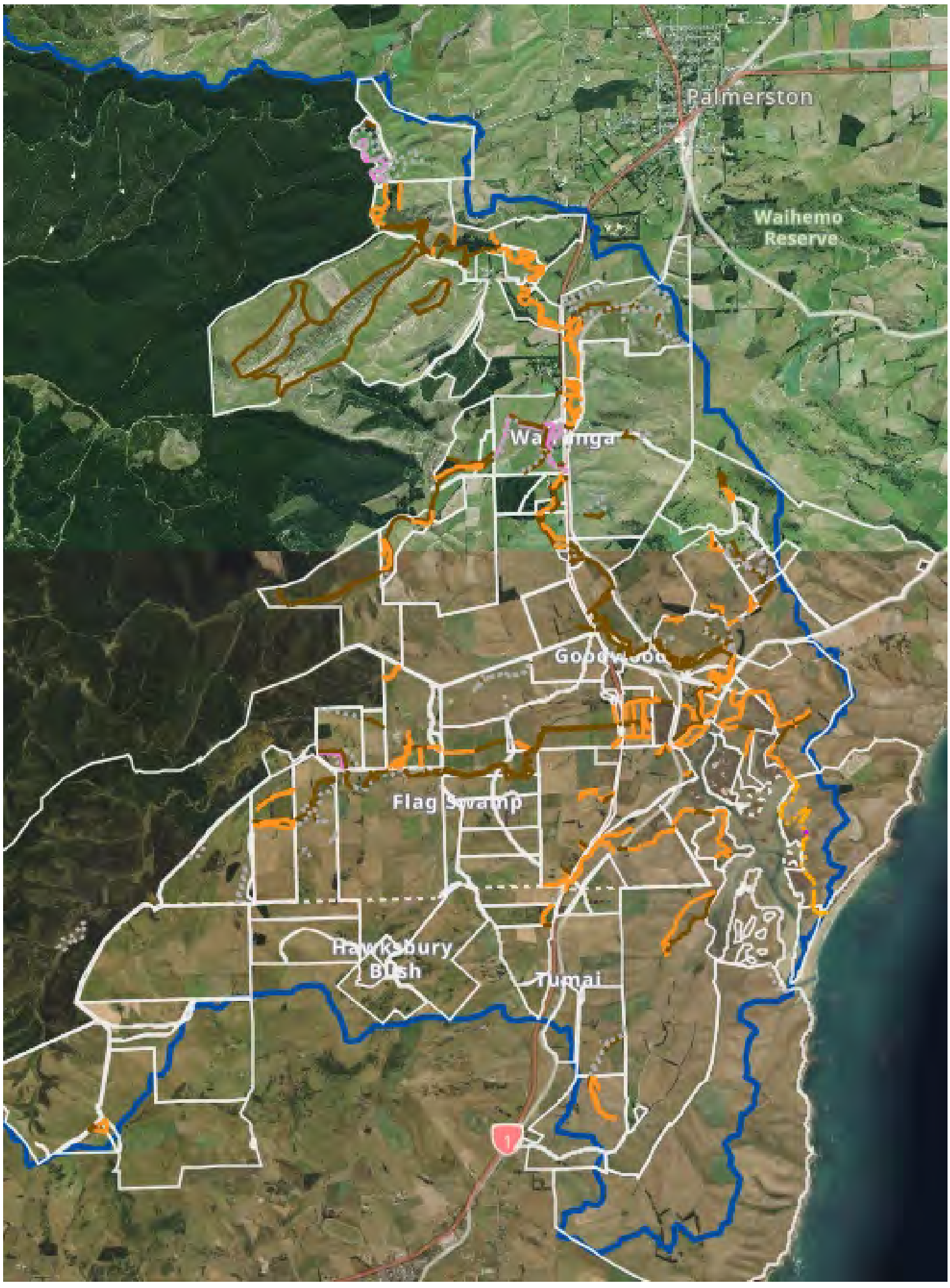


Figure 4: Orange lines on this map show location and extent of fencing completed by landowners through the project Te Hakapupu.

The Catchment Action Plan

[10] The Toitū Te Hakapupu Catchment Action Plan is completed. Key values for the catchment have been identified based on workshops and discussions with the community and representatives of Kāti Huirapa ki Puketeraki. Strategies and actions have been identified to support/enhance these values, many of which were supported by the Toitū Te Hakapupu project. The CAP has been developed to align with the Integrated Catchment Management process (Attachment 1).

Forestry Action Plan

[11] The Toitū Te Hakapupu Partnership Group initiated conversations with forestry companies to work together to do more to protect water quality at critical times in the forestry cycle. Following these conversations, plans are underway for a collaborative research project to investigate and understand how to best protect water quality throughout the harvest cycle. Goals and actions around forestry activities are within the Catchment Action Plan.

Environmental baselines

[12] Near the beginning of the project environmental baselines were measured to be able to identify changes as a result of environmental actions through the project, and beyond. Results show that Te Hakapupu/Pleasant River catchment and estuary are showing stress from the effects of land use, in particular excess sediment. The main goal of the project has been to reduce the levels of stress on Te Hakapupu and the catchment by specifically targeting interventions to reduce sediment entering the waterways and enhancing biodiversity.

Water Quality Monitoring

[13] Water quality monitoring has been completed over three years. This monitoring gives an indication of baseline nutrient and sediment load in the catchment. Ongoing monitoring will support the understanding of how actions on the ground influence water quality in the river and estuary habitat.

[14] Results so far indicate that turbidity (the measure of sediment in the river) exceeds the recommended threshold as set by the NPS-FM for ecosystem health. Various water quality monitoring methods applied over three years highlight how the ‘flashy’ nature of the catchment (long periods of extremely low flow, interspersed with high flow events) impacts water quality. Ongoing SOE monitoring at the Pleasant River site will give an indication of suspended sediment in the river over time. It is important to note that the work that has been completed through this project may take up to 10 to 15 years to show in the results of the monitoring programme

AquaWatch Waka

[15] Water quality measurements were taken across the catchment using five AquaWatch “Waka” (Figure 5). These measure dissolved oxygen, temperature, turbidity, pH and conductivity with data collected in real time and visible via a web page that community and rūnaka can sign in to. The Waka were a useful way to assess how activities, such as establishing sediment traps in minor tributaries, could influence turbidity (sediment load) in Te Hakapupu / Pleasant River.

[16] There is an opportunity for the waka to be utilised by other communities if they are looking to collect data, but this is still being assessed.



Figure 5: AquaWatch Waka in the Pleasant River

Understanding where sediment comes from

[17] Sediment source tracking (NIWA), erosion risk mapping (Whirika), actual erosion mapping (GeoSolve) and ground truthing were techniques used to understand key sediment sources in the catchment. Sediment hot spots were identified, along with land use activities that could be high risk for sediment production. Stream bank erosion and sub soil erosion were found to be the two key sources of sediment (NIWA). Certain land use activities were also seen to be high risk. This information has been included in mapping layers for Te Hakapupu catchment planning and data storage.

Community Engagement Events

[18] Of the 44 landowners engaged with, 35 proceeded with works on their properties to improve water quality. This is an 80% success rate. Many positive relationships were developed throughout the catchment over the four years. All agreements entered into were followed through and works successfully delivered on farms. Landowners primarily made their 25% contribution by working with the Aukaha Field Team planting or with contractors to complete their fencing.

[19] A number of community planting days were also organised to support landowners and the project (Figures 6 and 7). The last of these, held on 18 May 2025 to celebrate the project's achievements, was attended by over 70 people.



Figure 6: Community planting day in Te Hakapupu catchment



Figure 7: Poster created for Community planting day to highlight project activities

Council partnership with Kāti Huirapa Rūnaka ki Puketeraki

[20] Through the partnership between the Rūnaka and Council, Toitū Te Hakapupu has been able to achieve some remarkable results over the four years of the programme. Although Council has led much of the work around catchment planning, fencing, and planting, the Rūnaka has been heavily involved in cultural and ecological monitoring of the catchment, as well as several stand-alone projects that have made significant gains in ecological and cultural health.

[21] Cultural/ecological monitoring of the river and estuary have not only allowed for a deeper understanding of these areas but has also acted as a waka to reconnect mana whenua to ancestral sites and landscapes. This has informed targeted projects including fish passage restoration, a Landscape Management Plan for Hikaroroa/Mt Watkin, and the Owhakaoho (Hakapupu Sandspit) Restoration Plan. Up to ten rūnaka members have directly worked on the project, in various capacities, as well as a project coordinator. Key outcomes from these projects include:

a. Unrestricted fish passage to over 95% of the catchment, with an increase in whitebait migration of over 14,000% following fish passage remediation in the lower catchment.
b. The discovery of two mokomoko (skink) species on Owhakaoho as well as Otago's 4th known population of katipo spiders.
c. A landscape plan that integrates cultural and community values for Hikaroroa/Mt Watkin and creates a pathway for shared intergenerational connection to the mauka.
d. Over 40,000 native plants supplied by the Rūnaka nursery to undertake restoration projects in the catchment.

[22] In addition to these projects, Toitū Te Hakapupu has provided an opportunity for mana whenua to build capacity and capability across a variety of kaupapa, guided by Oraka Taiao, Oraka Whānau – The Taiao Capacity and Capability Strategy. The implementation of this strategy has allowed whanau to access training and certification across a number of taiao-related kaupapa and will continue to guide the Rūnaka well beyond the life of Toitu Te Hakapupu. The Rūnaka has also worked to bring together cultural narratives from historical and contemporary matauraka to showcase the deep connection that mana whenua holds for the awa and share their vision for the future of the catchment (Figure 11).



Figure 9: Poster describing Toitū Te Hakapupu partnership highlights

Fish passage

[23] Using the results of the fish passage barrier assessment completed by Puketeraki staff (kamahi) (Attachment 2), the project team identified five of the seven priority barriers for improvement. The project worked with Waitaki District Council to adapt two priority sites at road ford crossings at Patterson Road and Brooklands Road to improve fish passage. Three priority farm culverts were replaced to allow fish passage. One in the mid Te Hakapupu/Pleasant River and two in the lower Watkin River (Figure 10).



Figure 10: Snip of a poster created for community to highlight project activities

Sediment traps

[24] In the mid catchment area, one particular pastoral farm site was identified as a risk to water quality. At this site, ten sediment traps were installed, planted with natives and are being monitored over time (Figure 11). This represents significant work from the landowner and the project team.



Figure 11: Snip of poster created for community to highlight project activities

Willow removal

[25] Willows were removed from a 450 metre section of the Wilkin tributary. This enabled planting of 4,000 native plants to provide suitable native habitat. The willows were dominating this small tributary, diverting the stream flow and excluding any vegetation diversity.

Erosion planting

[26] Five landowners in Te Hakapupu catchment have planted poplars this winter, following erosion damage and slips in the October 2024 flood event. Poplar clones assessed as suitable for the East Otago catchment area have been planted and will be monitored with photo points over the coming years to assess the effectiveness of this trial work. The area planted will provide coverage of approximately 2.5 hectares.

Budget and KPIs

[27] The project has met all KPI within the Funding Deed, within the budget allocated ($4,040,000 MfE funding). There are some remaining activities such as fencing (980 m), planting (3,000 plants) and video stories (5 subject mini videos and 1 overarching video) to be completed over the coming months that will consume the remaining funding. MfE has agreed that the funding will roll over into the 25/26 financial year to enable this.

	MFE Claimed	ORC Inkind	Landowner Contributions	Grand Total
Year 1	$ 73,227.00	$ 28,546.00		$ 101,773.00
Year 2	$ 752,483.10	$ 560,712.17		$ 1,313,195.27
Year 3	$ 973,842.64	$ 346,709.09	$ 158,707.20	$ 1,479,258.93
Year 4	$ 2,043,308.03	$ 360,833.70	$ 271,665.15	$ 2,675,806.88
TOTAL PROJECT	$ 3,842,860.77	$ 1,296,800.96	$ 430,372.35	$ 5,570,034.08
Total MfE Funding available	$4,040,000			

Figure 12: Table showing total spend to end June 2025 for Toitū Te Hakapupu Project

Ongoing project work

[28] Although the bulk of the actions of the ground required in the funding deed have been complete, there are ongoing works required to support the success of some activities:

a. Planting has been completed, and now three years of maintenance will be carried out to ensure these plants survive and are not overwhelmed by pest plants. Contracts are in place for this.

b. Sediment traps have been installed, and these will be monitored to assess their effectiveness and ensure they remain effective. Sediment traps will be monitored by Landowners and catchment advisors.

c. Improvements in fish passage have involved modifying and replacing culverts. These will be monitored by landowners and catchment advisors to ensure they retain their integrity, and any maintenance is carried out to ensure their effectiveness.

d. Council has a flow monitor in Te Hakapupu/Pleasant River, and this will continue to provide water quality information to the rūnaka and the community.

<u>Maintaining the Gains</u>

Project overview

[29] In December 2021 Council received $961,234 of funding to work in partnership with QEII National Trust and Aukaha to control pest plants in priority QEII covenants over 3 years.

[30] The project was extended to 31 March 2025 – a total period of 3 years and 4 months. QEII representatives worked with Council staff to identify suitable covenants to assess and prioritise for pest plant work. A set of prioritisation criteria were agreed to select covenants where the most biodiversity value would be achieved from pest plant work.

[31] Aukaha and Council staff worked together to set up a team to carry out the pest plant control work. Aukaha recruited a kaiarahi (supervisor) and three kaimahi (staff) to train and carry out the pest plant work in covenants. QEII facilitated liaison between landowners and the Aukaha Field Team. Site visits were carried out by ORC, QEII and Aukaha to assess the covenant for suitability and priority and scope the work for planning purposes. The project reached and exceeded its KPIs, and targets stated in the Funding Deed and still came in under budget. The KPIs are shown below:

Maintaining the Gains Key Performance Indicators		
Indicator	KPI	Achieved
Conservation outcomes protected (Ha)	1,100	2525
Employment outcomes (no FTE)	7	7
Number of covenants pest plant control	16	36
Other required activities		
Training	Driver licensing, equipment training (e.g. scrub bar), 4WD training, Site monitoring, First Aid – bush safety, Plant identification, Weed control methods (Growsafe)	All training completed
Cultural Connections Plan	Matauraka Māori infused throughout project	Aukaha infuse māori tikaka, te ao māori and mātauraka throughout their organisation.

Figure 12: Maintaining the Gains Performance Indicators

[32] Outside of the KPIs achieved, multiple extra positive outcomes were achieved through this project. This includes:

a. Strengthened relationship with local weed control group SWAT (Seek Weeds And Terminate) who assisted with training on specific elements of local weed control.
b. Relationships developed between landowners and the Aukaha Field Team and Council staff.
c. Benefits to landowners (alongside weed control) in wellbeing - the feeling that their weed problem had been significantly reduced.
d. Three organisations working together effectively and forming great relationships.
e. Neighbours and the wider community talked positively about their achievements, ORC's support and the improvement in QEII site conditions due to the work.

[33] This model has worked well, with all this work taking place within the initially proposed budget.

Budget and Spend

[34] The Funding Deed for Maintaining the Gains project allowed for a total of $961,230.00. This funding was provided in progress payments. Because the project spend was not as high as budgeted, ORC only received $778,876 in total funding. Of that, the total spend was $654,819 with a surplus of $124,048. This was refunded to DOC.

Project Financial Summary - Maintaining the Gains

Otago Regional Council

Funding	
Grant Funding Received	778,867
	778,867
Expenses	
Legal Expenses	2,693
Motor Vehicle (ORC)	1,576
Professional Services and Consultants	13,416
Supplies, Services and Contractors	572,642
Time/Salary (ORC)	64,493
	654,819
Funding Surplus	**$124,048**

Figure 13: Spend detail for Maintaining the Gains Project showing surplus

[35] Aukaha are trialling a transition to commercial independence for their Field Team. They are trained and skilled in pest plant control and planting.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[36] Council's strategic directions commit Council to delivering integrated environmental management, engaging communities and collaborating to deliver, and this work is consistent with those commitments. These projects have delivered on these directions.

Financial Considerations

[37] There are some ongoing costs associated with delivery of the Toitū Te Hakapupu project specifically around the maintenance of plants. This has been captured in existing Environmental Implementation budgets to ensure that the success and investment made for this project is supported and long-lasting.

[38] Council have received a project extension for Toitū Te Hakapupu to facilitate fund management of $80,000 to East Otago Catchment Group to develop a Pest Management Strategy.

Significance and Engagement Considerations

[39] This update is consistent with the Council's Significance and Engagement Policy.

Legislative and Risk Considerations

[40] This paper does not trigger legislative or risk considerations.

Communications Considerations

[41] Communications around the achievements of the projects is ongoing and the Environmental Implementation staff will work with the Communications team to complete this.

NEXT STEPS

[42] Work will continue to deliver plant maintenance for Toitū Te Hakapupu, finalise the video story, and administer funding to East Otago Catchment Group to develop a pest management strategy.

ATTACHMENTS

1. Toitū Te Hakapupu Pleasant River Catchment Action Plan July 2025 [**10.6.1** - 20 pages]
2. Fish Passage Assessment of Te Hakapupu Pleasant River [**10.6.2** - 94 pages]
3. Te Hakapupu Pleasant River Nature-based Solutions Feasibility Study [**10.6.3** - 103 pages]
4. Appendix 1 Nature Based Solutions Technical Specification March 2024 [**10.6.4** - 14 pages]
5. Appendix 2 GH D Te Hakapupu Pleasant River Model Build Report December 2024 [**10.6.5** - 23 pages]
6. Appendix 3 Te Hakapupu Pleasant River Catchment Maps December 2024 [**10.6.6** - 11 pages]
7. Appendix 4 Biodiversity & Land Cover Te Hakapupu Pleasant River December 2024 [**10.6.7** - 4 pages]
8. Appendix 5 Landscape Context Te Hakapupu Pleasant River Catchment [**10.6.8** - 5 pages]
9. Appendix 6 Planning Context & Consenting Requirements Te Hakapupu Pleasant River Catchment December 2024 [**10.6.9** - 9 pages]
10. ORC BECA Nature Based Solutions for Flood Resilience Engagement Study July 2025 [**10.6.10** - 27 pages]

TOITŪ TE HAKAPUPU
PLEASANT RIVER CATCHMENT RESTORATION PROJECT

Toitū Te Hakapupu / Pleasant River Catchment Restoration Project

Catchment Action Plan

Date: July 2025



A partnership project by:

Otago Regional Council

Kāti Huirapa Runaka ki Puketeraki

In collaboration with:

Ministry for the Environment Manatū Mō Te Taiao | Essential Freshwater Fund

A JOBS FOR NATURE PROJECT

East Otago Catchment Group

TOITŪ TE HAKAPUPU
PLEASANT RIVER CATCHMENT
RESTORATION PROJECT

Developed with assistance from Whirika Consulting Ltd, July 2025

TOITŪ TE HAKAPUPU
PLEASANT RIVER CATCHMENT RESTORATION PROJECT

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A partnership project by:

Otago Regional Council

Kāti Huirapa Runaka ki Puketeraki

In collaboration with:

Ministry for the Environment Manatū Mō Te Taiao
Essential Freshwater Fund
A JOBS FOR NATURE PROJECT

East Otago Catchment Group

About the plan

The purpose of this Catchment Action Plan is to set out a pathway to achieve the community's vision for the catchment, including actions to address challenges in the catchment. Mana whenua and community perspectives underpin our plan's direction.

This plan has been prepared as part of the Toitū Te Hakapupu / Pleasant River Catchment Restoration Project (referred to as the 'Toitū Te Hakapupu project' or 'the project'), a Jobs for Nature project funded by the Ministry for the Environment. The project runs from July 2021 to June 2025 and is being delivered by the Otago Regional Council (ORC) in partnership with Kāti Huirapa Rūnaka ki Puketeraki (Puketeraki).

This is a living document, meaning it can evolve to guide Toitū Te Hakapupu project implementation and the restoration of the catchment over the short term (until mid-2025). It will also set a pathway to guide actions in the medium (15 years) and longer term (50 – 100 years).

The values and perspectives of mana whenua (Puketeraki) and local community form the basis of the plan. These essential inputs came from discussions with representatives of Puketeraki and from their own plans including a cultural health monitoring plan. Community perspectives came from three workshops in 2023 and discussions with local landowners and stakeholders.

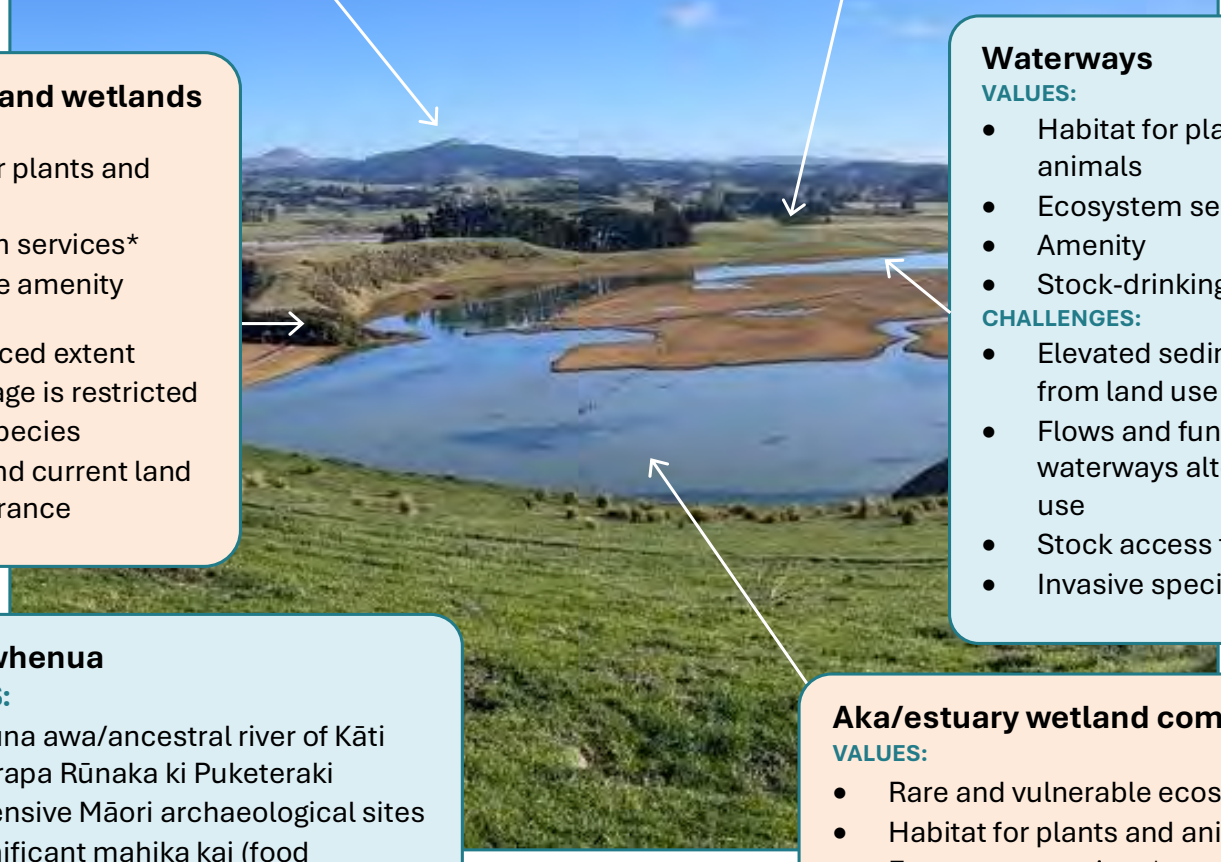
The results of a forestry action plan developed with a forestry working group are incorporated into this plan. This group consisted of representatives from Puketeraki, the local community, and forestry management companies, with five meetings held between May 2023 and March 2024. A risk assessment of forestry practices in relation to catchment values and objectives was created. Actions were identified and are incorporated into this plan.

The plan is also based on water quality and ecological health information collected as part of the project. Those results sit alongside a wider comprehensive overview of the natural characteristics of this catchment and land use and development within it - the '*Toitū Te Hakapupu/Pleasant River Catchment Restoration Project - Context analysis to inform catchment action plan*.' (Ahikā, 2023).

This plan is intended to be 'owned' collectively by the community, landowners and managers, Puketeraki, the ORC and other stakeholders. It informs and reflects the focus and priorities of the Toitū Te Hakapupu project. It can be utilised by landowners, community groups, local councils, and other stakeholders to focus and coordinate efforts to protect and enhance this catchment.

TOITŪ TE HAKAPUPU
PLEASANT RIVER CATCHMENT RESTORATION PROJECT

1. Te Hakapupu catchment at a glance



Distinctive peaks
VALUES:
- Culturally significant
- Recreation
- Landscape amenity

CHALLENGES:
- Land use affecting landscape amenity e.g. forestry on peaks
- Lack of access

Rural land
VALUES:
- Agricultural productivity
- Commercial forestry productivity
- Rural amenity

CHALLENGES:
- Pace of regulatory change
- Land use change
- Pests and weeds

Biodiversity and wetlands
VALUES:
- Habitat for plants and animals
- Ecosystem services*
- Landscape amenity

CHALLENGES:
- Loss/reduced extent
- Fish passage is restricted
- Invasive species
- Historic and current land use – clearance

Waterways
VALUES:
- Habitat for plants and animals
- Ecosystem services*
- Amenity
- Stock-drinking water

CHALLENGES:
- Elevated sediment inputs from land use
- Flows and functioning of waterways altered by land use
- Stock access to waterways
- Invasive species

Mana whenua
VALUES:
- Tīpuna awa/ancestral river of Kāti Huirapa Rūnaka ki Puketeraki
- Extensive Māori archaeological sites
- Significant mahika kai (food resources / gathering) sites

CHALLENGES:
- Lack of access
- Degraded waterways
- Significant depletion of mahika kai species
- Loss of kaitiakitaka and cultural inter-generational mātauraka (knowledge)
- Loss of integral cultural activity

Aka/estuary wetland complex
VALUES:
- Rare and vulnerable ecosystem
- Habitat for plants and animals
- Ecosystem services*
- Recreation
- Landscape amenity

CHALLENGES:
- Drainage and grazing
- Elevated sediment, nitrate and nutrient inputs from land use
- Modification of natural function e.g. flap-gates, embankments
- Invasive species

*Ecosystem services are the processes and outputs that nature provides us with, both direct and indirect, such as food, water, air quality, pollination, climate regulation and recreation.

Figure 1. Te Hakapupu Aka/Pleasant River Catchment at a glance

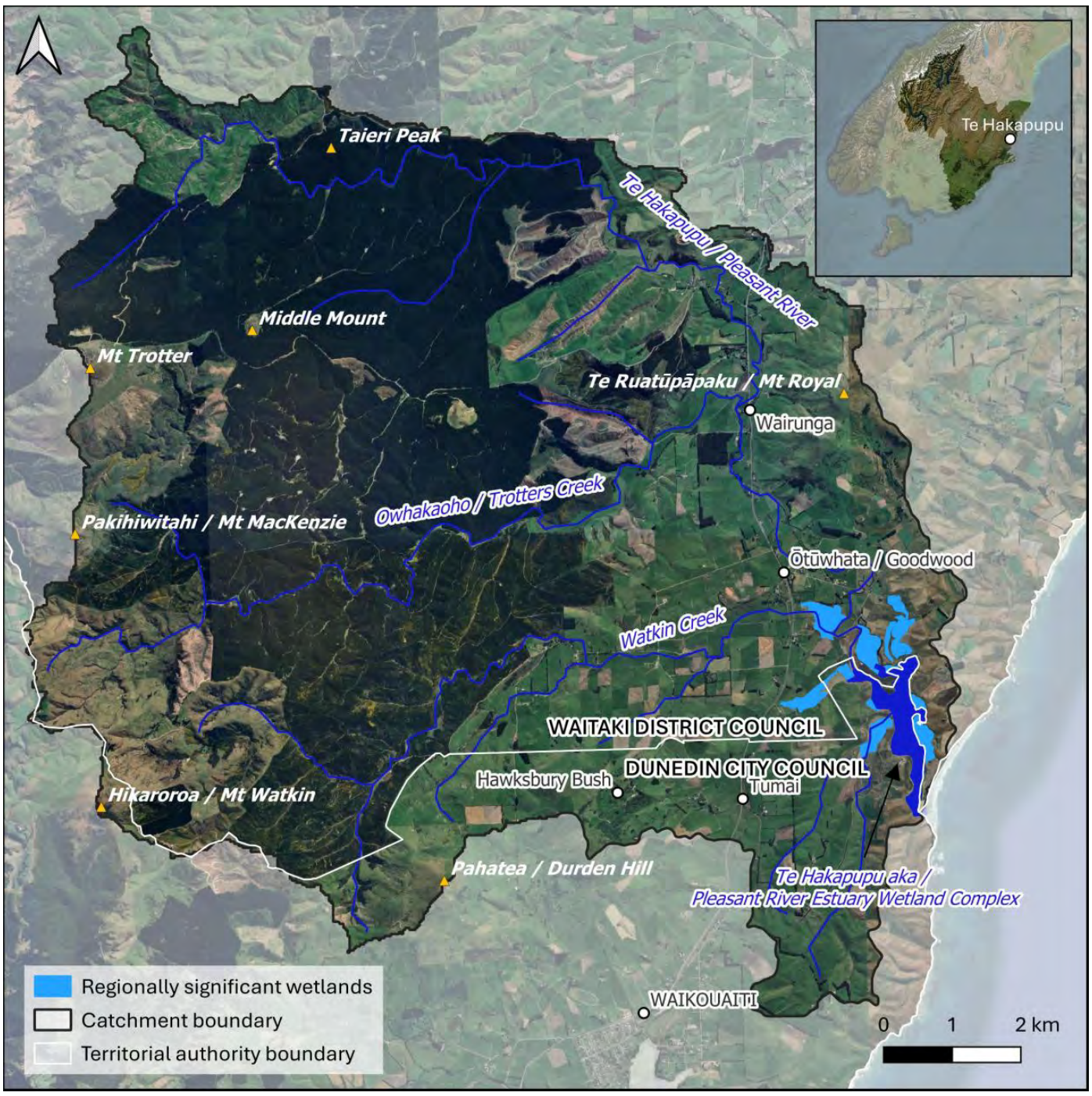


Figure 2. Te Hakapupu catchment in East Otago

2. Mana whenua

Kāti Huirapa Rūnaka ki Puketeraki holds mana whenua status in East Otago and Te Hakapupu catchment. As mana whenua Puketeraki have a kaitiakitaka obligation, arising from rakatirataka, to care for water bodies and protect their mauri from degradation. As with other catchments in East Otago, Te Hakapupu catchment was part of their network of seasonal trails and provided sources of mahika kai and mahika rākau (food and resources) as well as significant kāika mahika kai sites (food gathering places) for hapū and whānau bonding. Historically, species such as tuna

(eels), pātiki (flounders), and īnaka (whitebait) were gathered from the aka/estuary.[1] Note: Please refer to glossary for terms not defined here.

The approach taken by Kāti Huirapa Rūnaka ki Puketeraki to their water bodies throughout the rohe (area) is ki uta ki tai (mountains to sea). This reflects the whakapapa of water and the interconnectedness between water, land and its people. More detail is given about this in Appendix A and the Glossary.

3. What's distinctive about this catchment?

Key characteristics of this catchment include:

- Awa/waterways within the catchment flow into the aka/estuary wetland complex. Indigenous species within these awa/waterways include tuna/long and short-finned eel, inaka (the main whitebait species), kokopu/giant bully and banded kōkopu, bluegill bully. These awa/waterways are characterised by low flows, with occasional high flows and flooding from heavy rainfall events.
- The catchment's landscape is framed by six volcanic peaks located in or partially within the catchment.
- There are few remaining remnants of indigenous vegetation left in the catchment, with indigenous forest areas, kānuka and mānuka, tumatakuru/matagouri and grey shrub making up only 1% of the catchment's landcover.
- Plantation forestry has emerged as a land use in the last 30 years, expanding to now cover around 47% of the catchment overall. On a sub-catchment basis it is now the dominant land use: 66% of the Owhakaoho/Trotters Creek sub-catchment, 62% of the upper Te Hakapupu / Pleasant River catchment, and 27% of Watkins Creek sub-catchment).
- Low intensity sheep and beef farms make up 43.9% of the catchment area. Other land uses include deer farming, dairy farming and lifestyle blocks.

Mana whenua and community perspectives:

a. The catchment is highly valued by Puketeraki – for its trails, tīpuna awa/ancestral river, wāhi tapu, mahika kai and kāika mahika kai sites (food gathering places).
b. The catchment has a distinctive landscape with its backdrop of volcanic peaks.
c. The community values the low-intensity farming systems in the catchment and the rural amenity of the area.
d. The aka/estuary wetland complex is a special place for birds, fish and other species and for its historic sites, recreational use and amenity values.
e. People care for the biodiversity and environment of the catchment.

[1] **https://kahurumanu.co.nz/atlas**

TOITŪ TE HAKAPUPU
PLEASANT RIVER CATCHMENT RESTORATION PROJECT

4. A special place: Te Hakapupu Aka/Pleasant River Estuary Wetland Complex

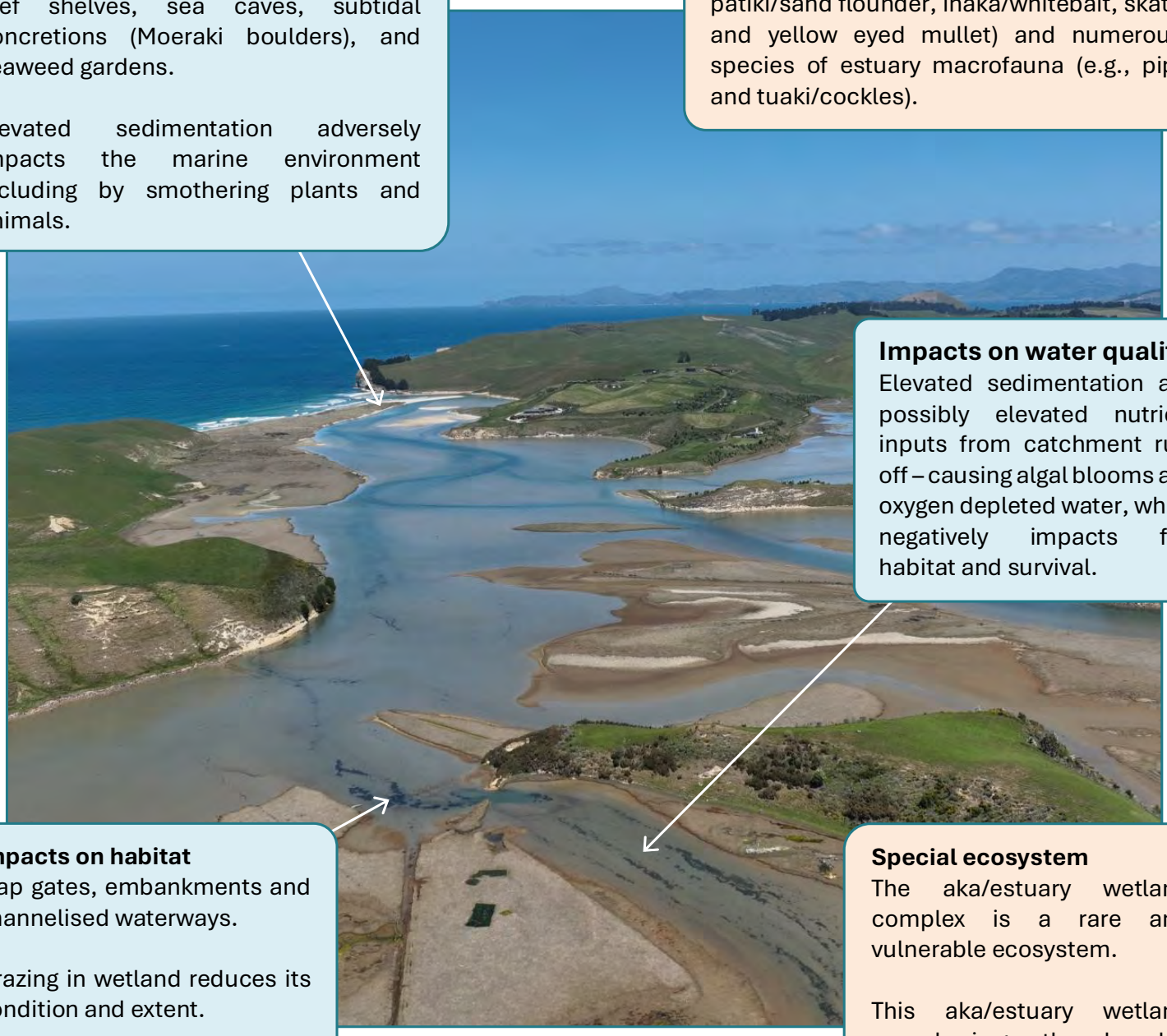
Marine reserve
Protects connection between waterways, estuary and marine habitats.

Links to rare examples of volcanic rock reefs, estuaries, kelp forests, exposed reef shelves, sea caves, subtidal concretions (Moeraki boulders), and seaweed gardens.

Elevated sedimentation adversely impacts the marine environment including by smothering plants and animals.

Diverse species
Home to many birds (e.g., bar-tailed godwit, banded dotterel, matukuku moana/white-faced heron).

Habitat for fish species (e.g. kahawai, pātiki/sand flounder, inaka/whitebait, skate and yellow eyed mullet) and numerous species of estuary macrofauna (e.g., pipi and tuaki/cockles).



Impacts on water quality
Elevated sedimentation and possibly elevated nutrient inputs from catchment run-off – causing algal blooms and oxygen depleted water, which negatively impacts fish habitat and survival.

Impacts on habitat
Flap gates, embankments and channelised waterways.

Grazing in wetland reduces its condition and extent.

Weeds and pest animals are impacting indigenous plants.

Special ecosystem
The aka/estuary wetland complex is a rare and vulnerable ecosystem.

This aka/estuary wetland complex is greatly reduced in area, and is now about 2% of its historic size.

Figure 3. Overview of Te Hakapupu Aka/Pleasant River Estuary Wetland Complex

5. Challenges in this catchment

5.1 Key challenge: elevated sediment inputs into awa/waterways

The key challenge facing Te Hakapupu catchment is the elevated level of sediment entering awa/waterways and the aka/estuary within the catchment. This is causing degradation of these awa/waterways, including by smothering habitat, decreasing invertebrates and food supply. This issue has been highlighted by monitoring work and has also been identified as a key concern of mana whenua, the local community and other stakeholders.

Information about the causes of the elevated level of sediment entering awa/waterways within the catchment are outlined below, along with other challenges facing the catchment.

5.2 Challenges linked to inherent and inherited factors

The following inherent (underlying characteristics) and inherited (caused by past activities) characteristics of the catchment create challenges:

1. **The geology of the catchment**: the presence of siltstone, sandstone and schist means that much of the catchment is vulnerable to erosion, including mass movement (slumping, landslides), rill and gully erosion, sheet erosion (e.g., washing/blowing away of exposed surface soils) and streambank erosion.
   Impacts:
   - Increased risks of erosion and sedimentation with elevated sediment inputs into awa/waterways and the aka/estuary which degrade habitat for freshwater species.

2. **Historic land development:** indigenous vegetation clearance including removal along riparian margins and steep erosion prone land; drainage of wetlands and cultivation.
   Impacts:
   - Increased risks of erosion and sedimentation – including streambank erosion, with elevated sediment inputs into awa/waterways and the aka/estuary.
   - Significant loss of biodiversity (with less than 1% of indigenous biodiversity remaining).
   - Significant loss of mahika kai (food resources) species such as tuna (eels), pātiki (flounders), and inaka (whitebait) and mahika rākau (plant resources) species such as raupō (bulrush), harakeke (flax), tūtū (native shrub) and toetoe.
   - Significant loss of wetland extent (including the aka/estuary wetland complex – with the remaining wetland estimated to be 2% of its original size).

3. **Climatic conditions:** Annual rainfall is low, (around 600-650 mm) and the catchment can become dry during the summer with very low instream flows and related impacts on instream habitat. The area can also experience sudden heavy rainfall events.
   Impacts:
   - Low flows can reduce instream habitat for freshwater species
   - Heavy rainfall events can cause landslips and erosion and increase sedimentation in awa/waterways and can damage infrastructure.

4. **Oxygen depleted ground water seeps:** Streams in some parts of the catchment may be influenced by anoxic ground water seeps (groundwater with depleted dissolved oxygen levels). The impact of these seeps is exacerbated by low flow conditions.
   Impact:
   - Adverse effects on fish and instream species.

5. **Historic modification of awa/waterways:** including culverts, embankments, flap-gates and straightening.
   Impacts:
   - Culverts limit the movements of migratory fish, disrupting their access to food, refuge and spawning areas.
   - Embankments and flap-gates impact natural functioning of awa/waterways e.g. reduced water volume and flushing flows within the aka/estuary arms.
   - Straightened awa/waterways can reduce instream habitat and result in faster flows that cause increased streambank erosion.

6. **Pests and weeds:** Some introduced animals and plants have become pest species.
   Impacts:
   - Weeds dominate and degrade biodiversity remnants and restoration plantings.
   - Pest animals such as deer, pigs and Canadian geese can cause damage to farm crops, indigenous plant species and streambanks (resulting in elevated sedimentation in awa/waterways). Pest animals can also contribute to increases of *E.coli* in awa/waterways.
   - Weed species such as willows or alders within awa/waterways may act as silt traps or create blockages within a channel, potentially exacerbating flooding of adjacent land.

7. **Combined**: land development (including private ownership), biodiversity and mahika kai loss, modification of awa/waterways and aka/estuary wetland complex.
   Impact:
   - Degraded biodiversity and loss of access means mana whenua no longer have access to sites and resources which enable cultural traditions to be sustained, and the wider community have lost access to/or reduced quality of recreation sites and food gathering opportunities.

5.3 Challenges linked to current land use

Current land use activity also creates challenges for the catchment. These include:

Forestry:

- large amounts of sediment can enter awa/waterways and the aka/estuary due to harvest and replanting (including associated earthworks).
- a lack of public access into forestry estate.
- high populations of pest species such as deer and pigs.
- expansion of forestry within the catchment may extend low flow periods or reduce instream flows.

Farming:

- stock access to awa/waterways results in:
  - damage to streambanks (increasing sedimentation in awa/waterways), poor instream habitat, degraded or destroyed spawning habitat
  - an increase in contaminants (including *E.coli*) in awa/waterways.
- run-off from poorly managed winter grazing practices can increase sedimentation in awa/waterways.

Appendix B gives more information about the challenges caused by land use within this catchment, and the results of monitoring of awa/waterways and the aka/estuary wetland complex.

What mana whenua and the community are concerned about:

a. The impacts of land use on awa/waterways, primarily due to erosion and sedimentation from stock and forestry and the lack of riparian protection.
b. The increased amount of forestry in the catchment and the associated risk of sediment entering awa/waterways and the aka/estuary.
c. Mahika kai resources have been significantly degraded by the effects of land development and practices on water quantity and water quality.
d. Forest owners and managers don't live in the catchment, creating a feeling of decreased social connection and concern as to whether owners/managers feel a sense of care for the catchment's environment.
e. The lack of access to parts of the catchment – including to peaks located within the forestry estate, awa/waterways and the aka/estuary wetland complex.
f. Biodiversity loss and management of pest species – including animals and weeds.
g. The community feels there is a lack of knowledge and implementation of good land use practices, especially by forestry companies.

6. The vision for the catchment

The vision for Te Hakapupu/Pleasant River Catchment:

He puna waiora, he whenua haumako /
A flourishing catchment and community

Outcomes to achieve this vision are:

1: Awa/waterways and the aka/estuary wetland complex are healthy.

2: Biodiversity within the catchment is thriving.

3: Kāti Huirapa Rūnaka ki Puketeraki values and role as kaitiaki are recognised and upheld.

4: Productive land use supports a thriving and connected community.

7. Achieving the vision

Objectives and corresponding actions have been developed to achieve these outcomes and are outlined below. Some of the key methods that can be used to measure progress towards the outcomes are also outlined below. More detailed targets and indicators have also been set for several of the actions and can be shared on request.

Outcome 1: Awa/Waterways in the catchment and the aka /estuary wetland complex are healthy.

Objective 1A. Sediment, nutrient and contaminant inputs to awa/waterways are reduced and water quality is improved.

Objective 1B. Riparian and instream habitat for freshwater and estuarine species is improved in condition.

Objective 1C. The condition of wetland areas within and around the aka/estuary wetland complex are improved.

Objective 1D. Natural functioning of awa/waterways and aka/estuary wetland complex is enhanced where there is landowner agreement.

Actions to improve water quality – with a key focus on reducing sediment inputs

1.1 **PRIORITY ACTION:** Install sediment traps in sediment hotspots on farmland and in the forestry estate, focusing on sediment capture close to the source.

1.2 **PRIORITY ACTION:** Plant trees and shrubs to stabilise land slips on farmland and in the forestry estate, to reduce erosion and sediment inputs to the awa/waterway.

1.3 **PRIORITY ACTION:** Fence and plant riparian margins (beyond regulatory requirements) where there is stream bank erosion, fish spawning habitat or run-off mitigation potential, and landowner agreement.

1.4 Land managers (forestry and farming) comply with regulations e.g. for farming: stock exclusion, winter grazing consents and for forestry: setbacks of new plantings from awa/waterways.

Actions to improve instream habitat

1.5 Fence and plant riparian margins to protect or create fish spawning and breeding habitat, based on an assessment of priority/benefit and feasibility.

1.6 Assess and upgrade culverts and fords to aid fish passage up and down awa/waterways.

Actions to restore the aka/estuary wetland complex

1.7 Based on a restoration investigation for the aka/estuary wetland complex, implement process of working with landowners to:

a. retire additional area/buffers around salt marsh areas from grazing.
b. carry out weed management within aka/estuary wetland complex.
c. alter structures affecting natural functioning of flows in the aka/estuary, focusing on flap gates in particular.

Actions to improve flow management

1.8 Enhance the function of existing wetlands, or construct wetlands to support water holding capacity during higher flows and increased water yields during periods of lower flows.

1.9 Willows and alders within awa/waterways are actively managed where they exacerbate flood risk (based on results of flood management assessment).

1.10 Re-naturalise the flow path of straightened awa/waterways where this will reduce streambank erosion and improve in-stream habitat, and will not exacerbate flood risk.

How progress towards Outcome 1 will be measured:

A. Fish surveys for target species (inaka, banded kōkopu, kōaro, giant kōkopu) – using the Fish Index of Biotic Integrity.

B. The Taxon-Independent Community Index - environmental DNA (eDNA) analysis to identify which species are present in awa/waterways.

C. Aka/estuary monitoring. This may include the following:

- Fine sedimentation monitoring
- Seagrass extent
- Macroalgal cover.

The monitoring specified above will be the key methods of measuring progress in addressing the key challenge for the catchment – the elevated levels of sediment entering awa/waterways.

Outcome 2: Biodiversity within the catchment is thriving.

Objective 2A. Existing remnants of indigenous vegetation and wetlands are protected from surrounding land uses.

Objective 2B. Indigenous vegetation in the catchment is increased.

Objective 2C. Pest species (animals and weeds) are controlled to a level that limits damage to indigenous biodiversity as well as farm land and farm operations.

Actions to protect biodiversity

2.1 Carry out a biodiversity assessment and develop a biodiversity strategy for the catchment.

2.2 Fencing off (beyond regulatory requirements) native riparian margins, wetlands and native shrubland areas to prevent disturbance from stock.

2.3 Create setbacks (beyond regulatory requirements) for earthworks, and forestry activities from wetlands and riparian margins.

Actions to increase biodiversity

2.4 Additional planting of indigenous species, focused on

a. enhancing remnants
b. potential for biodiversity corridors
c. riparian plantings
d. replacing riparian weed trees with native species e.g. willows and alders where appropriate from a flood management perspective.

2.5 Creation of biodiversity hubs and corridors with indigenous species within the forestry estate, includes enhancement of riparian zone.
2.6 Enhance wetlands through plantings and weed management.
2.7 Develop and share local native planting guides.

Actions to manage weeds and pests

2.6 Undertake weed and pest surveys to inform actions.
2.7 **PRIORITY ACTION:** Increase coordinated management of pest animals and weeds, with priority given to pest animals.

How will progress towards Outcome 2 be measured:

A. Vegetation structure and composition
B. Land under indigenous vegetation
C. Distribution and abundance of weeds and animal pests

Outcome 3: Kāti Huirapa Rūnaka ki Puketeraki values and role as kaitiaki are recognised and upheld.

Objective 3A. Mahika kai and taoka species are sufficiently abundant to support cultural practices.

Objective 3B. Mana whenua access to kāika mahika kai locations, wāhi tapu and wai tapu (culturally significant sites) is improved.

Actions to restore mana whenua values

3.1 Mahika kai, kāika mahika kai locations and taoka species habitats are prioritised for planting, stock fencing and water quality improvement actions.
3.2 Planting of raupō along Te Hakapupu awa (SH1 from around Patterson Road and upstream) and protection with fencing.
3.3 Make existing access paths to culturally significant sites known with communication to rūnaka, and information signs, including in te reo Māori, and maintain and enhance these paths.
3.4 Establish new access paths or informal access agreements to kāika mahika kai locations, wāhi tapu, wai tapu and other culturally significant sites with landowner agreement, to enable mātauraka Māori to be shared with Rūnaka members, with te reo Māori signage where appropriate.

How progress towards Outcome 3 will be measured:

A. Cultural Health Index assessment

Outcome 4: Productive land use supports a thriving and connected community.

Objective 4A. Productive land uses within the catchment are supported to comply with regulation and apply best management practices that support the environment and the viability of their business.

Objective 4B. Opportunities for social connection are provided for the local community.

Objective 4C. There are trails and recreational opportunities within the catchment, that the local community know about and enjoy.

Actions to support productive land use

4.1 **PRIORITY ACTION:** Hold community events to inform, encourage and support farmers and forestry managers with best management practices and hold workshops to work together through challenges, with a key focus on minimising the amount of sediment entering waterways.

4.2 Provide information resources to farmers and forestry managers.

Actions to improve social connection

4.3 Hold community events such as science activities, planting days and field days.

4.4 Support relationships and communication within the community, including between forestry owners and managers, Rūnaka and landowners, via in person activities, and communications including through social media.

Actions to improve recreational opportunities

4.5 Assess potential access routes and recreation sites within catchment and develop options for their enhancement.

4.6 Forestry companies communicate with the community about how to access forestry areas.

4.7 Restore access to and the quality of food gathering, recreational, swimming and/or other human use values and areas e.g. picnic area, access to aka/estuary for kayaking, bird watching, walking.

How progress towards Outcome 4 will be measured:

A. Landowner and community perception (via feedback/survey)

8. Glossary

The meanings provided below are sourced from the glossary in the Kāi Tahu ki Otago Natural Resource Management Plan 2005, except those marked with an asterisk are sourced from Te Aka Māori Dictionary.

TERM	MEANING
aka	estuary (and within this document only, it refers also to the wetland estuary complex)
wa	river, stream
hapū	kinship group, clan, tribe, subtribe - section of a large kinship group and the primary political unit in traditional Māori society. A number of related hapū usually shared adjacent territories forming a looser tribal federation (iwi)*
kai	food*
kāika	home, village, settlement*
kaimoana	seafood*
Kāi Tahu	descendants of Tahu, the tribe
kaitiakitaka	the exercise of customary custodianship, in a manner that incorporates spiritual matters, by takata whenua who hold mana whenua status for particular area or resource
kaumātua	respected elder
mahika kai	places where food is produced or procured
mahika rākau	plant resources
mana whenua	customary authority or rakatirataka exercised by an iwi or hapū in an identified area
mātauraka	knowledge
mauri	essential life force or principle; a metaphysical quality inherent in all things both animate and inanimate. (Ngāi Tahu Fresh Water Policy)
mokopuna	grandchild, descendant
takiwā	area, region, district*
te taiao	the world, Earth, natural world, environment, nature*
tikaka	correct procedure or customs
tīpuna	ancestor
wai	water
whakapapa	genealogy
whānau	family

Appendix A: Mana whenua

Kāti Huirapa Rūnaka ki Puketeraki values are interwoven and include mauri, mahika kai, mātauraka Māori and kaitiakitaka. Mauri is a life-giving force that flows from our living world and down through whakapapa, connecting and binding together all aspects of our world. Protection of mauri is the primary resource management principle of Kāti Huirapa Rūnaka ki Puketeraki and mana whenua have a kaitiakitaka obligation, arising from rakatirataka, to care for our water bodies and protect their mauri from degradation. Kāi Tahu believe that people, flora, fauna and natural phenomena such as forest, waters, mist, wind and rocks possess a mauri or life force. Waterbodies and estuaries with an intact and strong mauri sustain healthy ecosystems and support mahika kai and other cultural values.

Many place names along the East Otago Coast originate from the waka Ārai-te-Uru. The names of the waves which wrecked the waka, plus the names of the many passengers of the waka are represented in the names of the reefs, hills, and mountains of East Otago. This includes Te Ruatūpāpaku/Mount Royal and Ohikaroroa (Hikaroroa)/Mount Watkin) - Te Ruatūpāpaku and Ohikaroroa were passengers on the Ārai-te-Uru waka.[2]

The availability, safe access to, and use of mahika kai supports and sustains connections to wāhi tīpuna, and the retention and transfer of mātauraka across the generations. Mātauraka Māori is a term that describes the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori creativity and cultural practices. The gathering of mahika kai provides for whānau wellbeing and contributes to manaakitaka by providing kai for events like hui.

Kāti Huirapa Rūnaka ki Puketeraki whānau have noted that their values associated with the catchment are currently degraded and their cultural traditions and practices are no longer able to be fully undertaken – including due to loss of access to sites (including significant kāika mahika kai sites) and loss or lack of abundance of mahika kai species – including awa/waterways within the catchment and within the aka/estuary wetland complex. The retention and passing on of inter-generational mātauraka Māori are only possible if resources such as mahika kai and accessibility to ancestral and traditional places are still available.

[2] https://kahurumanu.co.nz/atlas. This site notes that after the Ārai-te-Uru capsized, many passengers went ashore to explore, however they needed to be back at the waka before daylight. Most did not make it back, including Te Ruatūpāpaku and Ohikaroroa, and instead transformed into many of the well-known geographical features of Te Waipounamu. During the 1879 Smith-Nairn Royal Commission of Inquiry into the Kāi Tahu land claims, Kāi Tahu kaumātua Merekihereka Hape recorded Te Ruatūpāpaku as a kāika mahika kai/food-gathering place where tuna /eels, aruhe/bracken fernroot, kāuru/cabbage tree root), tūī, and kūkupu/wood pigeon were gathered.

Appendix B: Impacts of land use

Forestry and farming

Forestry as a land use has only emerged in the catchment since the 1990s but has increased substantially to now cover about half of the catchment. The harvest and replanting of this expanded forestry estate markedly increases the risk of sediment entering the catchment's awa/waterways and aka/estuary. Comparing recent sedimentation in the catchment's awa/waterways by land use type suggests that plantation forestry harvest areas can contribute a high proportion of sediment into awa/waterways.

Pastoral farming also increases the risk of erosion and sedimentation inputs – including through stock access in riparian areas, lack of vegetative cover in riparian areas and winter gazing. Pastoral farming can also result in elevated levels of nutrients and contaminants entering awa/waterways.

What monitoring tells us about the impacts of land use on the awa/waterways

Monitoring indicates high levels of sediment deposits present in mid-Watkin Creek, whilst monitoring of the aka/estuary wetland complex indicates elevated levels of sediment enter the aka/estuary from awa/waterways. Monitoring also suggests streambank and subsoil erosion are the primary sources of sediment depositing in awa/waterways, particularly from Owhakaoho/Trotters Creek.[3]

Water quality monitoring in this catchment is limited, but it suggests that water quality varies throughout the catchment. Data collected to date has identified breaches to the national bottom line for some of the *Escherichia coli* (E. coli) guidelines for ecosystem health and also for contact recreation (swimming). Sites sampled to measure awa/waterway ecological health, include rankings of 'fair', 'poor' or 'average', with most of the monitored sites ranked as 'fair'. Sites ranked as 'poor' were largely driven by channel modification, a lack of riparian vegetation, little shade, and higher amounts of stream bank erosion. [4]

Degraded aka/estuary wetland complex

The aka/estuary wetland complex is a critical receiving environment in the catchment. The historic extent of the aka/estuary wetland complex has significantly reduced in size (to approximately 2% of its original size) but remains the largest aka/estuary wetland complex in the North Otago Freshwater Management Unit (one of the areas in which the ORC manages water

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[3] Subsoils are soils underlying surface soils – these could be mobilised in a variety of ways e.g. from activities such as earthworks or roading, or as a result of landslides, slumping, or tunnel gully erosion.
[4] From ecological monitoring undertaken at ten sites during the Toitū Te Hakapupu project in 2023.

and sets freshwater objectives and limits). It is classified as a Naturally Uncommon Ecosystem (meaning historically rare) and as 'vulnerable' (ecosystem red-list criteria, International Union for Conservation of Nature) due to historic and ongoing loss in extent and decline in its ecological integrity.

This decline is due to a variety of factors including the presence of structures and embankments which impact natural flow characteristics, grazing of remaining wetland areas and the impact of weed species on indigenous plants species.

Monitoring of the aka/estuary has indicated that there are elevated nitrate and nutrient levels and sedimentation from catchment run-off, resulting in enriched muddy sediments in the aka/estuary, in part reflecting catchment land uses dominated by pastoral farming and exotic forestry.[5] This has resulted in signs of eutrophication, within the aka/estuary (i.e., excess algal growth coupled with poor sediment oxygen and muddy sediments), particularly in the side arms and upper aka/ estuary. Eutrophication is a process where the addition of nutrients in a waterbody can lead to algal blooms and oxygen depleted water, which negatively impacts fish habitat and survival.

While eutrophication was observed, the analysis of trace elements (focusing on heavy metals) carried out as part of the monitoring in the aka/estuary indicates that there are no significant contaminant sources in the catchment. This is positive as land use such as agriculture can lead to soil contamination with trace metals and other pollutants, which are associated with practices such as fertiliser application.

Reclamation, drainage and structures that impede salt marsh growth are common in the aka/estuary, including causeways, flap gates and shoreline hardening for rail infrastructure. These modifications have significantly altered aka/estuary hydrology and disrupted the natural connectivity between the land and the sea, compromising overall ecological health and ecosystem services.[6] Ongoing drainage and grazing of salt marsh habitat have also been identified as a significant issue for the health of the aka/estuary.

There is significant scope for salt marsh protection and restoration, with the largest gains likely achieved through restoring the natural connectivity (i.e., removal of flap gates, causeways), and re-flooding areas of existing or previous aka/estuary habitat, particularly in the upper aka/estuary where herb field vegetation persists. Active management to reduce catchment nutrient and sediment loads, and to prevent further salt marsh losses and enhance existing habitat will be necessary to prevent further decline, or to support enhancement of the aka/estuary. The

[5] Roberts KL, Stevens LM, Forrest BM, (2022) Broadscale intertidal habitat mapping of Pleasant River (Te Hakapupu) estuary. Salt Ecology, prepared for Otago Regional Council and Forrest BM, Roberts KL, Stevens LM (2022) Fine scale intertidal monitoring of Pleasant River (Te Hakapupu) estuary. Salt Ecology Report 093, prepared for Otago Regional Council. 29p.
[6] Roberts KL, Stevens LM, Forrest BM, (2022) Broadscale intertidal habitat mapping of Pleasant River (Te Hakapupu) estuary. Salt Ecology, prepared for Otago Regional Council

remaining areas of salt marsh will need to be protected and enhanced to prevent further losses with restoration undertaken in suitable areas.[7]

[7] Roberts KL, Stevens LM, Forrest BM, (2022) Broadscale intertidal habitat mapping of Pleasant River (Te Hakapupu) estuary. Salt Ecology, prepared for Otago Regional Council

FISH PASSAGE ASSESSMENT OF THE HAKAPUPU (PLEASANT) RIVER

Prepared by Kāti Huirapa Rūnaka ki Puketeraki



Matt Dale (Waterscape Connections Ltd) and Julia Rata te Raki, 2024

Kāti Huirapa Rūnaka ki Puketeraki

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Executive summary

The Toitū te Hakapupu project is a Ministry for the Environment (MFE) funded Jobs for Nature project that is managed jointly by the Otago Regional Council (ORC) and Kāti Huirapa Rūnaka ki Puketeraki. As part of this project, Kāti Huirapa Rūnaka ki Puketeraki has been contracted to assess potential fish passage barriers in the Hakapupu catchment and make recommendations on actions to be taken where barriers have been identified.

This will allow the Hakapupu Partnership Group and landowners to make informed decisions around prioritisation and funding of fish passage improvement actions in the catchment and lead a significant increase and the distribution and abundance of migratory fish species within the Hakapupu catchment.

In total, 20 instream structures were assessed for fish passage across the 4 sub-catchments of the Hakapupu catchment. Of these 20 structures 7 were considered to be of high priority for replacement or remediation. In all cases, complete removal and replacement of the existing structures is recommended, although some temporary remediation measures may be appropriate while more permanent solutions are progressed.

1.Introduction

The Toitū te Hakapupu project is a Ministry for the Environment (MFE) funded Jobs for Nature project that is managed jointly by the Otago Regional Council and Kāti Huirapa Rūnaka ki Puketeraki. The project is focussed on the Hakapupu (Pleasant River) catchment, with the aim of enhancing the ecosystem and cultural values, improving water quality through combining Kāi Tahu mātauraka (knowledge) and modern science to inform these kaupapa.

For mana whenua, the Hakapupu awa was an important mahika kai area where tuna (eels), pātiki (flounder), tuaki (cockles) and īnaka (whitebait) were abundant. The awa was also used as a trading hub, and a place to connect with wider Kai Tahu whānui.

As part of this project, Kāti Huirapa Rūnaka ki Puketeraki has been contracted to assess potential fish passage barriers in the Hakapupu catchment and make recommendations on remediation where barriers have been identified.

1.1. Fish species of the Hakapupu catchment

Ten species of freshwater fish, and seven estuarine/marine species have been identified in the Hakapupu catchment using a combination of fish surveys and eDNA monitoring (

Table 1). Of these freshwater species, bluegill bully, īnaka (inanga) and longfin tuna are considered threatened (at risk – declining), and four are considered mahika kai species (banded kokopu, īnaka, longfin tuna, shortfin tuna). Of the estuarine fish species detected, four are considered mahika kai species, kahawai, sand flounder, skate and yellow eyed mullet.

Table 1 Fish species of the Hakapupu catchment

	Species	Threat classification	Mahika kai species
Freshwater migratory	**Banded kokopu**	Not threatened	Yes
	Bluegill bully	At risk – declining	
	Common bully	Not threatened	
	Īnaka (inanga)	At risk – declining	Yes
	Longfin eel	At risk – declining	Yes
	Redfin bully	Not threatened	
	Shortfin eel	Not threatened	Yes
Freshwater non-Migratory	**Upland bully**	Not threatened	
	Brown trout	Introduced	
	European perch	Introduced	
Marine/Estuarine	**Estuary clingfish**	Not assessed	
	Kahawai	Not assessed	Yes
	Sand flounder	Not assessed	Yes
	New Zealand smooth skate	Not assessed	Yes
	Spotty	Not assessed	
	Thornfish	Not assessed	
	Yelloweye mullet	Not threatened	Yes

1.2. Fish passage

Many of Aotearoa's fish species undertake significant migrations as part of their life cycle, including many of our iconic freshwater species such a tuna (eel) and our five whitebait species. Most of our migratory (diadromous) freshwater fish species fall into two categories.

- Amphidromous species that are born in freshwater/estuaries, then drift into the ocean as larvae before migrating back into freshwater to grow into adults and spawn, e.g., īnaka
- Catadromous species that are born in saltwater, then migrate into freshwater as juveniles where they grow into adults before migrating back into the ocean to spawn, e.g. tuna

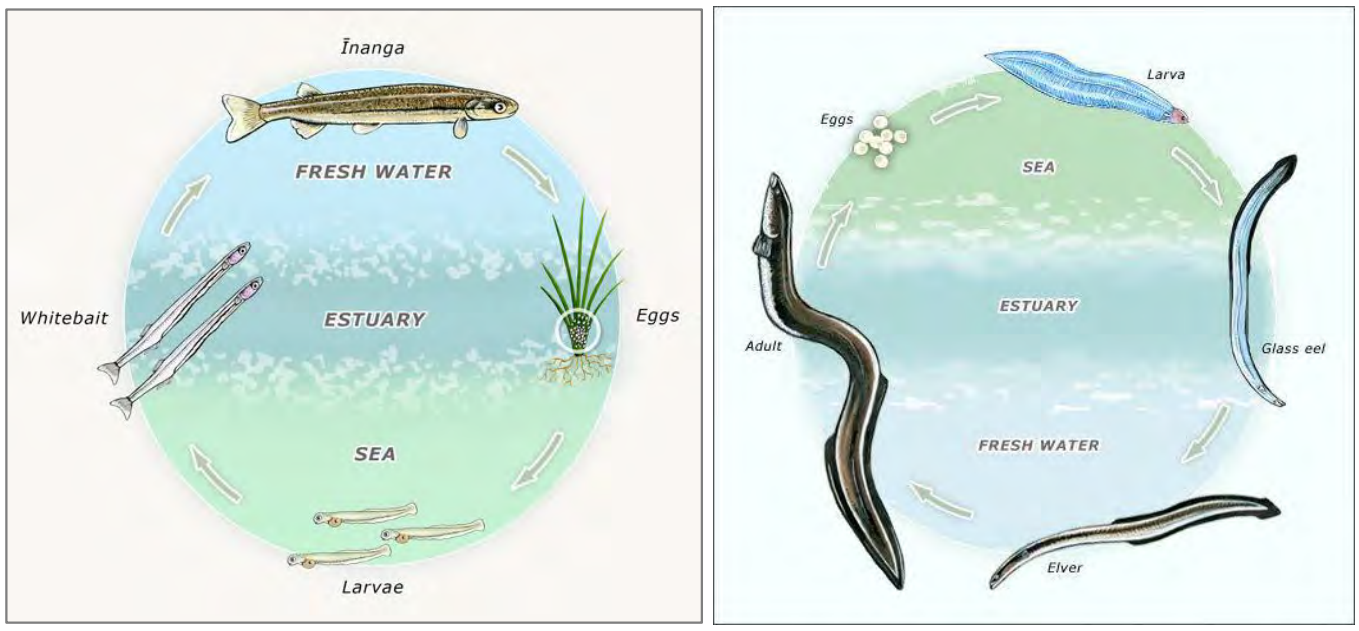


Figure 1 Examples of amphidromous (left) and catadromous (right) lifecycles that require movement between freshwater, estuarine and marine environments.

The kanakana (lamprey) is our only example of the third category of diadromy. They are known as anadromous, which means that they born in freshwater, migrate to the ocean as juveniles where they grow into adults before migrating back into freshwater to spawn.

Instream infrastructure, such as culverts, weirs, and dams can have significant impacts on our freshwater migratory species by preventing them from moving between their breeding, juvenile and adult habitats. In many cases, this can lead to certain species only being able to access a fraction of the habitat that would naturally be available in a river catchment. In some cases, this can lead to the complete local extinction of some species.

The effect of migration barriers varies between species, largely due to their different climbing and swimming abilities. Some species such as tuna, koaro, and kōkopu have excellent climbing abilities and are able to move through or around most structures that impede fish passage. However, species such as īnaka (inanga), smelt, and pātiki (black flounder) are less able to do so and can be impeded by relatively small barriers.

In some cases, the presence of species that are vulnerable to predation will necessitate the maintenance or enhancement of barriers to prevent upstream migration. In Otago, this is particularly necessary for protecting populations of non-migratory *Galaxias* from trout. eDNA monitoring undertaken as part of the Toitū te Hakapupu project has indicated that there are no non-migratory *Galaxias* present in the Hakapupu catchment, therefore intentional barriers have not been considered further in this report.

To address this issue, the New Zealand Fish Passage Guidelines (Franklin *et al,* 2018) were developed in 2018, and adopted into the National Environmental Standard for freshwater (NESFW) in 2020.

This report seeks to assess fish passage barriers in the Hakapupu catchment and make recommendations for remediation in alignment with the New Zealand Fish Passage Guidelines and the NESFW 2020.

2. Methods

Fish passage has been assessed using the Fish Passage Assessment Tool, which is a digital assessment protocol developed by NIWA and the New Zealand Fish Passage Advisory Group. The tool was downloaded to mobile devices and the results uploaded to the New Zealand Fish Passage Database upon completion.

Instream structures were initially identified using aerial imagery and a helicopter flyover. Each site was then visited by trained kaimahi and a full assessment was undertaken using the Fish Passage Assessment Tool.

2.1. Fish passage assessment tool

The fish passage assessment tool provides a method of assessing the risk that a structure provides to fish passage, as well as collecting the key metrics that contribute to this risk. Further details on how to use the app are available in the Fish Passage Assessment Protocol mobile application User Guide (Franklin, 2018).

2.1.1. Fish passage risk

Fish passage risk is defined by the likelihood that fish movements will be impeded by the structure that is being assessed. This can be somewhat subjective and does depend on the assessor's knowledge of fish passage, fish movement capabilities and behaviour. The definitions of each risk class are outlined in Table 2.

Table 2 Qualitative descriptions of the different fish passage risk classes (Franklin, 2018)

Risk class	Description
Very high	Very high chance that most or all fish species will be blocked most or all the time.
High	High chance that the movements of many fish species and life stages will be restricted for much of the time.
Moderate	Moderate chance that movements of some fish species and life stages are commonly restricted.
Low	Some chance that movements of weaker swimming species are restricted some of the time.
Very low	Movements are unimpeded for most or all fish species and life stages for most or all the time.
Not assessed	Select this if you are not confident or do not have the right knowledge to determine the likely risk.

The key characterises of instream structures that contribute most to fish passage risk depend to some extent on the type of structure (e.g. weir, culvert, etc). The assessment of the Hakapupu catchment showed that most structures that pose a risk to fish passage were culverts or culverted fords, therefore the following examples will be focussed on culvert characterises (Figure 2).

- Fall height – the distance between the culvert lip and the water level at the downstream end.
- Overhang – the horizontal distance that the culvert lip hangs over the water at the downstream end.
- Water velocity – The speed of the water through the culvert barrel.



Figure 2 Key characterises of culverts that contribute most to fish passage risk

An additional structure that was added to some culverts in the Hakapupu Estuary were flap gates (sometimes known as tidal gates). These gates are attached to the downstream ends of culverts and are designed to close on an incoming tide to prevent saltwater intrusion into the upstream catchment (Figure 3). These structures are particularly detrimental to īnaka, which not only require access to tidally affected areas for spawning, but also rely on variation in tidal amplitude to spawn. This means that even if adult īnaka are able to navigate the flap gates, there may be insufficient tidal amplitude for successful spawning.



Figure 3 An example of a flap gate from the Hakapupu Estuary

2.1.2. Remediation Prioritisation

A key output of this project is to recommend priorities for remediation for all of the identified structures that have negative impacts on fish passage. This prioritisation takes in a number of considerations, some of which are subjective, and others that are more objective. These include;

- Fish passage risk
- Location within the catchment
- The likely species impacted by the structure
- The cultural, ecological and/or recreational value of these species

Note that remediation cost <u>does not</u> factor into the priority assessment, though this may factor in to the type of remediation that is chosen to address the risk posed by the structure.

3.Structure replacement/remediation

Once fish passage risks have been identified and prioritised, landowners should work with the relevant agencies to undertake remediation activities. This may include the replacement of structures, or the retrofitting of existing structures with features that address the specific issues posed by each structure. Where existing structures impede

the movement of aquatic organisms, removal and replacement should always be considered as the first and preferred solution for maximising fish passage at existing structures.

It is outside the scope of this report to provide technical and design specifications for the remediation of individual structures within the Hakapupu catchment, however the following sections provide high level guidance to support the early parts of this decision making process.

Further details on structure replacement and remediation are available in the New Zealand Fish Passage Guidelines and on the Department of Conservation fish passage webpage.

3.1. Removal and replacement of existing structures

The New Zealand Fish Passage Guidelines are clear in the preference of the removal and replacement of structures that impede fish passage. The order of preference of replacement structures is outlined in Figure 4, which prioritises matching the natural stream conditions as much as possible within the constraints of the specific site. This guide can also be useful when considering the installation of new structures.

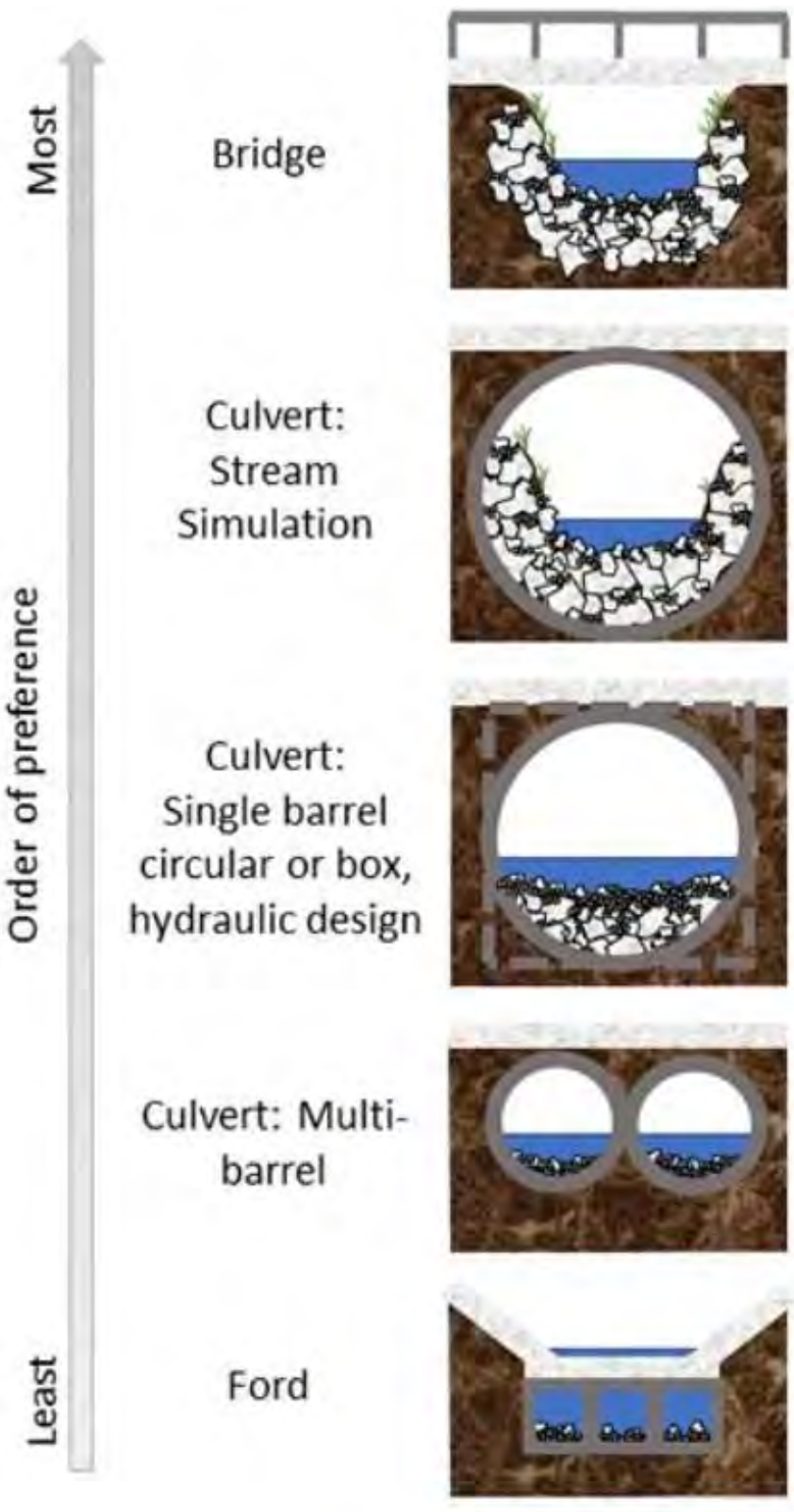


Figure 4 Order of preference for culvert replacement with regards to fish passage risk.

3.2. Remediation of existing structures

There are several options for retrofitting existing structures, the suitability of which is determined by a combination of the structure characterises and the specific species that are present in the catchment. As a general rule, remediation is more effective for

climbing species such as tuna, kōkopu and koaro, and is less effective for species such as īnaka.

3.2.1. Rock ramps

Rock ramps are the preferred option for overcoming vertical drops that impede the movement of fish Figure 5. Rock-ramp structures typically take the form of a series of transverse rock ridges, with pool sections between the ridges that act as resting areas for migrating fish (Franklin *et al*, 2018).



Figure 5 Example of the retrofitting of a rock ramp to an existing culvert

3.2.2. Floating ramps

Floating ramps are considered a low-cost alternative to concrete ramps and are particularly useful as an intermediate step to provide fish passage while funding or resource consents are secured for the replacement of an existing structure. These ramps are generally sections of rubber matting bolted to the bottom of the culvert and can be further enhanced with the addition of mussel spat ropes (Figure 6).



Figure 6 Examples of the retrofitting of floating ramps to existing culverts. The ramp on the right also includes mussel spat ropes to further improve fish passage.

3.2.3. In-culvert baffles

In culvert baffles are used to reduce water velocities and provide resting areas through the length of the culvert barrel (Figure 7). This is particularly important for species with poor climbing abilities such as īnaka.



Figure 7 Examples of the retrofitting of in-culvert baffles to reduce water velocity through existing culverts

3.2.4. "Fish friendly" flap gates

Although it is preferable to completely remove flap gates where possible and restore natural connection and hydrology, there are some instances where this may not be possible due to practical or economic considerations.

In these situations, it is possible to install "fish friendly" flap gates that still serve their primary purpose of reducing saltwater intrusion, but also allow fish to pass for a greater part of the tidal cycle. There are two main types of fish friendly flap gates commonly used in Aotearoa, the cantilever gate and offset top hinged (Figure 8).



Figure 8 **Examples of "fish friendly" flap gates. The cantilever gate on the left, and the offset top hinged on** the right.

4. Results

The results of the Hakapupu fish passage assessment have been organised into three groups based on their location within the catchment.

- Estuary (E) – All sites within the Hakapupu estuary and its tributaries
- Watkin Creek (W) – All sites within the Watkin Creek sub-catchment
- Hakapupu (H) – All sites within the Hakapupu main stem and its minor tributaries.

Although the Owhakaoho (Trotters Creek) sub-catchment was also investigated, no fish passage barriers were identified.

This section provides a high-level overview of fish passage risk and priority for the sites in each sub catchment, however detailed site assessments and photos are provided in Appendices 2 to 21.

The information collected by the Fish Passage Assessment Tool has a high level of detail, and it is not useful to present all this information as part of this report. A catchment-wide summary table is provided in Appendix 1 for those who wish to view more of this detail, and the full dataset is available in the Fish passage Assessment Tool web page.

In total, 20 potential fish passage barriers were identified and assessed (Figure 9), with fish passage risk assigned in alignment with the criteria of the Fish Passage Assessment Tool.

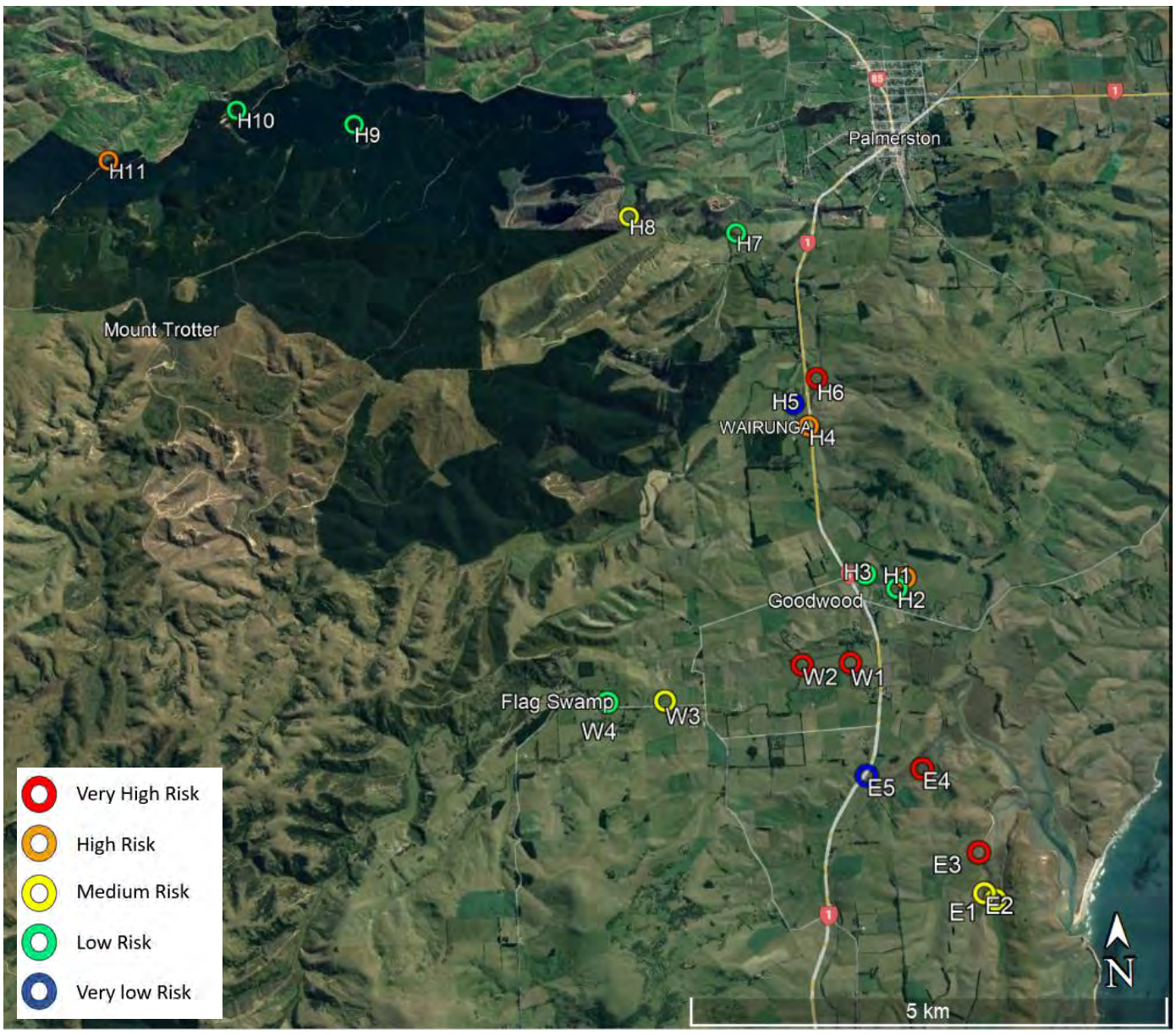


Figure 9 Location of all instream structures assessed for fish passage risk in the Hakapupu catchment

4.1. Estuary Sites

There were a total of five estuary sites assessed, located in the tributaries flowing directly into the Hakapupu Estuary (Figure 10).

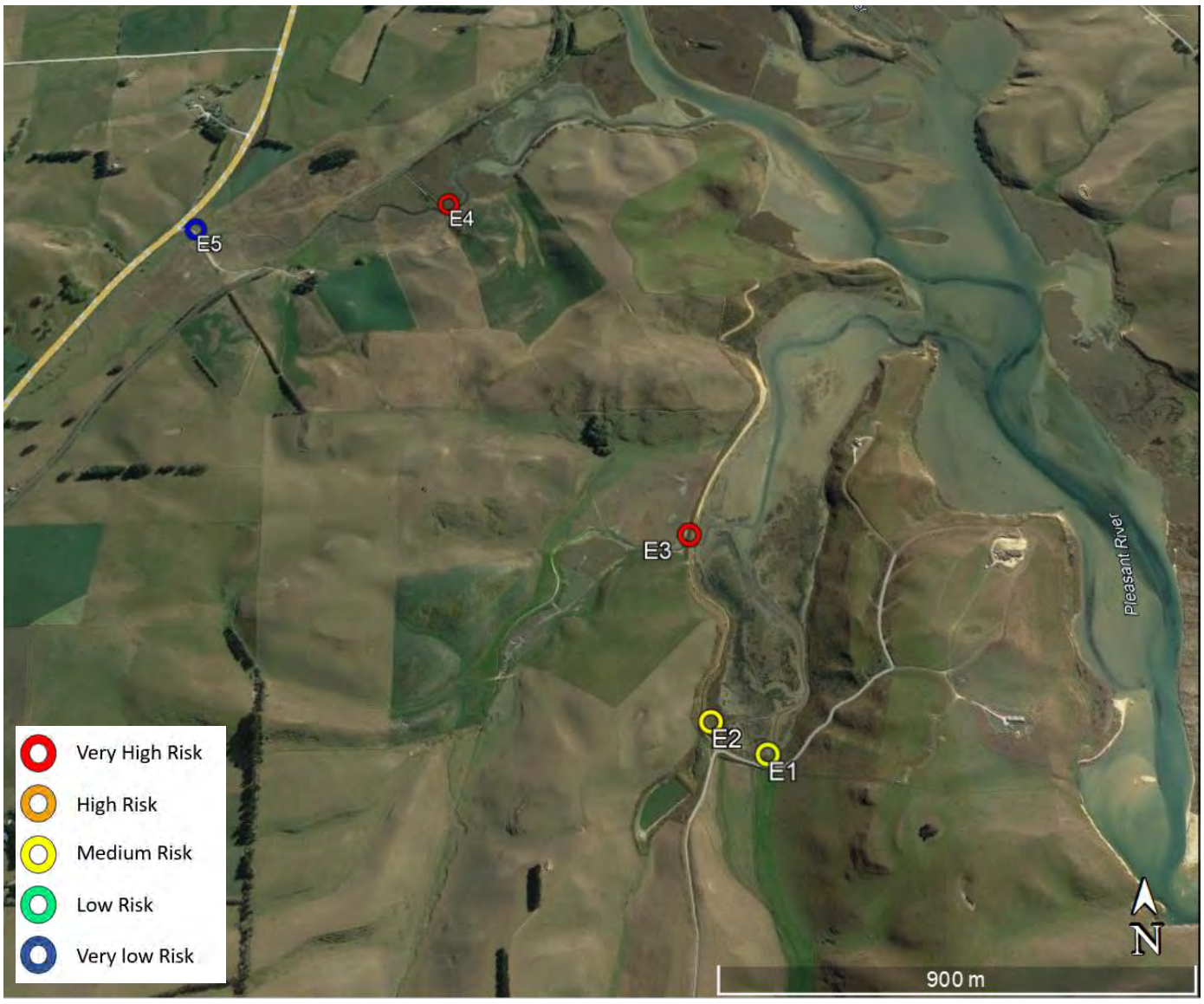


Figure 10 Location of potential fish passage barriers in the Hakapupu Esturay

Of these structures, three were culverts with attached flap gates, and two were stand-alone culverts (Table 3). Structures E3 and E4 were considered to be both high risk and high priority. In both cases, the fully closed flap gates prevented almost all fish passage from occurring for most of the tidal cycle, reducing the availability of both adult and spawning habitat for īnaka in particular.

Table 3 Summary of fish passage barriers identified in the Hakapupu Estuary. High priority sites are highlighted in red.

Site Name	Database ID	Date	Structure type	Risk to fish passage	Priority
E1	177858	13/12/2023	Flap gate with culvert	Medium risk	Low
E2	177856	13/12/2023	Culvert	Medium risk	Low
E3	177868	13/12/2023	Flap gate with culvert	Very high risk	High
E4	177866	13/12/2023	Flap gate with culvert	Very high risk	High
E5	177862	13/12/2023	Culvert	Very low risk	Low

4.2. Watkin Creek

A total of four structures were identified in the Watkin Creek sub-catchment (Figure 11), two of which were considered to be very high risk to fish passage. Additional culverts were identified in smaller ephemeral tributaries, but they were not assessed further due to the lack of fish habitat in the upstream catchment.

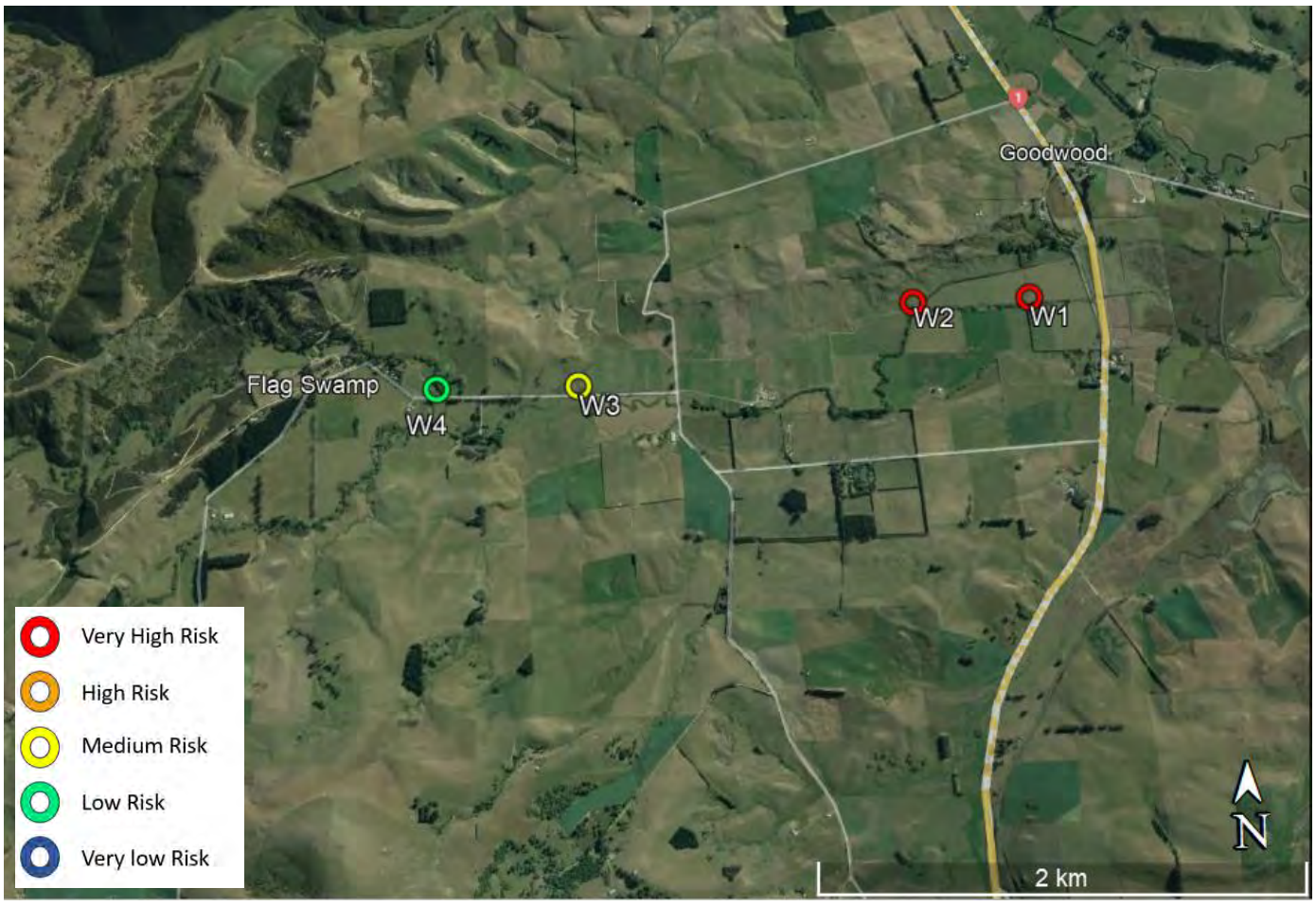


Figure 11 Location of assessed structures in the Watkin Creek sub catchment.

Of the four structures, W1 and W2 are considered high priority for replacement or remediation (Table 4). This high priority is due to the large upstream catchment and significant amount of adult īnaka habitat that is currently inaccessible to this species.

Table 4 Summary of fish passage barriers identified in the Watkin Creek sub-catchment. High priority sites are highlighted in red.

Site Name	Database ID	Date	Structure type	Risk to fish passage	Priority
W1	177872	14/12/2023	Ford with culvert	Very high risk	High
W2	177871	14/12/2023	Culvert	Very high risk	High
W3	177867	14/12/2023	Culvert	Medium risk	Moderate
W4	177869	13/12/2023	Ford without culvert	Low risk	Low

4.3. Hakapupu main stem

Off the 11 structures identified in the main stem of the Hakapupu River, three are considered high risk, and one is considered very high risk (Figure 12).

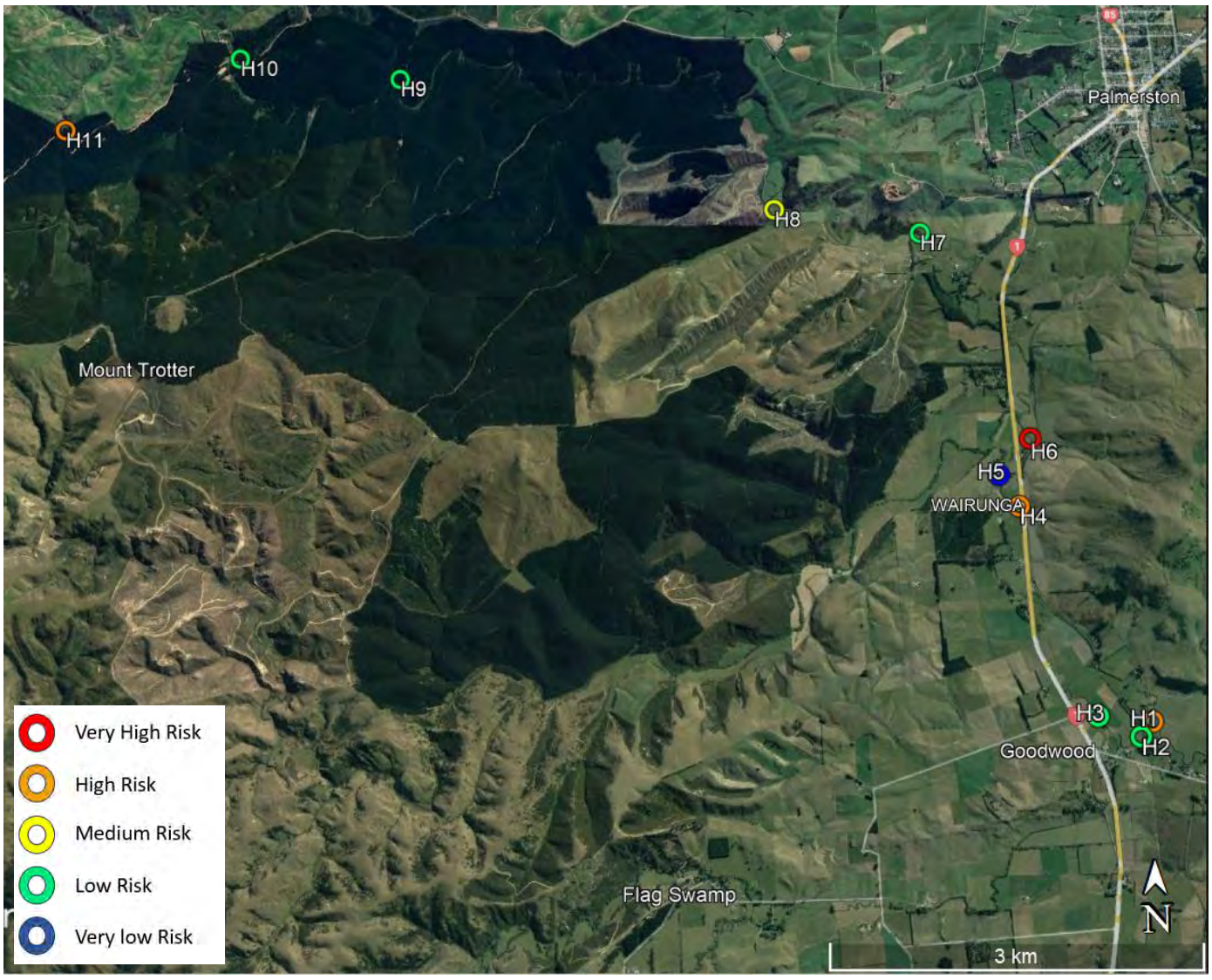


Figure 12 Location of assessed structures in the Hakapupu main stem and its tributaries.

Three of these structures are considered high priority for replacement or remediation (Table 5), as the majority of the Hakapupu catchment sits above these sites. The likely impact of these structures is a severe reduction in the amount of adult īnaka habitat, as well as significant reduction in the range of pātiki and smelt within the catchment. H11 is not considered a priority site due to its location high in the catchment and the intermittent flows in this reach over the summer months.

Table 5 Summary of fish passage barriers identified in the main stem of the Hakapupu River. High priority sites are highlighted in red.

Site Name	Database ID	Date	Structure type	Risk to fish passage	Priority
H1	177857	13/12/2023	Ford with culvert	High risk	High
H2	177861	13/12/2023	Ford with culvert	Low risk	Low
H3	178012	27/12/2023	Ford without culvert	Low risk	Low
H4	177855	13/12/2023	Ford with culvert	High risk	High
H5	177859	14/12/2023	Bridge	Very low risk	Low
H6	177863	14/12/2023	Culvert	Very high risk	High
H7	177860	14/12/2023	Bridge	Low risk	Low
H8	177873	14/12/2023	Culvert	Medium risk	Low
H9	177877	14/12/2023	Culvert	Low risk	Low
H10	177876	14/12/2023	Culvert	Low risk	Low
H11	177875	14/12/2023	Culvert	High risk	Moderate

5.Recommendations

In total, 7 sites are considered high priority for removal or remediation (Figure 13). The primary driver for the prioritisation of these sites is to provide sufficient fish passage to ensure that īnaka have full access to their natural range within the catchment. As īnaka are one of the poorest climbers of the fish species in the catchment, it is expected that all other species will also have access to their full range if īnaka passage is restored.



Figure 13 Location of high priority sites for replacement/remediation in the Hakapupu catchment.

In all cases, removal and replacement of the structure is considered the preferred option (Table 6), again due mainly to the high value placed on īnaka in this catchment.

Table 6 Summary of high priority structures in the Hakapupu catchment

Site Name	Database ID	Structure type	Detailed assessment	Recommended action
E3	177868	Flap gate with culvert	Appendix 4	Removal of flap gate, installation of fish friendly gate if this is not possible
E4	177866	Flap gate with culvert	Appendix 5	Removal of flap gate, installation of fish friendly gate if this is not possible
W1	177872	Ford with culvert	Appendix 7	Complete removal and replacement with large diameter culvert imbedded in stream bed
W2	177871	Culvert	Appendix 8	Complete removal and replacement with large diameter culvert imbedded in stream bed
H1	177857	Ford with culvert	Appendix 11	Removal and replacement with bridge or large box culvert. Rock ramp as a short-term alternative
H4	177855	Ford with culvert	Appendix 14	Removal and replacement with bridge or large box culvert. Rock ramp as a short-term alternative
H6	177863	Culvert	Appendix 16	Complete removal and replacement with large diameter culvert imbedded in stream bed

Glossary

Amphidromous	Amphidromous fish are born in freshwater/estuaries, then drift into the ocean as larvae before migrating back into freshwater to grow into adults and spawn, e.g., banded kōkopu.
Anadromous	Anadromous fish are born in freshwater, migrate to the ocean as juveniles where they grow into adults before migrating back into freshwater to spawn, e.g., lamprey.
Apron	A hardened surface (usually concrete) placed at the inlet and/or outlet of a structure to protect the structure from erosion.
Baffles	A device used to modify and restrain the flow of water.
Built barrier	An instream structure built with the explicit intent of restricting or preventing the movement of aquatic organisms.
Catadromous	Catadromous fish are born in saltwater, then migrate into freshwater as juveniles where they grow into adults before migrating back into the ocean to spawn, e.g., longfin eel.
Culvert	A connection between two water bodies or parts of a waterbody, typically a pre-formed concrete tube located below roads or other constructions.
Fish passage	The movement of fish and other aquatic organisms between all habitats necessary to complete their life cycle.
Fish passage design flow	The range of flows over which fish passage is required.
Ford	A shallow place in a river or a stream allowing one to walk or drive across.
Impede	Delay or prevent by obstructing them; hinder.
Rock-ramp fishway	A type of fish pass consisting of rock ridges and pools that mimics natural stream conditions to facilitate movements of aquatic organisms around or over an obstruction.
Weir	A barrier across the cross-sectional width of a river that alters the flow characteristics of the water and usually results in a change in the height of the river level.
Wetted margin	A shallow, low velocity area along the edges of the water.

Wetted width	The width of the river channel at the water surface.
Wingwall	A wall on a structure that ties the structure to the river bank.

References

Franklin. P., 2018, Fish Passage Assessment Protocol mobile application User Guide, NIWA CLIENT REPORT No: 2018349HN, https://niwa.co.nz/sites/niwa.co.nz/files/User%20guide%20v1.3%20FINAL.pdf

Franklin. P., Gee. E., Baker. C., & Bowie. S., 2018, New Zealand Fish Passage Guidelines for structures up to 4 metres, NIWA CLIENT REPORT No: 2018019HN. https://niwa.co.nz/sites/niwa.co.nz/files/Final%20NZ%20Fish%20Passage%20Guidelines%20with%20Cover%20Page%2014-12.pdf

Appendix 1: Hakapupu fish passage barrier summary table

Site name	Site id	latitude	longitude	Date	Tidal?	Structure type	Number of culvert barrels	Structure slope	Gate type	Risk to fish passage	For NES FW?	Risk class
E1	177858	-45.56686654	170.7165208	13/12/2023	Yes	Flap gate with culvert	1	Same as stream	Top hung	Medium risk		Very High
E2	177856	-45.5662413	170.7151297	13/12/2023	Yes	Culvert	1	Steeper than stream		Medium risk		Very High
E3	177868	-45.5624378	170.715023	13/12/2023	Yes	Flap gate with culvert	1	Same as stream	Top hung	Very high risk		Very High
E4	177866	-45.55437778	170.7084778	13/12/2023	Yes	Flap gate with culvert	2	Same as stream	Top hung	Very high risk		Very High
E5	177862	-45.55491547	170.70067	13/12/2023	Yes	Culvert	1	Same as stream		Very low risk		Medium
H1	177857	-45.53525833	170.7089556	13/12/2023	No	Ford with culvert	3	Steeper than stream		High risk		High
H2	177861	-45.53633585	170.7076013	13/12/2023	No	Ford with culvert	2	Steeper than stream		Low risk	Yes	High
H3	178012	-45.5353197	170.7073661	14/12/2023	No	Ford without culvert				Low risk		High

Site name	Site id	latitude	longitude	Date	Tidal?	Structure type	Number of culvert barrels	Structure slope	Gate type	Risk to fish passage	For NES FW?	Risk class
H4	177855	-45.518875	170.6970389	14/12/2023	No	Ford with culvert	3	Steeper than stream		High risk		Very High
H5	177859	-45.5164003	170.6950885	14/12/2023	No	Bridge				Very low risk		Very Low
H6	177863	-45.51359886	170.6989032	14/12/2023	No	Culvert	2	Less than stream		Very high risk		Very High
H7	177860	-45.4967798	170.6885473	14/12/2023	No	Bridge				Low risk		Very Low
H8	177873	-45.49487592	170.6729098	14/12/2023	No	Culvert	1	Steeper than stream		Medium risk	Yes	Very High
H9	177877	-45.48297888	170.6299422	14/12/2023	No	Culvert	1	Same as stream		Low risk		Medium
H10	177876	-45.48103541	170.6115663	13/12/2023	No	Culvert	1	Same as stream		Low risk		High
H11	177875	-45.48714235	170.5920002	27/12/2023	No	Culvert	1	Same as stream		High risk		High
W1	177872	-45.5437791	170.6999063	14/12/2023	No	Ford with culvert	1	Steeper than stream		Very high risk		Very High
W2	177871	-45.5438971	170.6930407	14/12/2023	No	Culvert	1	Steeper than stream		Very high risk		Very High
W3	177867	-45.54716695	170.6732591	14/12/2023	No	Culvert	1	Steeper than stream		Medium risk		Very High
W4	177869	-45.5471686	170.6651473	13/12/2023	No	Ford without culvert				Low risk		Low

Appendix 2 – Site E1

Fish passage database ID: 177858

Date of assessment: 13/12/23

Location: Lat: -45.5669, Long: 170.7165208

Structure type: Flap Gate with culvert

Risk to fish passage: Medium

Priority for replacement/remediation: Low

Description: Site E1 is located off Thornburn Rd where is crosses a small tributary of the south-western tidal arm of the Pleasant River estuary (Figure 14).



Figure 14 Location of site E1

The structure consists of a single 0.75m culvert with a flap gate attached to the downstream end. A small gap was present between the culvert lip and the flap gate which would have allowed passage for small fish at most (if not all) periods of the tide, however there was very little habitat upstream of the culvert meaning that its priority for replacement should be considered low.



Figure 15 Downstream view of the E1 culvert



Figure 16 Upstream view of the E1 culvert

Appendix 3 – Site E2

Fish passage database ID: 177856

Date of assessment: 13/12/23

Location: Lat: -45.5662413, Long: 170.7151297

Structure type: Culvert

Risk to fish passage: Very high

Priority for replacement/remediation: Low

Description: Site E2 is located off Thornburn Rd where is crosses a small tributary of the south-western tidal arm of the Pleasant River estuary (Figure 17Figure 14).



Figure 17 Location of the E2 culvert

The structure consists of a single 0.45m culvert which has an overhang of 0.05m and a drop height of 0.1m at mid-tide. It is likely that fish passage would be possible during high tide, but the culvert would be considered perched for much of the tidal cycle. There is very little fish habitat upstream of the culvert meaning that its priority for replacement should be considered low.



Figure 18 Downstream view of the E2 culvert



Figure 19 Upstream view of the E2 culvert

Appendix 4 – Site E3

Fish passage database ID: 177868

Date of assessment: 13/12/23

Location: Lat: -45.5624378, Long: 170.715023

Structure type: Flap gate with culvert

Risk to fish passage: Very high

Priority for replacement/remediation: High

Description: Site E3 is a privately owned structure located on the western edge of the south-western tidal arm of the Pleasant River estuary (Figure 20).



Figure 20 Location of the E3 flap gate

The structure consists of a 1m wide culvert with an attached flap gate with no fish passage remediation. The flap gate creates a strong seal with the culvert preventing fish passage for most, if not all, of the tidal cycle. This structure prevents fish passage to a significant tributary of the Hakapupu estuary. Although riparian habitat is significantly degraded due to stock grazing and channel modification, this tributary would be expected to provide īnaka spawning and adult habitat, should restoration activities be undertaken. The lower reaches of the tributary would also be expected to provide habitat for estuarine species such as mullet, while the upper reaches would be expected to provide habitat for tuna should fish passage be restored.

Due to the combination of the high risk for fish passage, and the significant amount of upstream habitat, this site should be considered the highest priority for restoration of all of the estuary sites. Ideally, the flap gate would be removed from the culvert to allow for full tidal variation in the upstream catchment. This would allow īnāka to access the area and provide sufficient tidal amplitude for spawning.

If removal of the flap gate is not possible/desirable, then remediation devices such as a cantilevered or offset "fish friendly" flap gate should be considered.



Figure 21 Downstream view of the E3 flap gate



Figure 22 Upstream view of the E3 culvert

Appendix 5 – Site E4

Fish passage database ID: 177866

Date of assessment: 13/12/23

Location: Lat: -45.55437778, Long: 170.7084778

Structure type: Flap gate with culvert

Risk to fish passage: Very high

Priority for replacement/remediation: High

Description: Site E4 is a privately-owned structure located on the northwestern tributary of the Pleasant River estuary (Figure 23).

The structure consists of a 0.6m wide culvert, with a top-hinged flap gate that remains closed for most of the tidal cycle. This flap gate blocks off approximately 1km of tidal channels, which flow through modified and "reclaimed" salt marsh.

This site should be considered a priority for remediation due to the large upstream catchment and potential for restoration. Ideally, the flap gate would be removed from the culvert to allow for full tidal variation in the upstream catchment. This would allow īnāka to access the area and provide sufficient tidal amplitude for spawning.

If removal of the flap gate is not possible/desirable, then remediation devices such as a cantilevered or offset "fish friendly" flap gate should be considered.



Figure 23 Location of the E4 flap gate



Figure 24 Upstream view from the E4 flap gate

Appendix 6 – Site E5

Fish passage database ID: 177862

Date of assessment: 13/12/23

Location: Lat: -45.55491547, Long: 170.70067

Structure type: Culvert

Risk to fish passage: Very low risk

Priority for replacement/remediation: Low

Site E5 is located further upstream from E4 where Tumai Rd crosses the northern western tributary of the Pleasant River Estuary (Figure 25). The upstream catchment has very little standing water due to heavy modification, drainage, and stock damage.

The culvert itself is 0.75m high and half submerged within the wetted channel, providing good fish passage throughout the tidal cycle. No further remediation is required.



Figure 25 Location of the E5 culvert



Figure 26 Upstream view of E5 culvert



Figure 27 Downstream view of E5 culvert

Appendix 7 – Site W1

Fish passage database ID: 177872

Date of assessment: 14/12/23

Location: Lat: -45.5437791, Long: 170.6999063

Structure type: Ford with culvert

Risk to fish passage: Very high risk

Priority for replacement/remediation: High

W1 is the most downstream instream structure in Watkin Creek and is located 300m west of SH1 (Figure 28). The culvert is 0.33 m wide and is perched with an estimated drop of 0.2 m and an undercut of 0.05 m, providing a significant barrier to upstream migrating dish. Due to the small size, water velocities through the culvert are particularly high and are likely to pose a significant barrier to upstream migration in addition to the perched culvert. Shoals of īnaka were observed immediately downstream of the culvert.



Figure 28 Location of W1 ford and culvert

Due to the large amount of upstream habitat, and the presence of significant restoration projects occurring in the upstream catchment, this structure should be

considered as a high priority for replacement. Due to the small diameter of the culvert, it is recommended that it be replaced, as any remediation efforts such as fish ladders will not address the high water velocities currently occurring through the culvert. Rock ramps and baffles may be considered as a short-term remediation option, but should not be considered a permanent solution.



Figure 29 Downstream view from W1 culvert



Figure 30 Upstream view from W1 culvert

Appendix 8 – Site W2

Fish passage database ID: 177871

Date of assessment: 14/12/23

Location: Lat: -45.5438971, Long: 170.6930407

Structure type: Culvert

Risk to fish passage: Very high risk

Priority for replacement/remediation: High

W2 is located 900m west of SH1 and consists of a large (1m) corrugated iron perched culvert with a 0.2m drop and 0.1m undercut. The culvert is showing signs of rust and degradation, and likely poses a significant barrier to upstream migration. Large shoals of īnaka were observed immediately downstream of the structure.



Figure 31 Location of W2 structure

Due to the large amount of upstream habitat, and the presence of significant restoration projects occurring in the upstream catchment, this structure should be considered as a high priority for replacement. Due to the large number of īnaka observed downstream of the site, it is recommended that the structure be replaced by a

similarly sized culvert that is imbedded at an appropriate depth in the stream bed. This is preferable over remediation efforts such as fish ladders, as they will not address the high water velocities currently occurring through the culvert and will be difficult to install and maintain due to the degraded nature of the culvert itself.



Figure 32 Downstream view of W2 culvert



Figure 33 Upstream view from W2 culvert

Appendix 9 – Site W3

Fish passage database ID: 177867

Date of assessment: 14/12/23

Location: Lat: -45.54716695, Long: 170.6732591

Structure type: Culvert

Risk to fish passage: Medium

Priority for replacement/remediation: Moderate

W3 is a large (1.2m) concrete culvert located on Galbraith Rd (Figure 34). The downstream end of the culvert has a small drop (0.1m) into the downstream pool, and although this can likely be navigated by most fish species present in the catchment (with some difficulty for īnaka), fish passage would be improved significantly though low-cost remediation measures such as a rubber matting/spat rope or a floating fish ladder.



Figure 34 Location of structure W3



Figure 35 Downstream view from W3 culvert



Figure 36 Upstream view from W3 culvert

Appendix 10 – Site W4

Fish passage database ID: 177869

Date of assessment: 13/12/23

Location: Lat: -45.5471686, Long: 170.6651473

Structure type: Ford without culvert

Risk to fish passage: Low

Priority for replacement/remediation: Low

W4 is a ford located immediately downstream of Galbraith Rd in the middle reaches of the Watkin Creek catchment (Figure 37). This ford provides no barrier to fish passage (Figure 38 & Figure 39) and should be considered low priority for mediation.



Figure 37 Location of site W4



Figure 38 Downstream view from W4



Figure 39 Upstream view from W4 looking at the Galbraith Rd bridge.

Appendix 11 – Site H1

Fish passage database ID: 177857

Date of assessment: 13/12/23

Location: Lat: -45.53525833, Long: 170.7089556

Structure type: Ford with culvert

Risk to fish passage: High

Priority for replacement/remediation: High

H1 is the most downstream structure on the main stem of the Hakapupu River, and is located on Brooklands Rd, northeast of Goodwood (Figure 40). The structure consists of a concrete ford with three culverts, with all three culvert barrels being perched well above the downstream water level (Figure 41).



Figure 40 Location of H1 culverted ford off Brooklands Rd

Of the three culvert barrels within the structure, those on the true right and middle of the ford are perched and undercut, with flows passing over an undercut concrete apron and then under a large pile of rip rap. It is unlikely that fish passage is provided by either

of these culverts (Figure 41). Flows that pass through the third culvert on the true left pass down a 2m concrete apron, which is perched at the downstream end with a drop of 0.1m.

Large shoals of īnaka were observed downstream, however the presence of smaller numbers of īnaka at upstream sites suggest that some fish passage is occurring past this structure.



Figure 41 Downstream view of the H1 culverted ford

The use of three smaller culverts has led to regular buildup of debris at the upstream end of the structure, which has created a further hindrance to fish passage (Figure 42).



Figure 42 Upstream view of the H1 culverted ford

Due to the location of the Brooklands Rd ford and the high risk it poses to fish passage, this site should be considered one of the highest priorities for remediation in the Hakapupu catchment. Ideally, this structure would be completely replaced with a bridge or large box culvert in alignment with the New Zealand Fish Passage Guidelines (Franklin, 2018), and this should be considered the preferred approach for this site. In the event that these works cannot be undertaken quickly due to budgetary constraints, it is suggested that the rip rap is removed and a concrete/rock ramp is installed along with in-culvert baffles. Note that this should only be considered a temporary measure and should not be undertaken as a long-term alternative to replacement.

Appendix 12 – Site H2

Fish passage database ID: 177861

Date of assessment: 13/12/23

Location: Lat: -45.53633585, Long: 170.7076013

Structure type: Ford with culvert

Risk to fish passage: Low

Priority for replacement/remediation: Low

H2 is a temporary two-barrel culverted ford placed to provide access to the construction site for the replacement of the adjacent rail bridge over the Hakapupu River. The site is located off Brooklands R, east of Goodwod (Figure 43).

The ford has been constructed by laying steel bridge piles along the stream bed and then covering them with rip rap and road metal. The culvert barrels have been laid at the same gradient as the stream bed with low water velocities and sufficient depth to provide fish passage.



Figure 43 Location of the H2 temporary culverted ford

H2 is one of only two structures identified in the Hakapupu catchment that is subject to the fish passage requirements of the National Environmental Standards for Freshwater, as

it has been installed after September 2020. These requirements include that all relevant information for the structure is provided to the Regional Council and it "….*must provide for the same passage of fish upstream and downstream as would exist without the weir (or culvert), except as required to carry out the works to place, alter, extend, or reconstruct the weir*"

An initial inspection undertaken on December 7th showed that the ford had partially collapsed over the downstream end of the culverts, preventing most fish passage (Figure 44). A subsequent visit on December 13th showed that this issue has been addressed and that risk to fish passage was low (Figure 45 Figure 46). No further remediation is required at this site, however the structure owners should ensure that further blockages do not occur.



Figure 44 Partially collapsed ford preventing fish passage at the H2 site on December 7th, 2023.



Figure 45 Downstream view of H2 culverts on December 13th 2023



Figure 46 Upstream view of H2 culverts on December 13th 2023

Appendix 13 – Site H3

Fish passage database ID: 178012

Date of assessment: 27/12/23

Location: Lat: -45.5348, Long: 170.7034

Structure type: Ford without culvert

Risk to fish passage: Low

Priority for replacement/remediation: Low

Site H3 is a ford located north of Goodwood on the east side of SH1 (Figure 47). The ford poses no risk to fish passage and does not require any remediation.

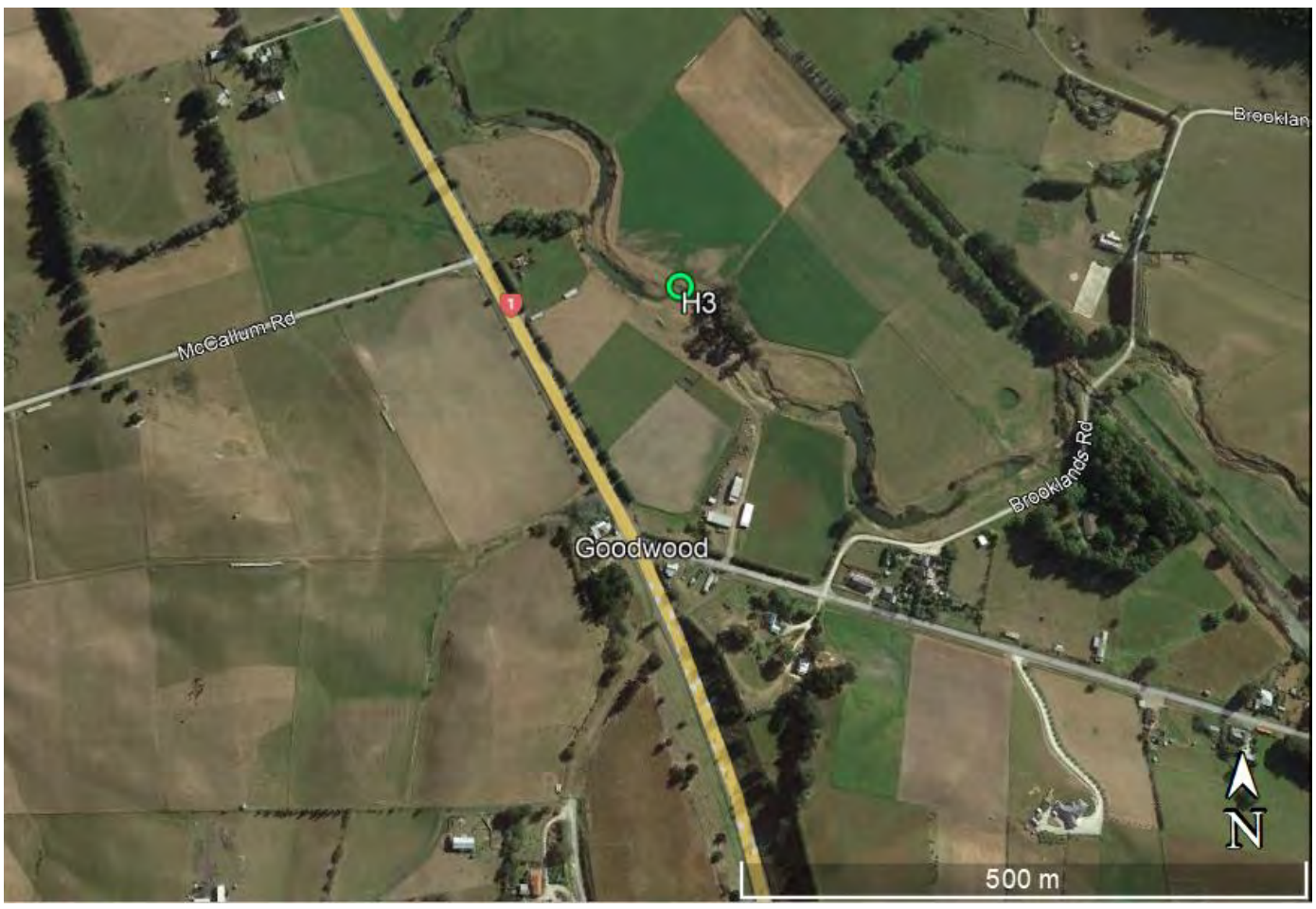


Figure 47 Location of H3 ford



Figure 48 The H3 ford

Appendix 14 – Site H4

Fish passage database ID: 177855

Date of assessment: 13/12/23

Location: Lat: -45.518875, Long: 170.6970389

Structure type: Ford with culvert

Risk to fish passage: High

Priority for replacement/remediation: High

H4 is a three barrelled culverted ford located where Pattersons Rd crosses the Hakapupu River (Figure 49). Each culvert has a width of 0.65m, with the upstream side of the ford having a 2m apron with wooden baffles to guide low flows through the centre culvert to increase water depth for fish passage (Figure 50). The downstream side of the ford has a short apron with a 0.12m drop to the pool below (Figure 51).



Figure 49 Location of the H4 culverted ford.

Although the upstream baffles do increase the water depth within the central culvert, it also acts to prevent any fish that pass through the outer culverts from accessing the upstream channel. Several īnaka were observed trapped between the baffle and the bank while the assessment was being undertaken. It is also likely that the increased velocity in the central culvert caused by the baffles is preventing īnaka from navigating the full length of the barrel, and as such is recommended that the baffles be removed.



Figure 50 Upstream view of the H4 ford at Pattersons Rd showing wooden baffles to channel flows into the central culvert.

Due to the location of the Pattersons Rd ford on the main stem of the Hakapupu, and the high risk it poses to fish passage, this site should be considered one of the highest priorities for remediation. Ideally, this structure would be completely replaced with a bridge or large box culvert in alignment with the New Zealand Fish Passage Guidelines (Franklin, 2018), and this should be considered the preferred approach for this site.

In the event that these works cannot be undertaken quickly due to budgetary constraints, it is suggested that a concrete/rock ramp be constructed, and internal culvert baffles are installed in all three barrels. Note that this should only be considered a temporary measure and should not be undertaken as a long-term alternative to replacement.



Figure 51 Downstream view of the H4 ford at Pattersons Rd

Appendix 15 – Site H5

Fish passage database ID: 177859

Date of assessment: 14/12/23

Location: Lat: -45.5164003, Long: 170.6950885

Structure type: Bridge

Risk to fish passage: Low

Priority for replacement/remediation: Low

The H5 site is a small bridge located 250m north of Pattersons Rd (Figure 52). The bridge has no effect on fish passage and should be considered a low priority for remediation.



Figure 52 Location of the H5 bridge north of Pattersons Rd.



Figure 53 Upstream view of the H5 bridge



Figure 54 Downstream view of the H5 bridge

Appendix 16 – Site H6

Fish passage database ID: 177863

Date of assessment: 14/12/23

Location: Lat: -45.51359886, Long: 170.6989032

Structure type: Culverted ford

Risk to fish passage: Very high

Priority for replacement/remediation: High

The H6 site is a two barrelled culverted ford located on a stock and vehicle crossing point on the Hakapupu River 100m east of SH1 (Figure 55). The ford itself is constructed from packed earth and the culvert barrels are constructed from welded truck wheel hubs (Figure 56) and are perched 0.2m above the stream with significant overhangs (Figure 57).

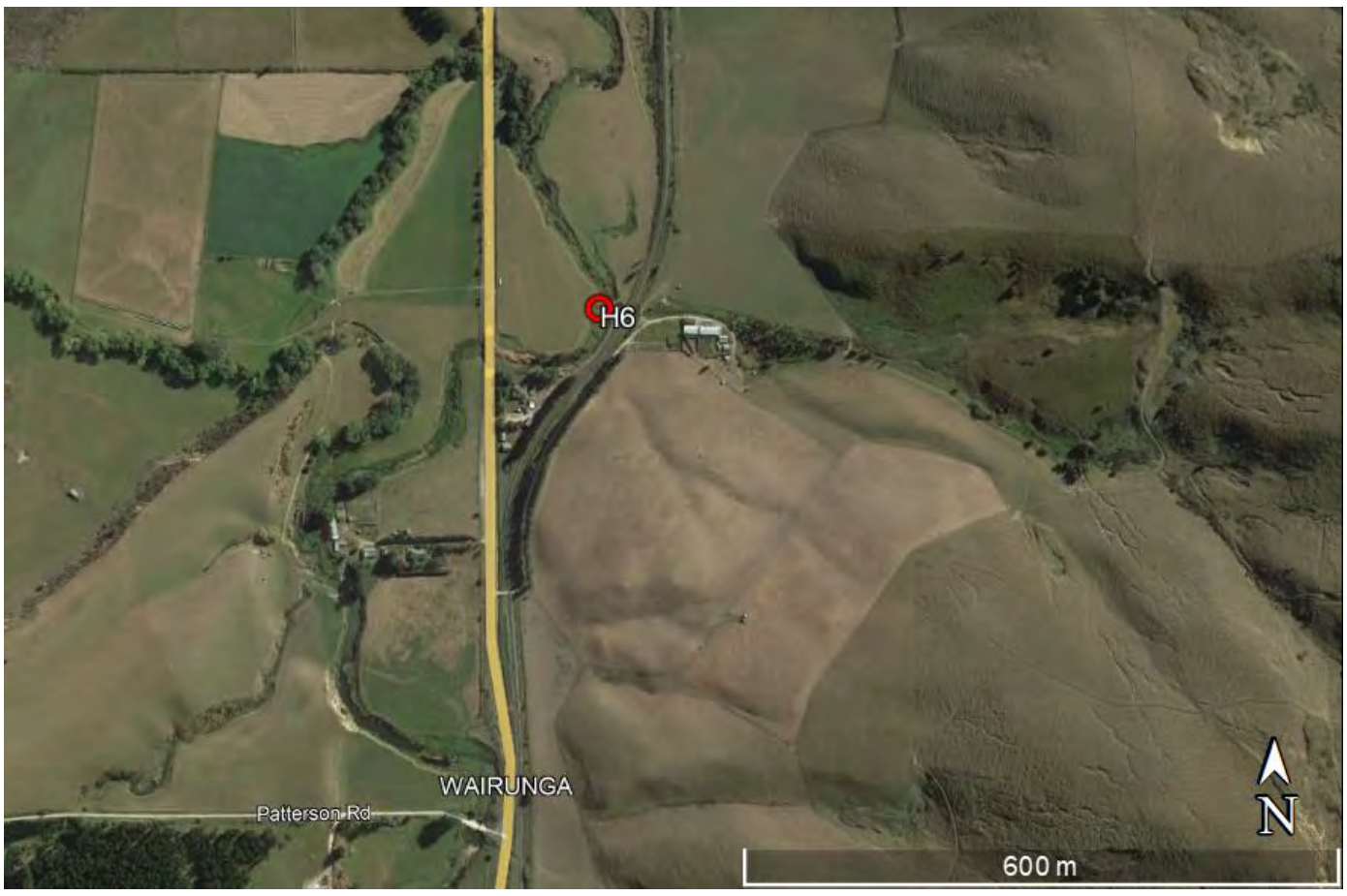


Figure 55 Location of the H6 culvert

The internal structure of the culverts have internal baffles created by the connection points of the wheel hubs used in their construction. These baffles have the effect of reducing water velocities within the culvert barrel (Figure 56).

The perched culverts with large overhangs means that this structure has the highest risk to fish passage within the Hakapupu catchment and should be considered a high

priority for replacement. Because of its location on the main stem of the Hakapupu with a large area of upstream habitat, this site should be prioritised for full replacement rather than remediation. It is suggested that the two culverts be replaced with a single large culvert fully embedded in the stream bed to ensure a natural substrate and water velocities.



Figure 56 Internal view of the H6 culvert.



Figure 57 Downstream view of the H6 culverts.



Figure 58 Upstream view of the H6 culverts.

Appendix 17 – Site H7

Fish passage database ID: 177860

Date of assessment: 14/12/23

Location: Lat: -45.4967798, Long: 170.6885473

Structure type: Bridge

Risk to fish passage: Low

Priority for replacement/remediation: Low

Site H7 is a partially collapsed bridge and adjacent ford on the main stem of the Hakapupu River 300m north of Stenhouse Rd (Figure 59). This structure is unlikely to have any impact on fish passage and should be considered a low priority for remediation.



Figure 59 Location of site H7 on the main stem of the Hakapupu River



Figure 60 Downstream view of the H7 ford and bridge



Figure 61 Upstream view of the H7 ford and bridge

Appendix 18 – Site H8

Fish passage database ID: 177873

Date of assessment: 14/12/23

Location: Lat: -45.49487592, Long: 170.6729098

Structure type: Culvert

Risk to fish passage: Medium

Priority for replacement/remediation: Low

Site H8 is located at the end of Stenhouse Rd on an intermittent tributary of the Hakapupu River, and has recently been installed as part of a road upgrade to support logging operations (Figure 62). At the time of assessment there were pools of water remaining at either end of the culvert, but the tributary was not flowing in the immediate reach (Figure 63 & Figure 64). Conversations with the forestry manager have indicated that this site is regularly damaged during flood events and has had to be repaired on several occasions in the past.



Figure 62 Location of the H8 culvert in the middle reaches of the Hakapupu catchment.

H8 is one of only two structures identified in the Hakapupu catchment that is subject to the fish passage requirements of the National Environmental Standards for Freshwater

(NESFW), as it has been installed after September 2020. These requirements include that all relevant information for the structure is provided to the Regional Council and it "….*must provide for the same passage of fish upstream and downstream as would exist without the weir (or culvert), except as required to carry out the works to place, alter, extend, or reconstruct the weir*"

The gradient of the culvert is steeper that the surrounding stream bed and would likely restrict fish passage for species such as īnaka, therefore it is possible that the culvert would not meet the NESFW under conditions of continuous flow. However, the intermittent nature of the stream and a natural lack of fish passage over the summer months reduces the remediation priority for this structure.

It is unclear if there is permanently wetted habitat further upstream of the culvert, therefore as a precautionary measure the landowner should ensure that the culvert is installed in alignment with the NZ Fish Passage Guidelines when it is next repaired following a flood event.



Figure 63 Downstream view from the H8 Culvert



Figure 64 Upstream view from the H8 Culvert

Appendix 19 – Site H9

Fish passage database ID: 177877

Date of assessment: 14/12/23

Location: Lat: -45.48297888, Long: 170.6299422

Structure type: Culvert

Risk to fish passage: Low

Priority for replacement/remediation: Low

The H9 culvert is located in the Calder Steward forestry estate in the upper reaches of the Hakapupu catchment (Figure 65).



Figure 65 Location of the H9 culvert

The culvert is 1m wide and located under a forestry access track. It has been damaged and partially collapsed by historic flood events. At the time of assessment surface flows had ceased in several locations either side of the culvert, however the presence of macrophytes, upland bully and stream invertebrates in the remaining pools indicate that they are perennial in nature.

Overall, this structure does not restrict fish passage any more than the surrounding stream bed at low flows. Although its remediation priority is low in its current state, the continued degradation of the culvert due to flood damage will likely result in fish passage issues in the future at which point it will need to be replaced.



Figure 66 Downstream view of the H9 culvert



Figure 67 Upstream view of the H9 culvert

Appendix 20 – Site H10

Fish passage database ID: 177876

Date of assessment: 14/12/23

Location: Lat: -45.48103541, Long: 170.6115663

Structure type: Culvert

Risk to fish passage: Low

Priority for replacement/remediation: Low

H10 is a concrete culvert located in the upper reaches of Hakapupu catchment within the Calder Steward forestry estate (Figure 68). The culvert is set at the same gradient as the surrounding stream, has good water depth and low velocity and does not impede fish passage in any way.



Figure 68 Location of the H10 culvert



Figure 69 Downstream view of the H10 culvert



Figure 70 Upstream view of the H10 culvert

Appendix 21 – Site H11

Fish passage database ID: 177875

Date of assessment: 14/12/23

Location: Lat: -45.48714235, Long: 170.5920002

Structure type: Culvert

Risk to fish passage: High

Priority for replacement/remediation: Low

Culvert H11 is located in the upper reaches of the Hakapupu catchment in the Calder Stewart Forestry estate (Figure 71). The structure is a steel box culvert with a slightly raised lip on the upstream edge (Figure 73), however historic floods have undermined the structure and it had collapsed at the downstream end. At low flows all surface water is directed underneath the structure to reappear at the downstream end (Figure 72).



Figure 71 Location of the H11 culvert

At the time of assessment, there was not continuous surface flow in the reach surrounding the culvert, with the stream consisting of a series of disconnected pools. As such, it is likely that the culvert would create a high risk to fish passage at moderate flows, but not at the low flows observed in mid-December. Although its remediation

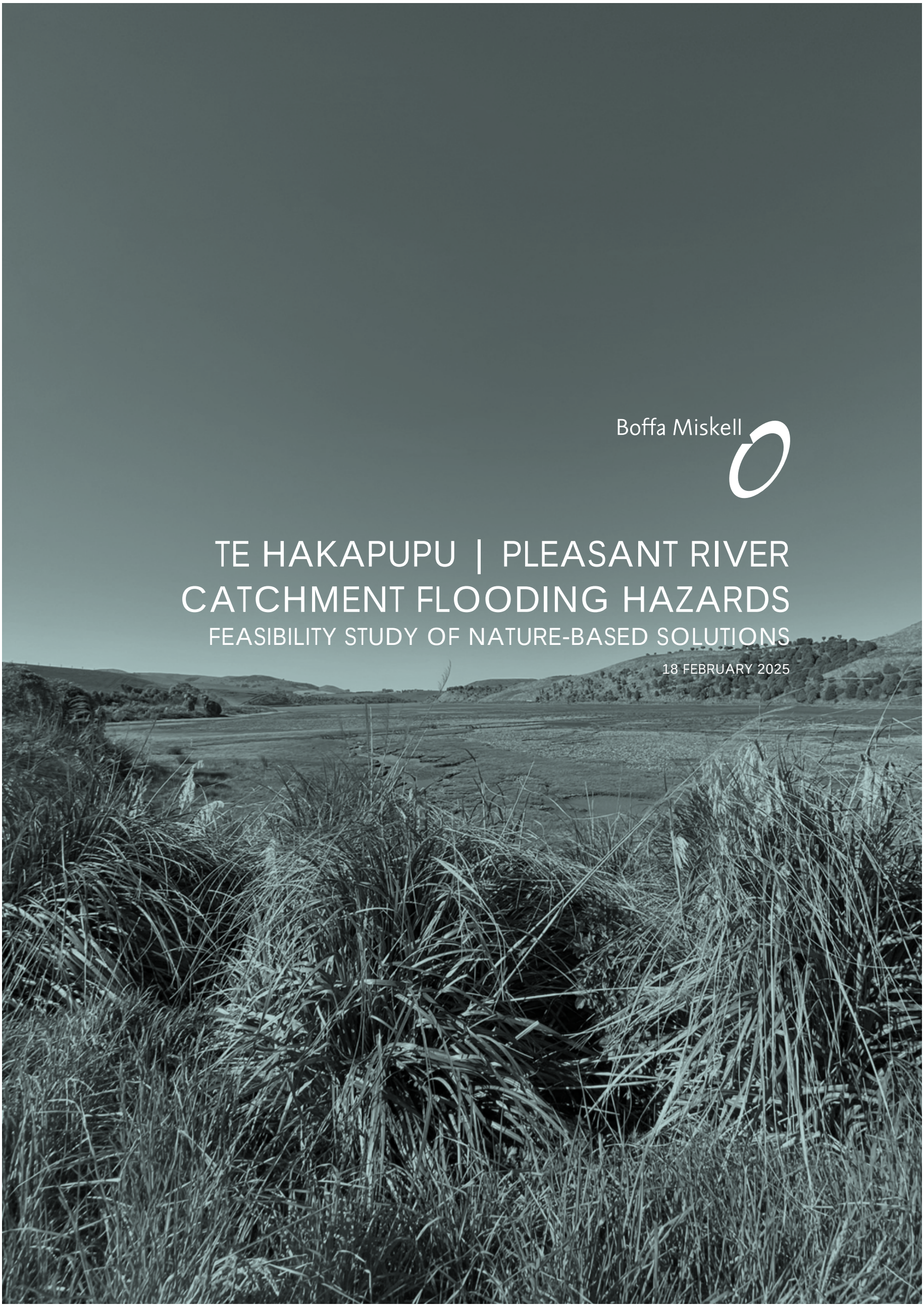
priority is low in its current state, the continued degradation of the culvert due to flood damage will likely result in the need to replace the structure in the medium term.



Figure 72 Downstream view of the H11 culvert.



Figure 73 Upstream view of the H11 culvert


Boffa Miskell
TE HAKAPUPU | PLEASANT RIVER
CATCHMENT FLOODING HAZARDS
FEASIBILITY STUDY OF NATURE-BASED SOLUTIONS
18 FEBRUARY 2025

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EXECUTIVE SUMMARY

The use of Nature-based Solutions (NbS) within Te Hakapupu/Pleasant River catchment (the catchment) present significant opportunities to manage flooding and associated hazards. However currently, in New Zealand, the understanding and use of NbS as a tool to manage flood hazards remains in its infancy. To help build a strong evidence-base to inform the future use of NbS for flood hazard management across Otago, Otago Regional Council (ORC) has commissioned a feasibility study of NbS to manage flood hazards in Te Hakapupu/Pleasant River catchment.

The study will look at how NbS could help lessen the long-term effects of flooding in Otago, as well as bring other benefits to the region. The project is one of 21 nationally to be fully funded by the Ministry for the Environment's (MfE) Essential Freshwater Fund. In addition, the work builds on and supports Toitū Te Hakapupu: The Pleasant
River Catchment Restoration Project, a partnership between Otago Regional Council and Kāti Huirapa Rūnaka ki Puketeraki to restore and enhance the mauri and health of the river system.

BUILDING AN UNDERSTANDING OF NATURE-BASED SOLUTIONS

Te Hakapupu/Pleasant River catchment in East Otago currently faces challenges from flooding and associated hazards, including streambank erosion and sedimentation, that occur during an extreme rainfall event. These challenges are commonly experienced in catchments across the Otago Region and wider New Zealand. As the effects of climate change continue to grow, the frequency and intensity of extreme rainfall events in the Otago Region are projected to increase, placing additional pressures on local communities and natural environment values.

NbS have the potential to effectively manage flood hazards in the catchment and other similar catchments in the Otago region. Taking actions to protect, conserve, restore, and sustainably use natural ecosystems can increase resilience to the effects of flood hazards, while simultaneously providing a wide range of social, economic, environmental, and cultural benefits.

As part of the feasibility study, several NbS interventions were evaluated to establish their flood hazard management capabilities, their alignment with global standards for NbS best practice, and their relevance to the catchment and its characteristics. A Rapid Flood Hazard Model was also developed to assist with understanding how the proposed NbS could affect the existing flood events in the catchment.

Three NbS interventions were identified as being feasible within Te Hakapupu/Pleasant River catchment.

1. **Landcover management:** Restoring and expanding existing pockets of remnant indigenous forest, working towards the gradual transition of large areas of landcover to permanent indigenous forest in vulnerable upper sub-catchment locations
2. **River and stream naturalisation:** Restoration of riparian vegetation, re-meandering channels, and reconnecting isolated or drained off-stream wetland areas along the catchments modified and unvegetated waterways
3. **Wetland restoration and construction:** Restoring and constructing surface flow wetland natural features, such as deep sedimentation ponds and shallow water vegetated areas in flood prone catchment locations

The possible application of these interventions across a typical river catchment is illustrated in Figure 1.

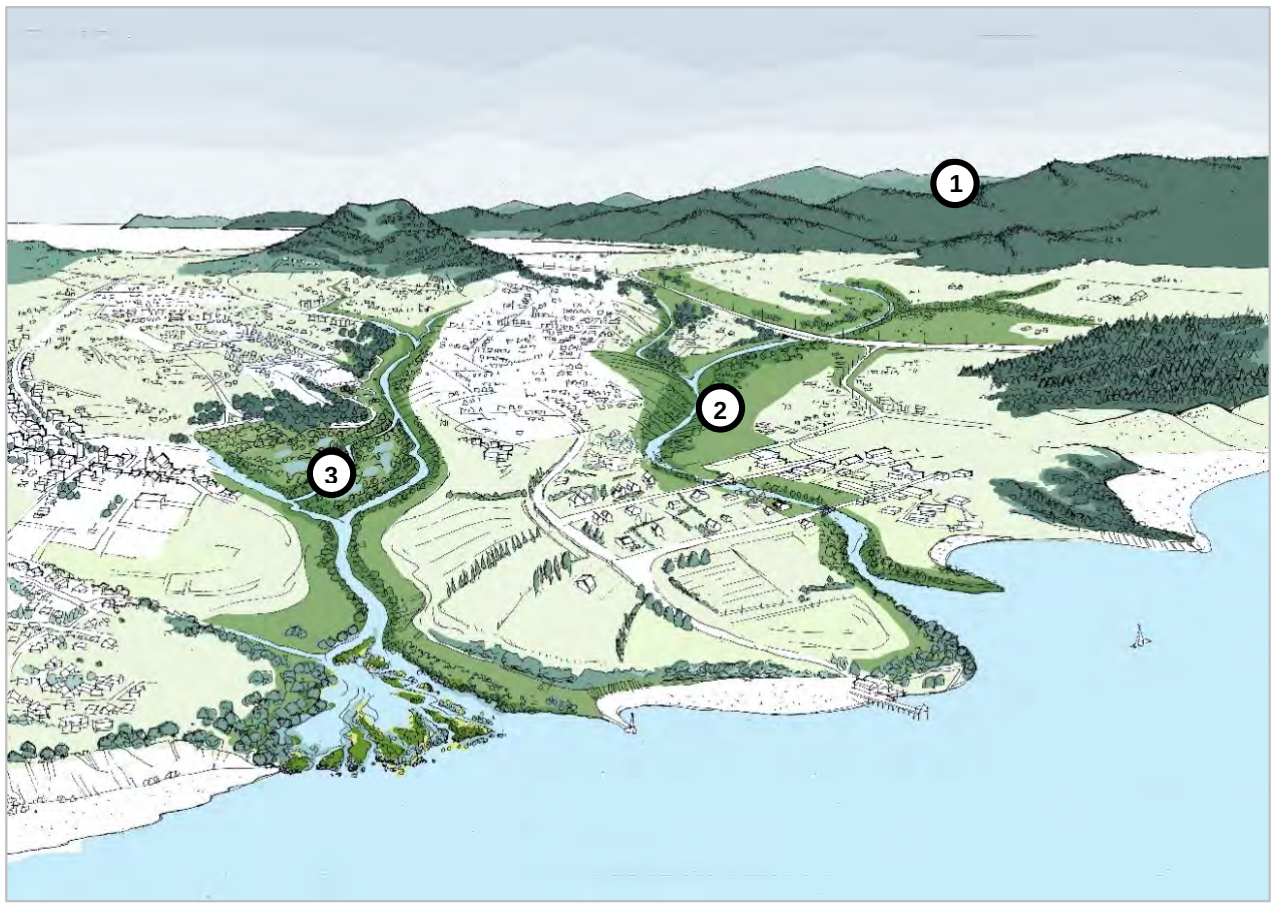


Figure 1: Possible application of the three nature-based solutions across an illustrative river catchment. 1: Landcover management; 2: River and stream naturalisation; and 3: Wetland restoration and construction. Source: Boffa Miskell Ltd.

The three NbS interventions were all assessed to provide significant benefits to flood hazard management within the catchment. They would also deliver a wide range of social, economic, environmental, and cultural benefits and support local catchment management goals currently being delivered by Toitū Te Hakapupu: The Pleasant River Catchment Restoration Project.

CHALLENGES FOR NATURE-BASED SOLUTIONS

While NbS interventions were evaluated to be technically feasible and beneficial for addressing flooding and associated hazards experienced within Te Hakapupu/Pleasant River catchment, at present, their practical application faces several barriers.

To sufficiently manage flood hazards in the catchment, NbS need to be considered at a catchment scale, across multiple land tenures. Specifically, in Te Hakapupu/Pleasant River catchment, it is recommended to progress landcover management in the upper catchment, before applying NbS in the lower catchment. This will safeguard against flood hazards currently experienced further downstream, during forestry harvest and replanting periods.

However, to do this, would require areas of land currently used for commercial forestry to be set aside for non-commercial native forest use.

Accordingly, in considering the large-scale land-use changes needed for NbS, the most significant challenges preventing their use would be the direct economic costs experienced by landowners from the loss of primary production lands (both forestry and agriculture).

To overcome these challenges and facilitate the wider use NbS in Te Hakapupu/Pleasant River catchment and other Otago catchments, it is recommended that a range of governance measures and economic incentives are in place that could encourage landowners to invest in NbS in the catchment.

FEASIBILITY STUDY KEY FINDINGS

Through the process of undertaking the feasibility study a number of key findings were established, that could guide the ongoing use of NbS as tools to manage flood hazards in Te Hakapupu/Pleasant River catchment and across the wider Otago region. It is recommended that these are tested further with ORC partners and stakeholders, including landowners, operators and investors, and the local community.

NbS are technically feasible

NbS are technically feasible as methods for the management of flooding and associated hazards in Te Hakapupu/Pleasant River catchment and across the wider Otago region. NbS will work to influence the natural processes across the catchment to effectively control and accommodate floodwater, and their use should be promoted as a method of flood mitigation.

Landcover management in upper catchment areas is the first step

Implementing land cover management NbS in the upper Te Hakapupu/Pleasant River catchment is critical to manage flooding and associated hazards, which are expected to increase in the lower catchment, during upper catchment forestry harvest periods.

NbS work most successfully when applied at scale

In a large catchment like Te Hakapupu/Pleasant River, to sufficiently manage flooding and associated hazards NbS should be applied at a suitably large scale[1]. NbS are most effective when implemented over larger areas or broader contexts, and while small-scale NbS projects can be useful, scaling them up maximises their ecological, economic, and social benefits.

Integrated NbS provide enhanced benefits

At scale, NbS need to work in an integrated manner to effectively manage flood hazards, working as a connected network and with surrounding land uses, across the catchment, from Ki Uta Ki Tai (mountains to the sea). When NbS are integrated across catchment areas their effectiveness and benefits are significantly enhanced.

Innovation is required to ensure NbS are economically viable

The current economic and funding framework presents one of the greatest challenges to NbS implementation, making them financially unviable for many landowners. To support large-scale adoption of NbS, especially across areas of productive forestry and farming land use like Te Hakapupu/Pleasant River catchment, innovative economic approaches are essential.

[1] E.g. The scale of a constructed wetland should be 1-5% of the contributing catchment area to effectively manage flooding and reduce contamination

RECOMMENDED ACTIONS TO SUPPORT THE USE OF NATURE-BASED SOLUTIONS

Successfully applying NbS will require strong governance and political backing, as well as economic support and financial assistance, for landowner, from both the private and public sectors. This could involve approaches like payments for environmental benefits, financial incentives for landowners, and cost sharing initiatives.

The following five actions are recommended to facilitate the practical implementation of NbS in Te Hakapupu/Pleasant River catchment and other similar catchments across the Otago region:

Action 1: Strengthen NbS governance and partnerships

Create innovative public and private partnerships, involving central and local governments, mana whenua, landowners, businesses, financial institutions, and community stakeholders to create a robust governance framework, that supports equitable application and funding of NbS for hazard management, and encourages time and financial investment by all parties.[2]

Action 2: Facilitate economic incentives for landowners

Develop and implement a model that provides economic incentives to landowners for transitioning existing land uses to NbS, (e.g. retiring productive farmland to become wetland). This could include mechanisms such as payments for ecosystem services, grants, tax incentives, and revenue from ecotourism.

Action 3: Promote Nature-based credit markets

Build greater understanding and application of the nature-based markets available for ecosystem services, and how they can be used to enable private investment in NbS as a tool to manage flood hazards (e.g. ability for private companies to finance NbS and associated carbon and biodiversity benefits to offset carbon emissions).

Action 4: Develop regional NbS policy, guidance, and standards

Develop NbS practice standards, guidance and supporting regional policies tailored for the Otago region to support landowners in adopting and implementing NbS on their properties. This includes ensuring consistency across the region by providing comprehensive guidance for NbS planning, addressing the required consenting pathways to streamline implementation

Action 5: Integrate NbS into catchment scale management and planning

Nature based solutions should be planned for and integrated within the Te Hakapupu Catchment Action Plan, and for other similar Otago region catchments through Integrated Catchment Management Planning (ICMP) processes to ensure they’re used correctly and cohesively with catchment land uses and community values.

[2] Financial institutions include banks, insurance companies, and other investment companies. These institutions are important to facilitating investment via tools such as green bonds and sustainability-linked loans

1. INTRODUCTION

1.1. PURPOSE OF THE NATURE-BASED SOLUTIONS FEASIBILITY STUDY

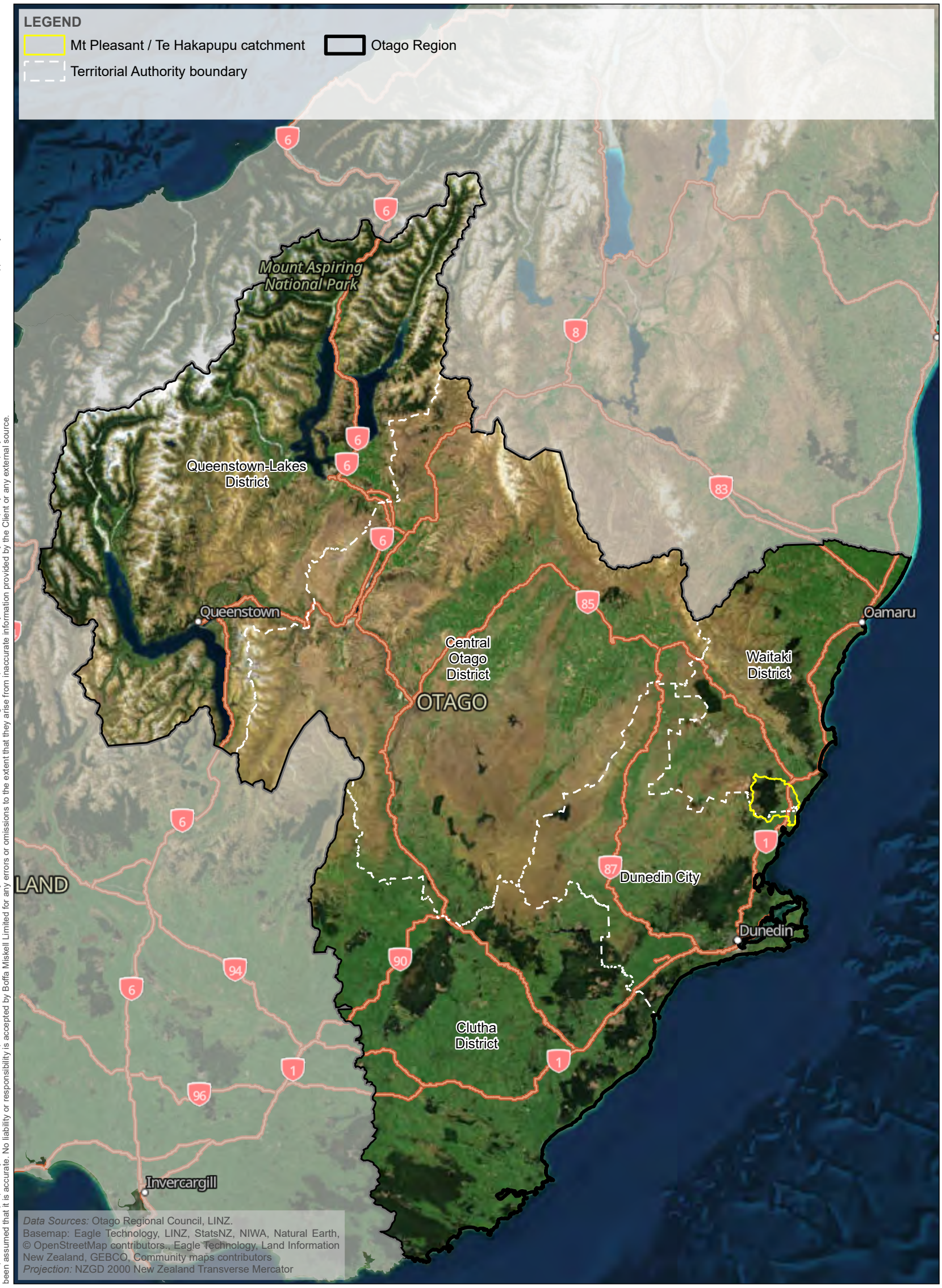
Boffa Miskell has been commissioned by Otago Regional Council (ORC) to undertake a feasibility study to investigate the use of nature-based solutions (NbS) in managing flooding and associated hazards in Te Hakapupu/Pleasant River catchment (the catchment).

The catchment is in Eastern coastal Otago (see Map 1) and covers about 12,800 hectares of rural land. It sits within the regional jurisdiction of ORC and spans the local authority boundaries of Dunedin City Council (DCC) and Waitaki District Council (WDC). The catchment includes Te Hakapupu / Pleasant River, Owhakaoho/Trotters Creek, Watkin Creek, and the Te Hakapupu / Pleasant River estuary wetland complex (see Map 2). The catchment is within the takiwā (territory) of Kāti Huirapa ki Puketeraki, who hold mana whenua status over East Otago and kaitiakitaka (guardianship) of the land.

The NbS feasibility study will inform ORC and its partners collective understanding of NbS and their benefits. It tests the viability of three NbS in managing flooding and associated hazards in the catchment and sets out several recommendations to take forward in the future. In addition, a key objective was to enable the transfer of the learnings from the study to other river catchments in the Otago region.

The NbS feasibility study will help ORC and its partners to:

- Establish an understanding of NbS based on global and national best practice, their benefits, and obstacles and barriers to implementation
- Understand how Te Hakapupu/Pleasant River catchment behaves in different extreme rainfall events, including during predicted peak flood periods
- Test how NbS best practice could contribute to flood hazard management in Te Hakapupu/Pleasant River catchment
- Provide recommendations for how ORC and relevant parties could work together to use NbS as a flood management tool in Te Hakapupu/Pleasant River catchment.
- Build upon the efforts and progress of the Toitū Te Hakapupu: Pleasant River restoration project, as a foundation to introduce and expand NbS within the catchment area.
- Establish regional NbS guidance, standards, and policy to enable the learnings from this study to be transferred to any catchment on Otago.



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TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Catchment Location

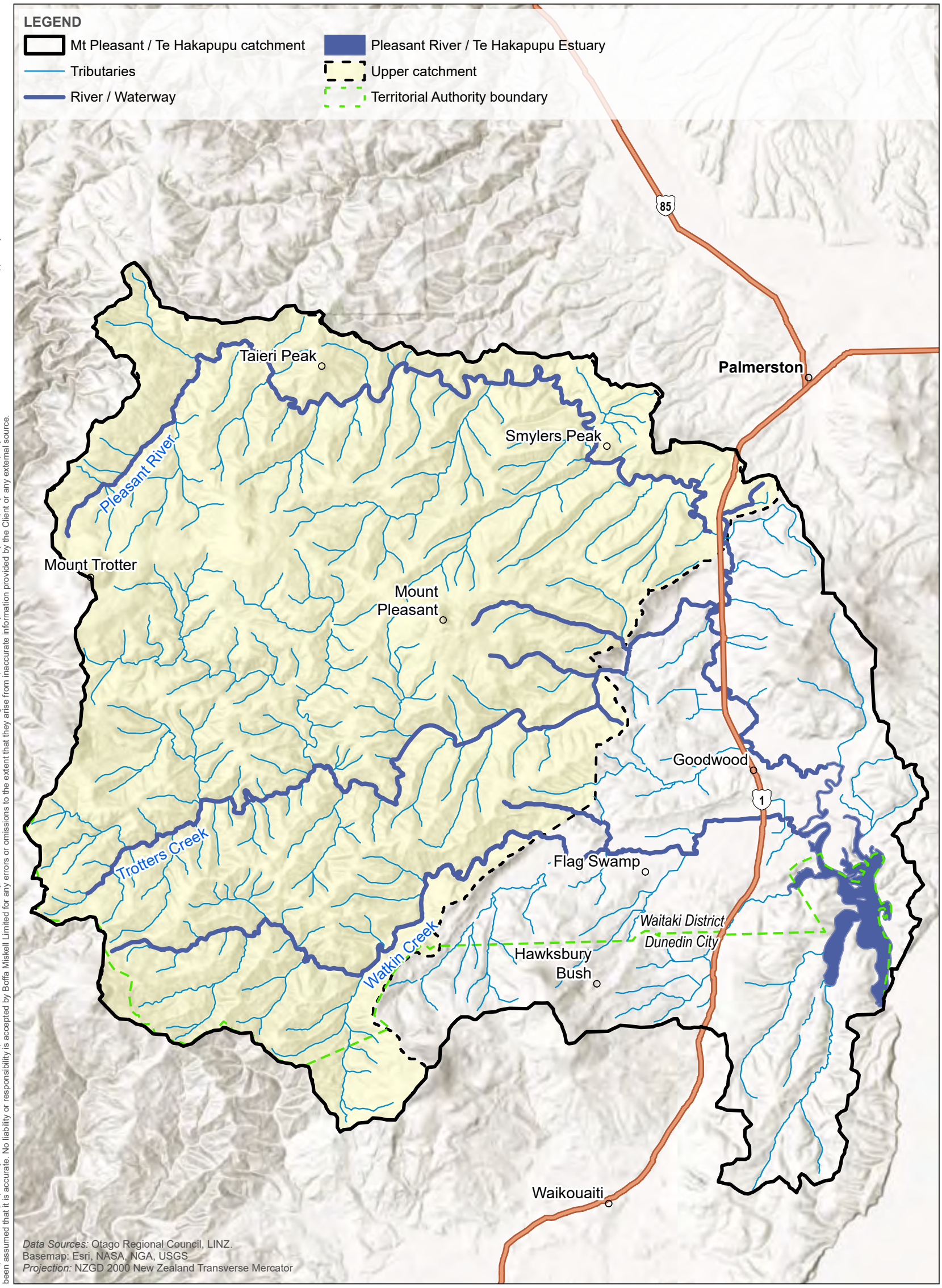
Date: 04 December 2024 | Revision: 0

Plan prepared for Otago Regional Council by Boffa Miskell Limited

Project Manager: Rachael.Eaton@boffamiskell.co.nz | Drawn: LJa | Checked: SPa

MAP 1

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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Feasibility Study

Date: 05 December 2024 | Revision: 0

Plan prepared for Otago Regional Council by Boffa Miskell Limited

Project Manager: Rachael.Eaton@boffamiskell.co.nz | Drawn: LJa | Checked: SPa

MAP 2

1.1.1 **Toitū** Te Hakapupu: The Pleasant River Catchment Restoration Project

In 2021, the catchment received funding from the Ministry for the Environment 'Essential Freshwater Fund' to support the Toitū Te Hakapupu – Pleasant River Catchment Restoration Project.[3] The project is a four-year partnership between the Otago Regional Council (ORC) and Kāti Huirapa Rūnaka ki Puketeraki.

The $5.2 million project is focused on improving the health of the water in the catchment which includes Owhakaoho/Trotters Creek, Watkin Creek, and the estuary. It aims to restore and enhance the mauri and health of this important river system.

Since its establishment, the project has conducted environmental monitoring to understand the current pressures on the catchment and supported landowners to plant approximately 68,000 plants and erect 27 km of fencing for freshwater enhancement.

See Appendix 4 for Toitū Te Hakapupu – Pleasant River Catchment Restoration Project native planting and fencing statistics (as of December 2024).

[3] Toitū Te Hakapupu: The Pleasant River Catchment Restoration Project | Otago Regional Council

1.2 FEASIBILITY STUDY METHODOLOGY

The methodology for evaluating the feasibility of NbS in Te Hakapupu/Pleasant River Catchment has been grounded on international NbS best practice, supported by collaboration with ORC, mana whenua, and community stakeholders.

Building upon an established understanding of NbS global and national best practice, a strong understanding of the catchment was developed through hydrology modelling, geospatial analysis, and catchment specific literature review. At key stages throughout the delivery of the feasibility study, engagement with the Toitū Te Hakapupu Partnership Group and other community stakeholders was conducted to gather additional insights and test findings.

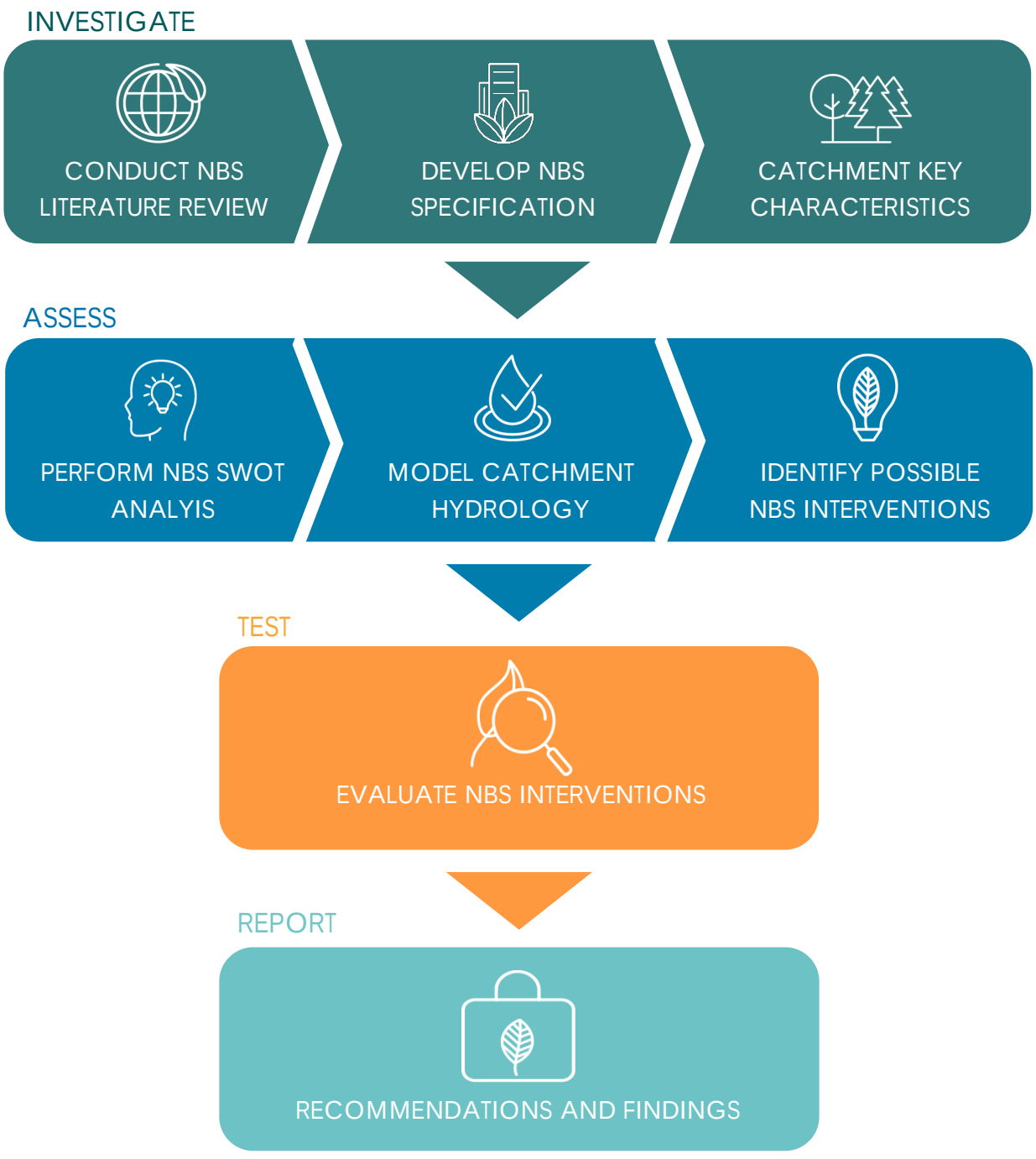


Figure 2: Overview of the Feasibility Study methodology

Investigation

To establish an understanding of NbS for flood management that could be applied in Te Hakapupu/Pleasant River catchment, a literature review was conducted. Based on leading international NbS literature sources, including the International Union for the Conservation of Nature (IUCN), the Nature-based Solutions Initiative, and the US Army Corps of Engineers, a variety of NbS approaches for flood hazard mitigation were identified for further investigation. Additionally, the literature review sought to uncover emerging NbS best practice standards and evaluation practices that should be considered throughout this feasibility study.

Applying the *IUCN 'Global Standard for Nature-based Solutions' (2020)* identified during the literature review, a 'Nature-based Solutions Technical Specification' was developed. This set the technical framework for the project, confirming the definition, functional criteria, and performance indicators to be used to design and evaluate NbS in the Otago region. The specification was developed to ensure NbS interventions proposed within Te Hakapupu/Pleasant River catchment reflect best practice guidelines and align with global NbS standards and agreements. See Appendix 1 for more information on the Technical Specification.

A spatial analysis was conducted for the catchment area to identify district plan landscape features and constraints, natural hazard zones, land uses, and remnant indigenous ecosystem coverage. Building upon this spatial information, a catchment specific literature review provided a strong understanding of the key catchment characteristics, environmental pressures, and values. This included gathering information concerning the water quality challenges in the catchment, mana whenua and community objectives for the catchment, and how the catchment would be affected by the projected impacts of climate change in the Otago region.

Assessment

Based on the various NbS approaches identified during the literature review, a SWOT (strengths, weaknesses, opportunities, and threats) analysis process was then conducted to assess and refine the use of NbS for flood hazard management in the catchment. This process sought to identify the key NbS that were deemed to most compatible within the environmental, social, and economic content of the Te Hakapupu/Pleasant River catchment. The SWOT analysis was conducted with input from technical experts, ORC project team members, Kati Huirapa Rūnaka ki Puketeraki, forestry operators, and the East Otago Catchment Group.

From the SWOT analysis, three NbS interventions were identified. These NbS were landcover management, river and stream naturalisation, and wetland restoration and construction.

Testing and evaluation

The three NbS interventions were tested in the catchment to understand their feasibility for flood hazard management. Using the functional criteria and relevant performance indicators from the NbS Technical Specification, and the Rapid Flood Hazard Modelling (RFHM) detailed below, an evaluation criterion was applied to each NbS intervention to test the opportunities, challenges, and possible benefits of NbS.

The evaluation of NbS interventions was conducted by technical planning, ecology, hydrologists, and landscape experts. To ensure interventions fit practically within existing landscape constraints and contribute to flood management, evaluations were further informed by the RFHM data and catchment geospatial information (GIS).

Evaluation considerations included the flood hazard management capability of NbS interventions, alongside the other possible benefits of NbS such as biodiversity, landscape character, economic value, and social benefits.

Findings and next steps

Outcomes of the evaluation processes and RFHM analysis have been collated in this feasibility study, with accompanying technical appendices and GIS resources provided. The conclusion of this feasibility study outlines the key findings and recommended actions needed for the successful implementation of NbS for flood management in Te Hakapupu/Pleasant River Catchment and other Otago catchments. These insights provide a foundation for informed decision-making and practical action across the region.

1.2.2 Rapid Flood Hazard Modelling

To inform the Te Hakapupu/Pleasant River catchment NbS feasibility study, Boffa Miskell commissioned hydrology modellers and technical experts to produce and analyse a Rapid Flood Hazard Model (RFHM) of the catchment.

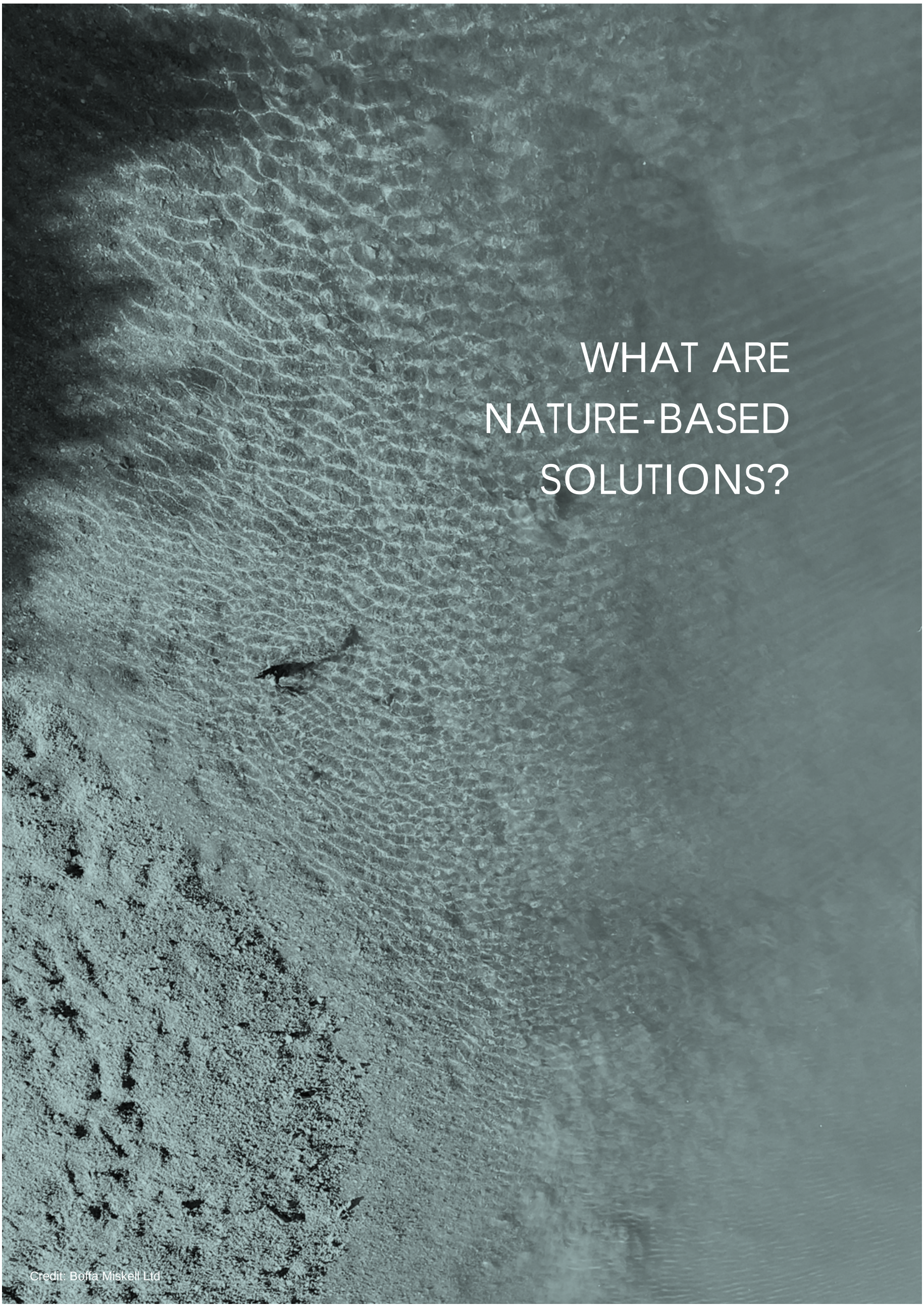
This modelling characterises how the current catchment will likely respond during an extreme rainfall event, in this case a one-in-100-year rainfall event (100-year annual return interval) with the added effect of climate change. The model simulates how rain, captured in the steeper inland areas of the upper catchment, flows through the main channels of Te Hakapupu / Pleasant River, Owhakaoho / Trotters Creek, and Watkin Creek into the flatter areas of the lower catchment.

The RFHM process aimed to establish and understand the expected characteristics of flood risks in the catchment during a one-in-10-year and one-in-100-year, 24-hour extreme rainfall event under future climate change scenario. RFHM outputs included predicted peak flood flow level, peak flood depth, and peak flood flow speed.

The RFHM helped to establish how the use of NbS would affect the predicted peak flood in the catchment, and their potential use in reducing flood magnitude and mitigating flood risks.

These findings, combined with coastal inundation modelling and the qualitative findings of this feasibility report, provides a suite of tools to evaluate how NbS and other flood management interventions may impact flood characteristics in the catchment. These tools will support the evolving understanding and application of NbS in the area and across the Otago region.

See Appendix 2 for more information about the RFHM process and outputs.


WHAT ARE
NATURE-BASED
SOLUTIONS?
Credit: Boffa Miskell Ltd

2. WHAT ARE NATURE-BASED SOLUTIONS?

2.1 DEFINING NATURE-BASED SOLUTIONS

Nature-based solutions seek to use natural processes to address environmental challenges, like flood hazards and risks, while providing biodiversity, human wellbeing, and community benefits

This NbS feasibility study uses the definition of NbS, formerly adopted by the United Nations Environment Assembly 2022 (UNEA). This definition builds upon the International Union for Conservation of Nature (IUCN) definition of NbS and other relevant NbS definitions formerly use to provide an internationally agreed approach for NbS.

'Nature-based solutions are actions to protect, conserve, restore, sustainably use, and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic, and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience, and biodiversity benefits' – (UNEA/EA.5/Res.5)

At present in New Zealand, a number of different definitions for NbS exist within various strategic planning frameworks, including council climate change and biodiversity strategies, the National Adaptation Plan, and Te Mana o te Taiao - Aotearoa New Zealand Biodiversity Strategy.[4] However, following the formal adoption on the UNEA NbS definition, work is currently underway by the Ministry for the Environment to communicate this collective definition across New Zealand NbS users.

To support the assessment of the feasibility of NbS for flood mitigation, currently being conducted by ORC and other regional or unitary councils, the Ministry of Business, Innovation, and Employment (MBIE) commissioned a literature review of NbS for flood management (NIWA. 2024). Applying the agreed UNEA definition of NbS, the literature review provided an up-to-date and in-depth analysis of the existing literature, case studies, and best practices related to the use of NbS for mitigating flood hazards. The literature review report provides a summary of the strengths, weaknesses, opportunities, and threats for NbS that can be used for flood hazard mitigation.

These themes are assessed in greater detail in this feasibility report for Te Hakapupu catchment.

2.2 TYPES OF NATURE BASED SOLUTIONS

As an umbrella concept, NbS include a number of related approaches that share a focus of protecting and enhancing the natural environment to address challenges, such as green infrastructure and water sensitive urban design (WSUD). Globally, NbS have been applied in response to a diversity of environmental challenges, including managing natural hazards and climate change adaptation, reducing greenhouse gas emissions (i.e. climate change mitigation), addressing biodiversity decline, or preventing land degradation.

[4] Note, definitions for Nature-based Solutions included in existing New Zealand planning frameworks predominantly reference NbS definitions from IUCN, the European Union, or WSUD guidance.

As illustrated in figure 4, NbS can be broadly classified under three core approaches of working with nature to address environmental challenges.

- **Protection, conservation, and restoration:** Protection and enhancement of natural environment features and ecosystems, such as river and flood plain naturalisation, coastal wetland, mangrove, and dune restoration, and control of browsing pest species.
- **Sustainable use:** The maintenance and sustainable use of natural environment values and ecosystems, such as native carbon forestry, community gardens, floodable recreation areas, regenerative agricultural practices.
- **Green infrastructure:** Development of issue-specific green infrastructure that creates natural environment features such as constructed wetlands, bioretention rain gardens and pervious paving in urban areas, and vegetated swales along flood prone waterways

Across a catchment, combining NbS with grey infrastructure can effectively maximize efficiency while minimizing economic trade-offs. Grey infrastructure can address critical planning challenges, such as enabling urban development within flood-prone areas by mitigating immediate risks from natural hazards. At the same time, NbS can complement these efforts by reducing the severity of hazards upstream and offering additional benefits, such as enhancing biodiversity and improving water quality, which grey infrastructure alone cannot achieve (TNC, 2023)

While a diversity of NbS approaches are available, careful consideration must be applied to ensure that NbS interventions are compatible with the natural landscape and existing land uses.

The type of NbS identified for testing in Te Hakapupu/Pleasant River Catchment were identified based on their ability to address the challenges associated with flood hazard, alongside their potential for enhancing the biodiversity values present in the catchment and ability to mitigate other environmental pressures, such as soil degradation and water quality decline.



Figure 3: Example of naturalisation of a waterway formerly contained in concrete channels as a method to manage the effects of extreme rainfall induced flooding. Source: Boffa Miskell Ltd.



Figure 4: Examples of the range of nature-based solutions that can be applied across a catchment. Image: Boffa Miskell Ltd.

2.3 THE BENEFITS OF NATURE-BASED SOLUTIONS

Healthy natural ecosystems act as the first line of defence against natural hazards, including flooding and associated hazards. When ecosystems are healthy, they buffer us from the impacts of natural hazards and increase our resilience to their effects (IUCN, 2020).

As shown in figure 5, NbS seek to protect, conserve, restore, and sustainably use natural ecosystems to address environmental challenges, such as flooding, while simultaneously contributing benefits for our environmental, social, economic, and cultural wellbeing. Through actions to establish or restore natural environment features, such as constructing wetland areas and replanting river riparian margins, NbS effectively manage flood hazards while enhancing the health of important ecosystems in a catchment.

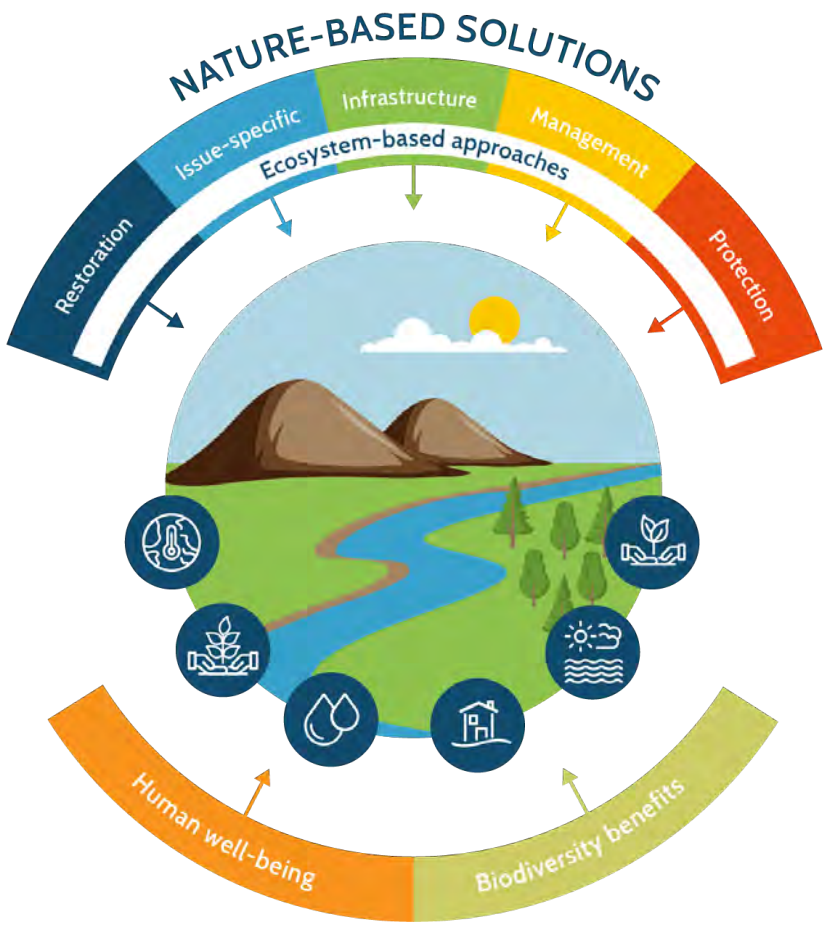


Figure 5: Diagram illustrating how Nature-based Solutions can result in benefits for human well-being and biodiversity. Source: IUCN, 2020

2.3.1 Flood hazard management

NbS are primarily designed as a response to an environmental challenge, such as flooding and associated hazards. NbS can act as practical additions or replacements for conventional 'grey' infrastructure to effectively mitigate and manage hazards across a landscape.[5] Whilst a historically tried and proven approach, in the face of climate change exacerbated flood hazards, 'grey' infrastructure approaches may face long-term challenges.

[5] **Grey infrastructure** refers to engineered structures such as dams, seawalls, or stormwater management pipes and drains.

Challenges include that grey infrastructure is often difficult and costly to adapt, maintenance costs increase as assets age, and they can negatively impact natural environment values through modifying the natural hydrology of a catchment (Climate Change Commission, 2024).

By contrast, NbS manage flood hazards by influencing the natural processes across a catchment to accommodate and redistribute water – changing how extreme rainfall is received by the environment and moves across the landscape.

These practices aim to restore and maintain the natural characteristics of a catchment's hydrology similar to those that existed pre-development.

2.3.2 Human wellbeing & social benefits

Table 1: Summary of human wellbeing and social benefits potentially gained from nature-based solutions. Adapted from More than Water – Assessing the Full Benefits of WSUD (Manaaki Whenua, 2019)

BENEFITS	SUMMARY
Provisioning / Mahika Kai	Traditional mahika kai sources in water bodies are abundant and carry a very low risk of human health effects from consumption.
Recreation	Water bodies are appealing for wide range of recreation, for instance having good water clarity, sandy bed sediments and limited levels of algal growth. Receiving water bodies are well suited to recreation, having a very low risk of human health effects from water contact due to excellent water quality.
Nature connection	Water bodies and green open spaces are celebrated as community assets and easily accessed, with stream and coastal margins in public ownership or easements, and well served by footpaths and accessways that allow views of the landscape and water in places.
Community resilience	Surface flooding is avoided or restricted to designated overland flow paths, flood storage basins and/or parks and reserves, allowing peak flows to spread out with low energy, limiting impact on private properties.
Supplementary water supply	Widespread harvesting and use of stormwater for potable and non-potable uses. Stormwater is detained in ponds/wetlands and is extracted for landscape irrigation during drought periods.

2.3.3 Biodiversity & environmental benefits

Table 2: Summary of biodiversity and environmental benefits potentially gained from nature-based solutions. Adapted from More than Water – Assessing the Full Benefits of WSUD (Manaaki Whenua, 2019)

BENEFITS	SUMMARY
More natural hydrological regime	Runoff volume, stream peak flows, time-to-peak, low flows, and flow variability are more similar to those in an undeveloped catchment than is the case with a conventional development approach
Better water quality	Concentrations of contaminants such as suspended sediments and nutrients in receiving water bodies (e.g. estuary wetland complex) are able to be processed and more similar to those in an undeveloped catchment than is the case with a conventional development approach
Better aquatic and riparian habitat quality	Stream channel geomorphology and bed substrate are more similar to those in an undeveloped catchment. Stream banks are stable and largely lined with diverse native riparian vegetation, providing shade and woody debris inputs to aquatic habitats
Better terrestrial habitat quality	The presence of significant areas of relatively undisturbed or rehabilitated natural vegetation provides high quality terrestrial habitat. Widespread green space is linked by vegetated corridors to maintain or restore a network of green corridors.
Drainage network and ecosystem connectivity	The natural drainage network is largely intact from its headwaters to the stream or river mouth, with few or no artificial barriers to fish passage and good habitat quality maintained throughout.
Natural Character	Characteristics of land, water bodies, and riparian margins are rehabilitated to largely the same as in undeveloped catchment, including the presence of significant undisturbed natural landforms, and improved channel form and sinuosity, water clarity, riparian and vegetation composition.
Carbon Sequestration and Mitigation	Widespread vegetation, especially trees and wetland plants, acts as significant sink of carbon, reducing overall land use emissions and contributing to climate change mitigation outcomes

2.3.4 Economic benefits

A healthy, biologically diverse environment offers substantial economic benefits. To maximize these, it is essential to evaluate the direct and indirect costs and benefits of NbS across their design, implementation, and maintenance phases.

Globally, NbS have the potential to reduce the intensity of climate hazards, such as flooding and coastal inundation, by 26%, with a potential cost saving from climate change impacts of USD 104 billion by 2030 and 393 billion by 2050 (WWF, 2022).

A recent report from WWF established that high-quality NbS can provide significant benefits to New Zealand's economic prosperity, with land-based environmental benefits, such as the provision of clean water and healthy soils, delivering benefits equivalent to 27% of New Zealand's GDP (WWF, 2024).

Furthermore, these natural environment values have been found to support employment, with approximately 1.2 billion jobs worldwide in sectors such as farming, fisheries, forestry, and tourism depending on the effective management and sustainability of healthy natural environments (WWF, 2020).

Implementing NbS to protect nature and achieve New Zealand's international biodiversity targets, under the Kunming-Montreal Global Biodiversity Framework, could save New Zealand an estimated $271.8 billion over the next 50-years (2025 – 2080). These savings stem from mitigating the impacts of nature decline and climate change while unlocking economic opportunities from a thriving natural environment (WWF 2024).

2.4 CHALLENGES & BARRIERS

Despite the significant opportunities NbS present, and as experienced by other NbS early adopters, their application within Otago and wider New Zealand faces a number of common challenges. Such challenges include economic viability of NbS, the ability for NbS to be applied at scale, a lack of national technical NbS guidance, standards and policies and misunderstanding about NbS, their purpose and value.

Economic viability of NbS

A key challenge that can impact the adoption and long-term viability of NbS are the economic challenges associated with private landowners changing land uses for NbS, from primary production land uses, such as farming and forestry, to natural ecosystems, such as wetlands. The economic viability of NbS, is impacted when landowners are unable to gain economic return from transitioning from productive land uses e.g farming and forestry to a natural ecosystem land use.

Ability to apply NbS at scale

If NbS are not made economically viable for landowners, their large-scale adoption and long-term use will likely remain limited. At present in New Zealand, limited funding, and financial incentives for NbS implementation and maintenance restricts their widespread use at scale required to address natural hazards, such as flooding and to bring other benefits.

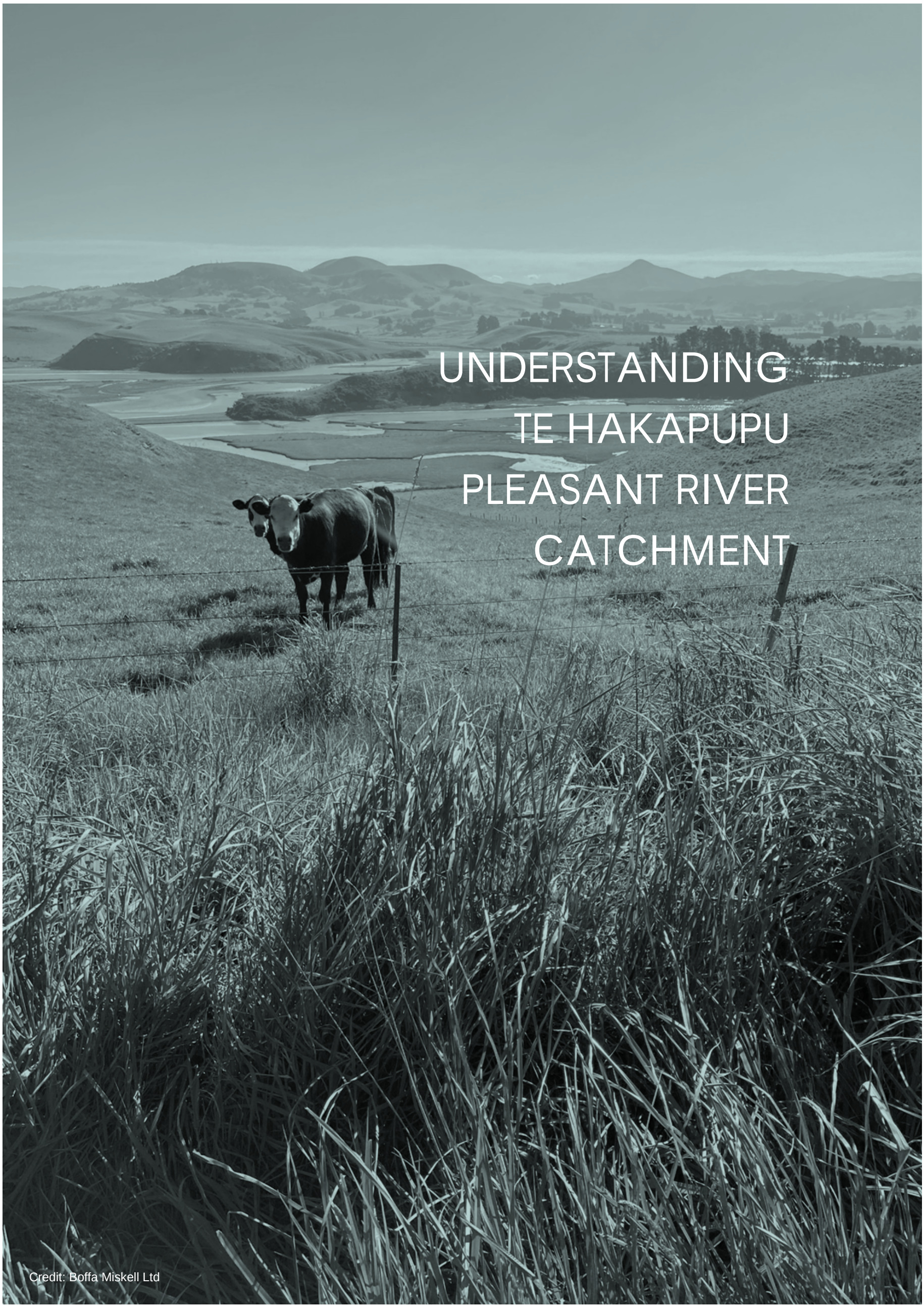
Where there is competition for use of land, including development pressures, the land available for NbS to function sufficiently can be constrained, further increasing the costs associated with the implementation of NbS. When presented with few economic incentives and competing land use pressures, achieving consensus between multiple landowners to implement NbS at large scales proves to be a challenge (NIWA, 2024).

Lack of a consistent technical NbS framework

Absence of comprehensive guidance and monitoring data leads to misuse or misinterpretation of NbS (UNEP, 2022). Without clear definitions and proper understanding, this may result in unintended adverse effects or failure to realise potential biodiversity benefits that could be gained.

While NbS can involve both natural and modified ecosystems, actions that degrade the overall integrity of natural ecosystems do not align with the NbS definition in the UNEA 5/5 Resolution or meet the criteria of IUCN's Global Standard for NbS, as they fail to provide environmental co-benefits (IUCN, 2024). For example, one of the common misconceptions is that actions designed exclusively for climate change mitigation, such as monoculture forest plantations are considered a nature-based solution.

As NbS continue to be adopted more frequently, there is a pressing need for greater clarity of what NbS entail, and what is required for them to be implemented successfully.


UNDERSTANDING
TE HAKAPUPU
PLEASANT RIVER
CATCHMENT
Credit: Boffa Miskell Ltd

3. UNDERSTANDING TE HAKAPUPU/PLEASANT RIVER CATCHMENT

3.1 OVERVIEW OF CATCHMENT CHARACTERISTICS

The Te Hakapupu/Pleasant River catchment lies on the east coast of north Otago, between Waikouaiti and Palmerston, north of Dunedin, covering about 12,800 hectares of rural land. The catchment is sparsely populated, with around 200 residents. It is a highly modified landscape characterised by rural settlements, farming, and forestry land uses.

3.1.1 Waterways and wetlands

The catchment contains a network of tributaries, that feed into three main rivers and waterways (Te Hakapupu/Pleasant River, Owhakaoho/Trotters Creek and Watkin Creek) all of which confluence at the coast at Te Hakapupu/Pleasant River Estuary Wetland Complex (See Map 3: Waterways and Wetlands).

The catchment varies in altitude from 616m above sea-level (Hikaroroa/Mt Watkin) to sea-level. The main tributary, Te Hakapupu/Pleasant River, has a reasonably well entrenched gradient of 1 in 110 above State Highway 1 (SH1). While below SH1, the channel opens out onto the estuary.

The wetland complex is predominantly an estuarine system of about 84 hectares in size. It is the largest wetland in the North Otago Freshwater Management Unit (FMU). Estuarine wetlands such as this are one of the Naturally Uncommon Ecosystems in New Zealand, meaning historically rare. It is also classified as ‘vulnerable’ due to historic and ongoing loss in extent and decline in its ecological integrity (Holdaway et al., 2012).

The wetland complex contains habitat for threatened and vulnerable freshwater and estuarine species, as well as providing recreational opportunities, and natural landscape character values. Additionally, mana whenua values are associated with the estuary wetland complex which supports mahika kai species, kaitiakitaka, mauri, and the practice and teaching of mātauraka Māori.

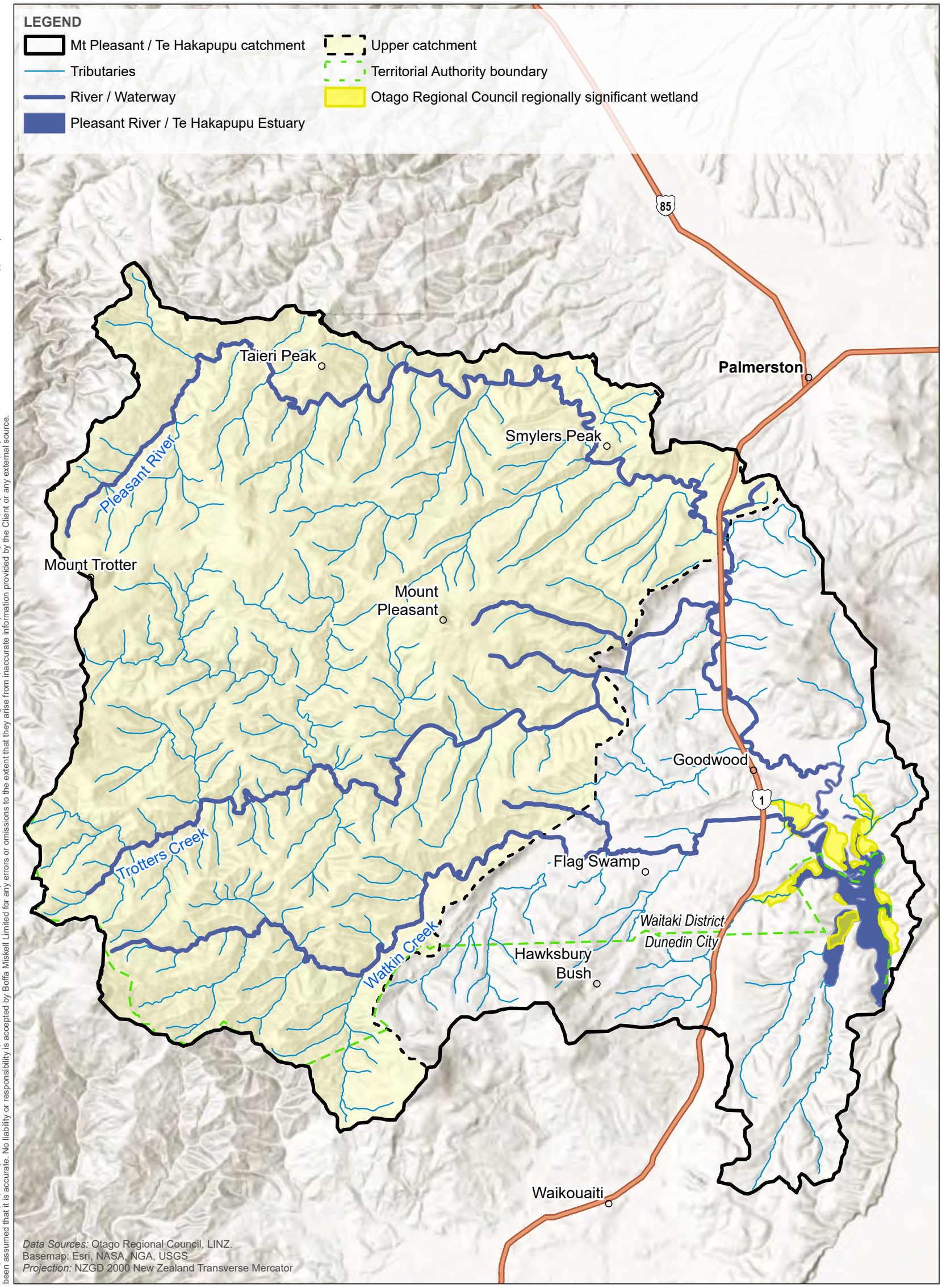
3.1.2 Landscape features

From the Te Hakapupu/Pleasant River estuary, the catchment rises to 616m elevation. The lower catchment is generally characterised as flat landscape with easy rolling hills, the upper catchment areas are dominated by more hilly terrain and steep slopes.

The upper catchment landscape contains six volcanic peaks, Mount Watkin (Hikaroroa), Mount McKenzie (Pakihiwitahi), Mount Trotter, Mount Royal (Te Ruatūpāku), Middle Mount, and Mount Pleasant. All peaks are identified as significant natural features in the Waitaki District Plan. Exotic forestry is a key feature of the upper catchment landscape.

See Appendix 5 for more information about the landscape context of Te Hakapupu/Pleasant River catchment.

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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Waterways and Wetlands

Date: 06 December 2024 | Revision: 0

Plan prepared for Otago Regional Council by Boffa Miskell Limited

Project Manager: Rachael.Eaton@boffamiskell.co.nz | Drawn: LJa | Checked: SPa

MAP 3

3.1.3 Ecosystems and habitats

At present, remnant indigenous ecosystems occur in small pockets across the catchment, with the estuary wetland complex containing valued indigenous plants, such as glasswort and sea primrose. In the upper catchment, small remnant areas of indigenous broadleaf forests, matagouri, coprosma, kōwhai scrub, and kānuka scrub are found. Collectively, these remnant indigenous forest and scrub areas cover approximately 1% of the catchment.

The estuary is identified as a Regionally Significant Wetland in the ORC Regional Plan, and as a Significant Natural Feature and an Area of Significant Nature Conservation Value under the Waitaki District Plan and as an area of significant biodiversity value in the Dunedin City Council 2nd Generation District Plan.

The estuary has a reduced size of approximately 2% of its historic extent due to drainage and reclamation (Leathwick *et al.,* 2010). State of the Environment monitoring of the estuary conducted by the ORC in 2022 has indicated that there are elevated nitrate and nutrient levels in the estuary. Additionally, sediment input, derived from natural and anthropogenic activities (farming and exotic forestry) in the catchment leads to enriched muddy sediments in the estuary (Forrest *et al,* 2022).

Built structures that impede salt marsh growth, such as causeways, flap gates and railway infrastructure, are common within the estuary wetland complex area. These structures have significantly altered estuary hydrology and disrupted the natural connectivity between the land and the sea, compromising the overall ecological health and ecosystem services of the estuary wetland complex (Ahikā Consulting Ltd, 2023).

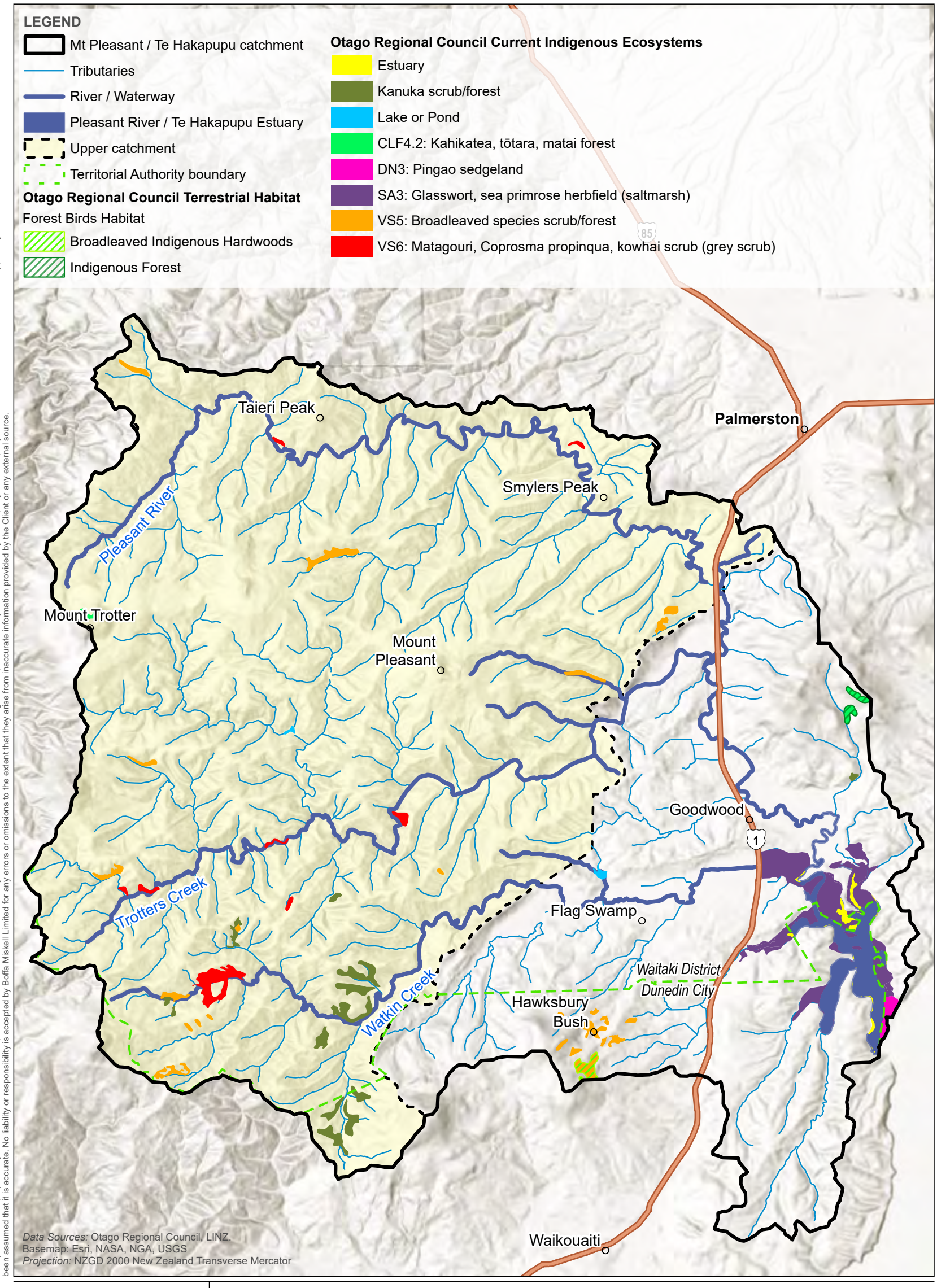
The catchment contains little formally protected conservation areas. These are mainly located at land surrounding the Pleasant River Sand Spit and the estuary mouth. Hawkesbury Bush represents the only moderately large QEII covenant in the catchment, covering 10 hectares of native forest remnants located near the southern extent of the catchment.

See Map 4 and Appendix 4 for more information about the biodiversity values identified within Te Hakapupu/Pleasant River catchment.

3.1.4 Land ownership and use

The land within the catchment is predominantly in private ownership, with nearly half being used for commercial exotic forestry. Plantation forestry land uses are located mainly in the steeper upper catchment area in the west of the catchment. Whilst a number of individual landowners undertake forestry activities as part of their farm businesses, four forestry companies (PF Olsen, Wenita, Ngāi Tahu Forestry, and Calder Stewart) oversee most of the forested area. The remaining land is used for farming, with small pockets of residential/lifestyle land near the coast. Pastoral farmland in the catchment is predominantly sheep and beef, with a smaller amount of dairy and deer farming. There are no arable farms within the catchment area.

Land use in Te Hakapupu/Pleasant River catchment is shown in Map 5



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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Ecosystems and Habitat

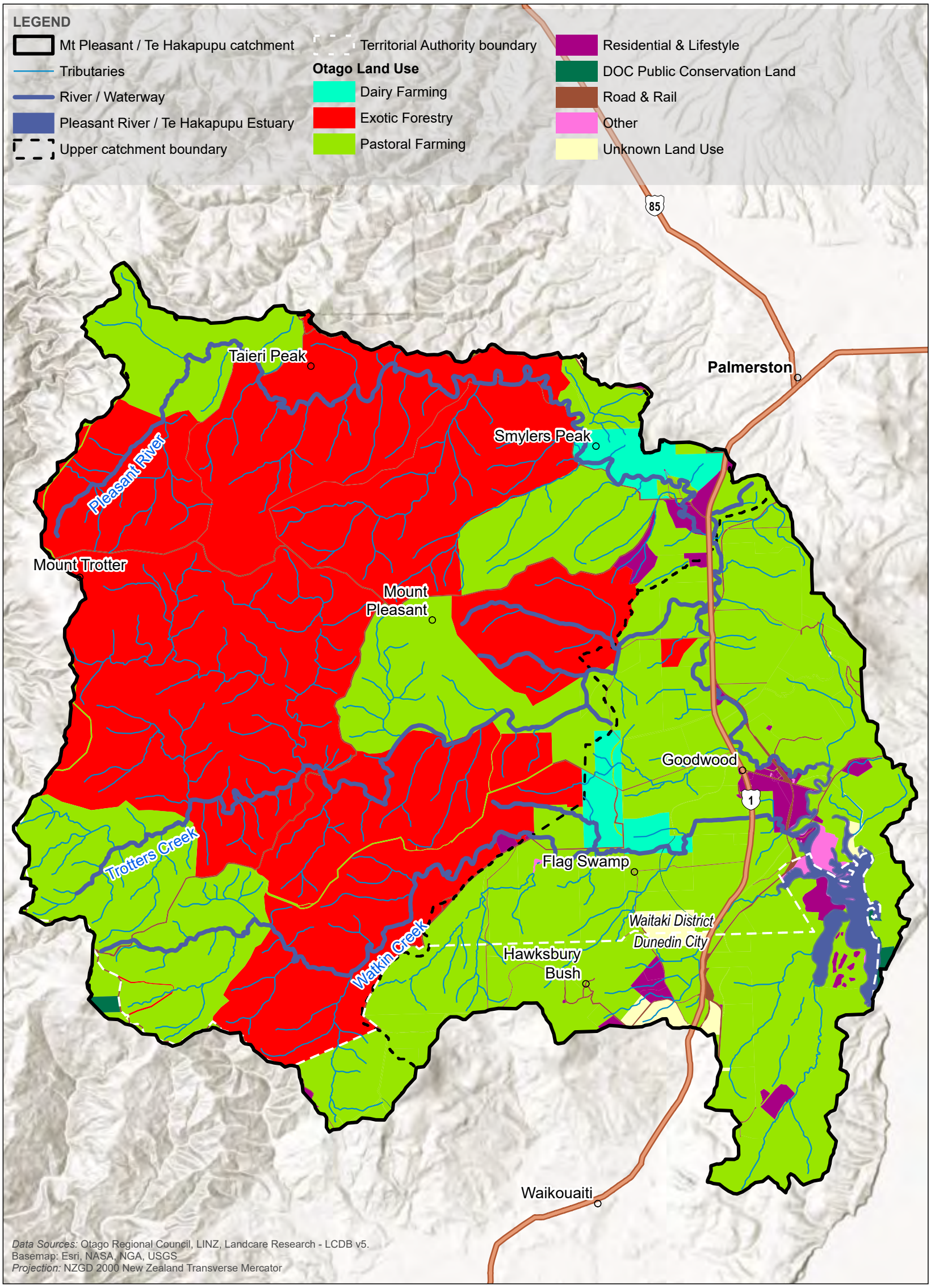
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MAP 4

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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Land Use

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MAP 5

3.1.5 Present day climate

The present day climate of Te Hakapupu/Pleasant River catchment is typical of coastal Otago, with annual mean temperatures ranging between 8-12°C. Summer mean temperatures range between 12-16°C and winter mean temperatures range between 6-8°C. Annual rainfall is comparatively low (compared to inland high elevation areas of the Otago Region), around 600-650mm, with the catchment sometimes becoming ‘dry’ by New Zealand standards during summer months, driven by higher evapotranspiration rates.

The East Otago area can also experience extreme high intensity rainfall events, typically occurring over a 12–72-hour period when a low-pressure zone is located to the east of the South Island. Historically, the average extreme rainfall depth received in the East Otago area is 166mm for a 100-year Annual Recurrence Interval (ARI) over a 24-hour period, and 95mm for a 10-year ARI over a 24-hour period, recorded at Palmerston (figure 6).[6]

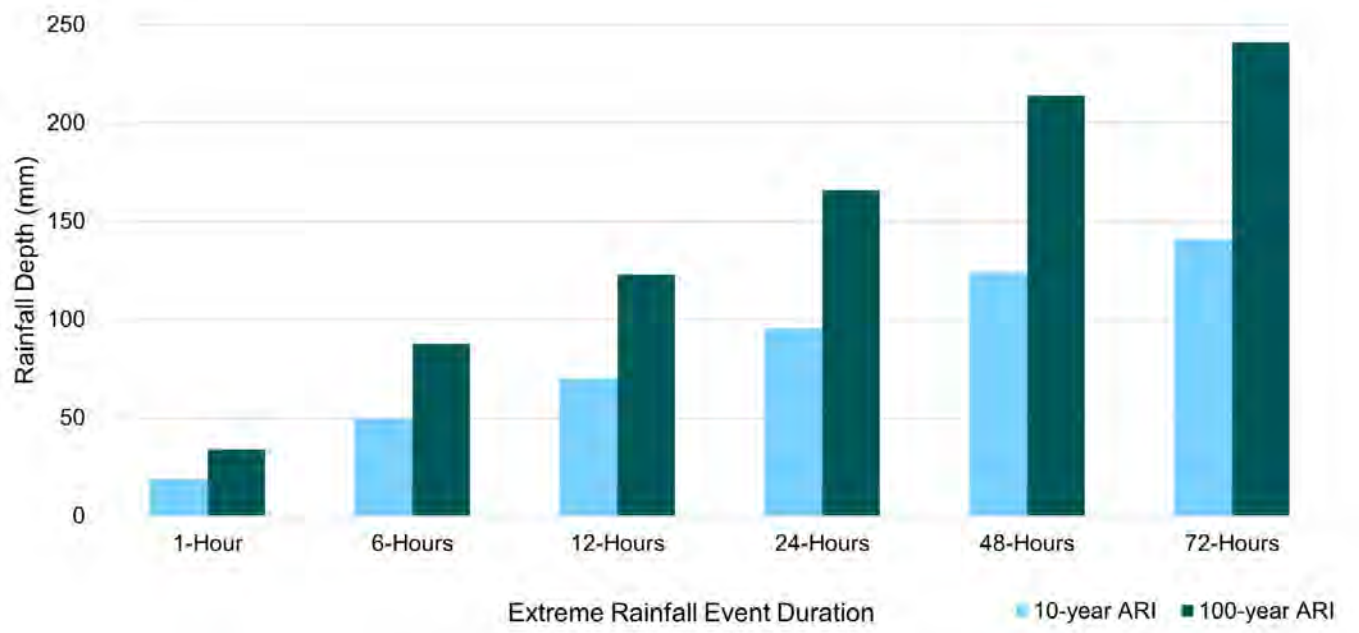


Figure 6: Historic 10-year ARI and 100-year ARI extreme rainfall event depths for 1-hour to 72-hour durations for the Palmerston area. Data sourced from Palmerston rain station, NIWA Cliflo

3.1.6 Flooding

In Te Hakapupu/Pleasant River catchment changes in land-use, land coverage, and catchment hydrology characteristics have increased the exposure to flooding and associated hazards within the catchment. This has included drainage of the large sections of the estuary wetland in the lower catchment and establishment, clearance of forest and scrub landcover for primary production lands in the mid and upper catchment, and later (in the 1990’s) establishment of significant plantation forestry operations in the upper catchment.

[6] **Annual Recurrence Interval (ARI):** Extreme rainfall events are often considered in the context of their expected ‘return period’, known as an Average Recurrence Interval (ARI) (e.g. a 1-in-100-year rainfall event has an ARI 100). This does not mean that an ARI-100 rainfall event will happen regularly every 100-years or will only occur once in 100-years; it refers to the probability of the event occurring in any one year (i.e. 1%)

Significant recorded flood events in the catchment include:

- October 1947 – The Palmerston railyards were flooded to a depth of 0.9m and the main road was flooded in several locations.
- October 1968 – The floodwaters in the branch above Goodwood reached very high levels, flooding at least three houses and all of the Flag Swamp adjacent to Watkin Creek. The severity of flood inundation was attributed to debris build up on the rail bridge.
- July 2022 – A heavy rainfall event across coastal Otago areas, with some areas receiving between 110-150mm of rainfall, forcing the closure of SH1 between Dunedin and Palmerston, shown in figure 7.
- October 2024 – A heavy rainfall event across coastal Otago areas, with some areas receiving between 160-180mm of rainfall, causing numerous land slips along transport routes and forcing the closure of SH1.

While rainfall induced flooding are fundamentally driven by meteorological processes, it is the interaction between the receiving environment and the rainfall event that determines whether the process results in a flood.



Figure 7: Flooding at Big Kuri Creek, north of Hampden, experienced during the July 2022 East and North Otago extreme rainfall event. Source: NZTA

3.1.7 Water quality

Monitoring of water quality has been undertaken since 2021 as part of the Toitū te Hakapupu Pleasant River Catchment Restoration Project to establish baseline information for the catchment and provide a greater understanding of the source and state of water quality issues experienced.

With the geology of the catchment dominated by schist (38%), sandstone (28%), and siltstone (22%), a large proportion of the catchment is vulnerable to erosion. This leads to

the deposition of sediment into the Hakapupu waterways and estuary. These sediment inputs have been raised as a significant issue for water quality within the catchment, with the health of the estuary adversely impacted by sedimentation and nutrient runoff.

Streambank and subsoil erosion are the primary sources of sediment depositing in the waterways, accounting for more than 80% of sediment deposited at most sampled sites. At the catchment outlets, streambank erosion accounted for as much as 98% of deposited sediment (Swales *et al,* 2023).



Figure 8: Suspended sediments being transported within Te Hakapupu / Pleasant River. Source: Peak Geospatial

Following forestry harvesting in Owhakaoho/Trotters Creek sub-catchment, the Owhakaoho/Trotters Creek was observed, contributing a large portion of the long-term suspended sediment loads (~77%) being discharged from the Hakapupu catchment (Swales et al, 2023).

With a significant amount of land use within the Owhakaoho/Trotters Creek sub-catchment being drystock pasture, and exotic production forestry activities increasing in the upper reaches, the disturbance of vegetation cover during a forestry harvest and replanting will likely exacerbate soil erosion in this area (Ahikā Consulting Ltd, 2023). It is likely that other forested sub-catchments would contribute similar if they were harvested as well.

With exotic production forestry being the dominant land use within the catchment, the land use sources of recent sedimentation in waterways suggest that harvest areas have the capability to generate much higher sedimentation than pastoral areas.

Specific proportional yields of topsoil from harvest areas are likely approximately 69 times higher than from pastoral farming crops and activities (Swales *et al,* 2023).

While this NbS Feasibility Study is focused on evaluating solutions for the management of flood hazards, considerations of sediment management are required as part of NbS evaluation to mitigate the effects of sediment during flood events, including reduced optical water quality (i.e., visual clarity, light penetration) and smothering of river floor ecosystems.

3.2 IMPACTS OF CLIMATE CHANGE ON THE CATCHMENT

3.2.1 Temperature

Consistent with climate change projections for coastal Otago, mean annual temperatures are projected to continue to increase over the coming decades under all climate change scenarios, warming by 1.5 – 2.5°C by 2090. This increasing mean temperature will cause an additional increase the number of 'hot days' (>30°C) experienced in the catchment annually and reduce the number of 'frost days' (<0°C) (Macara et al, 2019).

3.2.2 Rainfall

Mean annual rainfall in the catchment is projected to increase under all climate change scenarios, with increases of up to 10-15% in mean annual rainfall expected by 2090 (under RCP 8.5).[7] The greatest mean rainfall increases likely experienced during winter (20-25%), with more moderate increases expected during summer (0-5%).

3.2.3 Sea level rise and coastal inundation

Relative sea-level rise is projected to occur in the coastal areas of the catchment in line with national sea-level rise rates, with minor vertical land movement (0.7± 2.2mm/year) at the estuary mouth, slightly moderating the relative effects experienced locally. 0.21m of relative sea-level rise is projected by 2050 and 0.74m by 2100 (under scenario SSP5-8.5 50th percentile). Consequently, the Te Hakapupu/Pleasant River estuary wetland complex is highly likely to be exposed to increasing salinity stress and from the effects of more frequent and intense coastal storm surges flooding further inland areas.

Areas at exposure to the future effects of coastal inundation during storm surge events include properties currently adjacent to the existing estuary as shown in flooding zones / hazard zones on Map 6.

3.2.4 Extreme rainfall events

A warmer atmosphere can hold more moisture, therefore extreme rainfall events are projected to increase in frequency and intensity with continued global warming. Following national trends, extreme rainfall events are projected to increase within the catchment in the coming decades.

Under best-case (RCP 2.6), mid-range (RCP 4.5), and hot-house (RCP 8.5) climate change scenarios, extreme rainfall events in the catchment are projected to increase in the coming decades, with the depth extreme rainfall expected to be more severe with higher levels of global warming. This change has the dual effect of increasing the physical depth of rainfall experienced during an extreme rainfall event and increasing the frequency of historic extreme rainfall events reoccurring.

---

[7] **Representative Concentration Pathways (RCPs):** Future climate change projections are considered under four emission scenarios, called Representative Concentration Pathways (RCPs) by the IPCC, based on future greenhouse gas concentrations, determined by economic, political and social developments during the 21st century. RCP8.5 is a 'business as usual' scenario with greenhouse gas emissions continuing at current rates

For example, under RCP 8.5 climate change scenario:

- A 100-year ARI 24-hour extreme rainfall event is projected to increase in depth from 166mm to 203mm by 2090 (i.e. increase in rainfall intensity) (Figure 6)
- The 166mm of rainfall historically expected during a 100-year ARI 24-hour event, is projected to be received during a 40-year ARI 24-hour event by 2090 (i.e. increase in the perceived frequency of historic events) (Figure 10)

The graph displayed in Figure 9 shows the projected increase in extreme rainfall depths under a hot-house (RCP 8.5) climate change scenario.

In the context of past extreme rainfall events experienced within the catchment, under a hot-house (RCP 8.5) climate change scenario, the annual reoccurrence interval of an extreme rainfall event, similar in magnitude to the flooding events of July 2022, would likely be approximately 10-years (i.e. 10% chance of occurring each year) by 2090 (NIWA HIRDS v4).

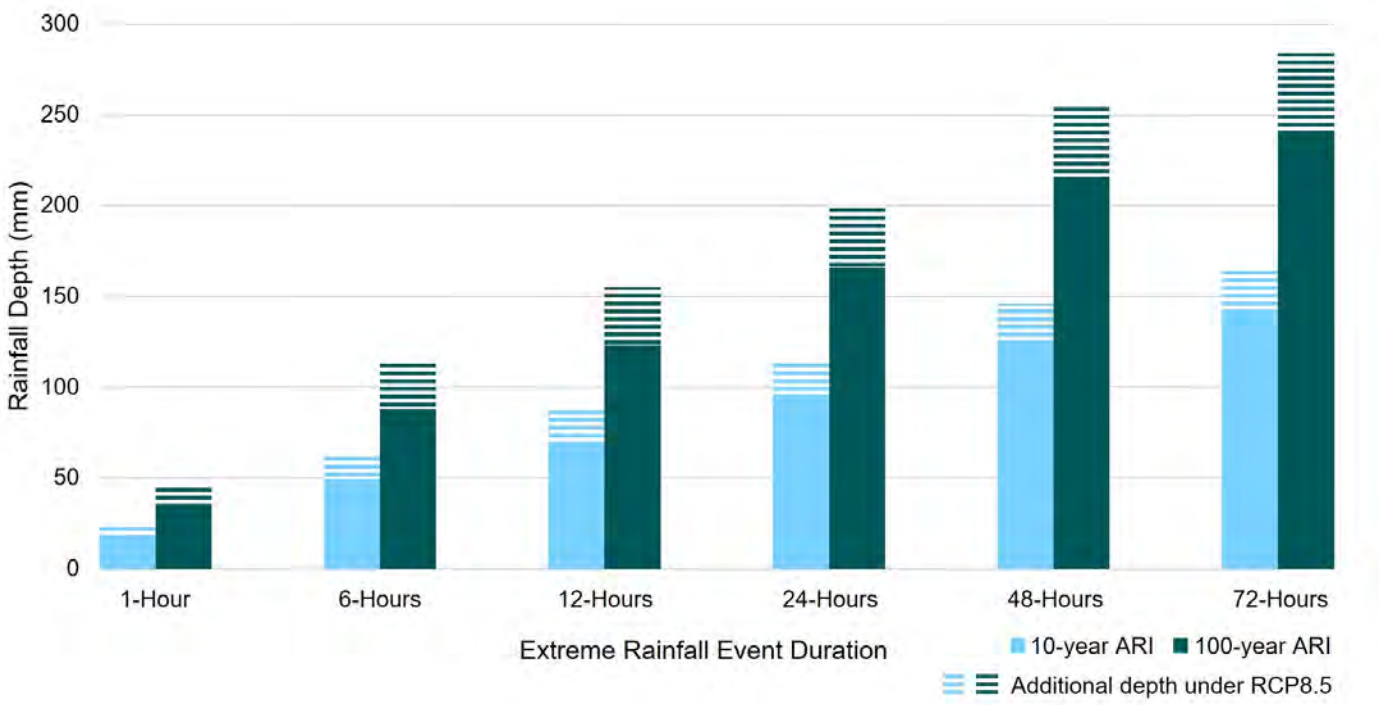


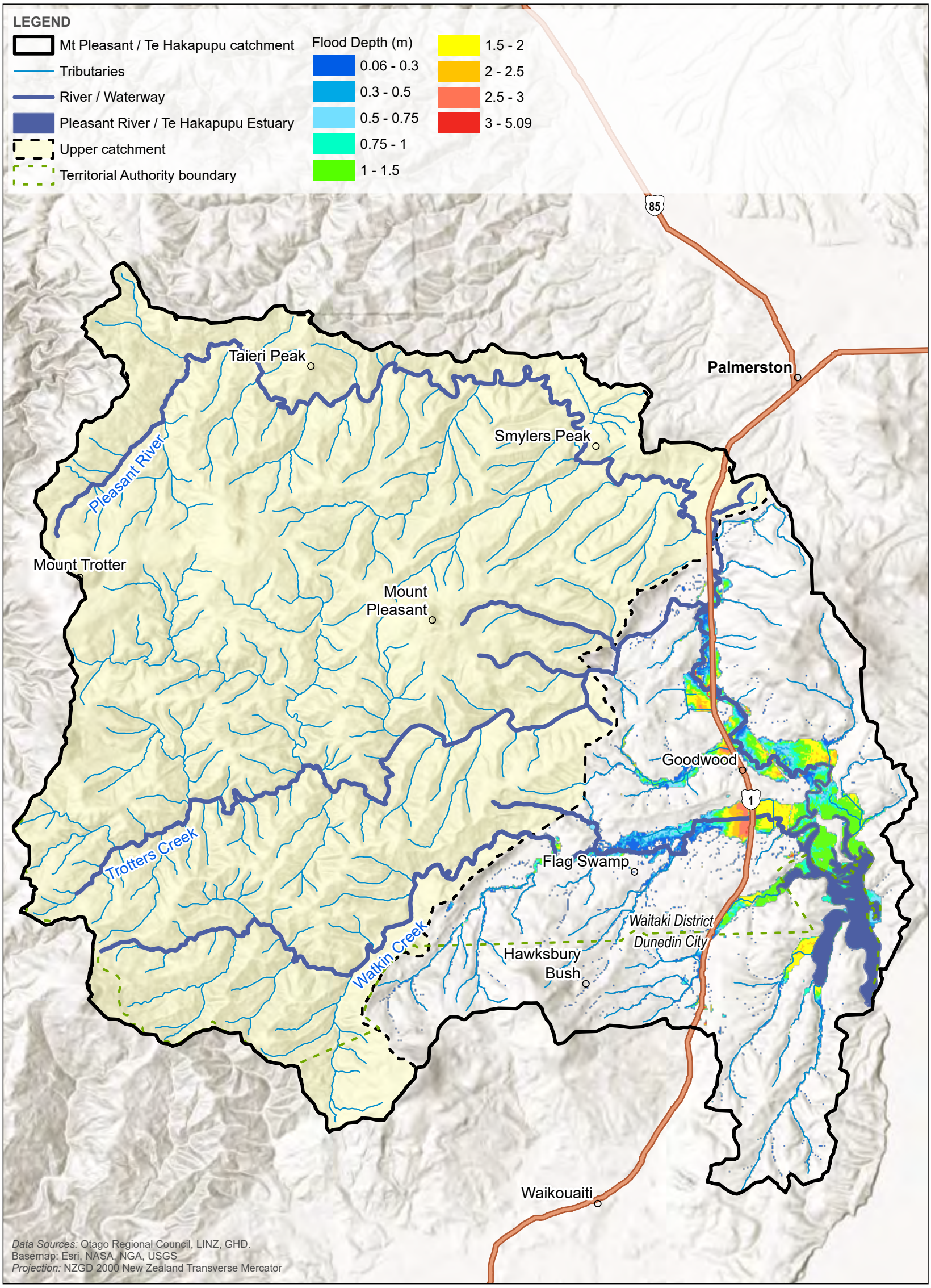
Figure 9: The projected additional rainfall depth (stripe bars) expected under climate change for historic 10-year ARI and 100-year ARI extreme rainfall event depths for 1-hour to 72-hour durations (solid bars). Data sourced from NIWA HIRDs database for climate change scenario RCP 8.5 at 2090

3.2.5 Extreme rainfall event induced flooding

Based on the Rapid Flood Hazard Modelling (RHFM) of the catchment, extreme rainfall event induced flooding is expected to exhibit similar behaviours to that observed during previous flood events.

The modelled flood characteristics that would occur in the catchment during a 100-year ARI 24-hour extreme rainfall event, under RCP 8.5, are shown in Map 6 (Flood Depth) and Map 7 (Flood Velocity). During extreme rainfall events, flood waters are modelled to flow down the upper and mid-catchment relatively swiftly, slowing as they approach the northern and western extent of the existing Te Hakapupu/Pleasant River estuary wetland complex. Surface flooding would commonly range from 0.5m to over 2.0m and is likely to occur in areas bordering the existing wetland, where lands have been historically drained and reclaimed for agricultural purposes.

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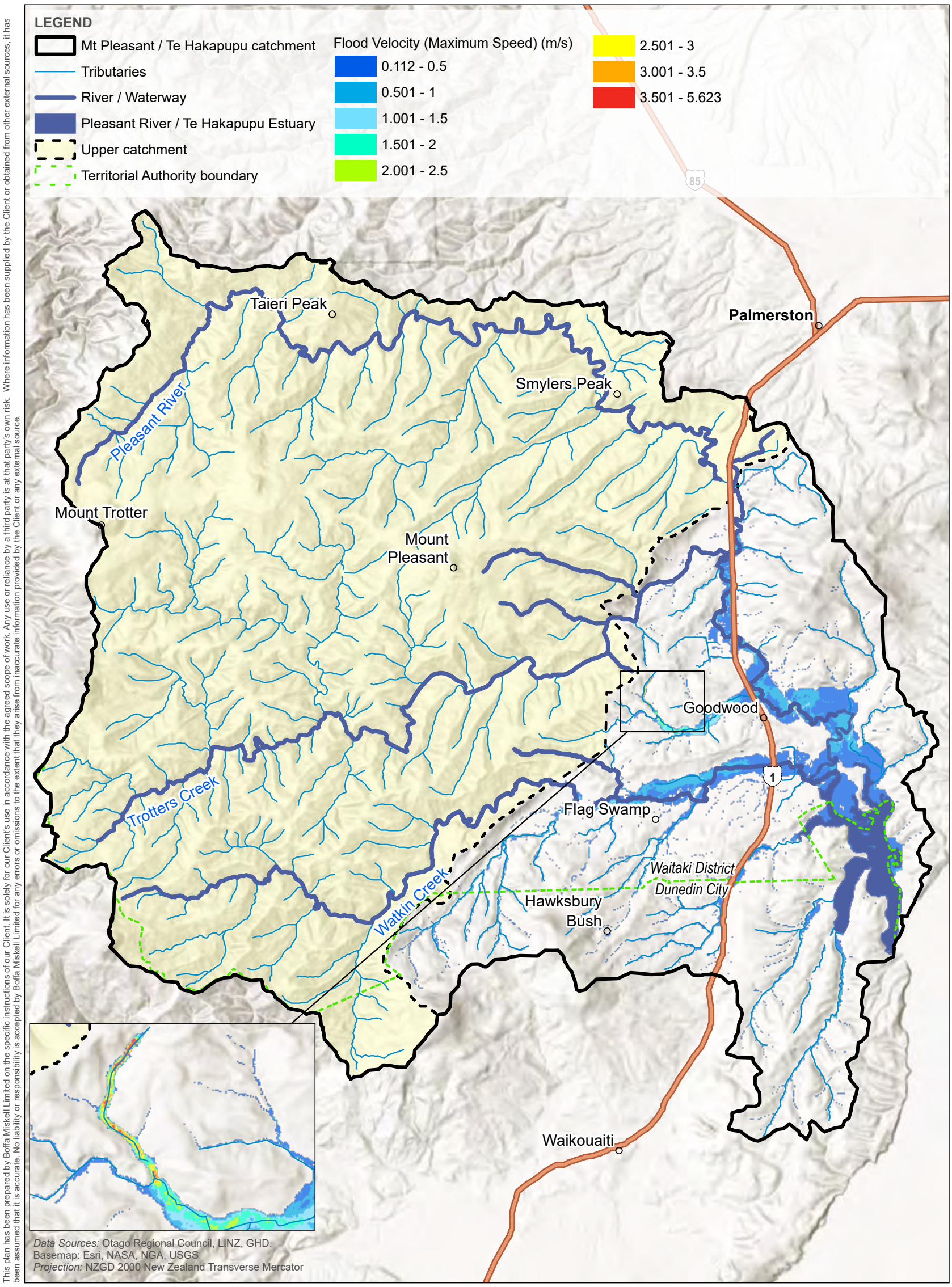
Flood Depth

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MAP 6



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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Flood Velocity

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MAP 7

3.3 STATUTORY & POLICY CONTEXT

To further assist with understanding the potential application of NbS within the catchment and across the wider Otago Region, an initial high-level review of the regional and local statutory and policy context was undertaken. This helps to identify any consenting and/or regulatory opportunities and challenges that would need to be considered. For more information on the statutory and policy context applicable to the use of NbS in Te Hakapupu/Pleasant River Catchment, see Appendix 6 or visit the ORC website.

3.3.1 Regional plans

The Te Hakapupu/Pleasant River catchment is within the Otago region and therefore is subject to the provisions of the Otago Regional Policy Statement 2019 (RPS), Otago Regional Policy Statement 2021 (pORPS) and the Otago Regional Plan: Water 2004 (ORPW).

3.3.2 Otago Regional Policy Statement

The Otago Regional Policy Statement 2019 (ORPS) and its update, the proposed Otago Regional Policy Statement 2021 (pORPS), provide the strategic framework for managing natural and physical resources across the Otago region.

The ORPS sets out objectives and policies to address key environmental issues, including freshwater management, biodiversity, climate change, and sustainable development. The pORPS, currently under development, builds on the ORPS by refining and updating policies to align with new national directives, such as the National Policy Statement for Freshwater Management 2020 (NPS-FM). The policies reflect a strong commitment to Te Mana o Te Wai, and highlight the relationship of Kai Tahu with water, prioritising the importance of the health and well-being of water bodies to ecosystems and communities.

The ORPS and the pORPS enable the integration of Nature-based Solutions (NbS) into freshwater management by promoting approaches like wetland restoration, riparian planting, and natural flood management to address environmental challenges such as sedimentation, nutrient runoff, and biodiversity loss.

3.3.3 Otago Regional Water Plan

The Otago Regional Plan: Water 2004 (ORPW) is currently the primary regulatory regional document for managing activities affecting freshwater in Otago. A replacement draft Land and Water Regional Plan (LWRP) for the Otago region has been developed but as of January 2025 isn't operative.

Rules in the ORPW that are particularly relevant to the NbS include those that relate to:

- The take, use and management of water, and the management of discharges.
- Land use on lake or riverbeds, or within Regionally Significant Wetlands, specifically:
    - Alternation of the bed of a river or a Regionally Significant Wetland.
    - The introduction or planting of vegetation; and
    - The removal of vegetation
- Other land use activities including structures on the margins of lakes and rivers.

3.3.3 North Otago Freshwater Management Unit

The North Otago Freshwater Management Unit (FMU) is a defined area under the proposed ORPS (pORPS), and the draft Land and Water Regional Plan (LWRP). It serves as a framework for sustainable freshwater management, with objectives tailored to environmental, cultural, and community needs. Te Hakapupu/Pleasant River catchment is within the North Otago FMU.



Figure 10: North Otago Freshwater Management Unit (FMU) (Source Otago Regional Council)

The proposed vision for the North Otago FMU by 2050 is summarised below:

I. **Freshwater Management**:

- Freshwater resources are managed in alignment with Te Mana o te Wai, ensuring that the health and well-being of water bodies are prioritised.
- Acknowledges that the Waitaki River is influenced by catchment areas within the neighbouring Canterbury region.

II. **Ecosystem Health**:

- Healthy riparian margins, wetlands, estuaries, and lagoons are restored and maintained, supporting vibrant indigenous habitats, and enhancing downstream coastal ecosystems.

III. Sustainable and Resilient Practices:

- Encourages innovative and sustainable land and water management practices to support food production and improve resilience to the effects of climate change.

As currently drafted, the North Otago FMU provides an indication of the ORC's intended approach to freshwater management in Te Hakapupu/Pleasant River catchment and a practical framework for incorporating NbS into freshwater management practices by promoting initiatives such as wetland restoration, riparian planting, and the use of natural processes to improve water quality.

3.3.4 District Plans

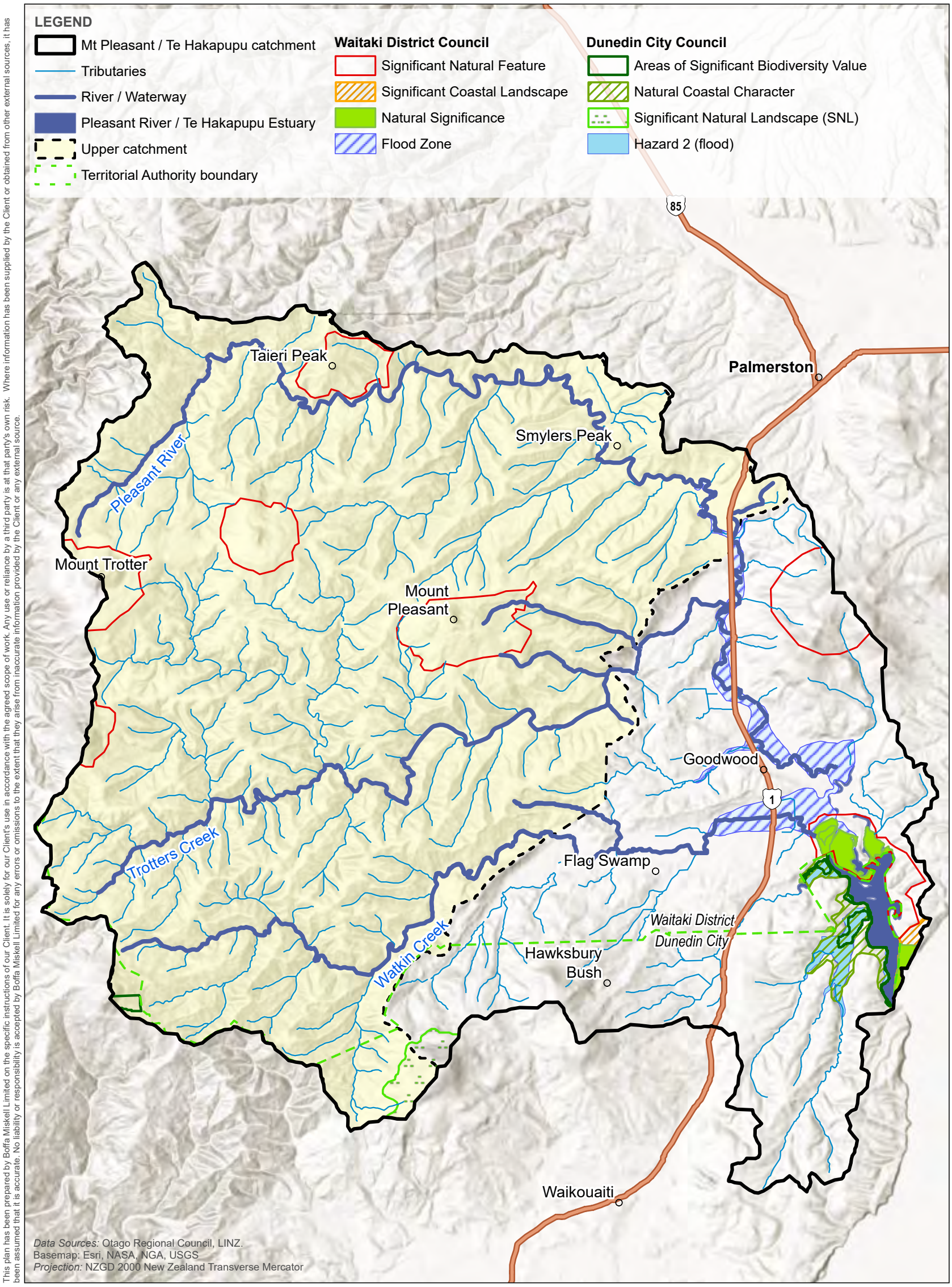
Te Hakapupu/Pleasant River catchment is mostly within the jurisdiction of the Waitaki District Council, apart from an area to the south of the estuary and part of Mt Watkin that fall in the jurisdiction of the Dunedin City Council.

The Waitaki District Plan and the Dunedin 2nd Generation District Plan are therefore the relevant district plans.

Within the Waitaki District, the catchment is largely within the rural zone, with some inland areas within the 'rural scenic' zone. Catchment areas within the Dunedin District Plan are also largely within the rural zone, except for a small rural residential area to the south of the Te Hakapupu/Pleasant River estuary. Both the Dunedin District Plan and the Waitaki District Plan identifies the estuary and surrounding wetland as areas of natural significance, with significant coastal and natural landscapes and features. The estuary and wetlands are also identified as flood hazard zones.

3.3.5 K**āi Tahu ki Otago Natural Resources Management Plan 2005**

Policies in the Kāi Tahu ki Otago Natural Resources Management Plan 2005 (NRMP) express the cultural importance of water to Kāi Tahu and the importance of protecting and restoring the mauri of all water. The policies cover the protection and enhancement of existing wetlands as well as the reinstatement of wetlands that have been neglected.



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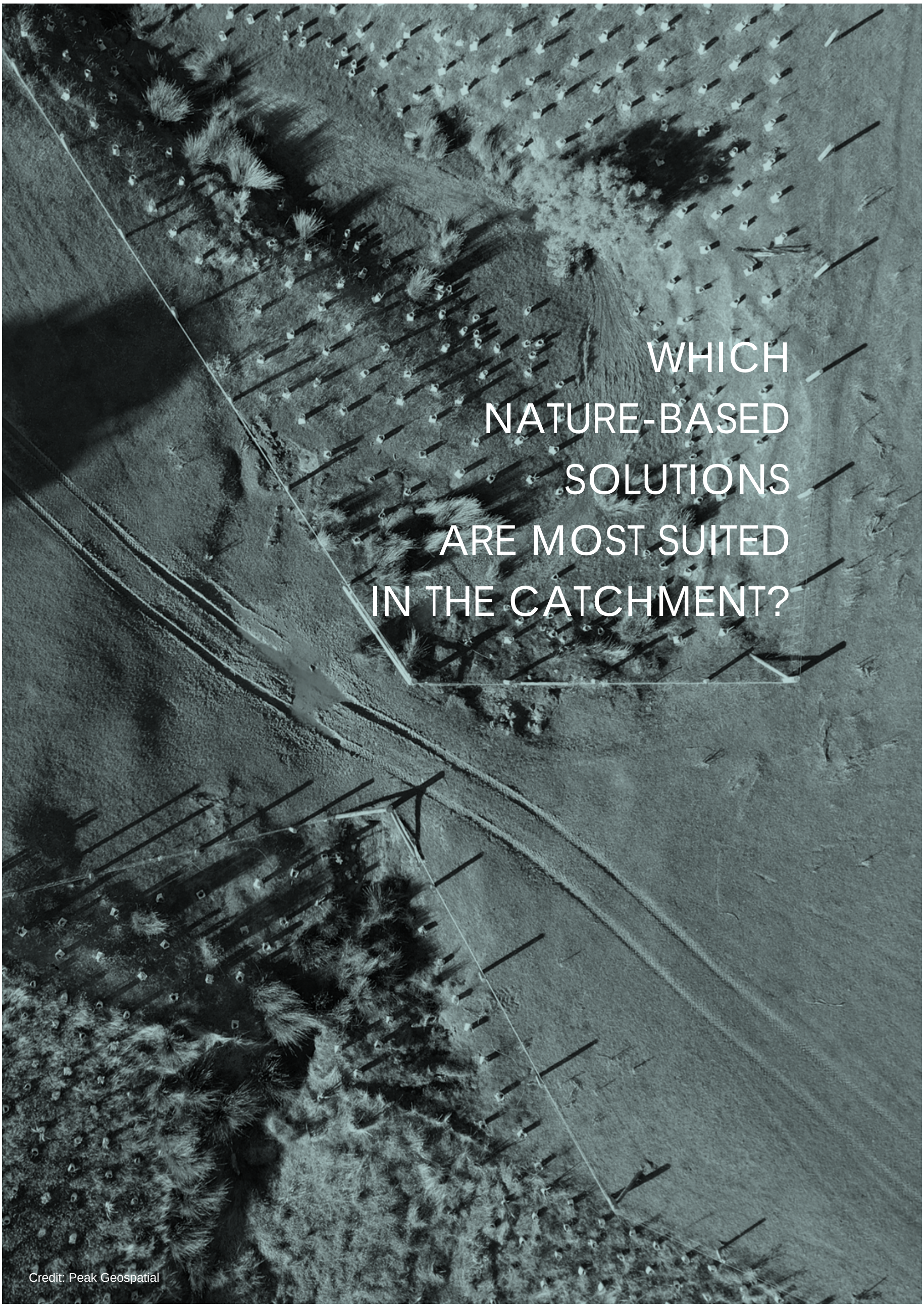
Dunedin City and Waitaki District Plans

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MAP 8


WHICH
NATURE-BASED
SOLUTIONS
ARE MOST SUITED
IN THE CATCHMENT?
Credit: Peak Geospatial

4. WHICH NATURE BASED SOLUTIONS ARE MOST SUITED IN THE CATCHMENT?

To assess how feasible the use of NbS are for the management of flooding and associated hazards in Te Hakapupu/Pleasant River catchment, three catchment specific NbS interventions were developed. With reference to the different types of NbS for flood management assessed in the recent NIWA literature review (NIWA, 2024), NbS interventions were considered for upper, middle, and lower catchment locations.

The three NbS considered most suited to the catchments environmental, social, and economic context are:

- Landcover management
- River and stream naturalisation
- Wetland enhancement and construction

These three NbS were developed based upon NbS best practice insights gathered through literature review and SWOT analysis discussions, hydrology modelling of the catchment during flood events, and the catchment's specific environmental characteristics.

Whilst targeted towards the management of how flood events are modelled to behave in the catchment, the NbS also seek to acknowledge the wider environmental challenges present in the catchment. These include the water quality challenges associated with streambank erosion and sedimentation, and the projected effects of sea-level rise and coastal storm surge inundation.

Additionally, the three NbS were developed with reference to the potential nature-based opportunities possible in the catchment. With reference to the Toitū Te Hakapupu Catchment Action Plan (CAP) (Ahikā, 2023), the NbS seek to contribute to the identified catchment restoration values. These include the enhancement of the natural functioning of the highly valued estuary wetland complex, with a focus on mahika kai and taonga species.

NbS interventions, such as bioretention systems, were not tested within the catchment. Whist contributing to flood management outcomes, these interventions were deemed impractical given the large scale and water quality pressures experienced in the catchment. Other related interventions, such as sedimentation ponds, were not considered in this feasibility study as they do not meet the definition of benefit requirements of NbS.

The below section describes the key characteristic of the three types of NbS that are considered in this feasibility study and outlines how they could conceptually be applied to the catchment environment. The outcomes of how the NbS were tested to performed in the catchment is detailed in section 5.

4.1 LANDCOVER MANAGEMENT

4.1.1 What is landcover management?

Landcover management is the practice of gradually transitioning areas of exposed clear-fell exotic plantation forestry to permanent indigenous forests work to manage flood hazards. This practice helps to moderate water yield and flows within a catchment, whilst avoiding the ‘window of vulnerability’ prompted by harvest cycles.

The "window of vulnerability" is a high-risk period that lasts for about eight years following the harvesting of a forest. During this time, the newly replanted trees have not yet grown enough to develop a full canopy or strong root systems capable of stabilising the soil and preventing sediment loss. Extreme rainfall events often increase the risk of sediment loss and flooding. Without tree cover and strong roots to hold the soil, more water flows downhill, carrying fine sediments and woody debris into lower areas.

Within Te Hakapupu/Pleasant River catchment, exotic plantation forestry is the most widespread single land use (~49%), predominantly situated in the steeper upper catchment. During an extreme rainfall event, sediment washing into waterways presents one of the greatest flood-related risks in the catchment. During flood events, sediment deposited in the riverbed, reduces the volumetric capacity of waterways. Sediment becoming dislodged from the riverbed and being washed down during floods is leading to sediment inundation of lower catchment freshwater and estuarine habitats.

These hazards associated with flooding are likely to be exacerbated during forestry harvest and replanting. Two major ‘pulses’ of forestry harvest are expected in the catchment over the coming decades (Map 10):

- The first harvest pulse occurring between present-day and 2028, covering approximately 33% of the catchment forestry estate.
- The second harvest pulse occurring from 2042 to 2049 covering approximately 40% of the catchment forestry estate.

Accordingly, the land exposed during the projected ‘windows of vulnerability’ is approximately 1,500 ha each year between 2024 – 2032, then larger again from 2042, to peak at over 2,500 ha per year (Ahikā, 2024).

4.1.2 How can landcover management work as a NbS?

Landcover management in Te Hakapupu/Pleasant River catchment will seek to restore and expand existing pockets of remnant indigenous forest, towards the gradual transition of large areas to permanent indigenous forest in vulnerable upper sub-catchment locations. Upper sub-catchment areas are shown in Map 9. With reference to the remnant indigenous forest ecosystems identified in Map 4, these areas will be prioritised for targeted pest control, maintenance, and planting to grow the extent of these areas and support natural regeneration.

This approach will manage the impacts of flooding and associated hazards in the catchment through restoring and permanently retaining upper catchment forested land cover in vulnerable areas (e.g. on erosion prone slopes and in vicinity of waterways).

With the effects of climate change projected to increase the frequency and intensity of extreme rainfall events across Otago, this NbS would avoid exacerbating an already significant flood-related risk by eliminating the reoccurring ‘windows of vulnerability’ over future generations. By restoring indigenous forest across large areas and permanently retaining forested land coverage, the landcover management approach aims to safeguard the hydrology of the upper catchment to effectively buffer against the effects of extreme rainfall events

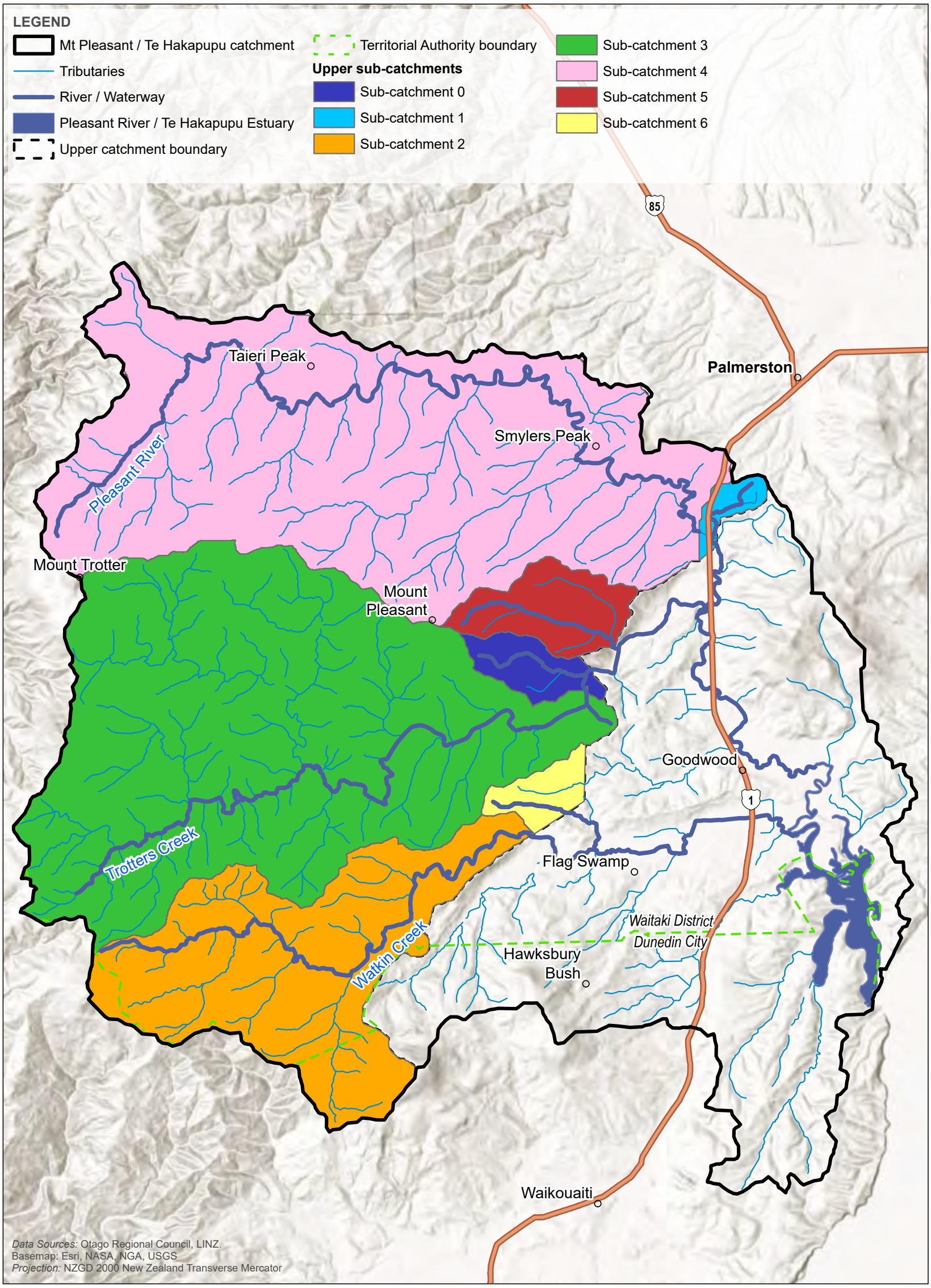
Plantation forestry within the Hakapupu Catchment is predominately contained within the upper catchment. Presently, there are 23 individual owners, of which four main forestry companies manage the vast majority of the planted area (Calder Stewart, Ngāi Tahu, PF Olsen, and Wenita). Aligning with existing harvest projections and replanting timeframes, this approach would require a long-term transition of upper catchment areas.[8]



Figure 11: Indigenous remnant forest area within pine forestry. Source: Pure Advantage

[8] While coupe harvest systems are being considered through the Te Hakapupu Forestry Action Plan as a practical solution to mitigate risks associated with harvest and replanting, this approach is not considered a NbS and is therefore excluded from this NbS feasibility study.

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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Catchment Map

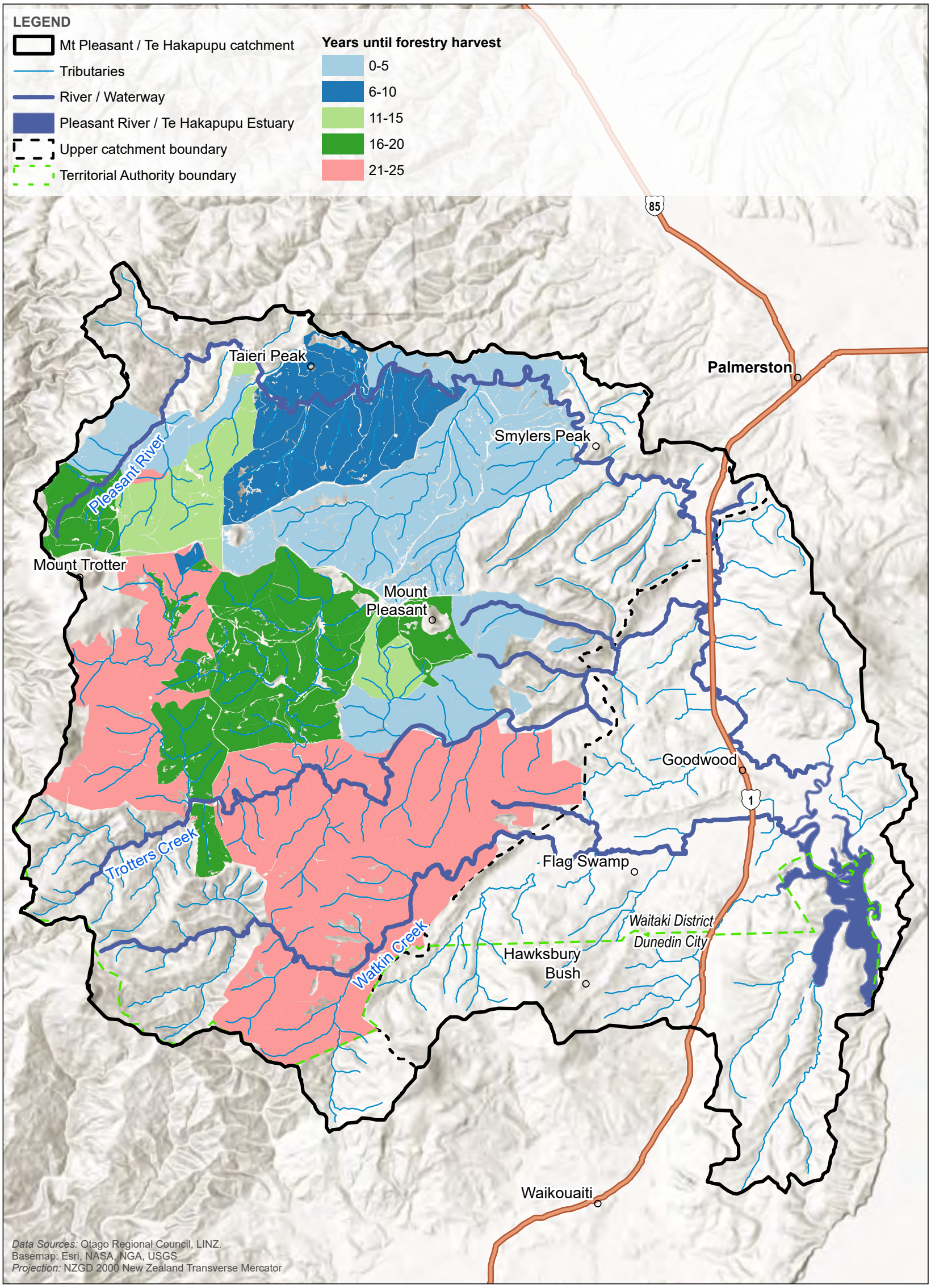
Date: 06 December 2024 | Revision: 0

Plan prepared for Otago Regional Council by Boffa Miskell Limited

Project Manager: Rachael.Eaton@boffamiskell.co.nz | Drawn: LJa | Checked: SPa

MAP 9

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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Forestry Harvest Timing

Date: 05 December 2024 | Revision: 0

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MAP 10

4.2 RIVER & STREAM NATURALISATION

4.2.1 What is river and stream naturalisation?

River and stream naturalisation, includes:

- restoration of riparian vegetation (riparian buffers)
- ‘making room for the river’
- reconnecting isolated or drained off-stream wetland areas
- works to mitigate flood hazards through intercepting contaminants entering the waterway during extreme rainfall events
- slowing peak flows
- stabilising banks to reduce erosion

Riparian buffers provide room for the natural dynamics of a waterway to function during extreme rainfall events. This includes accommodating the rise and fall of water levels, helping to slow down the velocity of peak flows, increasing water retention and infiltration, and reducing streambank erosion and thus the potential effects of associated downstream flood impacts (e.g., sediment inundation and water contamination).

Whilst channelisation of waterways is not as severe as other more hydraulicly modified catchments in the Otago Region, the main tributaries of the Te Hakapupu / Pleasant River, Watkin Creek, and parts of Owhakaoho / Trotters Creek in the mid-catchment currently have relatively bare, unvegetated riparian margins. As a result, these unvegetated, well entrenched channels facilitate fast peak flood flow velocities up to 5 m/s during an extreme rainfall event. With little riparian vegetation to protect stream banks, stream bank erosion accounts for as much as 98% of deposited sediment at the catchment outlets to the Hakapupu Pleasant River Estuary Wetland Complex (Swales *et al,* 2023).

Te Toitū Te Hakapupu partnership project has undertaken considerable restoration of riparian areas in the lower catchment in recent years, including 27km of fencing and almost 68,000 plantings. However, large sections of waterways throughout the Hakapupu catchment remain ‘denaturalised’ as farming land uses has constrained natural waterways and riparian corridors into more uniform, deeper channels to improve farm management.

Additionally, as waterways have become increasingly ‘denaturalised’, small adjoining tributaries and off-stream wetland areas that provide important spawning habitat for freshwater species, and help retain water during dry periods, have become piped or cut off from the main channel. Consequently, during extreme rainfall events, flood waters tend to flow at faster velocities through the main tributaries of Te Hakapupu / Pleasant River, Owhakaoho / Trotters Creek, and Watkin Creek. This causes surface flooding of low-lying areas in the lower catchment and allows for the rapid transport of sediment and other contaminants from the upper catchment into the vulnerable estuary wetland complex.

4.2.2 How can river and stream naturalisation work as a NbS?

Undertaking river and stream naturalisation, in the catchment, such as along Te Hakapupu/Pleasant River, Owhakaoho/Trotters Creek, and Watkin Creek, aims to reduce flooding hazards by restoring the natural hydrodynamics of the waterways. Naturalisation helps to slow down peak water flow speeds and increases the rivers' natural capacity to absorb and redirect water during heavy rainfall events.

A healthy vegetated riparian area helps protect the banks from erosion and act as a buffer between land and water, filtering sediments and contaminants from runoff. They also serve to shade waterways, regulating temperatures, minimising algae growth, and provide for in-stream habitat.

With increases in hot days (>30°C) projected to occur in the catchment with climate change, a healthy riparian area can play a critical role in mitigating the potential effects of direct warming and heat contamination in freshwater environments that may occur during an extreme rainfall event in future.



Figure 12: Naturalisation of a previously channelised waterway, including daylighting piped tributaries, restoring riparian buffer vegetation and re-meandering waterway. Source: Boffa Miskell Ltd.

4.3 WETLAND RESTORATION & CONSTRUCTION

4.3.1 What is wetland restoration and construction?

Wetland restoration and construction works to intercept, accommodate, and process excess floodwaters flowing down the catchment during an extreme rainfall event. Through restoring or constructing natural wetland features, such as deep sedimentation ponds or shallow water vegetated areas, wetlands can detain large volumes of water and remove contaminants including suspended sediments and nitrates.

To successfully accommodate flood flows and significantly reduce contaminant load in runoff, as a rule constructed wetlands need to be between 1% and 5% of their contributing catchment size (Tanner *et al,* 2021). Wetlands smaller than this scale will be frequently overwhelmed by flood flows and provide insufficient time to enable contaminant reduction. This 1% to 5% wetland size refers to the actual ‘wetted’ area under normal flow conditions, this does not include the additional areas required for marginal planting and landscape modification.

Te Hakapupu/Pleasant River estuary wetland complex is a critical receiving environment within the catchment. However, classified as a Naturally Uncommon Ecosystem and vulnerable due to its historic reduction in size and ecological decline, the estuary wetland complex faces numerous pressures including invasion from invasive weed species, grazing of remaining wetland areas, and alteration of natural flow characteristics (Holdaway *et al.,* 2012).

Te Hakapupu/Pleasant River Estuary Wetland Complex currently covers approx. 84 hectares (~0.6% of the catchment) following significant historical drainage. Consequently, the current extent of the wetland area limits its natural ability to accommodate flood water during extreme rainfall events, causing flooding of homes, productive agricultural lands, and associated infrastructure located on reclaimed land. Additionally, the reduced wetland extent limits the assimilative capacity of the wetland, driving the high sediment mud content with the estuary.

4.3.2 How can wetland restoration and construction work as a NbS?

Surface-flow constructed wetlands are used nationally and internationally to collect, treat, and store stormwater runoff. By providing storage volume space to accommodate flood flows and vegetative resistance to slow flood flows, constructed and restored wetland areas can buffer the impacts of flood flows entering into important habitats and ecosystems, and prevent damage and disruption to surrounding land uses and infrastructure.

Plausible locations for wetland restoration and construction have been considered at the northern and western extent of the existing wetland complex. Located on reclaimed areas, these low-lying locations occupy the most flood prone areas within the lower catchment and are modelled to receive between 1.5m – 3m flood depths outside of the existing channel during an extreme rainfall event. Flood water tends to move at slower velocities within these areas as shown in Map 8.

Various locations across the mid and upper catchment also lend themselves to construction or restoration of both on-stream and off-stream wetlands and sediment detention ponds (as identified in the Catchment Action Plan, 2024). Whilst these add value to flood hazard

mitigation across the catchment, restoration of the historically reclaimed estuary wetland complex is considered to provide the greatest biodiversity benefits and flood mitigation capacity.

Additionally, along with accommodating rainfall induced flood flows, the identified lower catchment wetland locations can act as a buffer for properties and assets potentially exposed to the future effects of coastal inundation from sea-level rise. Following late-century climate change projections (2090), these locations are projected to be exposed to inundation events from both extreme rainfall induced flooding and coastal storm surge.

By locating surface flow wetlands within these lower catchment areas, this NbS seeks to work with the existing landscape to effectively accommodate flood waters, mitigating the impacts of a flood event.



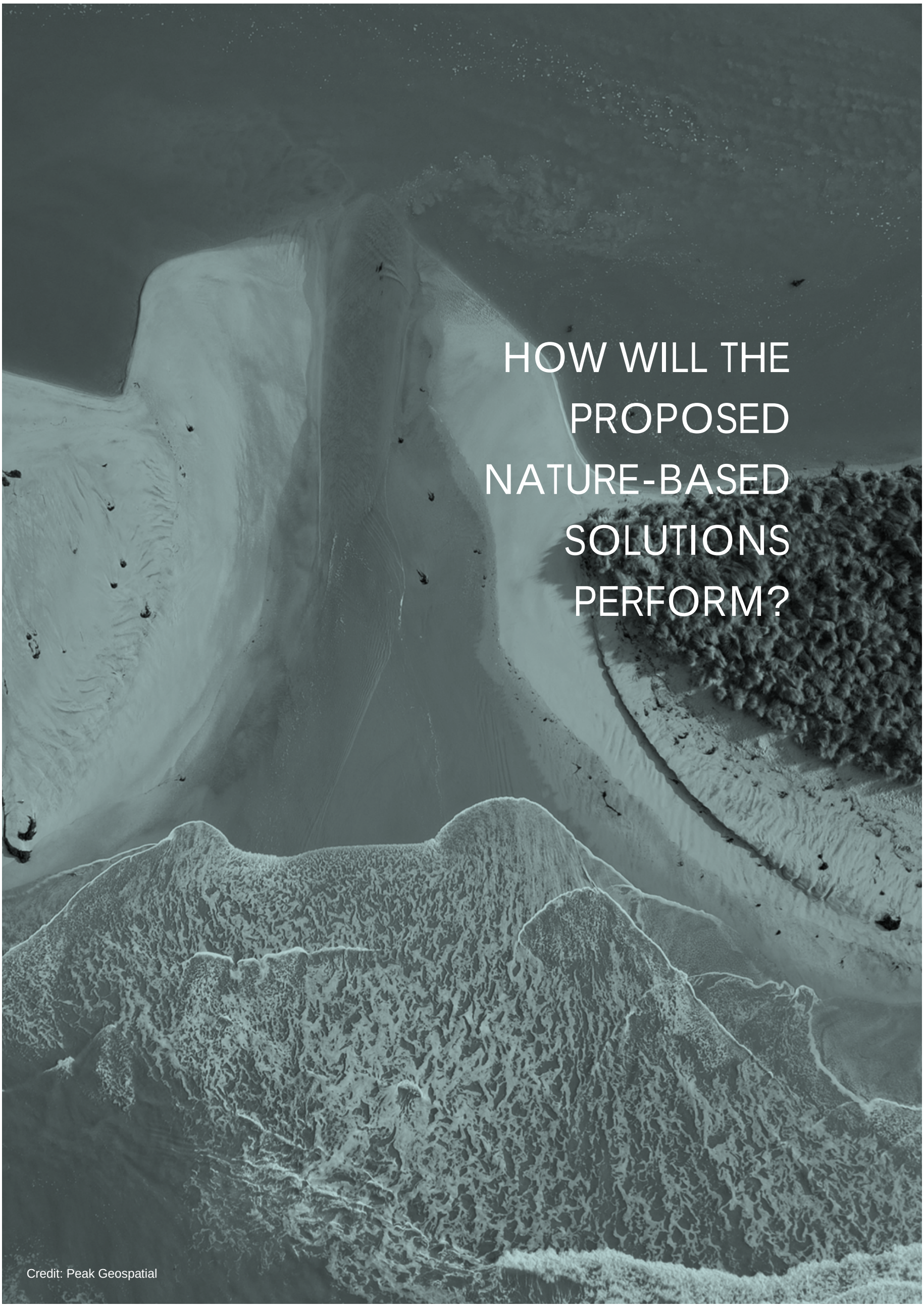
Figure 13: Construction of a wetland in Thomsons catchment, Otago. Source: Manuherekia Catchment Group

4.4 OVERVIEW OF NATURE-BASED SOLUTIONS FOR TE HAKAPUPU/PLEASANT RIVER CATCHMENT

Table 3: Overview of the three NbS interventions that are tested in Te Hakapupu/Pleasant River catchment

	1. LANDCOVER MANAGEMENT	2. RIVER AND STREAM NATURALISATION	3. WETLAND RESTORATION AND CONSTRUCTION
FLOOD HAZARD MANAGEMENT TYPE	The landcover management NbS approach seeks to manage flood hazards through: a. Protection of lower catchment areas from flood flows and flood-related impacts of sediment mobilisation and debris flows through permanently retaining water yield moderation and stabilising steeper surfaces. b. Avoidance of 'windows of vulnerability' prompted by ongoing plantation forestry harvest and replanting cycles.	The river and stream naturalisation NbS approach seeks to manage flood hazards through: a. Mitigation of surface flooding through the slowing of peak flood flows by increasing water retention and allowing for runoff infiltration. b. Accommodation of additional flood waters during extreme rainfall events through possible increases in volumetric capacity of the river channel. c. Protection of vulnerable ecological and mahika kai values within the Te Hakapupu/Pleasant River catchment through the interception of runoff contaminants and mitigation of streambank erosion.	The wetland restoration and construction NbS seeks to manage flood hazards through: a. Managed retreat of built infrastructure and primary production land used away from flood prone areas b. Accommodation of excess slow moving flood waters during extreme rainfall events in increased water retention areas c. Protection of vulnerable ecological and mahika kai values within the Te Hakapupu/Pleasant River estuary wetland complex through the interception and treatment of suspended sediments and other contaminants
SCALE	Expansion of remnant indigenous forest areas overtime, planned in alignment with projected forestry harvest events to cover large upper sub-catchment areas.	River and stream naturalisation length to span the unvegetated areas of all three waterways of the mid-catchment Te Hakapupu/Pleasant River corridor, the mid-catchment Owhakaoho / Trotters Creek corridor, the mid-catchment Watkin Creek corridor.	New wetland restoration and construction area cumulatively spanning approx. 140 ha. Resulting in total catchment wetland area exceeding 1.75% total catchment size.
KEY CHARACTERISTICS	For existing pockets of remnant indigenous forest areas within the plantation forest estate, restoration and enhancement work would support connecting existing remanent bush and create new areas that can act as seed sources for large scale transition to native forest and other catchment restoration activities, such as riparian buffer area planting. For large scale transition of areas of plantation forestry to permanent indigenous forest, restoration activities would align with existing harvest timeframes. Locally sourced indigenous species would be used for planting, with preference to hardy, fast growing species that meet Emission Trading Scheme requirements (i.e., 5 m canopy).	For restoration of riparian buffer areas, given the relatively flat to undulating topography of the mid-catchment areas, at minimum a 3 m fenced setback is considered for the identified waterways in alignment with National Environmental Standards for Freshwater. Additionally, livestock will be fenced for exclusion from the riparian area and structures identified as High Risk and Very High Risk to fish passage removed or remediated. Through river and stream naturalisation, detached and degraded oxbow sections of waterways / off-stream wetland areas will be reconnected to provide additional water retention capacity and important fish spawning habitat. Riparian buffer areas will be planted with native sedge and rush species in lower wet stream banks, surrounded by hardy riparian species such as Carex and harakeke species on embankments and tall tree species along the corridor proximity.	Given the challenges with Te Hakapupu catchment faces with water quality, particularly sedimentation transported from upper catchment plantation forestry areas during heavy rainfall events, wetland inflow locations will be constructed with deeper sedimentation ponds (1-1.5m deep and 20% of immediate wetland area) at inlet to intercept and store suspended sediments. While also providing increased water retention and detention capabilities during flood events, these sedimentation ponds will support the prevention of sediment deposition that could adversely impact the vegetated areas of the main wetland and could be transported into the lower estuarine environment. Wetland areas will be planted with native wetland sedge and bulrush species in shallow zones, surrounded by hardy riparian species on embankments and riparian margins.
POSSIBLE CATCHMENT APPLICATIONS	Restoration and expansion of existing pockets of remnant indigenous forest, towards the gradual conversion to wide-scale permanent indigenous forest to occur across vulnerable upper sub-catchment areas, covering Te Hakapupu / Pleasant River, Owhakaoho / Trotters Creek, and Watkin Creek sub-catchments	Te Hakapupu/Pleasant River and Watkin Creek naturalisation proposed to occur along the majority of its mid-catchment length. The Owhakaoho / Trotters Creek naturalisation proposed to occur in the upper-mid-catchment section, west of Wairunga.	Wetland restoration and construction is proposed at the western and northern extent of the present-day estuary wetland complex, located at the confluence of Watkin Creek and the wetland, and following Te Hakapupu/Pleasant River northwest.


1
2
3


HOW WILL THE
PROPOSED
NATURE-BASED
SOLUTIONS
PERFORM?
Credit: Peak Geospatial

5. HOW WILL THE PROPOSED NBS PERFORM?

Using the functional criteria and relevant performance indicators from the NbS Technical Specification, the following evaluation criterion was applied to each NbS intervention to test the opportunities, challenges, and possible benefits of its use for flood hazard management in Te Hakapupu/Pleasant River catchment.

Table 4: Evaluation criteria for Te Hakapupu NbS Feasibility Study in relation to IUCN Global Standards for Nature-based Solutions relevant functional criterion and performance indicators

	TECHNICAL CRITERION	PERFORMANCE INDICATORS	EVALUATION CRITERION
HAZARD	Nature-based Solutions effectively address societal challenges	The societal challenges addressed are clearly understood and documented	How does the NbS contribute to flood hazard management in the catchment?
LANDSCAPE	Design of Nature-based Solutions is informed by scale	The design of the NbS is integrated with other complementary interventions and seeks synergies across sectors	How does the NbS contribute to landscape amenity value, character, and recreation opportunities?
BIODIVERSITY	Nature-based Solutions result in a net-gain to biodiversity and ecosystem integrity	The NbS actions directly respond to evidence-based assessment of the current state of the ecosystem and prevailing drivers of degradation and loss	What are the potential biodiversity benefits, challenges, and practicalities of the NbS in the catchment?
		Opportunities to enhance ecosystem integrity and connectivity are identified and incorporated into the NbS strategy	
ECONOMIC	Nature-based Solutions are economically viable	Cost-effectiveness is considered to support the choice of NbS	What are the high-level costs of the establishment and maintenance of the NbS in the catchment?
COMMUNITY & CULTURE	Nature-based Solutions equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	The potential costs and benefits of associated trade-offs of the NbS intervention are explicitly acknowledged and inform safeguards and any appropriate corrective actions	What are the potential impacts, benefits, and trade-offs the NbS may have in the catchment, alongside productive rural land uses and as part of Kāti Huirapa ki Puketeraki's takiwā?
CLIMATE	Nature-based Solutions are managed adaptively, based on evidence	A framework that enables adaptive management us applied throughout the intervention lifecycle	How does the NbS adapt to and/or help mitigate the effects of climate change in the catchment?
REGULATORY	NbS are sustainable and mainstreamed within an appropriate jurisdictional context	The NbS is informed by the facilitating policy and regulation frameworks to support its uptake and mainstreaming	Is the NbS consistent with consenting requirements and key legal or policy considerations? (e.g. land ownership, NPSFM, NESFW, NESPF, RPS, District Plan)

5.1 LANDCOVER MANAGEMENT

Landcover management will focus on the expansion of remnant indigenous forest pockets in upper sub-catchment areas, towards the gradual transition from clear fell plantation forestry to permanent indigenous forest in vulnerable locations. This NbS approach would seek to mitigate the effects of extreme rainfall induced flood through permanently restoring the natural hydrology in vulnerable upper sub-catchment areas.



Figure 14: Possible application of landcover management in upper catchment areas in Otago catchments

5.1.1 How does landcover management contribute to flood hazard mitigation in the catchment?

In reference to the drivers of flooding and associated hazards within Te Hakapupu/Pleasant River catchment, this NbS would effectively increase environmental and infrastructure resilience in the catchment through the following means:

Protect: Protection of the relatively flat mid and lower catchment areas and land uses from exposure to the effects of flood flows and the flood-related impacts of sediment mobilisation and debris flows through permanently retaining water yield moderation and stabilisation of steeper surfaces.

Avoid: Avoidance of the windows of vulnerability, caused by ongoing plantation forestry harvest and replanting cycle in upper sub-catchment areas. These windows of vulnerability increase both the exposure and vulnerability of the relatively flat mid and lower catchment areas to increased flood flows and the flood-related impacts of sediment mobilisation and debris flows.

Overall, the Rapid Flood Hazard Model indicates that in a 100-year extreme rainfall event in a post-harvest scenario (i.e. during the period of plantation forestry harvest and replanting) there could be and increase in flow from upper catchment areas in the order of 25% or more, compared to the current plantation forestry coverage. This would likely exacerbate the impacts of flood events across the lower catchment.

If the current plantation forestry blocks in the upper catchment were transitioned back to a full native bush coverage, then a potential reduction in flow would be possible in the order of 6-7% during a 100-year extreme rainfall event, compared to the current plantation forestry coverage. Therefore, reducing the impacts of flooding across the lower catchment and avoiding increased flows during plantation forestry harvest and replanting periods.

5.1.2 How does landcover management contribute to landscape amenity value, character, and recreation opportunities?

The landcover management NbS intervention involves the restoration and expansion of existing pockets of remnant indigenous forest within the catchment, seeking a gradual, long-term transition of large areas in the upper sub-catchments from exotic plantation forestry to wide-scale permanent indigenous forest.

The restoration and enhancement work would support connecting existing remanent indigenous forested areas and create new areas that can act as important local seed sources.

Potential benefits

The long-term outcome of this NbS intervention would be a large-scale permanent indigenous forest across upper sub-catchment. Replacing the existing exotic plantation forestry with permanent indigenous forest will have a positive effect on the landscape, amenity and natural character values of the upper catchment areas and wider landscape.

By replacing the plantation forestry in vulnerable locations, the mobilisation of sediment and debris to waterways can be significantly mitigated, reducing flood-related risks in the catchment, effects on water quality and clarity, and effects on lower catchment freshwater and estuarine habitats. These changes would enhance and allow for the better protection of landscape and natural character values throughout the catchment, beyond the immediate location of the proposed change.

A gradual transition to permanent indigenous cover across upper sub-catchment would also have potential benefits for the perceptual and associative dimensions of landscape, and visual amenity, as well as the experiential aspects of natural character. The increase in native vegetation is likely to raise aesthetic values for example, in regard to levels of naturalness and visual coherence as it gradually leads to a more natural sequence of indigenous vegetation types in the area.

5.1.3 What are the potential biodiversity benefits, challenges, and practicalities of landcover management in the catchment?

Biodiversity benefits & challenges

Indigenous vegetation cover in the catchment is very limited (approximately 1%) and essentially all land cover is exotic in nature (pasture and plantation forestry). Gradual replacement of plantation forestry with permanent indigenous forests across large areas of the upper sub-catchments would massively increase local population sizes of indigenous flora and fauna species. Indigenous forest at large scales would, in time, be likely to be resilient and self-sustaining. Targeted plantings could be used to bolster desired threatened, at Risk or locally uncommon plant populations within the catchment.

Compared to tall exotic plantation forestry with high levels of rainfall interception and evapotranspiration, indigenous forest cover typically displays increased downstream water yield but reduced flow flashiness during rain events, an important ‘win-win’ in terms of buffering stream flows. They can therefore also act as ‘water storage’ during drier periods, mitigating currently occurring low flow periods in the catchment. Downstream runoff of sediment and ‘flashy’ stream flows in heavy rain events would be reduced in the long term if a large proportion of the catchment (particularly in steep and erodible areas) is permanently vegetated.

In regard to wider natural hazards in the catchment, extensive gorse or fast-growing successional indigenous forest types (e.g. kānuka scrub / forest) are flammable and vulnerable to fire. This also applies to existing pine plantations. Long term, mixed broadleaf native forests are generally resistant to fire.

Practicalities of implementation

The cost, nursery infrastructure, personnel, and planting maintenance requirements for large scale indigenous afforestation likely make an approach reliant on wholesale / widespread indigenous plantings infeasible. Therefore, any realistic approach would be reliant on facilitating native forests to regenerate themselves with minimal interference. This would likely still require targeted pest control (focused on the most concerning / habitat-altering plant and animal pests). Because of the limited existing seed source for indigenous forest species in the catchment, this approach would also be reliant on the rate and extent of natural spread from adjoining indigenous habitats, such as on Mt Watkins / Hikaroroa, and / or targeted indigenous plantings of ‘nodes’ to accelerate natural regeneration processes.

Noting the potential fire risk, an interim vegetation cover of gorse or other pioneer exotic species may establish in the short term, but in the long term (~30 years), with sufficient seed source, succession to native vegetation cover would be expected. Ongoing and effective suppression of browsing mammals will increase regeneration rates, as will interventions that increase populations of species such as kereru that are capable of transporting fruits of large-seeded tree species.

A more feasible approach than planting following forestry harvest may be to underplant indigenous species beneath an in-situ pine canopy. However, the major limitations of indigenous seed source and pests noted above would also apply. Additionally, harvest practices of the pine canopy would need to avoid damage and destruction of emerging indigenous species. If ‘nodes’ of plantings are used, this would likely still require many 10s-100s of thousands of plants, and as above, this would require several years lead-in time for a specialist nursery to propagate. While low stature plantings may mature within a short time

frame (<5 years), many forest tree / shrub species are slow-growing and will not mature for many decades (or centuries).

5.1.4 What are the high-level costs of the establishment and maintenance of landcover management in the catchment?

Establishment & Maintenance costs

Landcover management approaches of transitioning exotic plantation forestry into large scale permanent indigenous forest areas incur a number of costs associated with the establishment and upkeep of indigenous species. For large-scale indigenous afforestation being considered in this NbS intervention, afforestation estimates vary depending on access and existing environment, although broadly:

- The Climate Change Commission estimates that the establishment costs for large scale indigenous afforestation are estimated to be around $6,600 per hectare and can be as high as $24,000 to $50,000 per hectare (CCC, 2021).

- Motu Economic and Public Policy Research estimates that large scale indigenous afforestation establishment costs range from $24,000 to $66,000 per hectare (Pohatu *et al.* 2020)

These estimated costs do not consider the maintenance costs associated with indigenous plantings. The cost of fencing, planting, and continuous weed and pest management could range from $12,000 to $15,000 per hectare (Pohatu et al., 2019). By aligning with the wider Te Toitū Te Hakapupu restoration project for indigenous afforestation, this NbS may be able to recognise a couple of cost reduction opportunities for landowners, including plant purchasing and planting.

PLANT PURCHASING: Sourcing of suitable plant species for indigenous afforestation may be propagated from remnant pockets of indigenous forest through establishment of a community nursery. Additionally, with suitable plant species already present in remnant indigenous forest pockets in the upper catchment, controlling weed species and invasive browsing pests may be sufficient to enable those remanent pockets to expand across large area naturally over time. Although, it should be noted that natural regeneration in coastal Otago is slower compared to other more temperate North Island regions. Alternatively, crowd sourcing mechanisms such as ‘Trees that Count’ could be applied to provide funding for plant purchase or aligning with national government afforestation grants.

PLANTING: Planting efforts can be supported by using community groups, public planting days, or facilitating corporate volunteer planting days.

Land use change costs

Forestry and logging are an important industry within the Otago Region and Waitaki District economies, adding approximately $81 million of value to the regional economy and $13 million of value to the district economy (Yang *et al.* 2023). Although permanent indigenous forestry does not often match the same financial returns as plantation forestry, indigenous afforestation provides an opportunity for reducing sediment and nutrient losses, enhancing indigenous biodiversity, offsetting greenhouse gas emissions, and contribution to wider ecosystem services such as fibre, animal shelter, habitat for beneficial species and aesthetic.

Under present-day (2025) market settings, the transition of land use from exotic plantation forestry to permanent indigenous forestry would likely incur significant economic costs for landowners. With plantation forestry blocks in the upper catchment participants in the New Zealand Emissions Trading Scheme (NZ ETS), under current NZ ETS settings, transitioning exotic plantation forest cover to be replaced by smaller, slower growing indigenous species would reduce forest carbon stocks in the near to midterm, incurring significant carbon credit surrender liabilities for landowners. As indigenous forests and exotic forests recognised within the NZ ETS sequester and store carbon at different rates, when mature exotic forests are gradually replaced with new indigenous forest species, the overall carbon stock will progressively reduce.

Indigenous forests are expected to sequester high levels of carbon in the long-term than compared to exotic forest species. However, after 100-years, the amount of carbon stored in an indigenous forest would still likely be below the initial 40-year peak of an exotic forest. This deficit in carbon stocks between exotic and indigenous forest species creates a large financial liability for participants.

Without change in NZ ETS settings to encourage greater levels of indigenous afforestation, this NbS intervention would present a financial risk to forestry participants within the catchment and disincentives the long-term transition at a large scale (MPI, 2023).

5.1.5 What are the potential impacts, benefits, and trade-offs landcover management may have in the catchment, alongside productive rural **land uses and as part of Kāti Huirapa ki Puketeraki's takiwā?**

The NbS intervention of landcover management align with the identified values and strategies of the draft Toitū Te Hakapupu CAP (Ahikā, 2023). The relevant values and strategies are detailed below.

Value 1: Waterways

Value 1 of the draft Toitū Te Hakapupu CAP recognises that waterways in the catchment and the estuary wetland complex provide important habitat and eco-system services, however, these values have been degraded over time, particularly due to the effects of plantation forestry operations in the upper catchment. The NbS intervention of landcover management would contribute benefits towards the enhancement of Value 1, specifically aligning with the following CAP strategies:

- S1A. Levels of contaminants and sediment entering waterways & estuary wetland complex will be reduced, in accordance with target attribute states as set out in the LWRP
- S1F. Instream flows and hydrological functions are maintained or improved in the catchment, including restoring wetlands, re-naturalising waterways and managing invasive plant species, where this does not increase flood risk

With the gradual transition of upper sub-catchment landcover from clear-fell plantation forestry to permanent indigenous forest, this NbS would significantly reduce the window of vulnerability to increased sediment and debris inputs catchment waterways are exposed to during harvest and replanting periods.

The high-risk period during the ‘window of vulnerability’ exists for approximately 8-years from the time of harvest until the replanted crop establishes a full canopy and sufficient root structure. During this window, the loss of canopy cover and root structures in the steeper upper catchment areas would see an increase in overall water yield into the lower catchment during rainfall events, likely transporting fine sediments and other woody debris.

During extreme rainfall events, it is often the debris flows that cause the greatest damage to lower catchment waterways.

With the effects of sediment inflows into the main waterways already creating issues with water quality in the lower catchment and estuary wetland complex, restoring the upper catchment watershed to permanently avoid the increased risks posed by forest harvest would likely contribute the greatest benefits to achieving CAP water quality related strategies.

Value 2: Biodiversity

Value 2 of the draft Toitū Te Hakapupu CAP recognises that biodiversity within the catchment provides important habitat, ecosystem services, and landscape amenity. However, with the widescale modification of the indigenous environment over time towards a predominant mix of exotic pastoral and forest land cover, these values have been diminished. The NbS intervention of landcover management would contribute benefits towards the enhancement of Value 2, specifically aligning with the following CAP strategies:

- S2A. Existing remnants of indigenous vegetation and wetlands will be identified, protected, and enhanced
- S2B. Increase indigenous plantings in the catchment to support the creation of biodiversity corridors, including within the forestry estate

Within the existing plantation forestry areas across the upper catchment, a number of small remanent indigenous forest pockets provide isolated habitat for biodiversity. Through initially seeking to protect and enhance these remanent indigenous forests and support their expansion across larger areas of the upper catchment, connectivity can be enhanced.

Value 3: Cultural significance

Value 3 of the Toitū Te Hakapupu CAP recognises that the Hakapupu catchment is part of Kati Huirapa ki Puketeraki’s takiwā and is culturally significant, however as mana whenua have lost access to large parts of the catchment and natural environment values have degraded, these values have become increasingly limited. The NbS intervention of landcover management would contribute benefits towards the enhancement of Value 3, specifically aligning with the CAP strategies:

- S3A. Water quality and habitat will be protected and enhanced with a focus on mahika kai and taonga species so that abundance is sufficient to support cultural practices.
- S3B. Access to key sites for cultural practices will be investigated, and where possible, re-established.
- S3C. Existing trails and access points will be enhanced.

For mana whenua, enhancing safe access to upper catchment areas where mahika kai values are supported helps sustain connections to wāhi tupuna and transfer of mātauraka Māori. Through the landcover management NbS intervention, mana whenua and community access to upper catchment areas could be safely enhanced without public interference in clear fell forestry operations. Access to key cultural sites could be supported through restoration activities, with opportunities to share mātauraka Māori for the sustainable use and protection of biodiversity values and taonga species.

5.1.6 How does landcover management adapt to and/or help mitigate the effects of climate change in the catchment?

Climate change adaptation

Beyond permanent indigenous forests being more resilient to the effects of extreme rainfall events and land instability, mature indigenous forest cover can support reducing catchment vulnerability to fire-related risks. The climate change effects on fire-related risks in New Zealand is an emerging research area. As such, the direct change a warmer and drier summer climate may have on fire risk within the catchment has not been specified within Otago Region Climate Change Projections (Macara *et al.* 2019). However, with more frequent extreme hot days and dry days (≤1mm) projected to occur across the Otago region, fire-risk profile of exotic forested areas may be subject to change.

Climate change mitigation

Undertaking a gradual transition from exotic plantation forestry to permanent indigenous forest presents both benefits and disbenefits for climate change mitigation – causing disbenefits in the near to mid-term, but benefits in the long-term. As detailed in the economic evaluation of this NbS, transitioning exotic forest species to permanent indigenous forest species creates change in the net-carbon stocks of a forested area, where the benefits will likely not be realised until future generations. Exotic forest species typically grow much faster than New Zealand indigenous species, sequestering and storing carbon within their biomass at a much higher rate per year. However, with slow continuous growth indigenous forests are expected to sequester comparatively high levels of carbon in the long-term.

In the scope of immediate climate change mitigation requirements, New Zealand, along with the rest of the world must rapidly reduce its net-carbon emissions in the coming years in effort to hold global warming well-below 2°C. The window of opportunity to achieve this target and avoid the more severe effects of climate change is closing fast within this decade (IPCC, 2021). Accordingly, reducing net-carbon stocks stored within Te Hakapupu forested would likely provide a disbenefit to net-emissions reduction efforts required to achieve near and mid-term emission budgets.

Alternatively, however, transitioning the catchments forested areas to permanent indigenous may contribute positively to national climate change mitigation efforts, as New Zealand must reach net-carbon zero and remain at net-carbon zero. Well-maintained permanent indigenous forests provide for longer term carbon sequestration beyond the end of this century and ensure greater permanence of carbon stocks. As climate change intensifies, the risks to exotic forestry plantations, such as flooding and fire, also increase. In contrast, permanent forest species with a well-established understory tend to be less vulnerable to these hazards.

5.1.7 Is landcover management consistent with consenting requirements and key legal or policy considerations?

Land ownership characteristics

The landcover management NbS would likely occur over the largest area of the three NbS, across large sections of the upper sub-catchments. There are 48 parcels of land in the forested upper catchment, and a total of 19 landowners, predominantly private entities.

There is a number of forestry companies who hold significant areas of land within this area, with Calder Stewarts, PF Olsen, Wenita, and Ngāi Tahu Forestry being the largest landowners.

Regulatory implications

At a very high-level, the NbS intervention of landcover management essentially seeks to facilitate the gradual conversion of exposed clear-fell plantation forestry areas to permanent indigenous forests. This NbS might involve the following activities (assuming that clearance of existing plantation forestry is undertaken in accordance with relevant rules and standards):

- Planting of indigenous vegetation, which may include within riparian areas
- Ancillary earthworks
- Fencing to exclude stock and browsing pests from restored areas

A summary of the potential consenting requirements associated with these activities under the relevant regulatory instruments is set out in Appendix 6. Note that it is assumed that the works will not occur in proximity to any inland natural wetlands as defined in the NPS-FM, but that a detailed site survey should be undertaken to verify this. If natural inland wetlands are affected, then there could be consent requirements under the NES-F.

Similarly, this NbS is not anticipated to trigger any consent requirements under the Otago Regional Plan: Water as it is unlikely to involve the types of activities managed under that plan (e.g. damming, diversion, discharge of water).

Policy considerations

General Policy Direction

It is expected that any improvement to water quality and freshwater habitat that arises as a result of the NbS would be broadly consistent with the general policy direction in the NPS-FM and the Otago Regional Plan: Water.

National Policy Statement – Indigenous Biodiversity

The NPS-IB has an overarching objective of maintaining indigenous biodiversity across Aotearoa New Zealand so that there is at least no net loss in indigenous biodiversity after the commencement date of the NPS-IB. Related policies seek to promote and provide for the restoration of indigenous biodiversity, [9] and to promote increased vegetation cover in both urban and non-urban environments.[10]

[9] NPS-IB Policy 13
[10] NPS-IB Policy 14

Dunedin District Plan

Objectives and policies in the Dunedin District Plan seek to maintain or enhance biodiversity values, including by encouraging conservation activity in all zones through the district. [11] Objective 16.2.3(f) seeks to maintain or enhance the rural character values and amenity of the rural zone, including by including extensive areas of indigenous vegetation and habitats for indigenous fauna. [12]

Waitaki District Plan

The Waitaki District Plan identifies ongoing modification and degradation of nature conservation values in the District as one of the key issues within the Rural parts of the District.[13] Related objectives seek to maintain biodiversity, nature conservation values and ecosystem functioning; as well as the quality of water, wetlands, lakes, rivers and their margins. [14]

Overall, landcover management would be generally consistent with the policy direction of the NPS-FM; NPS-IB; Otago Regional Plan: Water; the Waitaki District Plan; and the Dunedin District Plan.



Figure 15: Landcover post forestry harvest, Southland. Source: Videocopter.

[11] Dunedin District Plan Objective 10.2.1 and Policy 10.2.1.5
[12] Dunedin District Plan Objective 16.2.3(f)
[13] Waitaki District Plan Issue 8
[14] Waitaki District Plan Objectives 16.9.2(1) and (2)

5.1.8 Summary of landcover management as a nature-based solution

Opportunities

- This NbS intervention would permanently restore the natural hydrology of vulnerable areas in upper sub-catchment locations, avoiding the exacerbation of flood hazards during forestry harvest and replanting periods.

- Permanent indigenous afforestation typically increased downstream water yield but reduced flood flows, addressing flood hazards but not exacerbating water pressures during dry spells.

- The NbS is broadly consistent with national and local policy and planning direction.

- The NbS would significantly increase indigenous plant populations in the catchment, enhancing cultural and community amenity values.

Challenges

- Considerable economic costs are associated with the establishment and upkeep of indigenous forests at large scale and loss of plantation forestry revenue.

- Likely reduce the overall forest carbon stock for decades, incurring significant NZ ETS carbon credit surrender liabilities for landowners and impacting climate change mitigation targets.

- Would require action of up to 19 landowners to be implemented in vulnerable areas across upper sub-catchment locations.

5.2 RIVER NATURALISATION

The NbS intervention of river and stream naturalisation would target the predominantly unvegetated riparian areas of the main Te Hakapupu / Pleasant River, Watkin Creek, and Owhakaoho / Trotters Creek waterways. This NbS would seek to manage flooding and associated hazards along the middle and lower waterway corridors, primarily through slowing flood flow velocities and intercepting runoff.



Figure 16: Possible application of river naturalisation in a typical Otago river catchment

5.2.1 How does river naturalisation contribute to flood hazard mitigation in the catchment?

In reference to the drivers of flooding and associated hazards within the Hakapupu catchment, this NbS would effectively increase resilience to the experienced impacts of flood events through the following means:

Avoid: Mitigation of severe surface flooding of areas and land uses vulnerable to the effects of flood hazards adjacent to waterway corridors, by enhancing riparian areas to slow runoff entering waterway, increase bank permeability, and slowing in stream peak flood flow velocities flowing down the catchment.

Avoid: Avoidance of fast flowing flood waters and unrestricted surface runoff from surrounding productive lands entering waterways, causing high levels of streambank erosion and transporting contaminants, by enhancing riparian areas to stabilise streambanks and intercept runoff contaminants.

While there is evidence of channel modification in the catchment through diverting and straightening through some properties, the main channels are is largely still that of a braided river system – so there would only be localised opportunities to implement changes. Compounding this, the flood extent shown in Map 7 is significant. Naturalisation of these localised areas (through reinstating a more sinuous channel form and increasing storage) would be unlikely to be of a scale that would make a significant change in flood extent.

Restoration of riparian vegetation would likely achieve benefits in terms of erosion management and protection of channel banks, but also may result in increased channel roughness and reduced channel capacity.

5.2.2 How does river naturalisation contribute to landscape amenity value, character, and recreation opportunities?

This NbS intervention involves undertaking river and stream naturalisation along modified waterways at Te Hakapupu/Pleasant River, Owhakaoho / Trotters Creek, and Watkin Creek. This will be achieved through the exclusion of stock and development activities within riparian buffer areas and the restoration of riparian vegetation with native shrubs and tall native tree species along the waterway corridor.

By naturalising these waterways within the catchment there is an opportunity to restore the natural flow characteristics, slow peak flow velocities, and increase their capacity.

Existing character and values

The main tributaries of Te Hakapupu/Pleasant River, Watkin Creek, and parts of Owhakaoho/ Trotters Creek in the mid-catchment are currently modified through agricultural and infrastructure development. While some work has been done through the Toitū Te Hakapupu project to enhance riparian planting, overall, they have relatively bare, unvegetated riparian margins and entrenched channels with small adjoining tributaries and wet areas being piped or cut off.

Potential benefits

This NbS seeks to restore the mid-catchment sections of the three main river corridors to vegetated riparian margins which will enhance the landscape, amenity and natural character values of the river corridors and the wider catchment.

Creating vegetated riparian buffers will enhance physical landscape values, abiotic aspects, and biotic aspects of natural character which have been degraded. This will be achieved through protecting the riverbanks from further erosion, restoring natural flows, improving water quality and clarity by filtering sediments and contaminants, increasing biodiversity, and providing shade over the waterways. Shade from the plants will assist rivers' life-supporting capacity for aquatic ecosystems. Reducing the sediment and nutrients that get into the waterways will also assist with better protecting the range of landscape and natural character values of Te Hakapupu/Pleasant River Estuary Wetland Complex at the lowest part of the catchment. Restoring and naturalising these corridors will also enhance values relating to perceptual and associative dimensions of the wider catchment's landscape and visual amenity values, particularly as a result of planting the bare riverbanks.

5.2.3 What are the potential biodiversity benefits, adverse effects, and practicalities of river naturalisation in the catchment?

Biodiversity benefits & challenges

At present, the riparian vegetation cover along the main waterways in the catchment is largely limited (i.e. bare or grassed banks) and / or exotic in nature (e.g. plantation forestry and willow). River naturalisation including riparian plantings would create greater ranges and larger population sizes of indigenous flora and fauna species, and the re-creation of ‘natural’ indigenous sequences of riparian vegetation.

Targeted plantings could be used to bolster desired Threatened, At Risk, and locally uncommon plant populations within the catchment. In turn, by creating vegetated corridors, habitats suitable for use by terrestrial fauna (i.e. birds, lizards, and invertebrates), or riparian nesting habitat for waterfowl and wetland bird species, may develop in time. Increased riparian cover utilising indigenous plant species may improve in-stream habitat conditions by, for example, intercepting sediments and runoff, by providing riparian shade, and by reducing pulses of leaf litter from exotic riparian species (e.g. willows).

Works to re-align or ‘make room for the river’ will require robust erosion and sediment control measures in place. Salvage and translocation of freshwater fauna may be required if works include temporary channel dewatering and realignment. Works to re-align or ‘make room for the river’ will also need to ensure that hydrological conditions within the ‘typical’ or ‘low flow’ channel remain suitable for freshwater fauna. Excessively widened waterways risk reducing water velocity and depth, increasing water temperature and / or enabling macrophyte growth, sediment build up at the exclusion of suitable conditions for freshwater fauna.

Conversely, narrow waterway corridors of riparian plantings inherently suffer from ‘edge effects’ that reduce the long-term resilience and functioning of plant communities. In turn, this creates opportunities for ongoing weed invasion. This weed invasion risk may be mitigated by greatly increasing the width of planted areas.

Practicalities of implementation

Earthworks to ‘create room for the river’ and conduct any re-align waterways will trigger potentially complex consenting and permitting requirements. Ecological input into plantings and design (including constructed bank, streambed substrates, depths, and structures such as bridges if any), and effects assessment for consenting and permitting processes would be required.

Establishing riparian plantings of at least 3 m width along the unvegetated areas of Te Hakapupu / Pleasant River, Owhakaoho / Trotters Creek and Watkin Creek corridors equates to approximately 3 ha of plantings. Whilst this potentially means 30,000 plants are required, this NbS solution is considerably more straightforward and of smaller scale than the wetland construction and restoration or landcover management NbS approaches.

Plants for this NbS would require several years lead-in time for a specialist nursery to propagate. While low stature plantings may mature within a short time frame (<5 years), many riparian tree / shrub species are slow-growing and will not mature for many decades (or centuries).

5.2.4 What are the high-level costs of the establishment and maintenance of river naturalisation in the catchment?

Establishment and maintenance costs

Establishment and maintenance costs of river and stream naturalisation within the catchment are primarily associated with the costs of fencing and restoring riparian setback areas as detailed in Table 5.

Similar to wetland restoration and construction activities, aligning with the wider Toitū Te Hakapupu restoration project that includes stream naturalisation, this NbS may be able to recognise a couple of cost reduction opportunities for landowners, including:

PLANT PURCHASING: Sourcing of suitable plant species for riparian areas may be selectively sourced or propagated from neighbouring well-established riparian areas within the catchment. Additionally, suitable plant species may already present in the proposed locations in which case, simply removing grazing pressure and controlling weed species may be sufficient to enable those remanent riparian plants to expand along the waterway corridor.

Alternatively, crowd sourcing mechanisms such as 'Trees that Count' could be applied to provide funding for plant purchase.

PLANTING**:** Planting efforts can be supported by using community groups, public planting days, or facilitating corporate volunteer planting days

Table 5: Indicative costs per hectare of activities associated with river and stream naturalisation

	INDICATIVE COST	$/HA (EXCL. GST)	NOTES
SITE PREPARATION	$0.5 per plant	$2,222	Spot spraying cost per plant. Alternatives are to spray whole area or use mechanical clearance.
FENCING	$20 - $30 per l/m	$20,800 – $31,200	Retirement fencing with electric 4-wire assuming 20 m wide x 500 m long planting area, fencing both sides 1040 m)
PLANT PURCHASE	$1.80 - $5 per plant	$8000 - $22,220	Assuming a mix of shrubs and trees in revegetation/forestry grades
PLANTING	$2 - $3 per plant	$8,880 - $13,330	Including $0.2 cost for fertilizer tab per plant. $0.35 for bamboo stake to allow for location.
REPLACEMENT PLANTING	$1.80 - $5 per plant	$2,500 - $5,000	5% mortality assumed; includes plant purchase and planting
PROJECT MANAGEMENT	$1 per m^2 of riparian area	$10,000	Generally, works managed by landowner or, Landcare group, NGO or Council and don't typically see a PM cost.
MAINTENANCE	Lump sum	$2,000 - $4,000	Allow for three visits over 2 years of maintenance
TOTAL COST PER HA		$54,000 - $88,000 per hectare	

Land use change costs

River and stream naturalisation along the waterways of the Hakapupu catchment would require the exclusion of stock grazing and setback from waterway margins. Should exclusions be greater than current regulation to achieve greater flood mitigation and biodiversity benefits, this would reduce the productive area on farms and require alternative the provision of water supplies for livestock.

While national cost-benefit analysis (economic cost vs environmental benefits) of riparian restoration for a variety of low, medium, and high-cost restoration scenarios and buffer widths found benefits typically outweigh the costs by between 2:1 and 20:1, this does not consider the impacts that direct personal costs may have on individual landowners (Eppink *et al.* 2016).

As common with NbS benefit realisation, the benefits of implementing wide-scale riparian restoration activities may provide significant benefits for flood mitigation and water quality. However, these broader benefits may not provide direct financial benefits to individual landowners. In comparison, without national or regional funding to support riparian restoration, the direct costs of fencing and restoring riparian margins, developing alternative water sources, as well as the opportunity loss through loss of productive land area could be difficult and expensive for farmers (Daigneault *et al.* 2017; B+LNZ & Federated Farmers, 2020).

Land use change benefits

DairyNZ commissioned research in 2021 to investigate the cost-benefits of 'Productive Riparian Buffers'. The aim of this research sought to develop edge-of-field agricultural methods that improve water quality and ecological conditions, while also providing production benefits for farmers (Matthews & Matheson, 2021). Although a number of the productive buffers analysed do not meet NbS definition or criteria, options including planting tōtara along waterways to produce commercial by-products of foliage for oils and pole, and planting mānuka for foliage for essential oils may be viable in Otago. However, these financial benefits of these productive riparian buffer options are limited due to the high harvest labour requirements and limited market opportunities at present.

While vegetated riparian margins are not typically recognised within the NZ ETS, restoration and establishment of riparian margins at the appropriate scale could yield afforestation carbon credits.[15] Alternatively, riparian margins of smaller sizes (not complying with NZ ETS requirements) may be recognised at present through Voluntary Carbon Market (VCM) verification bodies should they meet requirements for additionality, transparency, and permanence.

While the amount of carbon sequestered is dependent on the biomass present within a riparian area (plant size and area) and its growth rate over time, the median sequestration values for riparian areas in New Zealand are estimated at 3.4 tonnes CO_2 per hectare per year.

[15] Current NZ ETS settings require post-1989 forests to be at least 1 ha in size, 30m wide, and consist of a 5m tall canopy.

5.2.5 What are the potential impacts, benefits, and trade-offs river naturalisation may have in the catchment, alongside productive rural land uses and as **part of Kāti Huirapa ki Puketeraki's takiwā?**

The NbS intervention of river and stream naturalisation align with the identified values and strategies of the draft Toitū Te Hakapupu CAPP (Ahikā, 2023). The relevant values and strategies are detailed below.

Value 1: Waterways

Value 1 of the draft Toitū Te Hakapupu CAP recognises that waterways in the catchment provide important habitat and eco-system services, however, these values have been degraded over time, particularly due to the modification and management practices around streambanks. The NbS intervention of river and stream naturalisation would contribute benefits towards the enhancement of Value 1, specifically aligning with the following draft CAP strategies:

- S1A. Levels of contaminants and sediment entering waterways and estuary wetland complex will be reduced, in accordance with target attributes states set out in the LWRP
- S1B. Riparian margins will be protected and enhanced, with stock and plantation forestry excluded
- S1C. Fish spawning areas will be protected and enhanced, and fish passage will be enhanced.
- S1F. Instream flows and hydrological functions are maintained or improved in the catchment, including restoring wetlands, re-naturalising waterways and managing invasive plant species, where this does not increase flood risk.

The naturalisation of the main waterways identified in the catchment would predominantly be achieved through the exclusion of livestock and enhancement or restoration of riparian margin vegetation. Conducted at an appropriate scale across the waterway corridors, this can support reducing the contaminants and sediment entering waterways and being transported into the estuary wetland complex. Suitably sized and maintained riparian areas support contamination removal from surface runoff from surrounding productive land uses through a combination of physical and biological processes.

By providing for enhanced riparian vegetation cover, shallow surface runoff flows experienced during extreme rainfall events can be slowed, allow particles (sediment, livestock waste, plant debris) to settle on bank areas, and slow the velocity of runoff.

Additionally, by increasing surface permeability, enhanced riparian areas can facilitate more surface runoff to infiltrate into the riparian soil, increasing the contact between soil and contaminants such as dissolved nitrogen and fine sediments (McKergow *et al.* 2022). The estimated performance of a well restored and vegetated riparian area for filtering sediment, nitrogen, and phosphorus from surface run off will vary dependant on topography and riparian setback width, however performance will generally increase with setback width.

Restoration and naturalisation of stream corridors in the catchment can also play an important role in reducing erosion and enhancing freshwater habitats, noting that stream

bank erosion accounts for as much as 98% of deposited sediment at catchment outlets into the estuary wetland complex. Through enhancing the root systems across a stream bank, riparian plants help to stabilise stream banks and buffer them from the effects of fast flows during extreme rainfall events, reducing sediment input from streambank erosion.

Value 2: Biodiversity

Value 2 of the draft Toitū Te Hakapupu CAP recognises that biodiversity within the catchment provides important habitat, ecosystem services, and landscape amenity. However, like the pressures experienced by waterways, these values have been degraded over time, particularly due to the modification and management practices around streambanks. The NbS intervention of river and stream naturalisation would contribute benefits towards the enhancement of Value 2, specifically aligning with the following draft CAP strategy:

- S2B. Increase indigenous plantings in the catchment to support the creation of biodiversity corridors, including within the forestry estate.

River and stream naturalisation of the presently unvegetated riparian areas of the main waterways within the catchment can support the enhancement of habitat and ecological functions of freshwater ecosystems. Key benefits that may enhance the biodiversity values found within catchment freshwater environments include:

- Reducing nutrients and sediments entering the waterway
- Providing or capturing organic material which can function as an important source of energy and serve as habitat for instream organisms
- Providing shading to moderate extreme temperatures in waterways.

Value 3: Cultural significance

Value 3 of the draft Toitū Te Hakapupu CAP recognises that the Hakapupu catchment is part of Kati Huirapa ki Puketeraki's takiwā and is culturally significant, however these values are diminishing as habitat available for mahika kai and taonga species is degraded. The NbS intervention of river and stream naturalisation would contribute benefits towards the enhancement of Value 3, specifically aligning with the CAP strategy:

- S3A. Water quality and habitat will be protected and enhanced with a focus on mahika kai and taonga species so that abundance is sufficient to support cultural practices.

River and stream naturalisation within Te Hakapupu catchment would provide beneficial outcomes for protecting and enhancing mahika kai abundance found within the catchment waterways by seeking to reduce the degrading pressures on these values from surrounding productive land uses. Riparian areas can be restored to contain a range of culturally important plant species, including those used for weaving or traditional medicines. Noting that important mahika kai species including Tuna, Banded kōkopu, and Īnaka are all ranked highly vulnerable to the effects of climate change, enhancing riparian areas to provide resilient habitat for these species will help protect these values for future generations (Egan *et al.* 2020).

5.2.6 How does river naturalisation adapt to and/or help mitigate the effects of climate change in the catchment?

Climate change adaptation

River and stream naturalisation of the currently unvegetated waterways of Te Hakapupu / Pleasant River, Watkin Creek, and parts of Owhakaoho / Trotters Creek, as identified in the NbS intervention, would provide beneficial outcomes to increasing the resilience of these freshwater environments to the effects of climate change.

As global warming drives the increase in mean annual temperatures across the Otago region in the coming decades, under a 'hot house' (RCP 8.5) climate change scenario, the catchment is projected to experience an increase of up to 1°C by 2040 and 2-2.5°C by 2090 (relative to a preset-day 1986-2005 average). Accordingly, as mean annual temperature increases, so too does the likelihood of extreme hot days (≥30°C). An additional 5 extreme hot days are projected annually for the catchment under a 'hot house' scenario by 2090.

Restoring riparian vegetation along the corridors of the main waterways across the catchment can reduce the effects of heat stress in freshwater environments, both through the shading of exposed areas during extreme hot days and by preventing heat contamination from runoff across hot surfaces entering waterways. Heat stress and surface water runoff across hot surfaces into surrounding waterbodies (e.g. a rainfall event after an extremely hot day) presents climate-related health risks to freshwater fish species. Sudden changes in water temperatures can alter the physical habitat conditions in freshwater environments and cause a range of physical and behaviour responses in freshwater species, through to death in severe circumstances.

Additionally, through re-establishing pre-existing off-stream wetland areas and small side tributaries, these can provide important water storage locations within the catchment. With longer and more frequent dry-spells projected for the Otago region, these areas enhanced through stream naturalisation can increase the resilience of freshwater resources during increasingly frequent low-flow events.

Climate change mitigation

While riparian vegetation that do not meet the size requirements of the NZ ETS are not currently recognised for their climate change mitigation benefits in New Zealand, these areas along with farm shelter belts and other vegetation types are intended to be considered in the coming years within on-farm net-emission monitoring.

Acknowledging the high sustainability of New Zealand's agricultural sector, comparative to international producers, the common agricultural land uses of the Hakapupu lower and mid catchment do emit considerable volumes of greenhouse gases. Consequently, fencing and restoring riparian areas along the main waterways of Te Hakapupu would provide a net-carbon reduction benefit to support climate change mitigation. As referenced in the economic evaluation, the median sequestration values for planted riparian areas are estimated at 3.4 tonnes CO_2 per hectare per year. Although these areas provide a comparatively low sequestration rate (compared to pinus radiata forest for example), when coupled with other emission reduction practices, riparian vegetation may provide an important contribution to achieving on-farm or regional net-carbon zero objectives.

5.2.7 Is river naturalisation consistent with consenting requirements and key legal or policy considerations?

Land ownership characteristics

Based on analysis which captured parcels of land within a 10m buffer of the reaches of the streams and rivers where it is proposed to undertake naturalisation activities, a total of 22 titles of land are affected, of which two are owned by the Crown. The remaining titles are privately owned.

Regulatory implications

Based on the current high-level understanding of the works associated with the NbS intervention of river and stream naturalisation in the Hakapupu catchment, it is anticipated that the works might entail:

- Removal of existing vegetation (which may or may not be pest plant species, but is assumed that no indigenous vegetation will be removed)
- Planting of vegetation within riparian areas
- Ancillary earthworks
- Fencing to exclude stock from riparian areas

A summary of the potential consenting requirements associated with these activities under the relevant regulatory instruments is set out in in Appendix 6. Note that it is assumed that the works will not occur in proximity to any inland natural wetlands as defined in the NPS-FM, but that a detailed site survey should be undertaken to verify this. If natural inland wetlands are affected, then there could be consent requirements under the NES-F. Similarly, this NbS is not anticipated to trigger any consent requirements under the Otago Regional Plan: Water as it is unlikely to involve the types of activities managed under that plan (e.g. damming, diversion, discharge of water).

Policy considerations

An overview of the policy direction relevant to the river and stream naturalisation NbS intervention is set out below.

National Policy Statement – Freshwater

The objective of the NPS-FM is to ensure that natural and physical resources are managed in a way that prioritises:

- First, the health and wellbeing of water bodies and freshwater ecosystems
- Second, the health needs of people
- Third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

Related policies of relevance to this proposed NbS include that freshwater is managed as part of New Zealand's integrated response to climate change;[16] to ensure that the health and

[16] NPS-FM Policy 4

well-being of degraded water bodies and freshwater ecosystems is improved;[17] and that the loss of river extent and values is avoided to the extent practicable.[18]

National Policy Statement – Indigenous Biodiversity

The NPS-IB has an overarching objective of maintaining indigenous biodiversity across Aotearoa New Zealand so that there is at least no net loss in indigenous biodiversity after the commencement date of the NPS-IB. Related policies seek to promote and provide for the restoration of indigenous biodiversity, [19] and to promote increased vegetation cover in both urban and non-urban environments.[20]

Otago Regional Plan: Water

Objectives and policies in the Otago Regional Plan: Water seek to maintain or enhance the natural and human use values associated with Otago's lakes and rivers, as listed in Schedules 1A, 1B and 1C to the regional plan; [21] as well as the spiritual and cultural beliefs, values and uses of significance to Kai Tahu in Schedule 1D of the plan. [22] The provisions of public access long the margins of lakes and rivers is recognised; [23] as well as maintaining or enhancing the amenity values associated with these margins.[24]

Most of the related policies address water management issues, but Policy 5.4.13 seeks to encourage and support community initiatives that assist in the maintenance or enhancement of lakes and rivers and their margins. [25]

Dunedin District Plan

Objectives and policies in the Dunedin District Plan seek to maintain or enhance biodiversity values, including by encouraging conservation activity in all zones through the district. [26] Objective 16.2.3(f) seeks to maintain or enhance the rural character values and amenity of the rural zone, including by including extensive areas of indigenous vegetation and habitats for indigenous fauna. [27]

Waitaki District Plan

The Waitaki District Plan identifies ongoing modification and degradation of nature conservation values in the district as one of the key issues within the Rural parts of the district.[28] Related objectives seek to maintain biodiversity, nature conservation values and ecosystem functioning; as well as the quality of water, wetlands, lakes, rivers, and their margins. [29]

Overall, river and stream restoration would be generally consistent with the policy direction of the NPS-FM; Regional Plan: Water; the Waitaki District Plan; and the Dunedin District Plan

[17] NPS-FM Policy 5
[18] NPS-FM Policy 7
[19] NPS-IB Policy 13
[20] NPS-IB Policy 14
[21] Otago Regional Plan: Water, Objective 5.3.1
[22] Otago Regional Plan: Water, Objective 5.3.2
[23] Otago Regional Plan: Water, Objective 5.3.5
[24] Otago Regional Plan: Water, Objective 5.3.4
[25] Otago Regional Plan: Water, Policy 5.4.13
[26] Dunedin District Plan Objective 10.2.1 and Policy 10.2.1.5
[27] Dunedin District Plan Objective 16.2.3(f)
[28] Waitaki District Plan Issue 8
[29] Waitaki District Plan Objectives 16.9.2(1) and (2)

5.2.8 Summary of river naturalisation as a nature-based solution

Opportunities

- This NbS intervention would stabilise stream banks and intercept runoff to reduce in stream contaminants.
- Naturalisation of riparian areas would potentially create suitable habitat for indigenous freshwater species, allowing for larger population sizes species and could bolster mahika kai values.
- With larger riparian setback areas, river naturalisation can be developed into productive zones, offering landowners opportunities to diversify their income, such as through productive riparian farming or other sustainable land uses.
- River naturalisation would enhance the natural landscape character and aesthetic values of lower and mid catchment areas.

Challenges

- Most riparian vegetation is currently excluded from NZ ETS and on-farm systems as recognised carbon sink.
- Without cost-benefit sharing or realisation of nature-based market opportunities, such as productive riparian zones or carbon values, the retirement of productive farmlands would cause a loss of revenue.
- Many riparian tree / shrub species are slow-growing and will not mature for many decades.
- Would require action of up to 22 landowners to be implemented across all currently unvegetated waterways in the lower and mid catchment.
- Has less potential to actively mitigate flooding related risks than the other two NbS presented in this report.

5.3 WETLAND RESTORATION AND CONSTRUCTION

The NbS intervention of wetland restoration and construction in Te Hakapupu/Pleasant River catchment, including at the northern and western extent of the existing wetland estuary, would seek to mitigate the effects of extreme rainfall induced flood hazards primarily through the provision of suitable areas substantial enough to accommodate and retain flood water.



Figure 17: Possible application of wetland restoration and construction in a typical catchment

5.3.1 How does wetland construction and restoration contribute to flood mitigation in the catchment?

In reference to the drivers of flooding and associated hazards within the catchment, this NbS would effectively adapt to reduce the experienced impacts of flood events through the following means:

Managed Retreat**:** Managed retreat of built infrastructure and primary production land uses vulnerable to the effects of flood hazards in the lower reaches of the catchment, predominantly located on historically drained and reclaimed wetland areas where flood waters are naturally predisposed to flow and pool. Retreat of these values to less flood prone locations would effectively reduce the hazard exposure and the subsequent hazard risk profile for infrastructure, people, and livelihoods.

Accommodate: Restoration and construction of wetland area located in historically drained and reclaimed wetland areas where flood waters are naturally predisposed to flow and pool would provide the landscape function of accommodating flood flows through retention and detention.

Accommodation of flood flows would reduce the vulnerability of surrounding people, infrastructure, and livelihoods to the effects of surface flooding, providing greater capacity to buffer the effects of extreme rainfall events as they increase under climate change scenarios.

Additionally, with properly constructed and maintained sediment ponds at inlet locations, this NbS can also serve to accommodate sediment and contaminants coming down the catchment, reducing the exposure of the lower estuary wetland complex to the flood-related effects of sediment inundation.

While wetland restoration and construction is considered as an approach to manage flood extent, the scale and depth of flooding in the 100-year ARI event in Te Hakapupu/Pleasant River Catchment suggest that the results will depend on where this storage is provided (and what scale of flood reduction would be targeted).

A large volume of storage would be necessary to achieve a material reduction, given that there are flood depths of more than 1.5m across most of the floodplain. In addition, flows are entering the main floodplain from a number of different reaches means that multiple basins could be necessary across the catchment.

5.3.2 How does wetland construction and restoration contribute to landscape amenity value, character, and recreation opportunities?

The wetland restoration and construction NbS intervention would seek to restore the existing Te Hakapupu/Pleasant River estuary wetland complex and create additional wetlands. The existing estuary wetland complex covers approximately 84 ha which would be expanded to approximately 140 ha in this NbS intervention. As part of this NbS intervention, wetland areas and margins will also be planted with native riparian species.

Existing character and values

The existing Te Hakapupu/Pleasant River estuary wetland complex is identified as a Regionally Significant Wetland and a Significant Natural Feature and an Area of Significant Nature Conservation Value under the Waitaki District Plan.

The 2015 Natural Character and Outstanding Natural Features and Landscapes Assessment for Otago's coastal environment (the 2015 Natural Character and Landscape Assessment) [30] identifies the estuary as a place of significance to local Maori including a highly significant archaeological site on the spit. However, while this wetland complex contains attributes that contribute to natural character, its inland extent is largely characterised by increased modification in the form of drainage and reclamation for improved pasture and is under pressure from invasive weed species, grazing, and alteration of natural flow characteristics. Some riparian planting is being undertaken through the Toitū Te Hakapupu project.

The 2015 Natural Character and Landscape Assessment finds that the estuary has high – medium landscape and natural character values. The higher ratings are particularly at its eastern (mouth) end with low – moderate values in its upper (inland) reaches).

[30] Coastal Environment of Otago: Natural Character and Outstanding Natural Features and Landscapes Assessment, Dunedin City Section Report, 28 April 2015, prepared by Mike Moore et al

Potential benefits

This NbS suggests to restore and expand Te Hakapupu/Pleasant River estuary wetland complex. This will buffer the impacts of flood flows entering the estuary wetland complex, better protect and increase the level of indigenous planting and habitat and assist with intercepting and treatment of suspended sediments and other contaminants. Restoring and expanding the existing estuary wetland complex will enhance the legibility and expressiveness of this natural landscape feature, the level of naturalness, which is currently modified, aesthetic values, and both the abiotic and biotic aspects of natural character, which have been degraded.

Under the implementation of this NbS intervention, the important wetland habitats and ecosystems found in the estuary wetland complex will be better protected from floods and sedimentation, with improvements in water clarity and reduction in channel modification together with restoration of the riparian margin, all increasing levels of natural character. Biodiversity benefits as a result of the planting of indigenous, riparian species will also enhance physical landscape values of the wetland complex as well as contributing to its natural character values.

The significance of Te Hakapupu/Pleasant River estuary to Kati Huirapa ki Puketeraki is identified in the 2015 Natural Character and Landscape Assessment as relating, among other things, to its importance as habitat for birds and Mahika kai values. This NbS intervention provides an opportunity to enhance these ecological and mahika kai values for tangata whenua which would result in a positive outcome for the feature's associative landscape values. With the wetland restoration and construction, particularly the riparian planting proposed, amenity values associated with this estuary, wetland complex and its margins will also be enhanced.



Figure 18: Slope Hill wetland area planting. Source: Whakatipu Reforestation Trust

5.3.3 What are the potential biodiversity benefits, adverse effects, and practicalities of wetland construction and restoration in the catchment?

Biodiversity benefits & challenges

While the catchment already contains a relatively large area of estuarine wetland, areas of freshwater wetland habitat are currently far more limited in extent. The freshwater wetlands are typically small and potentially vulnerable, as they are largely surrounded by more intensive human activities and land uses.

A very large (c.140 ha) constructed and restored freshwater wetland would provide habitat for greater ranges and / or larger population sizes of indigenous flora and fauna. Targeted works could bolster desired Threatened, At Risk, and locally uncommon plant populations or support particular fauna species of ecological, cultural, or conservation importance within the catchment.

Where they sit low in the catchment, freshwater and brackish wetlands often provide important ‘overflow’ habitat. These ‘overflow’ habitat areas can be used seasonally or temporarily by coastal and estuarine species during high tide or climate conditions that reduce feeding habitats in the coastal environment, therefore benefitting coastal species as well. Additionally, increased wetland extent provides flow buffering for downstream waterways during flood and drought conditions, and open water areas provide refugia for aquatic species.

Constructed wetlands are often highly invadable by aggressive pest species, including plants (e.g., willows, alders), and tolerant fish species (e.g., rudd, perch). Whilst upfront design can reduce risk, ongoing and potentially costly pest control may be required if the desired outcome is to support indigenous species. Where constructed wetlands receive large sediment inputs from the upper catchment, this may ‘choke the system’ and prompt periodic maintenance and dredging. This risks additional cost, substantial mobilisation of sediment into downstream waterways, and loss of flora and fauna habitats that have established in the interim. This can be minimised by construction of forebays or implementation of additional measures to reduce sediment runoff in the first instance.

Practicalities of implementation

Wetland construction at the scale proposed in this NbS intervention is technically feasible in terms of design and construction but would be a large undertaking. Although, suitable land of existing low ecological value (productive farmland) is available on which a wetland could be constructed. Ecological input into plantings, wetland design (in terms of desired water levels and range, special features, and fish habitat and passage), and effects assessment for consenting and permitting processes (in relation to bulk earthworks and general works in / around waterways) would be required.

Furthermore, to achieve beneficial outcomes for biodiversity values within Te Hakapupu/Pleasant River catchment, wetland creation adjacent to waterbodies will likely require robust construction erosion and sediment control measures to be in place. Such measures will help minimise temporary impacts on in-stream habitat quality caused by construction activities.

Newly constructed wetland habitat (e.g. bare soils and shallow standing water) is highly invadable by weeds (as noted above). Therefore, very large-scale indigenous plantings to

rapidly establish a desirable vegetation cover will be needed. The scale of plantings required would need several years lead-in time for a specialist nursery to propagate.

5.3.4 What are the high-level costs of the establishment and maintenance of wetland construction and restoration in the catchment?

Establishment & maintenance costs

Establishment and maintenance of wetland restoration and construction can vary significantly depending on the site characteristics and associated pressures, as detailed in Table 6.

Table 6: Indicative cost per hectare (2020) to establish and maintain a new wetland area if all works were to be undertaken by contractors at commercial rates. Summarised from Tanner *et al,* 2022. Note, these estimates exclude consent-related costs.

	INDICATIVE COST	$/HA (EXCL. GST)	NOTES
SITE SURVEY AND WETLAND DESIGN	Lump sum	$3,000 - $7,000	Survey of wetland site and design, including positioning of inlet and outlet structures, treatment basins and estimate of excavation works
EARTHWORKS	$6.25 per m^2 of wetland surface are for initial site clearance. $15 per m^3 for site excavation	$110,000 - $130,000	Includes excavation and re-laying of topsoil to form wetland base for planting, and construction of a suitable weir and outlet structure at downstream end. Excludes provision for fish passage structures
FENCING	$5 - $10 per l/m	$1,000 - $5,000	Assumes optimised wetland shape to minimise fence length
PLANT PURCHASE	$1.80 - $5 per plant	$25,000 - $60,000	2.04 plants per square metre (0.7 m spacings) within the wetland area to be flooded; all plants purchased from commercial nurseries
PLANTING	$2 - $3 per plant	$28,000 - $43,000	Assumes planting is done by commercial planter
REPLACEMENT PLANTING	$1.80 - $5 per plant	$2,500 - $5,000	5% mortality assumed; includes plant purchase and planting
PROJECT MANAGEMENT	$1 per m^2 of wetland	$10,000	Earthworks and planting supervision
MAINTENANCE	Lump sum	$2,000 - $4,000	Per annum. Assumes bi-yearly clean-out of sedimentation pond
TOTAL COST PER HA		$175,000 - $260,000 per hectare	

The locations identified for wetland restoration and construction as a NbS to flood hazard mitigation, in alignment with the wider Te Toitū Te Hakapupu restoration project, lend themselves to a number of cost reduction opportunities, including:

EARTHWORKS: Locating the wetlands within the historical Te Hakapupu/Pleasant River wetland area with natural drainage channels will likely require less earthworks to create the wetland area.

PLANT PURCHASING**:** Sourcing of suitable plant species for wetland and riparian areas may be selectively sourced or propagated from neighbouring wetland and riparian areas. Additionally, suitable plant species may already be present in the proposed locations given their tendency for naturally accommodating flood flows, in which case, simply removing grazing pressure and controlling weed species may be sufficient to enable those remanent plants to expand across the wetland area naturally. Alternatively, crowd sourcing mechanisms such as 'Trees that Count' could be applied to provide funding for plant purchase.[31]

PLANTING: Planting efforts can be supported by using community groups, public planting days, or facilitating corporate volunteer planting days.

Following the construction and restoration of wetland areas, a well-established wetland should incur only minor maintenance costs. Maintenance costs, particularly in a catchment such as Te Hakapupu / Pleasant River, will include the maintenance of the sedimentation ponds that function to intercept and process suspended sediments before entering the wider estuary wetland complex.

Sediment accumulation within wetland ponds should be regularly monitored, particularly during upper catchment harvest periods and heavy rainfall events. Removal of accumulated sediments should be conducted when the sediment ponds are half full of accumulated sediments. This will ensure the wetland may continue to optimally function and does not resuspend stored sediments during extreme rainfall flood events.

Land use change costs

Wetland construction and restoration of an area large enough to successfully accommodate flood flows within Te Hakapupu catchment would require the retirement of existing productive agricultural landholdings in the lower catchment.

Landholdings identified in the NbS intervention for wetland construction and restoration generally occupy Land Use Class 2 for Land Use Capability in the New Zealand Land Resource Inventory tool, primarily used for beef farming. Sheep, beef, and grain farming are of particular importance within the Otago Region and Waitaki District, adding approximately $530 million of value to the regional economy and $70 million of value to the district economy (Yang *et al.* 2023). On average, farm sale prices for the Otago Region between March and May 2024 were approximately $17,370.00 per hectare.[32]

Land use change benefits

Whilst requiring land use change of existing productive agricultural landholdings, reducing income revenue for the landowner, wetland restoration and construction does offer financial opportunity through nature-based market mechanisms – namely, blue carbon credits and biodiversity credits. These nature-based markets are a type of 'green financing', used to encourage and facilitate private investment and provide income incentives to deliver NbS.

- **Blue carbon credits** refer to the carbon sequestered and/or stored in coastal and marine ecosystems, which can be used to offset carbon emissions.

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31 www.treesthatcount.co.nz

32 Published by Statista Research Department, Jul 15, 2024

- **Biodiversity credits** refer to measurable biodiversity co-benefits provided by a project or activity, which can be used as an offset to support ‘nature-positive’ claims.

Although a relatively nascent market a not currently recognised under the New Zealand Emissions Trading Scheme (NZ ETS), recognition and financial return for high quality blue carbon and biodiversity credits through the Voluntary Carbon Market (VCM) is quickly gaining momentum internationally. Accordingly, interest in these nature-based markets is building within New Zealand, with collaborative effort across government, iwi, non-government organisations, researchers, and landowners to share information and create market opportunities (Jacobs, 2024).

Initial analysis of New Zealand blue carbon opportunity estimates New Zealand’s current national blue carbon stock at approximately 2.66-3.76 megatonnes of carbon, with a likely carbon sequestration rate of 50,000-260,000 tonnes of CO_2 per annum (Ross *et al,* 2023). As reference, an NZU carbon credit (representing one tonne of carbon removed and stored) trades at $61.80 at time of writing. Recent research into blue carbon market activity indicates that there is the potential demand for New Zealand sourced blue carbon credits from both domestic and international buyers, with demand anticipated to increase in line with global trends (Claes *et al,* 2022). While complex land tenure and carbon rights present a key challenge for recognising blue carbon credits in New Zealand, as this NbS intervention considered the restoration of wetland areas on existing land tenure as opposed to public land and waters. Accordingly, many of the tenure-related challenges may not be experienced.

Additionally, when undertaking NbS development rather than solely pursuing carbon sequestration outcomes, the generation of carbon credits can also deliver biodiversity co-benefits. These biodiversity benefits may be applied to support carbon credits from NbS to yield a premium price (well above the average NZU trading price) or be recognised as standalone biodiversity credits. The potential price premium added by biodiversity credits reflect the positive narrative that can be used in corporate sustainability reporting and product marketing. The Ministry for the Environment recently consulted on the opportunity to facilitate growth of biodiversity credit systems in New Zealand, receiving overall strong support (Mfe, 2024).



Figure 19: Thomsons wetland planting, Otago. Source: Manuherekia Catchment Group

5.3.5 What are the potential impacts, benefits, and trade-offs wetland construction and restoration may have in the catchment, alongside **productive rural land uses and as part of Kāti Huirapa ki Puketeraki's takiwā?**

The NbS intervention of wetland restoration and construction align with the identified values and strategies of the Toitū Te Hakapupu Catchment Action Plan (CAP) (Ahikā, 2023). The relevant values and strategies are detailed below.

Value 1: Waterways

Value 1 of the draft Toitū Te Hakapupu CAP recognises that 'Waterways in the catchment and the estuary wetland complex provide important habitat and eco-system services'. However, these important habitats and ecosystem services are under pressure from the effects of erosion and sedimentation, particularly from pastoral farming and plantation forestry operations within the catchment reducing water quality and causing degradation to the estuary wetland complex.

The NbS intervention of wetland restoration and construction would contribute benefits towards the enhancement of Value 1, specifically aligning with the following draft CAP strategies:

- S1A. Levels of contaminants and sediment entering waterways and estuary wetland complex will be reduced, in accordance with target attributes states set out in the Land and Water Regional Plan (LWRP)
- S1E. Natural functioning of the estuary wetland complex will be enhanced, where there is landowner agreement

The restoration and construction of wetland areas identified in the catchment can support reducing the contaminants and sediment entering the estuary wetland complex. An appropriately maintained wetland occupying 1-5% of the catchment area, with sediment ponds developed at the inlet of wetland areas, on average should remove 50-90% respectively of the long-term sediment inputs through a range of physical, chemical, and biological processes (Tanner *et al,* 2021).

Suspended sediments being transported through the catchment from upper catchment operations and stream bank erosion are primarily removed in a constructed wetland by settling and deposition. Larger sand and soil particles will deposit in the inlet sediment pond, while the finer silt and clay sediments will be dispersed through the wetland where they may be removed through biological and chemical processes.

Additionally, dissolved nitrates present in agricultural runoff from pastoral farming activities can be removed by a restored and constructed wetland through biological processes, such as microbial de-nitrification and plant uptake. For cool climate zones, such as the Otago Region, the median nitrogen removal rates for a well-maintained wetland occupying 1-5% of catchment area range from approximately 20% to 40% respectively (Tanner *et al.* 2021).

The NbS intervention of wetland restoration and construction would also support enhancement of the estuary wetland area by increasing the spatial extent of the wetland area within its historic natural extent. At 84 ha, the estuary wetland complex has significantly reduced in size from its likely historic extend, to approximately 2% of its historic size. By considering the extension of the estuary wetland complex at its northern and western

present-day extend, a wetland restoration and construction NbS would seek to enhance the natural functioning of the complex. Growth of the wetlands within these locations would serve to increase the wetlands natural function of removing and processing suspended sediments and contaminant being transported downstream from developed productive lands.

Value 2: Biodiversity

Value 2 of the Toitū Te Hakapupu CMP recognises that 'Biodiversity within the catchment provides important habitat, ecosystem services, and landscape amenity'. However, these important habitats, ecosystem services, and landscape amenity are under pressure from land clearance, modification, and pest and weed species in the catchment. The NbS intervention of wetland restoration and construction would contribute benefits towards the enhancement of Value 2, specifically aligning with the draft CAP strategy:

- S2A. Existing remnants of indigenous vegetation and wetlands will be identified, protected, and enhanced

In alignment with S2A, the NbS intervention of wetland restoration and construction would contribute to the increase of indigenous vegetation and wetland area in the catchment. Through either the dedicated sourcing and planting of indigenous plant species or fencing and maintenance to facilitate the natural expansion of remnant indigenous wetland plant species, wetland restoration and construction delivered at scale within Te Hakapupu would significantly increase indigenous vegetation and wetland area. By connecting restored and constructed wetland areas to the existing Estuary Wetland Complex, protection and enhancement of indigenous vegetation and wetland area would likely increase the habitat availability for important biodiversity values.

Value 3: Cultural significance

Value 3 of the Toitū Te Hakapupu CMP recognises that 'the catchment is part of Kati Huirapa ki Puketeraki's takiwā and is culturally significant', however, mana whenua have lost access to large parts of the catchment, and cultural values are degraded. The NbS intervention of wetland restoration and construction would contribute benefits towards the enhancement of Value 3, specifically aligning with the following draft CAP strategy:

- S3A. Water quality and habitat will be protected and enhanced with a focus on mahika kai and taonga species so that abundance is sufficient to support cultural practices

The NbS intervention of wetland restoration and construction seeks to enhance the mahika kai values of Te Hakapupu/Pleasant River Estuary Wetland Complex. Historically, the estuary wetland complex has been rich source of mahika kai for Puketeraki whānau, with freshwater migratory species such as Kōkopu, Īnaka, and Tuna being found in the catchment's freshwater environments and Pātiki, Kahawai, and Aua being found in the marine estuary. Wetland restoration and construction in connection to the existing estuary wetland complex would seek to enhance the habitat availability and quality for mahika kai species present. Additionally, by increasing the extent of the estuary wetland complex further inland, the NbS would help increase the resilience of mahika kai to the effects of sea-level rise, coastal inundation, and increased salinity stress, noting that Tuna, Banded kōkopu, and Īnaka are all ranked highly vulnerable to the effects of climate change (Egan *et al.* 2020).

5.3.6 How does wetland construction and restoration adapt to and/or help mitigate the effects of climate change in the catchment?

Climate change adaptation

Wetland restoration and construction in the lower catchment areas identified in this NbS intervention, would help increase the resilience of the catchment to the future effects of climate change. As illustrated in Map 6, the lower catchment is exposed flood hazards associated with coastal inundation.

With minor vertical land movement (0.7± 2.2mm/year) at the estuary mouth, relative sea-level rise is projected to occur in line with national sea rise rates, with 0.21m of relative sea-level rise projected by 2050 and 0.74m by 2100 (under scenario SSP5-8.5 50th percentile). As a result, the catchment's estuary wetland complex is likely to be exposed to increasing salinity stress and coastal inundation from the effects of more frequent and intense coastal storm surges, causing flooding of inland areas.

By locating wetland construction and restoration NbS within areas exposed to future coastal inundation during storm surge events, this NbS serves to increase climate resilience through two key approaches:

- Reducing the exposure of existing productive agricultural landholdings to more frequent and severe coastal inundation events through the managed retreat of farming activities and infrastructure away from these areas.
- Providing additional habitat for wetland biodiversity values unable to cope with increasing salinity stress from rising sea levels to accommodate migration further inland, less exposed locations.

Wetland restoration and construction within these locations, effectively increasing the inland extent of the estuary wetland complex, will help buffer the effects of relative sea level rise and avoid the 'coastal squeeze' of critical biodiversity values within the catchment. Furthermore, this NbS would likely increase the connectivity between coastal, estuary, and wetland ecosystems, allowing greater potential for the gradual retreat and reorganisation of habitats to suit the changing environment over time.

Climate change mitigation

As a NbS, changing land use from agricultural to wetland would provide a net-carbon benefit. Acknowledging the high sustainability of New Zealand's agricultural sector, comparative to international producers, on average, sheep and beef farming in New Zealand emits 3.6 tonnes of greenhouse gases per hectare per year (between 0.16-7.1 tonnes/ha/year) (MfE, 2024). As discussed in the Land Use Change Cost and Benefits section, restoration and construction of wetlands as a NbS presents climate change mitigation opportunities, through the sequestration and storage of carbon dioxide (CO_2).

While significant gross reductions in gross greenhouse gas emissions is required to mitigate the effects of climate change, growth of permeant CO_2 removals is required to avoid the most severe effects of climate change. Wetlands are considered efficient carbon stores, with the ability to store significant volumes of carbon in plant biomass and sediments.

Although the specific carbon removal capability of wetlands still requires further research and site-specific analysis to quantify, an initial analysis of national blue carbon stocks (across

wetland, mangroves, salt marches, and sea grass) estimates current national carbon at approximately 2.66-3.76 megatonnes of carbon, with a likely carbon sequestration rate of 50,000-260,000 tonnes of CO_2 per annum (Ross *et al,* 2023).

5.3.7 Is wetland construction and restoration consistent with consenting requirements and key legal or policy considerations?

Land ownership characteristics

Of the approximate size identified within the wetland restoration and construction area; there are 24 titles of land which are owned by 17 landowners. Two of those owners are public entities – the Otago Regional Council and Waitaki District Council. The remaining landowners are private owners.

Regulatory implications of NbS

Based on the current high-level understanding of the works associated with NbS intervention of wetland restoration and construction within the Hakapupu catchment, it is anticipated that the works might entail:

- Restoration and enhancement of the existing wetland
- Construction of new wetland areas
- Associated earthworks
- Planting of vegetation (potential within existing wetlands and riparian areas)
- Removal of existing vegetation (which may or may not be pest plant species, but is assumed that no indigenous vegetation will be removed)
- Potential take, damming, or diversion of water
- Discharge of water

A summary of the potential consenting requirements associated with these activities under the relevant regulatory instruments is set out in Appendix 6.

Policy considerations for NbS

An overview of the policy direction relevant to the NbS intervention of wetland restoration and construction is set out below:

National Policy Statement – Freshwater

The objective of the NPS-FM is to ensure that natural and physical resources are managed in a way that prioritises:

- First, the health and wellbeing of water bodies and freshwater ecosystems
- Second, the health needs of people
- Third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

Related policies of relevance to this proposed NbS include that freshwater is managed as part of an integrated response to climate change;[33] and that there is no further loss of natural inland wetlands, their values are protected, and their restoration is promoted. [34]

National Policy Statement – Indigenous Biodiversity

The NPS-IB has an overarching objective of maintaining indigenous biodiversity across Aotearoa New Zealand so that there is at least no net loss in indigenous biodiversity after the commencement date of the NPS-IB. Related policies seek to promote and provide for the restoration of indigenous biodiversity, [35] and to promote increased vegetation cover in both urban and non-urban environments.[36]

Otago Regional Plan: Water

Objectives and policies in the Otago Regional Plan: Water seek to recognise, sustain, maintain and enhance wetlands within the region. [37] This includes by identifying Regionally Significant Wetlands in accordance with specific criteria;[38] and promoting the conservation, creation and reinstatement of wetland areas. [39] Maintaining the passage of fish, and improving the passage of fish, is also recognised as an objective which could be relevant in relation to this NbS depending on the ultimate design of the proposal. [40]

Restoration of the ecological and cultural values of degraded waters is recognised as a fundamental principle of Māori environmental management in the Otago Regional Plan: Water.[41] Similarly, the Otago Regional Plan: Water notes that many wetlands of significance to Kai Tahu have been lost, and their loss could continue. [42]

Dunedin District Plan

Objectives and policies in the Dunedin District Plan seek to maintain or enhance biodiversity values, including by encouraging conservation activity across the district. [43] The clearance of vegetation within setbacks from wetlands is managed to ensure biodiversity values are maintained or enhanced and that there is no reduction in the extent of natural wetlands. [44]

Waitaki District Plan

The Waitaki District Plan identifies ongoing modification and degradation of nature conservation values in the district as one of the key issues within the Rural parts of the district.[45] Related objectives seek to maintain biodiversity, nature conservation values and ecosystem functioning; as well as the quality of water, wetlands, lakes, rivers and their margins. [46]

Overall, wetland restoration and construction would be generally consistent with the policy direction of the NPS-FM; Regional Plan: Water; the Waitaki District Plan; and the Dunedin District Plan.

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[33] NPS-FM Policy 4
[34] NPS-FM Policy 6
[35] NPS-IB Policy 13
[36] NPS-IB Policy 14
[37] Otago Regional Plan: Water, Objectives 10.3.1 and 10.3.2
[38] Otago Regional Plan: Water, Policies 10.4.1 – 10.4.2.A
[39] Otago Regional Plan: Water, Policy 10.4.6
[40] Otago Regional Plan: Water, Objective 8.3.4
[41] Otago Regional Plan: Water, Clause 4.13.8
[42] Otago Regional Plan: Water, Clause 4.13.6
[43] Dunedin District Plan Objective 10.2.1 and Policy 10.2.1.5
[44] Dunedin District Plan Policy 10.2.1.Z
[45] Waitaki District Plan Issue 8
[46] Waitaki District Plan Objectives 16.9.2(1) and (2)

5.3.8 Summary of wetland restoration and construction as a nature-based solution

Opportunities

- This NbS intervention at sufficient scale would effectively accommodate excess flood flows in areas amenable to hydrological restoration and reduce contaminants entering the lower estuary wetland complex.
- With the creation of water retention and detention ponds, wetland areas can buffer downstream flows during flood and drought conditions.
- Provide habitat for greater ranges and larger populations of native species, including mahika kai species, and support the retreat of aquatic species from the impacts of sea-level rise.
- Wetland restoration and construction can provide for blue carbon and biodiversity credit opportunities in emerging markets by creating measurable enhancements in carbon storage and biodiversity values.
- The NbS is broadly consistent with national and local policy and planning direction, although requiring potentially complex consenting requirements when working in waterways.

Challenges

- With sedimentation pressures in the catchment, wetland areas would require bi-annual maintenance of sediment ponds to ensure functionality is retained.
- Wetland areas can often be highly invaded by aggressive pest plant and fish species, diminishing biodiversity values.
- Without cost-benefit sharing or realisation of nature-based market opportunities, would cause loss of economic value to landowner.
- Would require action of up to 17 landowners to be implemented across lower catchment.


WHAT HAVE
WE LEARNT?
Credit: Boffa Miskell Ltd

6. WHAT HAVE WE LEARNT?

6.1 FEASIBILITY OF NATURE-BASED SOLUTIONS FOR FLOOD MANAGEMENT

NbS present an integrated solution to effectively address the interconnected challenges of flood hazards, biodiversity loss, and land degradation within Te Hakapupu catchment. As a large and highly modified coastal Otago catchment, Rapid Flood Hazard Modelling developed for this feasibility study projects flood waters to be quickly transported from the steeper upper catchment areas, along well-entrenched waterways, to cause surface flooding in historically drained wetland areas in the lower catchment. With the upper catchment of Te Hakapupu dominated by exotic plantation forestry and mid catchment predominantly pastoral farming land uses, flood waters transport contaminants, causing additional flood-related impacts as they discharge into the ecologically and culturally significant Te Hakapupu Estuary Wetland Complex

The NbS tested in this feasibility study considered interventions that worked with the natural landscape and catchment hydrology to address flood hazards in a sustainable way and at scale. The NbS tested were all assessed to effectively mitigate flood-related hazards within the catchment, while possessing the potential to deliver benefits to biodiversity values, cultural values, natural landscape character, and local community catchment management plan targets. Additionally, these NbS were assessed to broadly align with national and local policy and planning requirements, although likely requiring potentially complex consenting requirements particularly when working in water ways.

While NbS interventions have been tested to be technically feasible and beneficial for addressing flood hazard and other challenges experienced within Te Hakapupu catchment, their potential use likely faces significant social and economic barriers. Requiring cooperation of over twenty or more individual landowners, all NbS require a substantial change in land use from productive agricultural or forestry uses.

Given the flood-related hazards are modelled to occurring in the mid and lower Te Hakapupu catchment locations, under current governance practices the direct economic costs incurred to individual landowners in implementing a NbS do not often generate a direct individual benefit. This is expected to create inequities in sharing the costs and benefits across effected landowners within the catchment. The sharing of economic costs and benefits is a common challenge experience by NbS practitioners globally and requires careful attention to ensure NbS are used sustainably and equitably.

Accordingly, any undertaking of NbS for flood hazard mitigation within Te Hakapupu catchment must first ensure that the governance framework for any intervention is well defined and economic incentives are available through alignment with nature-based market opportunities as much as practicable.

6.2 FEASIBILITY STUDY KEY FINDINGS

NbS are technically feasible in Te Hakapupu/Pleasant River catchment

Nature based solutions are technically feasible as methods for the management of flooding and associated hazards in Te Hakapupu/Pleasant River catchment and across the wider Otago region. NbS will work to influence the natural processes across the catchment to effectively control and accommodate floodwater, and their use should be promoted as a method of flood risk mitigation.

Landcover management in the upper catchment is the first step

Implementing land cover management NbS in areas of the upper Te Hakapupu/Pleasant River catchment is crucial for reducing flood-related risks, which tend to increase during forestry activities, such as forestry harvesting and replanting. While addressing the current level of hazards is essential, it is equally important to prevent conditions from worsening. Without permanently restoring and maintaining the hydrology of the upper catchment, through land management practices, the flood risk in the Te Hakapupu/Pleasant River catchment is expected to increase significantly, recurring in line with harvest and replanting ‘windows of vulnerability’.

NbS work most successfully when applied at scale

In a large catchment like Te Hakapupu/Pleasant River, to sufficiently manage flooding and associated hazards NbS should be applied at a suitably large scale. NbS are most effective when implemented over larger areas or broader contexts, and while small-scale NbS projects can be useful, scaling them up maximises their ecological, economic, and social benefits. This would require large land use changes from farming and forestry in Te Hakapupu/Pleasant River catchment. In general, small-scale interventions will cost more per hectare and generate less benefits that a large-scale intervention.

Integrated NbS provide enhanced benefits

Nature-based solutions (NbS), such as river naturalisation and wetland construction, need to function in an integrated manner, from Ki Uta Ki Tai (mountains to the sea), across the catchment, connecting with each other and with surrounding land uses. At scale, interconnected nature-based solutions are essential for effectively managing flood hazards, working as a cohesive network to maximise their impact. Integrated NbS also provide significant benefits for biodiversity, landscape, amenity, and recreation, while also contributing to regional climate change adaptation and mitigation goals.

Innovation is required to ensure NbS are economically viable

The current economic and funding framework presents one of the greatest challenges to NbS implementation across Te Hakapupu/Pleasant River catchment. The direct cost and financial burden to landowners of implementing NbS, coupled with the resulting loss of productive land currently used for forestry and farming, makes at large-scale NbS financially unviable for many forestry and farming landowners in the catchment.

To support large-scale adoption of NbS and to help landowners benefit financially from NbS, especially across areas of productive forestry and farming land use like Te Hakapupu/Pleasant River catchment, innovative economic approaches are needed. This will require strong governance and political backing, as well as economic support and financial assistance, from both the private and public sectors. This could involve financial incentives for landowners, such as payments for environmental benefits and cost sharing initiatives and programmes.

6.3 RECOMMENDED ACTIONS

The following actions are recommended to facilitate the practical implementation of NbS in Te Hakapupu/Pleasant River catchment and other similar catchments across the Otago region.

The recommended actions consist of actions that ORC can lead and deliver at a regional scale; however, most would benefit from engagement and collaboration with other parties, including central government agencies to ensure national consistency, financial institutions, and funding partners to help address economic barriers, and landowners, mana whenua, district council within the Otago Region and local communities to ensure local buy-in.

Action 1: Strengthen NbS governance and partnerships

Develop and apply robust governance and partnership approaches for NbS alongside landowners, businesses, mana whenua and financial institutions to ensure the costs and decisions for NbS design and implementation are shared fairly.

To support the national and regional policy direction relating to NbS use in the Otago region, NbS governance and partnership approaches should seek to achieve the following outcomes:

- Define how the direct costs and benefits from NbS that span different locations, land uses, tenures, and vested interests will be equitably shared
- Define how under-represented groups and effected people will be engaged throughout NbS development processes
- Identify private and public financial investment opportunities, including green bonds and sustainability-linked loans
- Define clear decision-making process and accountabilities for NbS development and ongoing maintenance, where NbS span different locations, land uses, tenures, and vested interests

The development and application of robust governance and partnership approaches for NbS that can be applied in the Otago region would help address the economic barriers that limit the practical feasibility of NbS use.

This recommended action would ensure that individual landowners are not overburdened by the costs of establishing and maintaining NbS on their land, particularly given the primary beneficiaries of NbS for hazard management are often not the direct landowner. Additionally, robust governance practices would ensure any economic benefits gained from NbS are appropriately attributed to the parties that invested their land, time, and money.

Action 2: Facilitate economic incentives for landowners

To address the potential economic impacts that may be experienced when landowners change land uses, particularly from changing primary production lands to NbS land uses (e.g. retiring productive farmland to become wetland), a model for economic incentives should be considered. Develop and implementing a model that provides economic incentives to landowners could include mechanisms such as payments for ecosystem services, grants, tax incentives, carbon credit sales and revenue from ecotourism.

Internationally, economic incentives are successfully used at national and regional scales to financially support landowners to undertake capital works and land management activities for the purposes of natural hazard mitigation and conservation.

Examples of these include:

- The Scottish Rural Development Programme, where government bodies offer funding packages for projects where land is used or maintained to provide benefits for water or biodiversity.[47] Funding packages are target high value areas to support landowners to undertake capital works and land management for environmental purposes, such as woodland afforestation. Funding is provided as either a one-off payment for capital works, or annual payments for specific land management options (e.g. floodplain management).

- The U.S Department of Agriculture's Agricultural Conservation Easement Programme helps landowners, land trusts, and other entities protect, restore, and enhance wetlands or protect working farms and ranches through conservation easements.[48] This supports landowners to restore and protect areas from the impacts of farming and development through the creation of easements. The government agency funds up to 100% of the easement value for the purchase of the easement and help funds restoration costs on the easement.

The development of similar economic incentive models for the Otago Region would provide significant benefits to overcoming the economic challenges currently facing NbS implementation. Additionally, the targeted application of a regional economic incentive model that focuses on areas of high risk or of high biodiversity value, could support the use of NbS in priority locations, helping to achieve other environmental benefits.

[47] Scottish Rural Development Programme (SRDP) - Agricultural payments: Common Agricultural Policy (CAP) - gov.scot
[48] Agricultural Conservation Easement Program | Natural Resources Conservation Service

Action 3: Promote nature-based credit markets

This recommended action aims to increase understanding and use of nature-based markets for ecosystem services, helping to attract private investment in NbS across Otago. One example is enabling private companies to "purchase" NbS and associated carbon and biodiversity credits to offset their carbon emissions.

To improve financial incentives for NbS and boost private investment in the region, efforts are needed to build greater recognition and trust in these nature-based markets for landowners. While central government is already working to enhance the New Zealand Emissions Trading Scheme (ETS) for afforestation, exploring other carbon removal methods, and supporting a biodiversity credit system, regional efforts will further advance these initiatives.

In addition, established catchment or landscape-scale restoration projects, like Toitū Te Hakapupu Restoration Project, could serve as pilot sites to test and scale nature-based credit market opportunities in New Zealand.

Actions to support use of nature-based credit markets at the Otago catchment scale could also include:

- Identification of biodiversity credit pilot opportunities for existing well-established landscape scale restoration project across the Otago region, along with the monitoring and reporting requirement likely required to meet biodiversity credit market verification standards.

- Assessment of afforestation carbon values across a catchment and identification of opportunities for carbon credits either through the New Zealand ETS or via credible Voluntary Carbon Markets.

- Building on the indicative outcomes from DairyNZ and NIWA’s assessment of productive riparian areas, conduct an assessment at catchment or district scale of the potential applications of productive riparian areas on Otago farms to understand the likely costs, economic opportunities, and optimal application of establishing economically productive riparian buffer areas on farm.

- Catchment scale analysis of saltmarsh and wetland areas to understand the blue carbon stock currently held within the catchment wetland and estuarine environments, and blue carbons stock change potential under different wetland restoration and enhancement scenarios.

Using nature-based credit markets to encourage landowners to invest in NbS will be crucial for overcoming the economic barriers that currently limit the adoption and long-term maintenance of these solutions.

Action 4: Develop regional NbS policy, standards, and guidance

Otago NbS practice standards, guidance and policy should be developed to support private landowners to actively adopt and implement NbS on their own properties. Standardised NbS practice and guidance would ensure that NbS used by a landowner are applied consistently across the Otago region, allowing NbS to function in an integrated manner to deliver greater benefits. This includes providing comprehensive guidance for NbS planning, addressing the required consenting pathways to streamline implementation.

Examples of Otago NbS practice policy, standards, guidance could include:

- Identification of the common NbS that can be used to mitigate natural hazards experienced in the Otago region and within a catchment.
- Promoting benefits of wide scale application if NbS and embedding information regarding the outcomes that can be provided by NbS into relevant regional policy
- NbS design standards and criteria to inform how they are implemented
- Guidance of the relevant policy and consenting requirements for common NbS, particularly for interventions in and around waterways, and support to facilitate NbS planning progress through the relevant consenting pathways
- Links to available NbS design and implementation tools and resources, including regional GIS resources and funding opportunities.

Otago NbS practice policy, standards and guidance would help community users to ensure their NbS work cohesively across the catchment and are able to function in an interconnected way to generate greater benefits. Additionally, by providing NbS policy and planning guidance, NbS users would be supported to navigate the required consenting needs to implement NbS in alignment with national and local policy direction.

Action 5: Integrate NbS into catchment scale management and planning

Nature base solutions should be planned for and integrated within the Te Hakapupu Catchment Action Plan, and for other similar Otago region catchments through Integrated Catchment Management Planning (ICMP) processes.

ICMP's are intended to be tools for managing natural resources on a catchment scale, looking at the ecosystems and land uses from the mountains to the sea. Accordingly, the integration of NbS planning within ICM programmes will be effective to ensuring NbS are designed and enabled at the correct scale to address natural hazards and work cohesively with catchment land uses and community values.

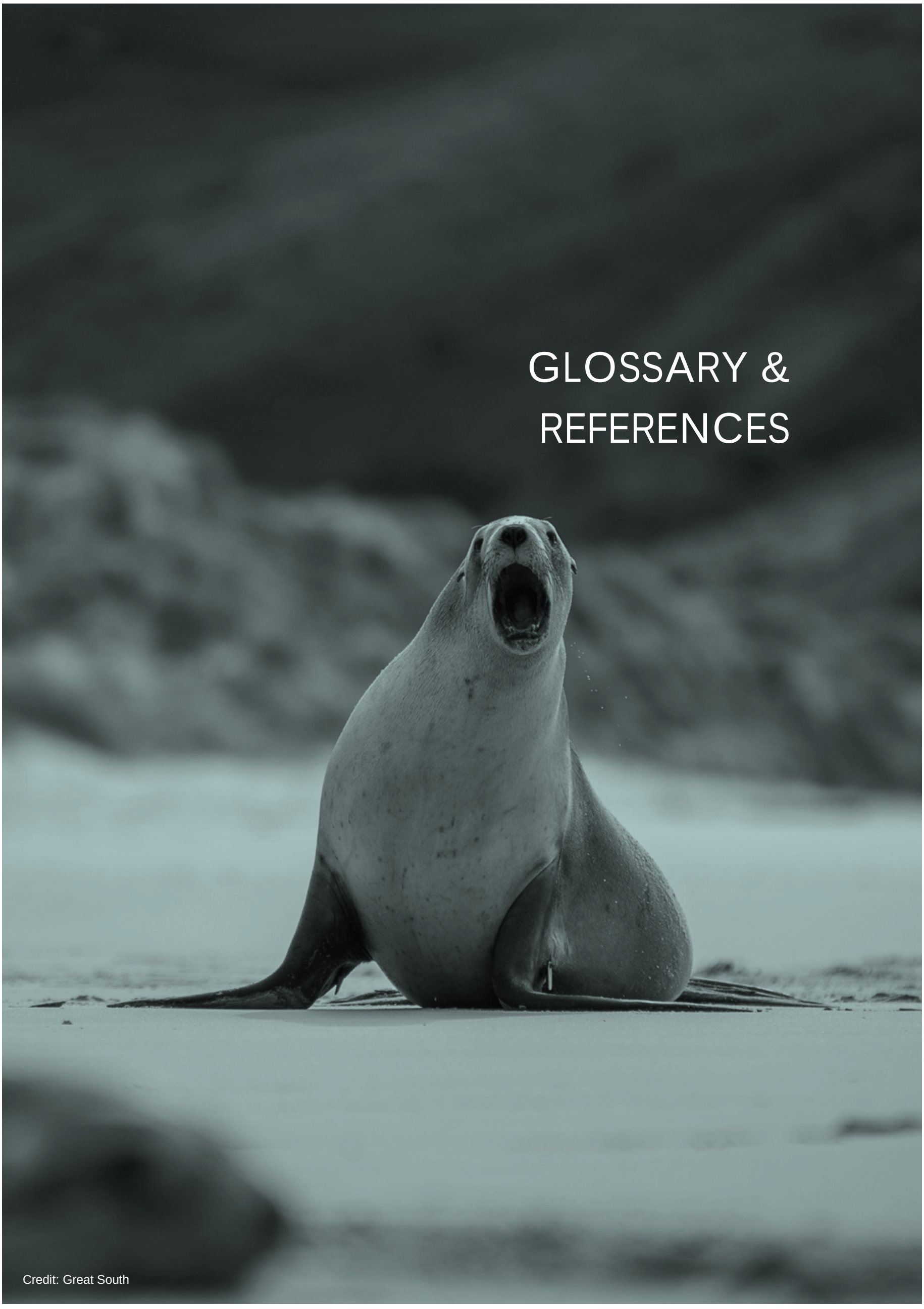
Key aspects of NbS integration within ICMP processes could include:

- Hydrology modelling of the catchment to understand the flood hazard characteristics under a diversity of climate change scenarios and timeframes (including a do-nothing scenario). Scenarios should consider the impacts of extreme rainfall events, relative sea-level rise, and coastal inundation events to people, property, and ecosystems.

- Spatial analysis of the catchment to identify the location, extent, and type of remnant indigenous vegetation present in the upper, mid, and lower catchment. Remnant indigenous vegetation areas identified should be assessed to understand their potential for indigenous habitat expansion through protection and enhancement measures.

- Identification of the type, scale, and optimal locations of NbS required to effectively mitigate natural hazards present in the catchment. This should include identification of where NbS should be applied as a single large intervention, or where they can be applied as a series of smaller interconnected solutions.

Integration of NbS within ICM programmes will help ensure NbS interventions are planned and implemented at an appropriate scale, relative to the size of the catchment and magnitude of the hazards and are able to function in an interconnected way to generate greater benefits.


GLOSSARY &
REFERENCES
Credit: Great South

7. GLOSSARY

Table 7: Glossary to key terms relating to Nature-based Solutions

TERM	DEFINITION
Adaptation	In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects. (IPCC, 2022)
Biodiversity	The variability among living organisms from all sources, including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. (Convention on Biological Diversity, 2006)
Biodiversity Credits	A type of economic instrument that recognises in a consistent way projects or activities that provide positive outcomes for biodiversity, against which 'nature-positive' claims can be made. (MfE, 2023)
Blue Carbon	Blue carbon is the carbon stored in coastal and marine ecosystems. Coastal ecosystems such as mangroves, tidal marshes and seagrass meadows sequester and store more carbon per unit area than terrestrial forests and are now being recognised for their role in mitigating climate change. (IUCN, 2017)
Climate Change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use. (IPCC, 2022)
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, 2022)
Green Infrastructure	A strategically planned network of high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings (UNEP Glossary)
Grey Infrastructure	Term used to describe engineered water and hazard management structures such as reservoirs, embankments, pipes, pumps, water treatment plants, and canals (NIWA, 2024)
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. (IPCC, 2022)

Impact	The consequences of realised 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 wellbeing, ecosystems and species, economic, social, and cultural assets, services (including ecosystem services), and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial. (IPCC, 2022)
Maladaptation	Any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead. (IPCC, 2022)
Nature	A holistic term that encompasses the living environment (te Taiao), which includes all living organisms and the ecological processes that sustain them. By this definition, people are a significant part of nature. This document uses the term 'biodiversity' to refer to biological diversity and 'nature' for the wider processes, functions, and connections in the natural environment, of which biodiversity is a part. (MfE, 2023)
Resilience	The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning and/or transformation. (IPCC, 2022)
Risk	The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. Relevant adverse consequences include those on lives, livelihoods, health and well-being, economic, social, and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure, and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making. (IPCC, 2022)
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, 2022)
Water Sensitive Urban Design	Water Sensitive Urban Design - an approach used in urban greening which adopts nature-based solutions (NBS) and ecosystem-based adaptation (NIWA, 2024)

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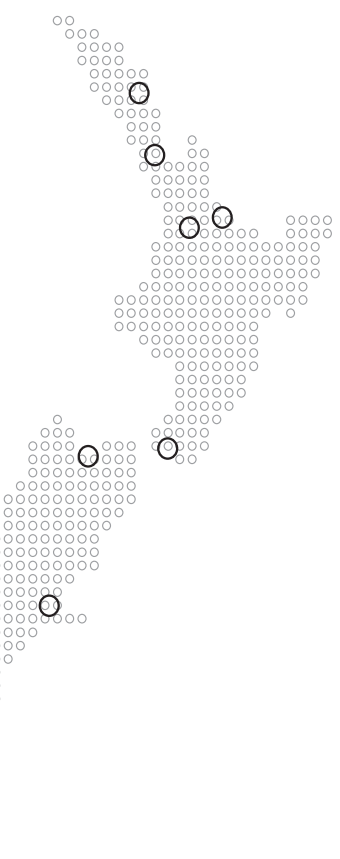
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APPENDIX 1: NATURE-BASED SOLUTIONS

TECHNICAL SPECIFICATION

MARCH 2024



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INTRODUCTION

The interest in Nature-based Solutions (NbS), particularly in addressing major challenges emerging from climate change, is growing in New Zealand and worldwide. This is evident in the growing number of investments in NbS development, and the inclusion of NbS in national strategies and international policy agreements, emphasising their importance in addressing the dual climate change and biodiversity crises.

Over the last decade, NbS have gained momentum internationally in research, policy, and practice, with greater recognition of the benefits these approaches can deliver to biodiversity and human wellbeing whilst addressing major societal challenges. NbS have become prominent through inclusion in the Ramsar Convention, UNFCCC, UNCCD (through COP 28) and the Convention on Biological Diversity – in particular the inclusion of two NbS targets in the Kunming – Montreal Global Biodiversity Framework. Nationally, NbS have become visible through inclusion as goals within Te Mana o Te Taiao - Aotearoa New Zealand Biodiversity Strategy 2020, and actions within New Zealand's National Adaptation Plan and Emissions Reduction Plan.

The purpose of this '*Nature-based Solution Technical Specification'* is to help achieve well-functioning and high quality NbS in New Zealand that are well integrated into environments. The specification has been developed in alignment with global standards and international agreements related to NbS to ensure solutions designed and implemented within New Zealand reflect existing best practices and facilitate reporting to relevant international agreements (i.e., the Kunming – Montreal Global Biodiversity Framework).

Two key outcomes are achieved within this specification:

- **Nature-based Solution Definition:** While internationally, agreement has been reached regarding the definition of NbS, nationally, a variety of definitions exist within strategy documents to-date creating ongoing misunderstandings and misinterpretations of NbS by decision-makers and stakeholders. Coherence and alignment of NbS definition on a global scale allows greater oversight and accountability of NbS use and benefits. Additionally, definition alignment supports the reduction of financing barriers of NbS.

- **Nature-based Solution Standards:** Without adherence to robust planning and implementation standards for NbS projects, significant maladaptation or unintended consequences may exist for local communities, mana whenua, national economies, and the resilience of indigenous biodiversity. NbS Standards, fit for New Zealand's unique environment, ensures NbS can be designed and implemented to address the specific requirements of local communities whilst delivering co-benefits.



Figure 1: Nature-based Solutions values - IUCN Global Standard for Nature-based Solutions 2020

DEFINITION

Nature-based Solutions are defined as **'actions to protect, sustainably manage, and restore natural and modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits.'**

- The global definition of Nature-based Solutions was formally agreed by governments at the United Nations Environment Assembly (UNEA) March 2022 (UNEA Resolution 5.5). The definition builds upon the International Union for Conservation of Nature (IUCN) definition of Nature-based Solutions, previously adopted at the 2016 World Conservation Congress and Member's Assembly.

- According to the IUCN, the social, economic, and environmental challenges that Nature-based Solutions can address include ensuring food security, water security, social and economic development, human health, climate change adaptation, and climate change mitigation.

- To differentiate a Nature-based Solution action from a conservation initiative, a Nature-based Solution that addresses biodiversity loss and ecosystem degradation should also address an additional societal challenge.

STANDARDS

The **'IUCN Global Standard for Nature-based Solutions, first edition'** is the most prominent global framework available to support the implementation of Nature-based Solutions. The Global Standard was adopted by 128 state and subnational members at the 2021 World Conservation Congress.

- The 'IUCN Global Standard for Nature-based Solutions' provides a common basis of understanding for Nature-based Solutions and provides a robust framework for Nature-based Solution intervention design, assessment, and implementation at scale.

- The 'IUCN Global Standard for Nature-based Solutions' is adaptable to the local, regional, and national social and ecological contexts, and focuses on achieving environmental, social, and economic goals in an integrated manner.

- The 'IUCN Global Standard for Nature-based Solutions' align with the UNEA definition for Nature-based Solutions, are assessed as a suitable operational framework for global implementation.

FUNCTIONAL CRITERIA & PERFORMANCE INDICATORS

Based on the '**IUCN Global Standard for Nature-based Solutions, first edition'**, the proceeding functional criteria for NbS and the performance indicators outline the standard NbS should seek to align with to ensure rigorous planning and monitoring has been conducted throughout the design and implementation of NbS.

- The Criteria and Performance indicators largely align with the IUCN Global Standards, with language and terminology adapted where appropriate to reflect New Zealand's context.

- The criteria provide measures to ensure all values and qualities are considered throughout NbS design and maladaptation and unintended consequences are mitigated, however this standard acknowledges that not all criteria will be achieved in all cases due to scale of projects and available resources.

CRITERION 1 NATURE-BASED SOLUTIONS EFFECTIVELY ADDRESS SOCIETAL CHALLENGES

Guidance: The purpose of Criterion 1 is to ensure that the NbS is designed as a response to societal challenges that has been identified as a priority by those who are or will be directly affected by the challenges. All stakeholders, especially mana whenua, land holders, and beneficiaries of the NbS, must be involved in the decision-making process used for identifying the priority challenges

CRITERIA 1 PERFORMANCE INDICATORS

Indicator 1.1 The most pressing societal challenges for mana whenua, land holders, and beneficiaries are prioritised

Guidance: The NbS intervention must address clearly specified challenges that have significant and demonstrable impacts on society. Identification of the most pressing societal challenges is best informed by a transparent and inclusive consultation process, as opinions may differ between external stakeholders and local populations and vice versa

Indicator 1.2 The societal challenges addressed are clearly understood and documented

Guidance: Establishing a clear understanding and rationale of the challenges to be addressed, and ensuring these are documented, is important for future accountability and optimising those strategies to contribute to human well-being outcomes. An NbS often yields multiple societal benefits, such as job creation or increased flow of ecosystem services, and the societal challenges these additional benefits address should also be documented.

Indicator 1.3 Human well-being outcomes arising from the NbS are identified, benchmarked, and periodically assessed

Guidance: NbS must deliver tangible and substantive benefits to human well-being. Specific, measurable, attainable, realistic, and timely (SMART) targets should be used as appropriate, as they are important for accountability and informing adaptive management

CRITERION 2 DESIGN OF NATURE-BASED SOLUTIONS IS INFORMED BY SCALE

Guidance: The purpose of this Criterion is to encourage NbS designs that recognise the complexity and uncertainty that occur in living dynamic land/seascapes. Scale applies not only to the biophysical or geographic perspective but also to the influence of economic systems, policy frameworks and the importance of cultural perspectives. Understanding the interactions which affect attributes like cultural values, laws, soils, forests, and water are important in this regard, as they are relevant to the assessment of the risk of undesirable change, or the probability of creating desirable change. NbS design seeks to maintain the productive capacity of ecosystems as well as the production of benefits necessary for human well-being (e.g., food production).

CRITERIA 2 PERFORMANCE INDICATORS

Indicator 2.1 The design of the NbS recognises and responds to interactions between the economy, society, and ecosystems

Guidance: The success of an NbS will be determined not only by the quality of the technical intervention but, critically, how well the interactions between people, the economy and the ecosystem are understood and responded to. For the solutions to be durable and sustainable, the design of NbS requires a “systems” framing that acknowledges and addresses these types of interactions and builds them into the decision-making process

Indicator 2.2 The design of the NbS is integrated with other complementary interventions and seeks synergies across sectors

Guidance: NbS will seek to work with and compliment other types of interventions, such as engineering projects, information technology, financial instruments, etc. Such complementary actions will inherently require the identification of synergies across different sectors according to the specifics and context of each situation

Indicator 2.3 The design of the NbS incorporates risk identification and risk management beyond the intervention site

Guidance: NbS has the potential to either positively or negatively impact, or be impacted by, stakeholders, interests, and ecosystems outside the immediate intervention area. For the solution to be durable and sustainable, such types of interactions both within and around the intervention area need to be understood and accounted for in the decision-making processes. Appropriate risk management options should be incorporated into the intervention design

CRITERION 3 NBS RESULT IN A NET GAIN TO BIODIVERSITY AND ECOSYSTEM INTEGRITY

Guidance: NbS are derived as goods and services from ecosystems, therefore strongly depend on the health of an ecosystem. Biodiversity loss and ecosystem change can have significant impacts on the functioning and integrity of the system. Therefore, NbS design and implementation must avoid undermining the integrity of the system and instead, proactively seek to enhance the functionality and connectivity of the ecosystem. Doing so can also ensure the long-term resilience and durability of the NbS

CRITERIA 3 PERFORMANCE INDICATORS

Indicator 3.1 The NbS actions directly respond to evidence-based assessment of the current state of the ecosystem and prevailing drivers of degradation and loss

Guidance: To develop a solution using nature, one must have a well-founded understanding of the current state of the ecosystems concerned. The baseline assessment needs to be broad enough to characterise ecological state, drivers for ecosystem loss and options for net improvements, making use of both local knowledge and scientific understanding where possible.

Indicator 3.2 Clear and measurable biodiversity conservation outcomes are identified, benchmarked, and periodically assessed

Guidance: In order to inform the design, monitoring, and assessment of an NbS, targets for enhancing key biodiversity values should be established. For each NbS, the type of target may differ; for example, the target could be the percentage of ecosystem area restored or the return of a keystone species.

Indicator 3.3 Monitoring includes periodic assessments of unintended adverse consequences on nature arising from the NbS

Guidance: Ecosystems are complex with interdependent components and processes. There will always be a level of uncertainty in how they will react to specific interventions or other external changes. Therefore, NbS should be designed and monitored to minimise and mitigate unanticipated risks that might undermine the ecological foundations of the solution itself

Indicator 3.4 Opportunities to enhance ecosystem integrity and connectivity are identified and incorporated into the NbS strategy

Guidance: Utilising NbS can provide an opportunity to enhance biodiversity conservation and ecosystem management efforts in ways that other types of intervention, in isolation (such as engineering), will not be able to achieve. If solutions are to be implemented close to natural ecosystems that are managed explicitly for conservation outcomes, the NbS should be designed to enable greater ecosystem connectivity. Furthermore, they could be designed to re-introduce lost components of an existing ecosystem, for example, by deliberately choosing formerly existing species of vegetation when restoring

CRITERION 4 NBS ARE ECONOMICALLY VIABLE

Guidance: The return on investment, the efficiency and effectiveness of the intervention, and equity in the distribution of benefits and costs are key determinants of success for an NbS. This Criterion requires that sufficient consideration is given to the economic viability of the intervention, both at the design stage and through monitoring the implementation. If the economic feasibility is not adequately addressed, NbS run the risk of being short-term projects, where, after closing, the solution and benefits provided cease to exist, potentially leaving the landscape and communities worse off than before

CRITERIA 4 PERFORMANCE INDICATORS

Indicator 4.1 The direct and indirect benefits and costs associated with the NbS, who pays and who benefits, are identified, and documented

Guidance: Identification and documentation of the main benefits derived, including their direct and indirect, financial and non-financial elements are key components for assessing the economic feasibility of the intervention, over time. This information should be differentiated according to who receives the benefits and who bears the costs

Indicator 4.2 Cost-effectiveness is considered to support the choice of NbS

Guidance: Investing heavily in upfront costs without considering the longer-term economic and financial sustainability can negatively impact the intervention’s viability. A cost-effectiveness study not only enables an examination of the upfront and recurring costs against the anticipated longer-term benefits of the proposed intervention(s) over time but also allows key (or hidden) assumptions to be made explicit, tested and verified

Indicator 4.3 The effectiveness of the NbS design is justified against available alternative solutions

Guidance: A key attribute of an NbS is that it is capable of addressing at least one societal challenge in a manner that is both economically viable and efficient. This means that the cost-effectiveness and affordability of the solution must be tested against viable alternatives. Alternative solutions may include a different nature-based solution (for example watershed catchment management rather than floodplain management), a different combination of conventional and nature-based solutions, or substitution of the nature-based solution entirely with a more conventional approach such as engineered infrastructure

Indicator 4.4 NbS design considers a portfolio of resourcing options and actions to support regulatory compliance

Guidance: The fact that NbS simultaneously offers multiple benefits to different stakeholders may place limits on some sources of financing, thereby undermining the interventions long-term viability. For example, private investors may not wish to bear the cost of delivering public goods or public authorities may be reluctant to cover costs for benefits that will accrue privately. This may require a resourcing package that integrates a range of financial mechanisms. Sources of investment can include public sector grants, incentives and low interest loans, private-sector loans and equity, blended public-private partnerships as well as philanthropic and voluntary contributions or combinations of the above, reflecting an equitable distribution of both the risks and returns

CRITERION 5 NBS ARE BASED ON INCLUSIVE, TRANSPARENT, AND EMPOWERING GOVERNANCE PROCESSES

Guidance: This criterion requires that NbS acknowledge, involve, and respond to the concerns of a variety of stakeholders, especially mana whenua and land holders. Good governance arrangements are proven to not only reduce an intervention's sustainability risks, but also to enhance its social 'license to operate'. At a minimum, NbS must adhere to and align with the prevailing legal and regulatory provisions, being clear on where legal responsibilities and liabilities lie. However, as often is the case with natural resources, basic compliance will need to be complemented with ancillary mechanisms that actively engage and empower mana whenua and local communities.

CRITERIA 5 PERFORMANCE INDICATORS

Indicator 5.1 Participation is based on mutual respect and equality, regardless of gender, age, or social status, upholds the right of mana whenua, and uphold the principles of the Treaty of Waitangi

Guidance: In order that governance arrangements function effectively, all affected stakeholders need to be equipped with the right information at the right time and the inputs they provide need to be meaningfully addressed. In doing so, a conscious effort is required to ensure that traditionally excluded groups are actively brought into the process in a manner that upholds their dignity and encourages their participation.

Indicator 5.2 Stakeholders who are directly and indirectly affected by the NbS have been identified and involved in all processes of the NbS intervention

Guidance: Stakeholder mapping and analysis identifies those who may be directly and indirectly, positively, or negatively, affected by the NbS. This allows the intervention to afford opportunities to affected stakeholders to engage with and participate in the design and implementation, advocate clearly to uphold their own rights and interests, and where necessary, prevent further marginalisation

Indicator 5.3 Decision-making processes document and respond to the rights and interests of all participating and affected stakeholders

Guidance: It is important that transparent and accessible documentation records key steps in NbS decision-making procedures. This helps enhance accountability and provides a strong basis for recourse in the case of any disputes or disagreements. Specific attention should be paid to noting which stakeholders where involved in decision-making and the role they played. This is particularly important where extreme inequity persists so that processes can be adapted to encourage meaningful and effective participation

Indicator 5.4 Where the scale of the NbS extends beyond jurisdictional boundaries, mechanisms are established to enable joint decision-making of the stakeholder in the affected jurisdictions

Guidance: Ecosystems do not follow political and administrative borders. Where appropriate, transboundary cooperation agreements between relevant authorities underpin NbS planning and implementation across frontiers to help ensure coherency and consistency of approach and desired outcomes

CRITERION 6 NBS EQUITABLY BALANCE TRADE-OFFS BETWEEN ACHIEVEMENT OF THEIR PRIMARY GOAL(S) AND THE CONTINUED PROVISION OF MULTIPLE BENEFITS

Guidance: Trade-offs in land and natural resource management is inevitable. Ecosystems provide a wealth of different benefits and not everyone values each of them in the same way. While trade-offs cannot be avoided, they can be effectively and equitably managed. This Criterion requires that NbS proponents acknowledge these trade-offs and follow a fair, transparent, and inclusive process to balance and manage them over both time and geographic space.

CRITERIA 6 PERFORMANCE INDICATORS

Indicator 6.1 The potential costs and benefits of associated trade-offs of the NbS intervention are explicitly acknowledged and inform safeguards and any appropriate corrective actions

Guidance: All trades-off are accompanied with an associated set of costs and benefits which may be subject to change over the entire NbS lifecycle. A key function of NbS safeguards is to ensure that necessary trade-offs do not negatively impact the most disadvantaged elements of society or, equally, that they are denied access to the intervention's benefits. It is therefore important that the costs and benefits of trade-off arrangements are fully understood, widely shared among affected stakeholders, and periodically revisited

Indicator 6.2 The rights, usage of and access to land and resources, along with the responsibilities of different stakeholders, are acknowledged and respected

Guidance: The legal and customary rights to access, use and control management over land and natural resources, particularly of vulnerable and marginalised groups, needs to be respected and upheld. Rights, use and responsibilities of stakeholder groups in relation to the NbS should be analysed and assessed, using appropriate tools and by building upon the outcomes of stakeholder analysis or mapping. This is particularly important when working in partnership with mana whenua where the principles of the Treaty of Waitangi must be upheld

Indicator 6.3 The established safeguards are periodically reviewed to ensure that mutually agreed trade-off limits are respected and do not destabilise the entire NbS

Guidance: Where risk is unavoidable, safeguards must be in place and periodically reviewed to anticipate and avoid adverse consequences of interventions, especially considering that inequity in trade-offs may change over time and that not all stakeholders may be equally affected. Therefore, NbS design and strategy needs to be explicit about whose benefits and whose costs will be addressed, including when and how this will be reviewed

CRITERION 7 NBS ARE MANAGED ADAPTIVELY, BASED ON EVIDENCE

Guidance: This Criterion requires that NbS implementation plans include provisions to enable adaptive management as a response to uncertainty and as an option to effectively harness ecosystem resilience. A degree of uncertainty is inherent when managing most ecosystems due to their complex, dynamic and self-organising nature. This also means that ecosystems have greater resilience which confers a wider range of options to respond to unanticipated social, economic or climate events. The foundation of adaptive management is the evidence-base provided by regular monitoring and evaluation, drawing on scientific understanding as well as indigenous, traditional, and local knowledge. By proactively adopting an adaptive management approach, the NbS can continue to be relevant through the lifecycle of the intervention and the risk of redundancy and stranded investments minimised.

CRITERIA 7 PERFORMANCE INDICATORS

Indicator 7.1 A NbS strategy is established and used as a basis for regular monitoring and evaluation of the intervention

Guidance: An NbS strategy, at its most basic, includes the reasoning behind the NbS, a precise articulation of the intended outcomes and clear understanding of how these should be achieved through the actions taken. It should be informed by the prevailing economic, social, and ecological conditions, and clearly state the assumptions as to whether and how they are expected to change

Indicator 7.2 A monitoring and evaluation plan is developed and implemented throughout the intervention lifecycle

Guidance: A monitoring and evaluation plan is a key requirement to understand whether the NbS strategy effectively delivers the intended outcomes and, thereby addressing the societal challenge; and, whether risks or unexpected impacts mean a change in strategy or action is required. Where NbS have synergies with other interventions or approaches, these should be included in the monitoring and evaluation plan. Observed and sustained deviations from the key elements of the NBS strategy should trigger an adaptive management response

Indicator 7.3 A framework that enables adaptive management is applied throughout the intervention lifecycle

Guidance: Learning based on evidence should drive NbS management. Furthermore, iterative learning is essential in informing adaptive management actions, in order to respond to the factors influencing NbS interventions. For this Criterion, indicators 7.1 and 7.2 provide a continuous feedback loop to learn and adapt the NbS intervention.

CRITERION 8 NBS ARE SUSTAINABLE AND MAINSTREAMED WITHIN AN APPROPRIATE JURISDICTIONAL CONTEXT

Guidance: This Criterion requires that NbS interventions are designed and managed with a view to long-term sustainability and that they take account of work with and align with sector, national, and other policy frameworks. There are various approaches to mainstreaming NbS; however, all rely on strategic communications and outreach. Audiences to consider include mana whenua, individuals (e.g. the public, academics), and institutions (e.g. local and central government bodies, businesses, and non-government organisations)

CRITERIA 8 PERFORMANCE INDICATORS

Indicator 8.1 The NbS design, implementation and lessons learnt are shared to trigger transformative change

Guidance: Transformative change can be characterised by scaling up (policy or programme mainstreaming), scaling out (expansion at the geographical or sectoral level) or replication of the NbS. Consequently, it is important that the process of design and implementation captures, documents, and makes available lessons learnt to individuals and stakeholders interested in replicating the process. This includes decision makers, investors and other NbS users from the public and private sectors

Indicator 8.2 The NbS is informed by the facilitating policy and regulation frameworks to support its uptake and mainstreaming

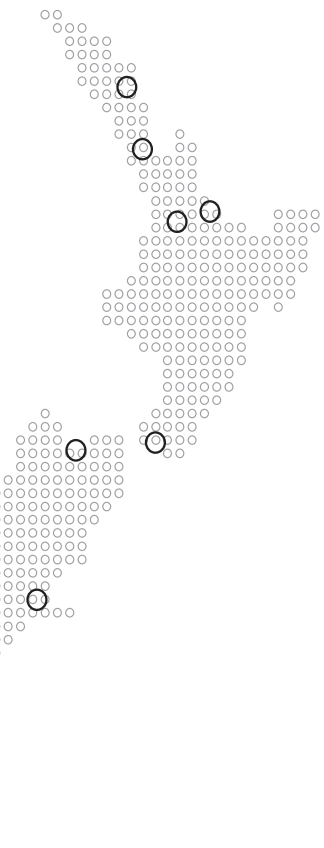
Guidance: The implementation of NbS is subject to a range of pre-existing policies, laws, and sectoral regulations, some of which may not be consistent or mutually reinforcing. In some situations, inconsistent policies and regulations may limit the effective rollout of NBS or, worse, actually contribute to the loss of important ecosystem functions over time. In such situations, it is important to a) be aware of policy, regulatory and legal limitations, and b) work with local and/or national decision makers as well as other key stakeholders, to highlight such obstacles and identify effective responses or other enabling solutions

Indicator 8.3 Where relevant, the NbS contributes to national and global targets for human well-being, climate change, biodiversity, and human rights, including the United Nations Declaration on the Rights of Indigenous Peoples

Guidance: NbS can make significant contributions to national economic, social and conservation targets and help achieve national commitments to international processes on climate change, human rights, human development, and biodiversity. Making these linkages explicit, documenting and communicating them, help further reinforce the profile and role of NbS nationally, secure broad-based and durable political commitment as well as societal support, thereby enhancing the long-term sustainability of the intervention

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Boffa Miskell is a leading New Zealand environmental consultancy with nine offices throughout Aotearoa. We work with a wide range of local, international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, Te Hīhiri (cultural advisory), engagement, transport advisory, climate change, graphics, and mapping. Over the past five decades we have built a reputation for creativity, professionalism, innovation, and excellence by understanding each project's interconnections with the wider environmental, social, cultural, and economic context.



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APPENDIX 2

Te Hakapupu - Nature Based Solutions

Rapid Flood Hazard Model Build Report

Boffa Miskell

10 December 2024

→ **The Power of Commitment**

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→ **The Power of Commitment**

Executive Summary

GHD was engaged by Boffa Miskell on behalf of Otago Regional Council (ORC) to undertake Rapid Flood Hazard Mapping (RFHM) of the Te Hakapupu Pleasant River Catchment (Te Hakapupu) to understand the initial flood risk in the catchment.

The purpose of this report is to document the stormwater modelling methodology for the Te Hakapupu catchment and present high level RFHM results for the existing development (ED) with future rainfall and climate change to identify flood risks in the catchment. This report summarises the modelling methodology and the assessment of results. Flood maps for the 100-year ARI storm event with future climate changes allowances and existing land use flood extents, level, depth and speed in the catchment form part of this report.

The following conclusions can be derived from this flood assessment:

– The hydrology assessment was undertaken using HEC-HMS and the hydraulic modelling was undertaken using InfoWorks ICM.
– The upper catchment was divided into seven sub-catchments of various sizes to generate inflow boundary for the lower catchment.
– A minimum grid size of 9m^2 was used for the 2D domain of the lower catchment in InfoWorks ICM.
– A constant downstream tidal boundary of 3.15mRL was used based on MHWS of 2.15mRL at Port Chalmers plus an additional metre to account for the sea level rise due to climate changes.
– The 2D InfoWorks ICM model has been set up for the 100-year ARI and 10-year ARI 24-hour storm duration events. Model has been simulated for the 100-year ARI 24-hour storm event at this stage.
– The maximum depth of flooding in the lower catchment was predicted to be about 5m mainly along the river system.

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1. Introduction

GHD was engaged by Boffa Miskell on behalf of Otago Regional Council (ORC) to undertake Rapid Flood Hazard Mapping (RFHM) of the Te Hakapupu Pleasant River Catchment (Te Hakapupu) to understand the initial flood risk in the catchment.

1.1 Purpose of this report

The purpose of this report is to document the stormwater modelling methodology for the Te Hakapupu catchment and present high level RFHM results for the existing development (ED) with future rainfall and climate change to identify flood risks in the catchment.

This report summarises the modelling methodology and presents the results. Flood maps showing the maximum flood level, depth, and speed in the catchment form part of this report.

1.2 Scope

The scope of work includes the following:

– Development of a simple HEC-HMS catchment-based model for the steep upper catchments to provide hydrological boundary conditions to the lower catchment.
– Develop a 2D hydraulic model for the lower downstream area using InfoWorks ICM with suitable mesh size to achieve a reasonable model run time.
– Determine rainfall profiles based on NIWA's High Intensity Rainfall Design System (HIRDS) v4.0 and climate change RCP 8.5 scenarios and a future climate change adjusted tidal boundary using published data.
– Set up the 2D hydraulic model to simulate the 100-year ARI and 10-year ARI 24-hour duration storm events.
– Provide model outputs (floodplain extent) for the future climate change 100-year ARI 24-hour duration storm event with existing land use.
– Summarise the outcomes in a report.

1.3 Limitations

GHD has prepared this report on the basis of information provided by Boffa Miskell and others who provided information to GHD, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

This report: has been prepared by GHD for Boffa Miskell and may only be used and relied on by Boffa Miskell for the purpose agreed between GHD and Boffa Miskell as set out section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Boffa Miskell arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this RFHM assessments for, and for the benefit and sole use of, Boffa Miskell to support their delivery of the Te Hakapupu Stage 1 Feasibility Study and must not be used for any other purpose or by any other person.

The information, data and assumptions (“Inputs”) used as inputs into the Model are from publicly available sources or provided by or on behalf of the Boffa Miskell, (including possibly through stakeholder engagements). GHD has not independently verified or checked Inputs beyond its agreed scope of work. GHD’s scope of work does not include review or update of the Model as further Inputs becomes available.

1.4 Assumptions

The following assumptions were made for this study:

– The RFHM assessment is based on the Te Hakapupu catchment topography only. The 1D pipe network, if any, has been excluded in this modelling assessment.
– All provided and sourced information (LiDAR data, catchment boundaries, GIS inputs) used for the development of the model have been assumed to be correct and accurate.
– The design storms and rainfall patterns have been generated using NIWA’s HIRDS v4.0 and climate change RCP 8.5 scenarios for the future scenario (2081-2100).
– Upper catchments have been assumed to be completely pervious whereas the lower catchment has been assumed to have 1% imperviousness.
– No validation of the model results using historical data has been undertaken.

1.5 Background

ORC are currently partnering with Kāti Huirapa Rūnaka ki Puketeraki to deliver Toitū Te Hakapupu. Toitū Te Hakapupu for a multi-million-dollar catchment restoration project in the Te Hakapupu catchment, focusing on improvements to water quality and biodiversity. The project aims to improve the wider ecosystem, reduce sediment and nutrient inputs, and promote the use of modern-day knowledge to sustain current efforts. Completed and ongoing work on the Te Hakapupu catchment includes understanding water quality issues, developing environmental baselines, fence implementation and planting works.

The Te Hakapupu catchment is primarily rural covering approximately 12,800 hectares of land and is situated in East Otago at the immediate south of the Palmerston township (Figure 1).



Figure 1 Te Hakapupu | Pleasant River Catchment Boundary

The current study is one of two studies occurring in parallel and involves a feasibility study into flood mitigation opportunities for the Te Hakapupu catchment, with particular emphasis on nature-based interventions (restored and constructed wetlands). Intervention options that provide co-benefits for water quality and the environment are preferred. Nature-based flood hazard mitigation opportunities are to be investigated by are:

- Modelling the hydrology of the Te Hakapupu catchment under different rainfall events
- Developing key design criteria for nature-based flood mitigation opportunities
- Identifying suitable locations for intervention opportunities with respect to potential benefits, implementation costs, land ownership, and consenting requirements

The second study is an engagement study intended to complement the feasibility study and seeks to develop understanding of the opportunities and barriers to communities, particularly landowners for which the natured based intervention options will be adopted on their land. The two studies together aim to facilitate informed evidence-based decision making for mana whenua, ORC, and the East Otago community by providing an improved understanding of the potential natured-based interventions and perspectives of the community surrounding these interventions.

ORC currently requires technical advice about the implementation of nature-based flood hazard intervention opportunities in the Te Hakapupu catchment and has engaged Boffa Miskell to complete the stage 1 feasibility study.

Boffa Miskell have engaged GHD to support the hydrological modelling component of the above feasibility study. This entails the development of a rapid flood hazard model to identify initial flood risk.

2. Model Build

2.1 Modelling Software

HEC-HMS v4.10 was used to undertake hydrological analysis while InfoWorks ICM v2023.2 was used to complete a two-dimensional (2D) hydraulic assessment.

2.1.1 Topographical Data

Two Digital Elevation Models (DEMs) – 1m Otago DEM and 8m NZ DEM were downloaded from the freely available LINZ website and used in the model build process. To bypass software limitations, the 8m DEM was used to determine the boundary conditions from the upper catchment for the lower Te Hakapupu catchment. Differences between using the 8m and 1m DEMs for the upper catchment were considered negligible. Once the boundary conditions were identified, the 1m LiDAR DEM was used to develop the 2D model using InfoWorks ICM. The vertical datum of the 1m LiDAR DEM is NZVD2016 while horizontal projection is based on New Zealand Transverse Mercator 2000.

2.1.2 Catchment Delineation

The model has been structured based on considering potential flood risk. Additionally as per the scope of works, the Te Hakapupu catchment was divided into an upper catchment and lower catchment to achieve reasonable computation times for the lower 2D model domain. Due to the elevated topography in the west of the Te Hakapupu catchment, drainage channels were generally expected to drain from west to east towards the lower catchment and the ocean. Areas with the greatest risk of flooding would be expected to be at low elevation/flat land. The split between the upper catchment and lower catchment was therefore taken from the base of the hills.

The relevant upper catchment areas (west of the hills) were determined using the 8m DEM. The upper catchment within Te Hakapupu was divided into seven hydrologic catchments based on the topography and therefore drainage channels within the catchment (Figure 2). Catchments were delineated to estimate the incoming flows from the upper catchments into the lower half of the Te Hakapupu catchment. Each catchment represents the area that drains into the lower catchment. The longest flow path for each of the upper catchments were determined to estimate the time of concentration for the flows discharging into the lower catchment.

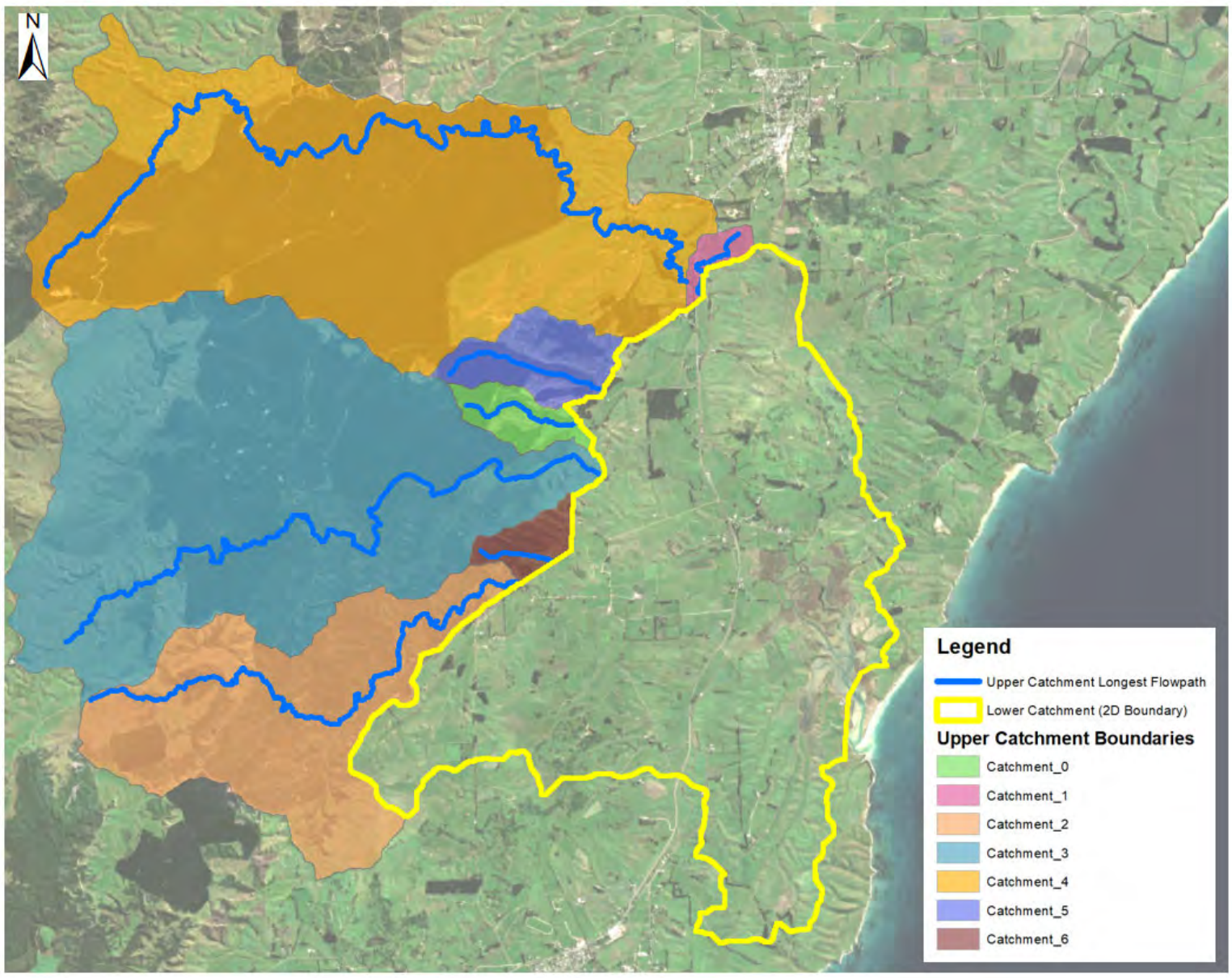


Figure 2 Delineated Upper Catchments and Lower 2D Model Boundary

2.2 HEC-HMS Model

HEC-HMS 4.10 was used to determine the boundary flow conditions from the upper catchment into the lower Te Hakapupu catchment.

2.2.1 Hydrological Parameters

A review of published geological map of the catchment (Institute of Geological and Nuclear Sciences, 1:250,000 Geological Maps, 2001) indicates that the Te Hakapupu catchment is made primarily of siltstone, sandstone, and schist, with smaller amounts of basalt, gravel, and sand (Figure 3).

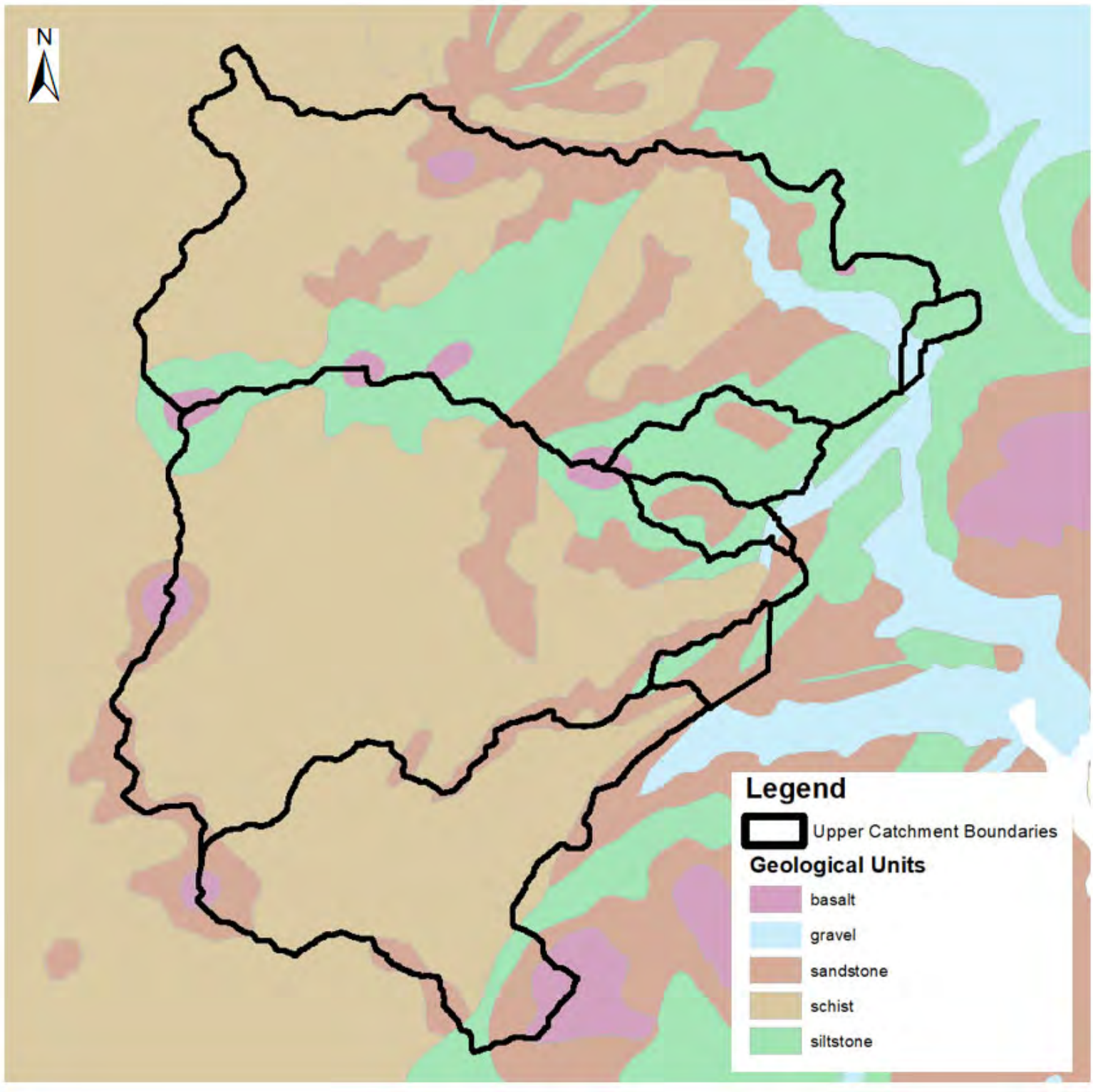


Figure 3 Geological Units within the Upper incoming Catchments of the Te Hakapupu Catchment

Each geological unit was classified and assigned a curve number based on Auckland Council's "Guidelines for stormwater runoff modelling in the Auckland Region". This is summarised in Table 1.

Table 1 Te Hakapupu catchment geological classifications and curve numbers (Source: Guidelines for stormwater runoff modelling in the Auckland Region, Auckland Council April 1999)

Geological Unit	Hydrological Soil Classification	Curve Number
Siltstone	Weathered mudstone and sandstone (Waitemata and Onerahi Series)	74
Sandstone	Weathered mudstone and sandstone (Waitemata and Onerahi Series)	74
Schist	Weathered mudstone and sandstone (Waitemata and Onerahi Series)	74
Basalt	Granular volcanic loam (ash, tuff, scoria)	39
Gravel	Granular volcanic loam (ash, tuff, scoria)	39

Geological Unit	Hydrological Soil Classification	Curve Number
Sand	Weathered mudstone and sandstone (Waitemata and Onerahi Series)	74
Unknown	-	74*

* A curve number of 74 was used for unidentified geological units as this was considered a more conservative value than 39.

The geological units of each upper catchment (Figure 2) were identified and their areas were calculated. The areas were then used to estimate a weighted average Curve Number (CN) for each upper catchment. The final weighted average CN numbers are provided below in Table 2.

Table 2 Weighted Average Curve Numbers for each Upper incoming Catchment

Catchment Number	Weighted Average Curve Number
Catchment_0	73
Catchment_1	64
Catchment_2	73
Catchment_3	74
Catchment_4	72
Catchment _5	73
Catchment _6	74

2.2.2 Elevation Profile of Flowpath

The elevation profile of each longest flow path was plotted out based on the river chainage across the 1m LiDAR DEM. In combination with the catchment area, the weighted CN as shown in Table 2, the elevation profile was used to estimate the time of concentration for each upper catchment.

2.2.3 Temporal Design Storm Pattern

The centre coordinates of the upper incoming catchment were calculated and input into NIWA's HIRDS v4.0 to determine rainfall depths for the 100-year ARI 24-hour storm duration. Together with NIWA's design parameters, the rainfall depths were used to generate the temporal storm pattern for each catchment for input into the HEC-HMS model for both upper and lower catchments.

2.2.3.1 Lower Catchment Rainfall Intensity Profile

The rainfall intensity profile applied was also developed in the HEC-HMS model, following a similar process as above using a time of concentration, initial losses and temporal design storm pattern specific to the lower catchment. The rainfall intensity profile represents the net rainfall (total rainfall minus losses) calculated in the HEC-HMS model. The net rainfall intensity profile of the lower catchment is illustrated in Figure 4 and was applied as rain-on-grid .into the entire 2D domain of the lower catchment.

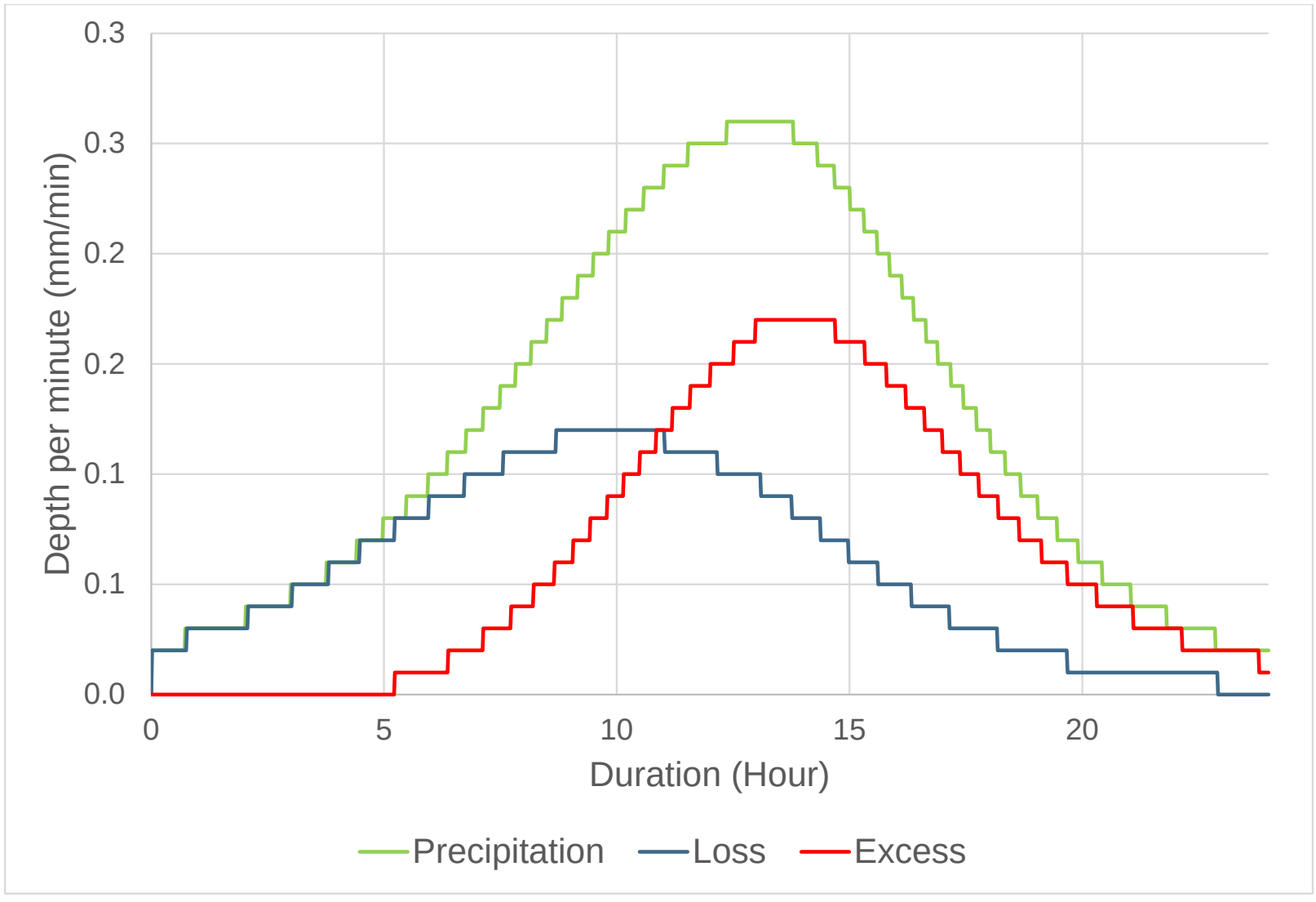


Figure 4 *Lower Catchment Rainfall Intensity Profile showing Total, Loss and Excess Rainfall*

2.2.4 Upper Catchment Inflows

Rainfall depths for the 100-year ARI 24 hour storm duration event with RCP 8.5 climate change were taken from HIRDS v4.0 at the centre of each of the seven upper catchments. This was used to determine the temporal design storm pattern for each upper catchment. The time of concentration and temporal design storm pattern for each upper catchment was then inputted into a rudimentary HEC-HMS model to simulate the incoming flows into the lower catchment. Upper catchment peak flows and rainfall are provided below in Table 3.

Table 3 *Upper incoming catchment peak flows and rainfall for the 100-year ARI 24-hour storm duration event*

Catchment Number	Total Rainfall (mm)	Total Loss (mm)	Total Excess (mm)	Peak Flow (m^3/S)
Catchment_0	180.93	70.47	110.38	4.50
Catchment_1	176.02	86.72	89.09	1.60
Catchment_2	190.02	71.41	118.02	48.10
Catchment_3	187.93	69.38	118.37	110.40
Catchment_4	190.02	73.06	116.23	107.50
Catchment_5	184.94	70.92	114.01	9.00
Catchment_6	176.02	67.97	108.14	3.60

The flow profile over the 24-hour duration for each upper catchment was extracted from HEC-HMS model and inputted as a boundary inflow to the InfoWorks ICM 2D model of lower catchment.

2.3 The 2D Hydraulic Model

The 2D hydraulic model was built in InfoWorks ICM v2023.2 after determining the boundary conditions in the HEC-HMS model. The 2D model boundary extends from the western hills within the Te Hakapupu catchment and covers the lower catchment area in the east up to the outfall of the river into the sea.

2.3.1 2D Surface Flow Model

The 2D model was developed and used to describe the overland flows within the 2D model domain. The ground surface within the 2D domain was represented by a minimum grid cell of 9 m^2 mesh generated in InfoWorks ICM using the 1m Otago DEM. A Manning's n-value of 0.06 was conservatively used for the entire 2D model domain.

2.3.2 Locations of Upper Catchment Inflows

The generated flow hydrographs as described in Section 2.2.4 above were loaded directly onto a node (Figure 5) near the downstream end of the upper catchment and the edge of the 2D model zone boundary, thus representing the discharge location of inflows into the lower catchment.

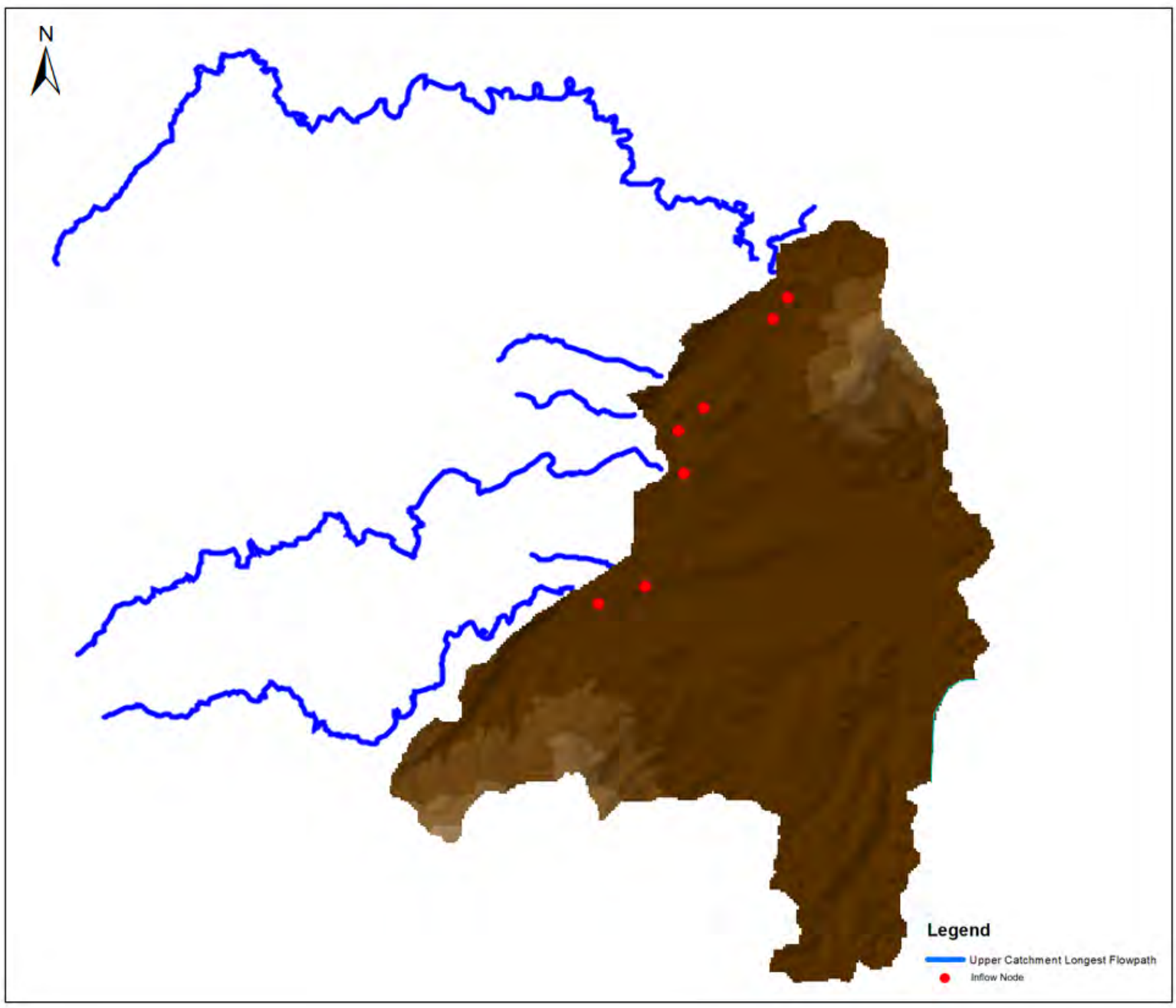


Figure 5 Location of incoming Flows into the Lower side of the Te Hakapupu Catchment

2.3.3 Tidal Boundary

The tidal boundary at the outfall of the Te Hakapupu River was derived from the nearest Port Chalmers tide data. The tidal boundary (see Figure 6) was set at 3.15 m based on the Mean High Water Spring (MHWS) level of 2.15mRL at Port Chalmers plus an additional one metre to account for future sea level rise due to climate changes.

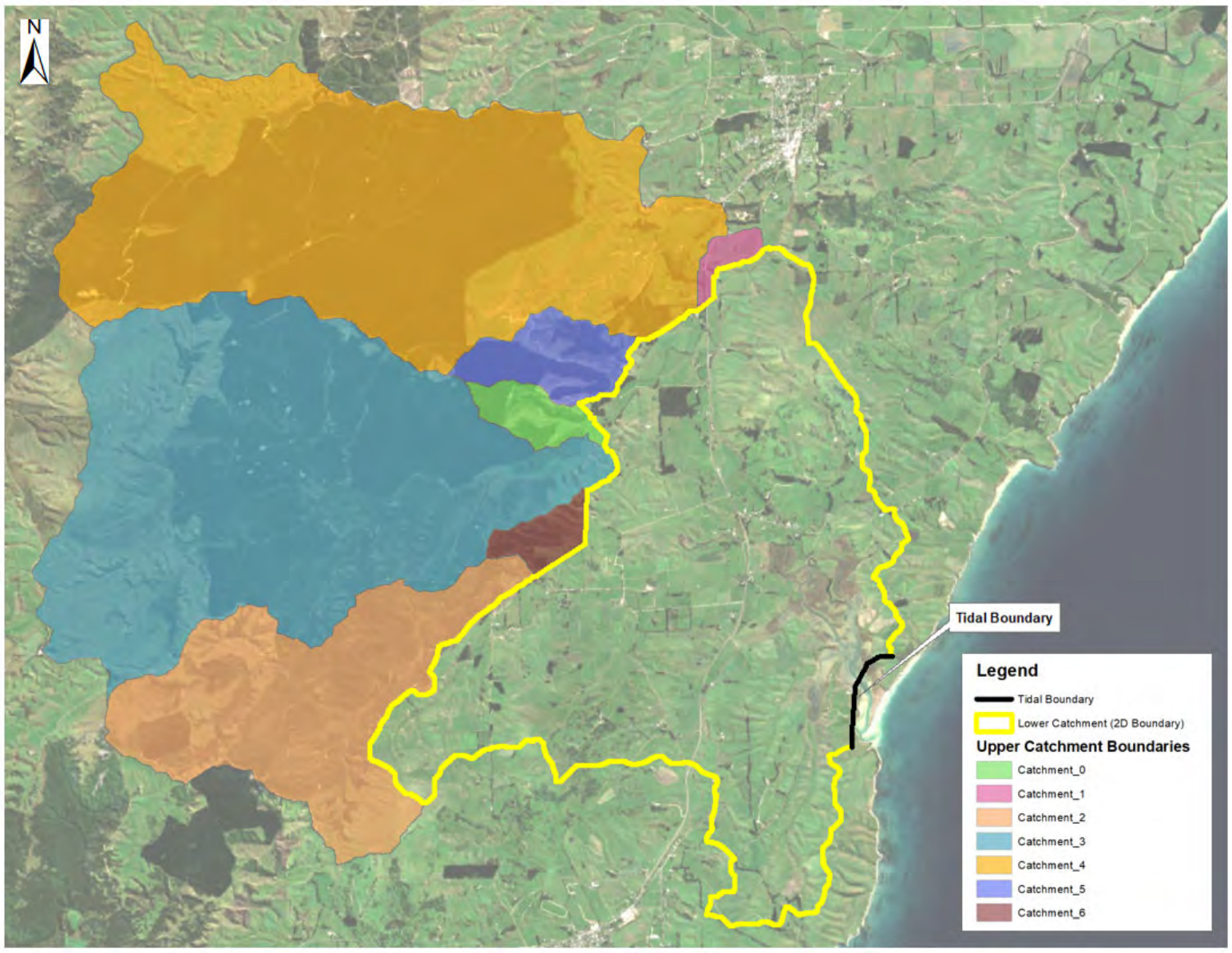


Figure 6 Location of the Tidal Boundary within the 2D Model

2.3.4 10-year ARI 24-hour Storm Duration

A scenario for the 10-year ARI 24-hour storm duration was set up following a similar process as the above. The HEC-HMS model was run using a temporal design storm pattern specific to the 10-year ARI 24-hour event. This enabled the HEC-HMS model to simulate peak flows and a rainfall intensity profile specific to the 10-year ARI 24-hour storm duration. The flow profiles and rainfall intensity profile were substituted in the 100-year ARI 24-hour scenario to set up the 10-year ARI 24-hour scenario. However, we haven't undertaken simulation of 10-year event at this stage.

3. Model Results

This section presents preliminary model results for the 100-year ARI 24-hour storm duration event prior to any model validation.

3.1 Existing Scenario

The predicted peak flood levels (Figure 7), peak depths (Figure 8) and peak speed (Figure 9) for the existing scenario 100-year ARI event are provided below for the lower catchment bounded in yellow. We have excluded 50mm depth from the predicted depth which is considered to be within the error margin of modelling software.

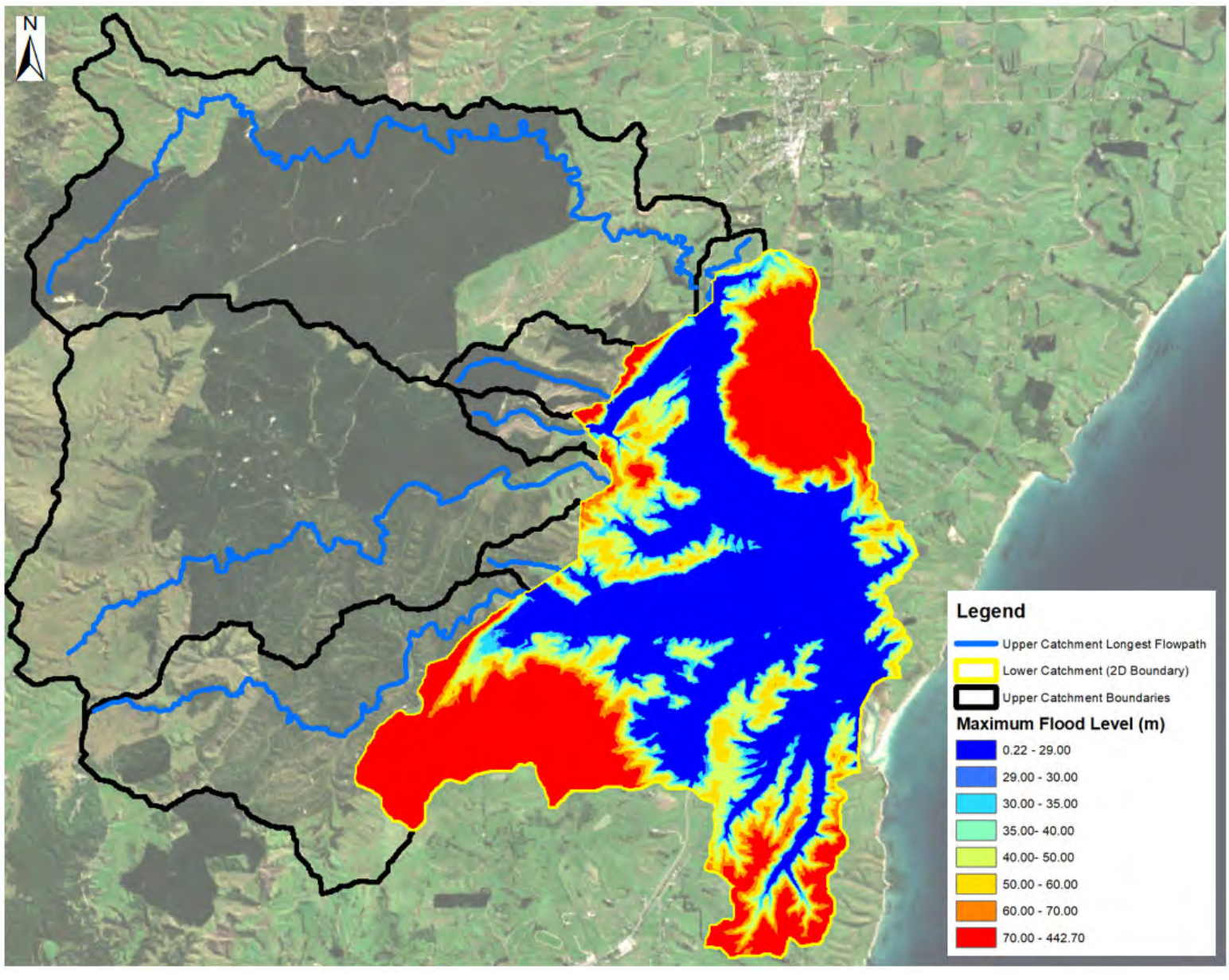


Figure 7 Predicted Peak Flood level during 100-year ARI Event

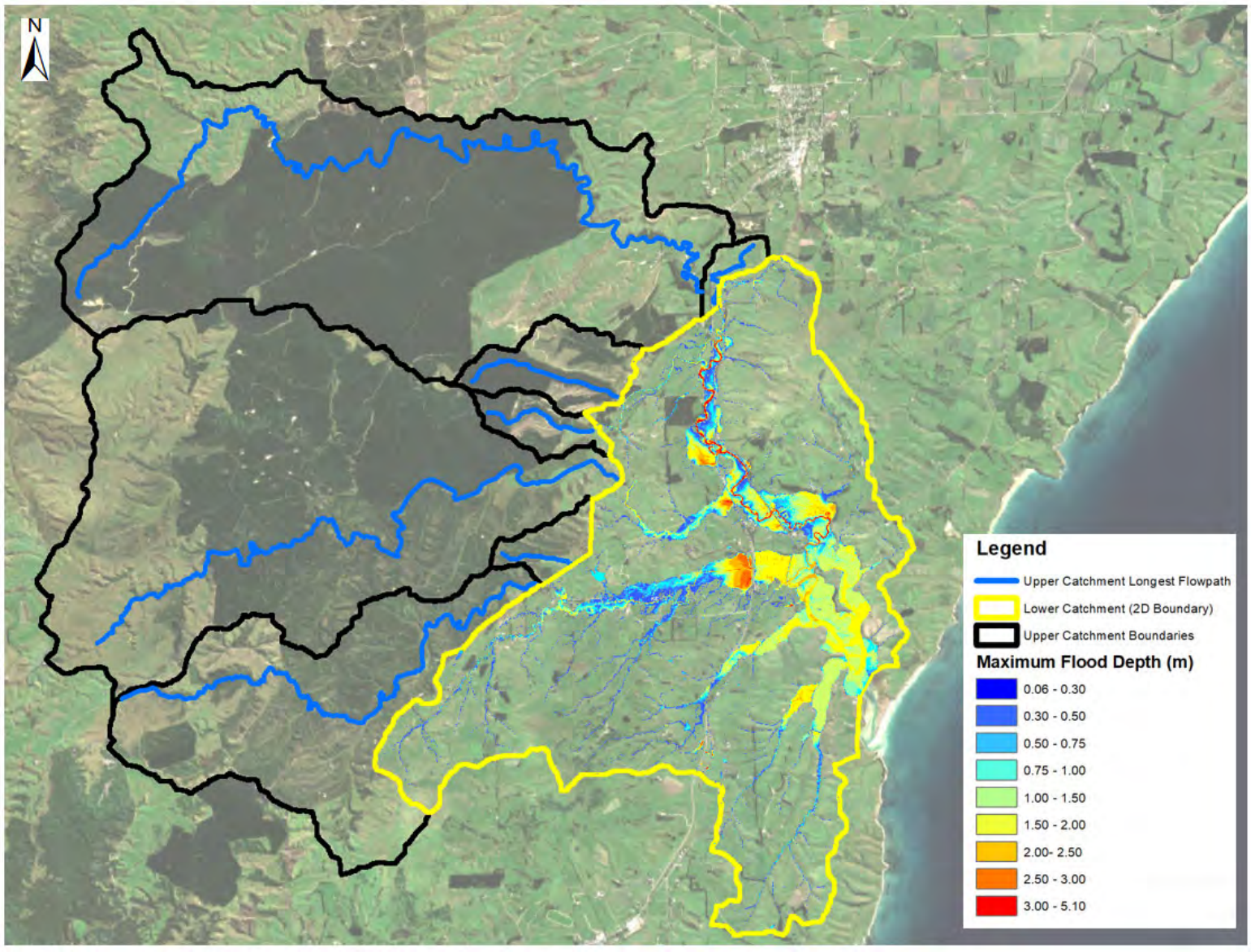


Figure 8 Predicted Peak Flood depth during 100-year ARI Event

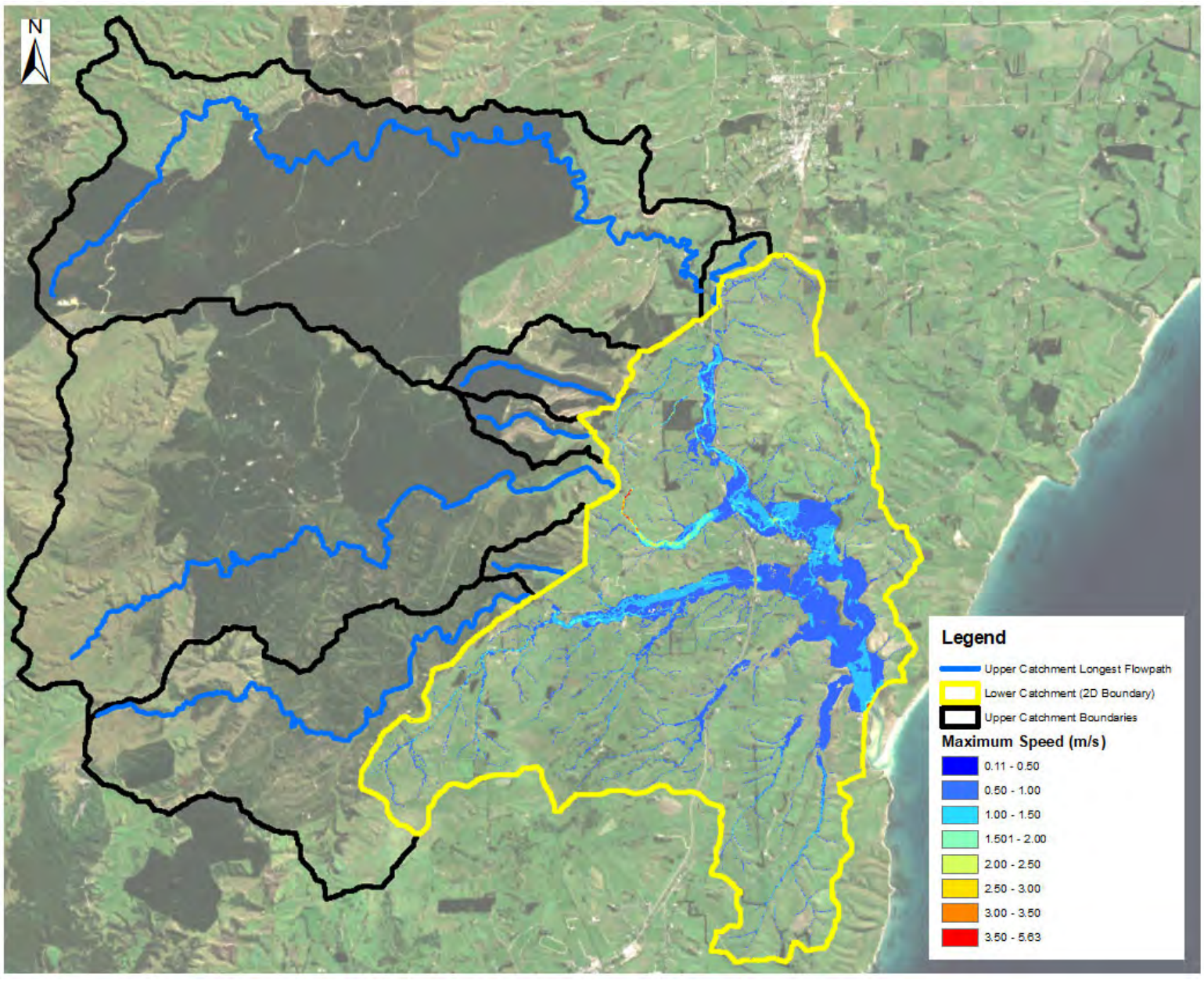


Figure 9 Predicted Peak Flow speed during 100-year ARI Event

4. Integration with Nature Based Solutions

For the Te Hakapupu catchment, opportunities to implement nature-based solutions will depend on ORC priorities and the specific issues and locations of concern within the catchment. From discussions with ORC it is understood that concerns relate to:

– Sediment generation risk from harvesting in the upper catchment
– The ability to modify the current river channel to modify flood levels
– The ability to implement storage within the catchment (delivered in the form of wetland areas or similar)

4.1 Land Use

The model can be used to test some aspects of potential policy decisions within the catchment, such as land use / land coverage.

The upper catchments are largely covered by a mixture of forestry. The upper catchment models (HEC HMS components) were run with different runoff characteristics to frame out the relative change in outflow that could occur:

1. immediately following wide-spread harvest; or
2. with the land reverted to native forest.

The following changes were made to the CN values for the models:

1. Poor/bare coverage that would result immediately following forestry harvest

– CN 74 changed to CN **90** (residual crop cover, poor hydrologic condition, group C soils)
– CN 39 changed to **68** (grass, poor hydrologic condition, group A soils)

2. Improved coverage that would (eventually) result if the land was allowed to return to native forest

– CN 74 changed to CN **70** (woods, good hydrologic condition, group C soils)
– CN 39 changed to **30** (woods, good hydrologic condition, group A soils)

It should be noted that the CN values are impacted by the underlying soils as well as the type of vegetation and are empirical values.

The results have been compared to the original values (as provided in Table 3) and are summarised in Table 4 below.

Table 4 100-year ARI 24-hour storm duration (RCP 8.5 climate change) peak flows from the upper catchments under different land coverage scenarios

Catchment Number	Original Peak Flow (m^3/s)	Post Harvest Peak Flow (m^3/s)	Native Bush Peak Flow (m^3/s)
Catchment_0	4.5	5.6	4.2
Catchment_1	1.6	2.3	1.5
Catchment_2	48.1	60.2	45
Catchment_3	110.4	138.3	102.9
Catchment_4	107.5	138.5	99.9
Catchment_5	9	11.3	8.5
Catchment_6	3.6	4.5	3.4

Overall, in a 100-year ARI event with the post-harvest scenario, the model indicates that there could be increase in flow from the upper catchments in the order of 25% or more from the current forestry coverage. If the current forestry block was transitioned back to a full native bush coverage then a potential reduction in the order of 6-7% in 100-year ARI flows from these catchments could be possible compared to the current forestry coverage.

The values above are not absolute but instead provide an indication of the relative scale of change in flow (not flood extent) in the upper catchments, in a large event with future climate change projections included. Results in smaller events may be less pronounced. That said, the results indicate:

– A risk of increased rate of runoff post harvest
– Post-harvest sedimentation risk (resulting from increased runoff and potentially increased velocity and scour) in some catchments in the event of large rainfall events.

4.2 River Modification

In terms of flooding, the form of the river and the channel capacity will obviously impact flood depths as well as the frequency of spilling outside of the main channel and flood extents. In larger events, however, the capacity of the wider floodplain becomes more important.

One option considered was increasing naturalisation of the river channel and assessing how this could be beneficial in reducing flood risk. Options for naturalisation include channel modification (including reverting back to a more sinuous channel), increased planting and floodplain protection / modification.

At a high level, while there is evidence of channel modification through diverting and straightening through some properties, the channel itself is largely still that of a braided river system – so there would only be localised opportunities to implement changes. Compounding this, the flood extent shown in Figure 8 is significant. Naturalisation of these localised areas (through reinstating a more sinuous channel form and increasing floodplain storage) would be unlikely to be of a scale that would make a significant change in flood extent.

Vegetation measures may achieve benefits in terms of erosion management and protection of channel banks, but also may result in increased channel roughness and reduced channel capacity. The current model is not sufficiently detailed for assessment of erosion management options.

4.3 Additional Floodplain Storage

While additional floodplain storage was one of the options initially considered as an approach to manage flood extent, the scale and depth of flooding in the 100-year ARI event suggest that the results will depend on where this storage is provided (and what scale of flood reduction would be targeted). A large volume of storage would be necessary to achieve a material reduction, given that there are flood depths of more than 1.5m across most of the floodplain. In addition, flows are entering the main floodplain from a number of different reaches means that multiple basins could be necessary across the catchment.

It is important to note that flooding is a natural process and that it is not unexpected that there will be flooding in a widespread area in the event of a 100-year ARI event. There will be a need to consider the cost and trade-offs between the scale of purchase of land for provision of flood storage in upper branches compared to purchase of properties that might already be impacted by flooding in the first instance.

As some of the current flow depths and flood extent appear to be impacted by some of the current road levels then further survey is recommended to confirm road crest levels as well as identification of critical properties and location of dwellings to allow solutions to be considered in a more targeted manner. This particularly applies to State Highway 1 which is cutting across the floodplain in a number of areas.

4.4 Next Steps

While further information is necessary to enable the model to be used to develop possible nature-based solutions in more detail, including the size and location of possible options, in its current form the model gives an indication of the scale of solutions that would need to be developed to result in a reduction in floodplain level / extent.

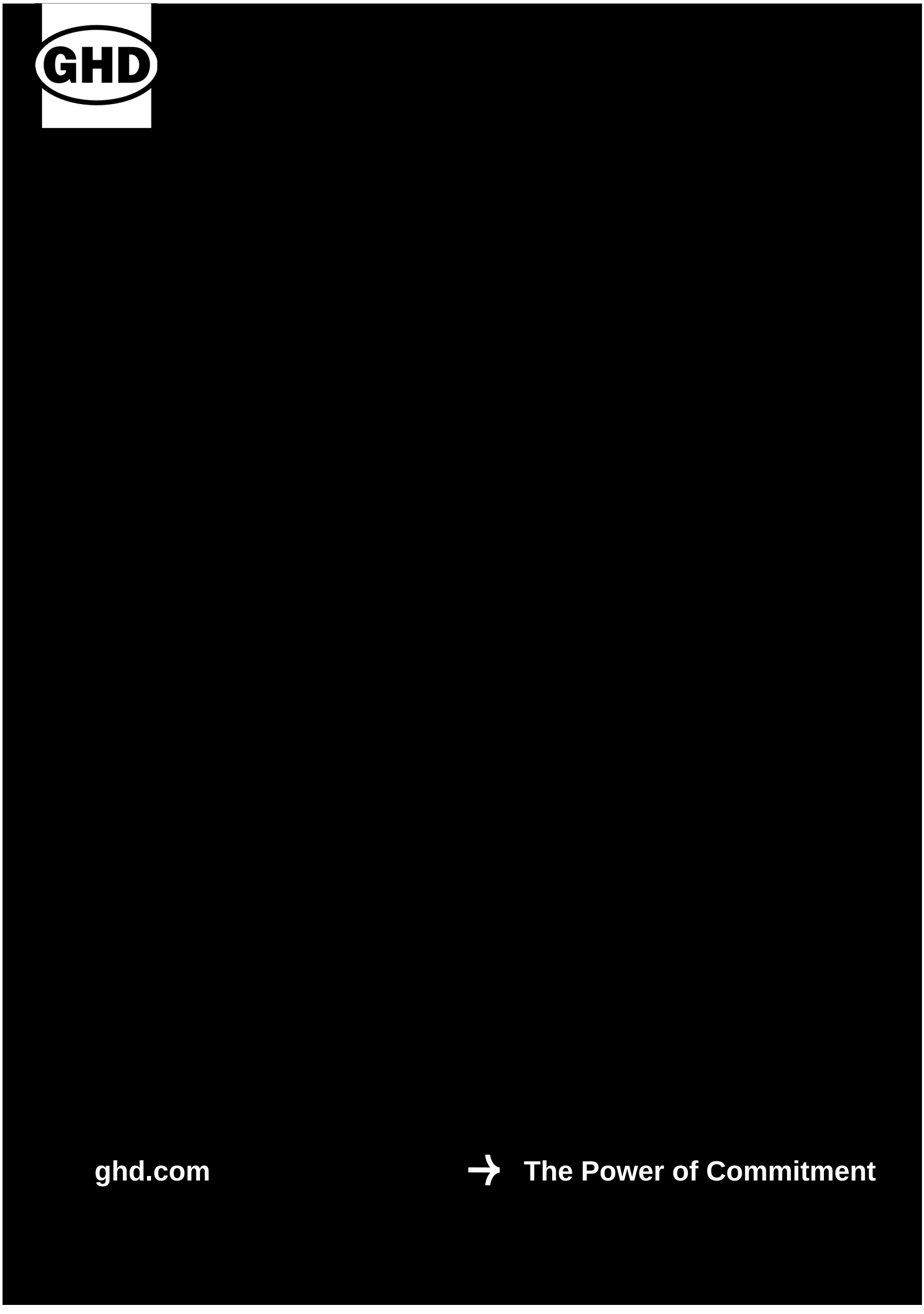
It is recommended that the following steps be considered going forward:

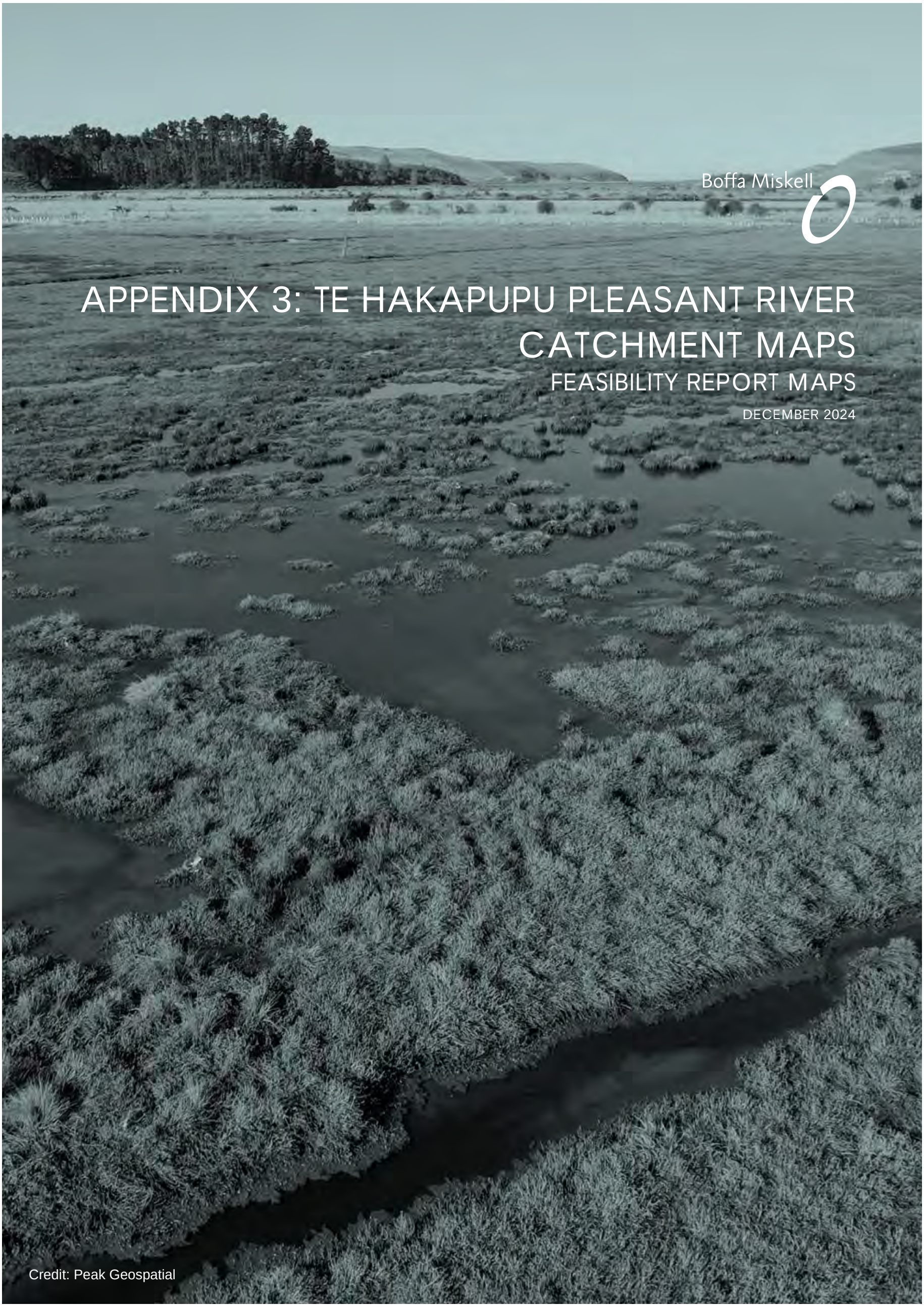
- ORC consider assessment of smaller ARI flooding events as this may offer opportunities to manage flooding at a scale more frequently experienced by property owners.
- Consideration of development of the 1D component of the model to enable smaller scenario runs to be considered in future.
- Survey of road crest and culvert details around State Highway 1
- Dwelling extents may be worth incorporating into the flood maps for future assessment to support assessment of risk to people.
- Review specific areas around State Highway 1 and discuss with NZ Transport Agency Waka Kotahi future plans around road improvements.

5. Conclusions

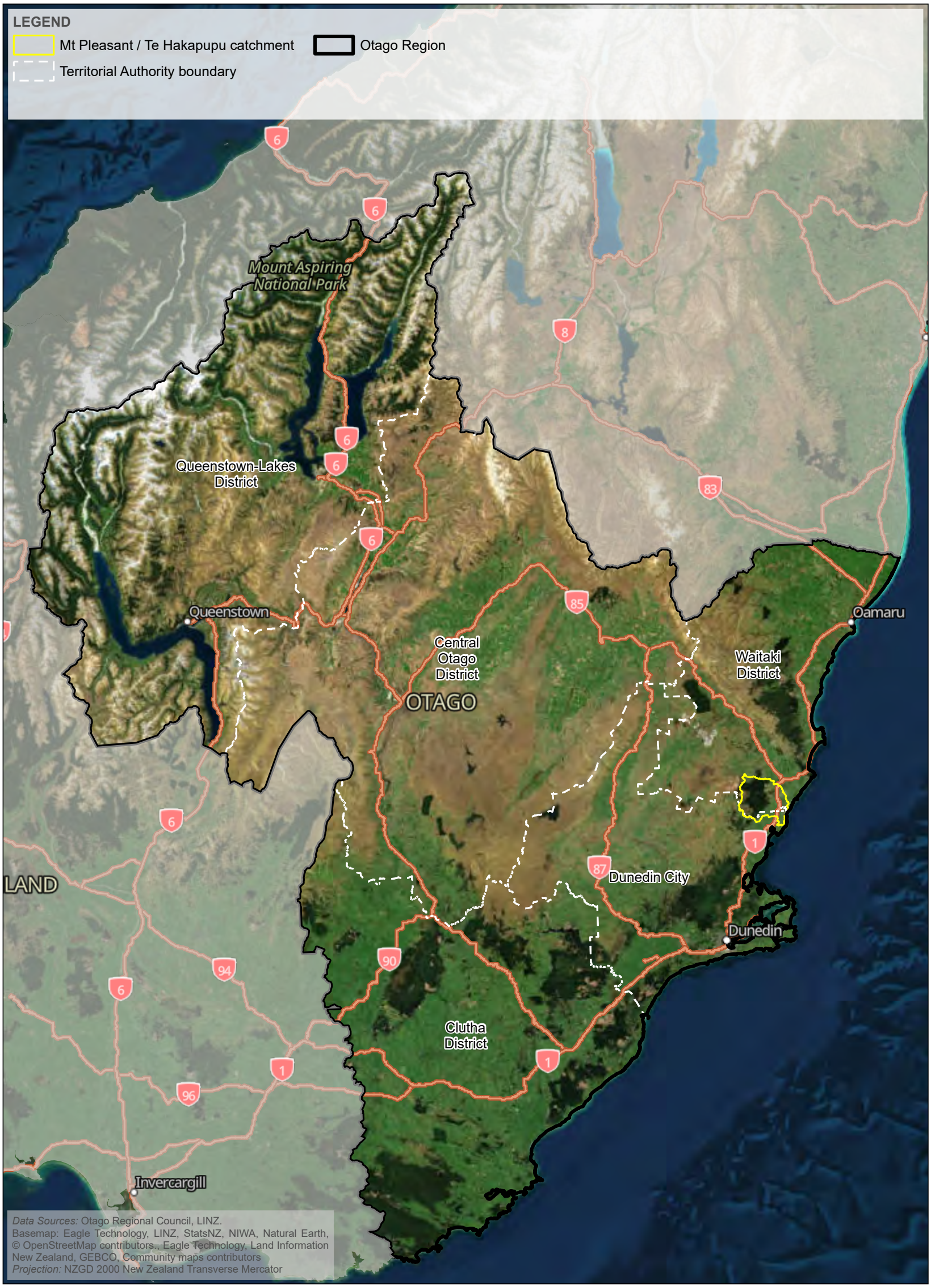
The following conclusions can be derived from this flood assessment:

- The hydrology assessment was undertaken using HEC-HMS and the hydraulic modelling was undertaken using InfoWorks ICM.
- The upper catchment was divided into seven sub-catchments of various sizes to generate inflow boundary for the lower catchment.
- A minimum grid size of 9m^2 was used for the 2D domain of the lower catchment in InfoWorks ICM.
- A constant downstream tidal boundary of 3.15mRL was used based on MHWS of 2.15mRL at Port Chalmers plus an additional metre to account for the sea level rise due to climate changes.
- The 2D InfoWorks ICM model has been set up for the 100-year ARI and 10-year ARI 24-hour storm duration events. Model has been simulated for the 100-year ARI 24-hour storm event at this stage.
- The maximum depth of flooding in the lower catchment was predicted to be about 5m mainly along the river system.


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APPENDIX 3: TE HAKAPUPU PLEASANT RIVER CATCHMENT MAPS
FEASIBILITY REPORT MAPS
DECEMBER 2024
Credit: Peak Geospatial

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TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Catchment Location

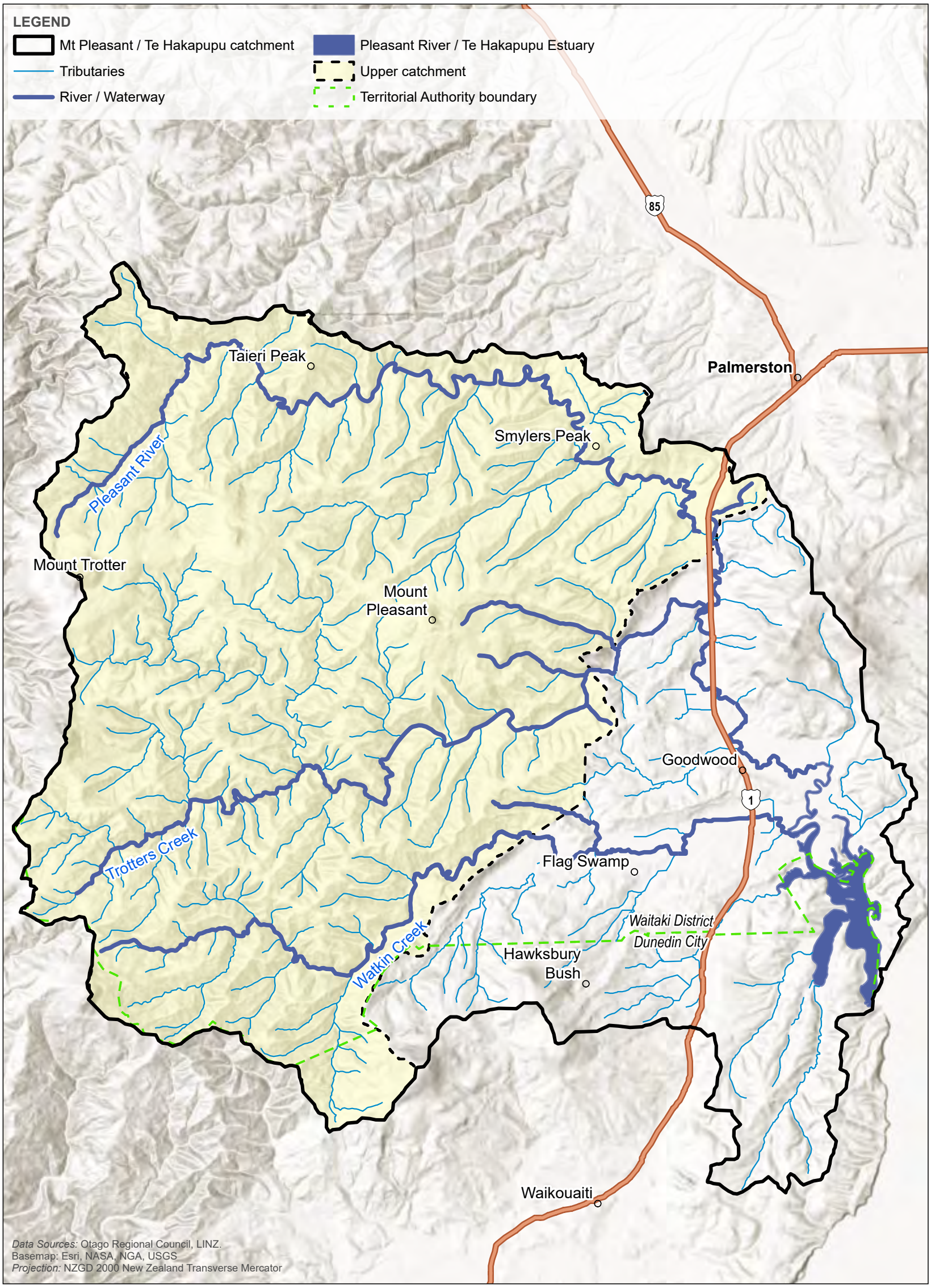
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MAP 1

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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Feasibility Study

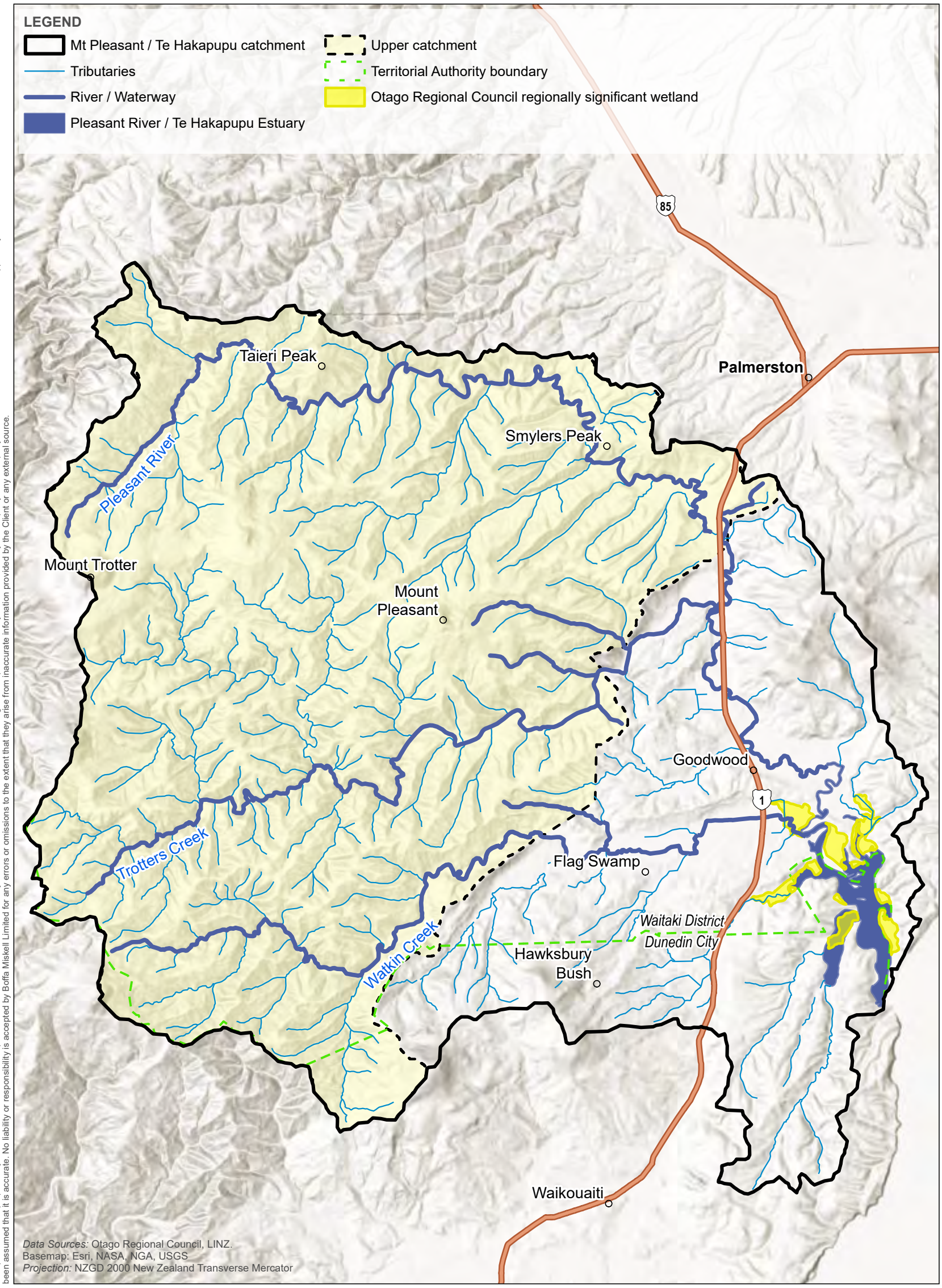
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Waterways and Wetlands

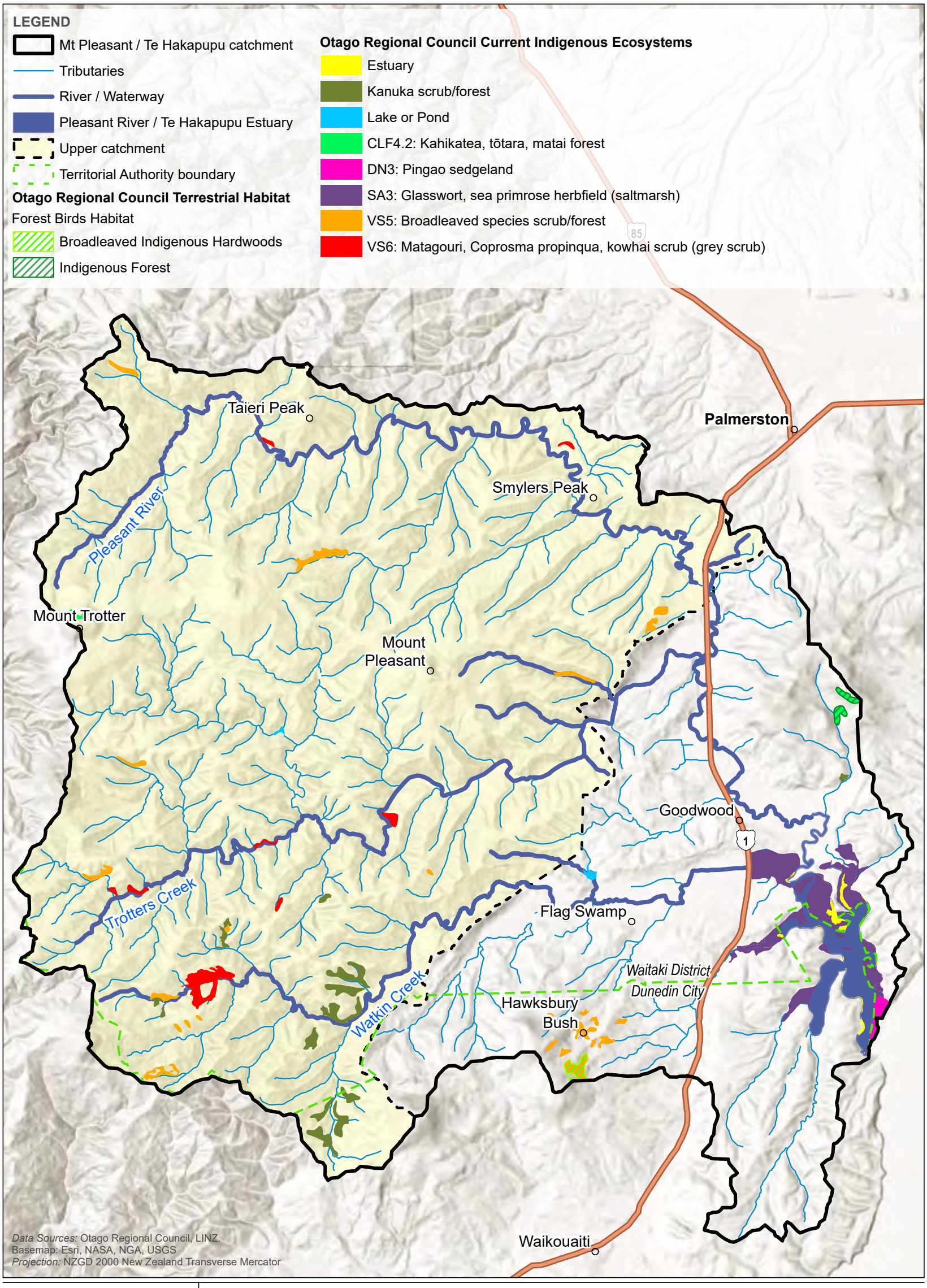
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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Ecosystems and Habitat

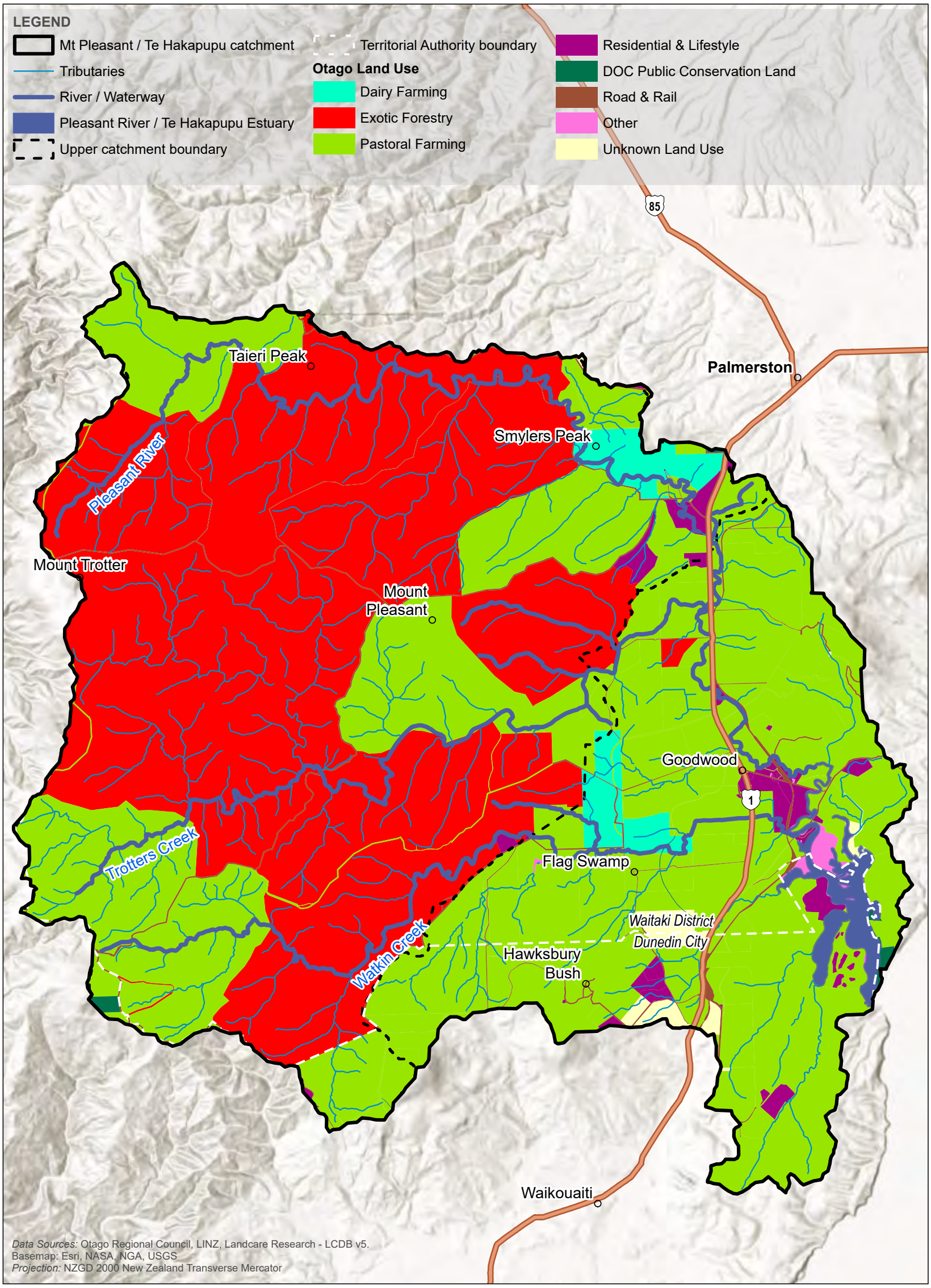
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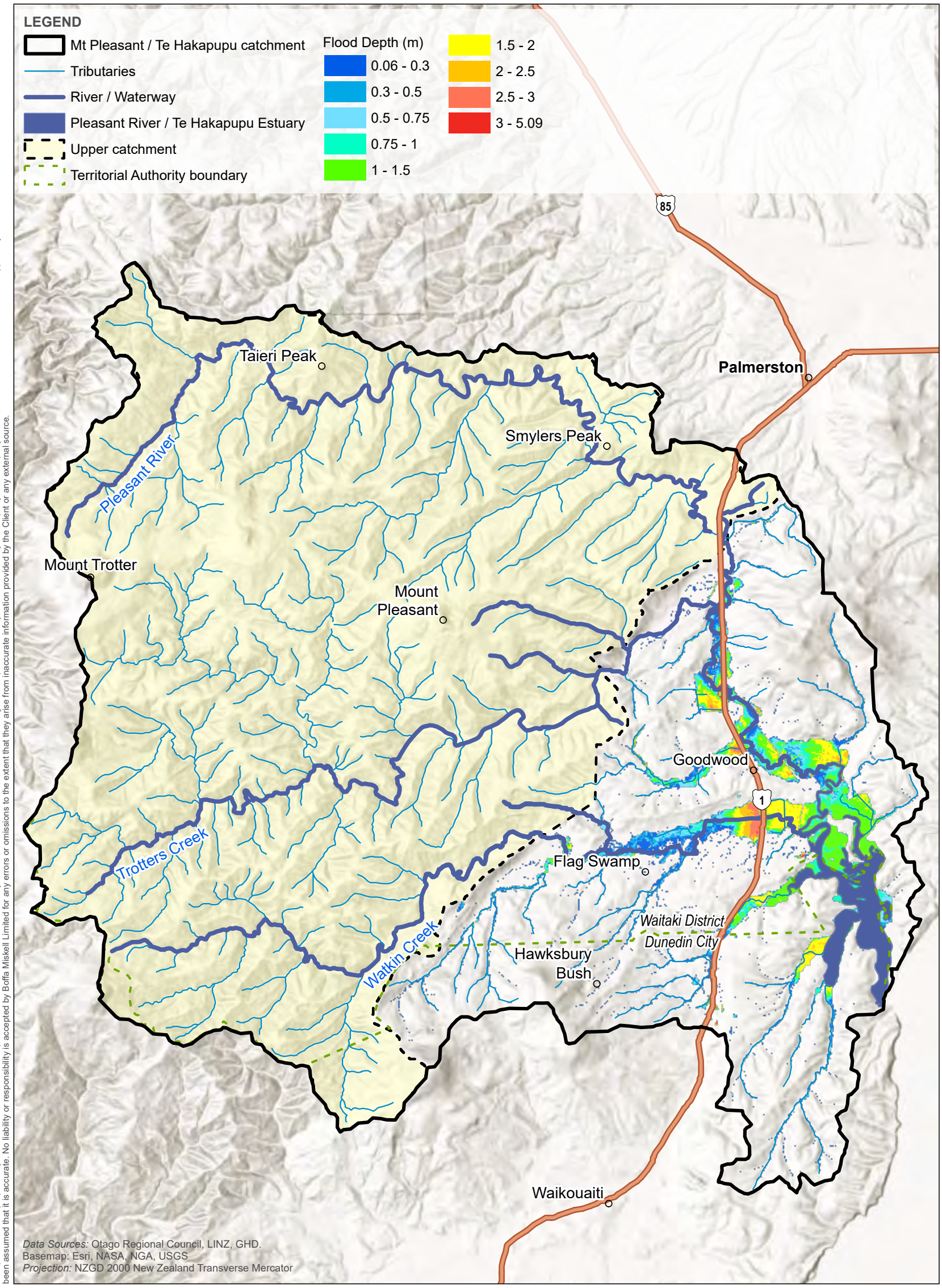
Land Use

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MAP 5



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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

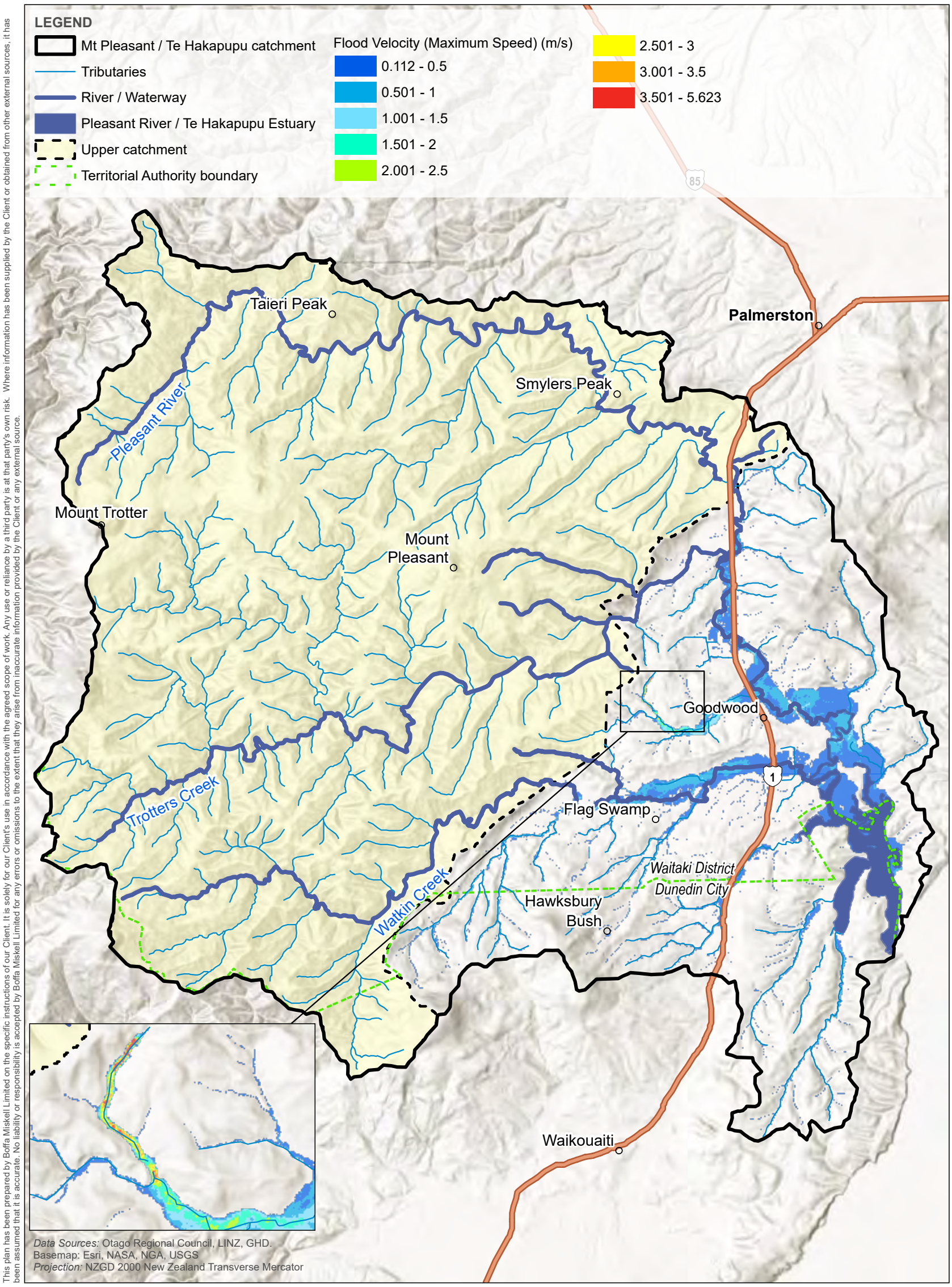
Flood Depth

Date: 05 December 2024 | Revision: 0

Plan prepared for Otago Regional Council by Boffa Miskell Limited

Project Manager: Rachael.Eaton@boffamiskell.co.nz | Drawn: LJa | Checked: SPa

MAP 6



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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

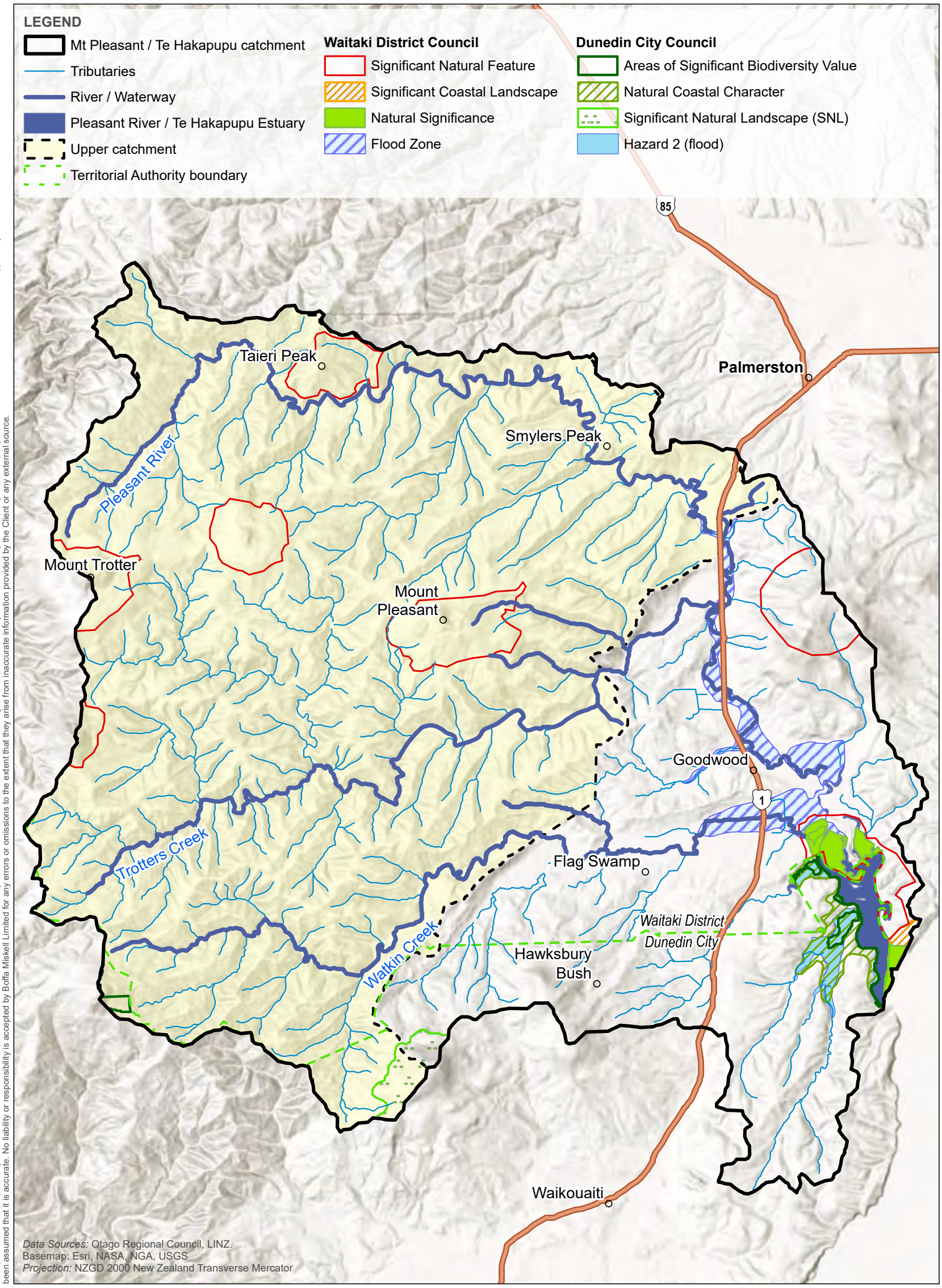
Flood Velocity

Date: 05 December 2024 | Revision: 0

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MAP 7



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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

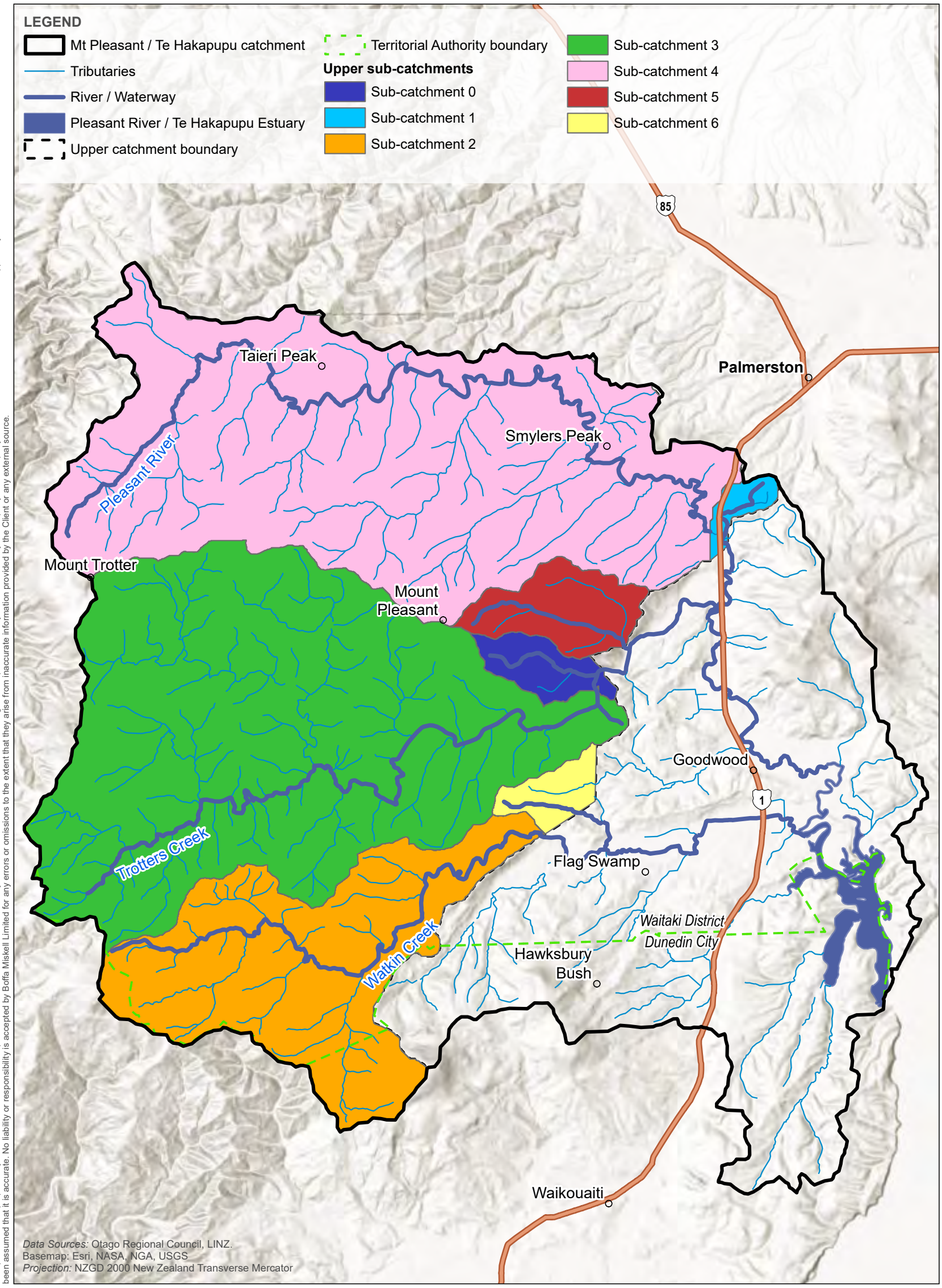
Dunedin City and Waitaki District Plans

Date: 05 December 2024 | Revision: 0

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MAP 8



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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

Catchment Map

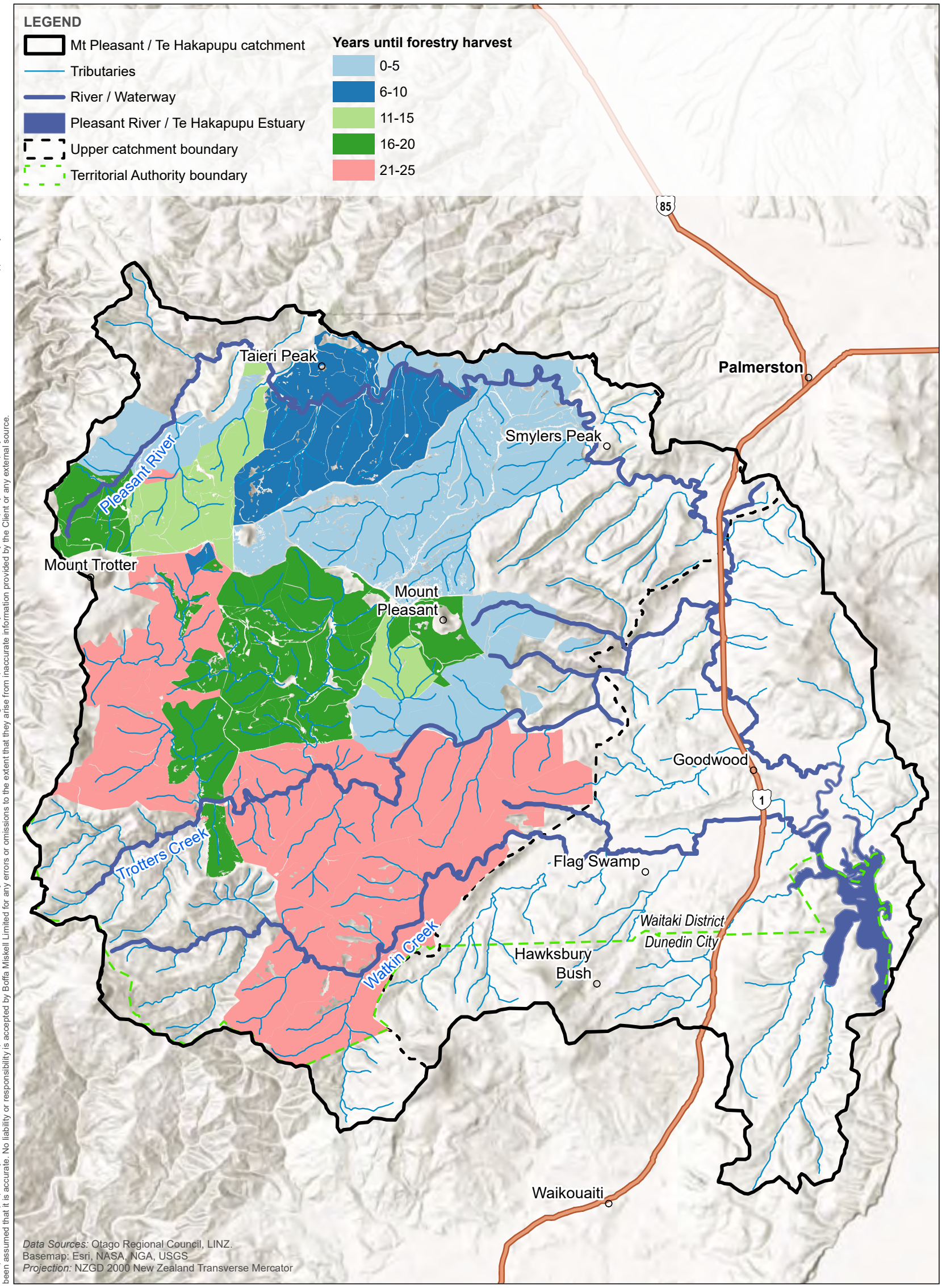
Date: 06 December 2024 | Revision: 0

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MAP 9

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PLEASANT RIVER / TE HAKAPUPU CATCHMENT NATURE-BASED SOLUTIONS

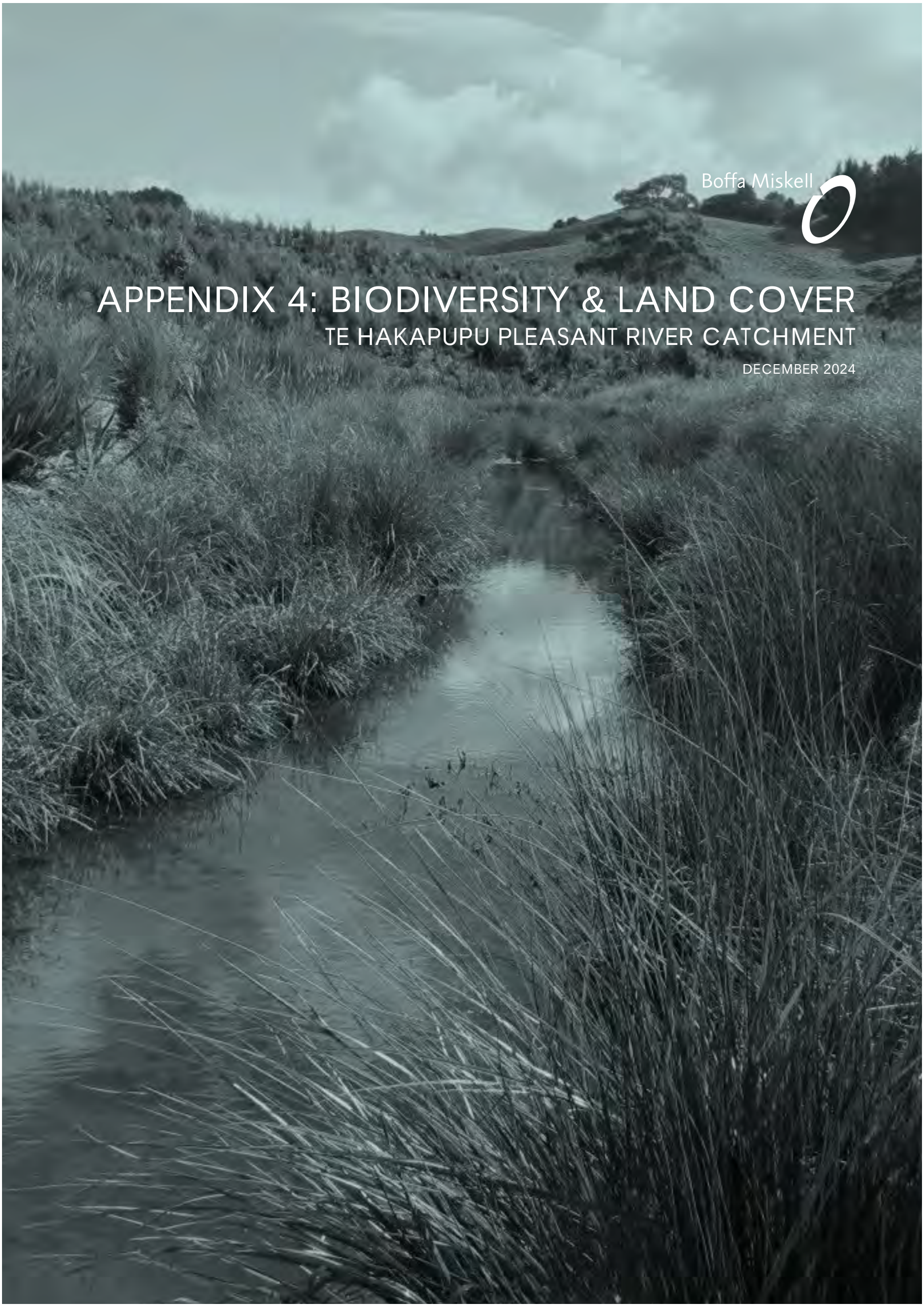
Forestry Harvest Timing

Date: 05 December 2024 | Revision: 0

Plan prepared for Otago Regional Council by Boffa Miskell Limited

Project Manager: Rachael.Eaton@boffamiskell.co.nz | Drawn: LJa | Checked: SPa

MAP 10


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APPENDIX 4: BIODIVERSITY & LAND COVER
TE HAKAPUPU PLEASANT RIVER CATCHMENT
DECEMBER 2024

BIODIVERSITY & LAND COVER CONTEXT

LAND COVER & CONSERVATION

The vegetation cover in Te Hakapupu catchment that may have existed prior to human arrival was likely dominated by forest species such as mataī, tōtara, and kahikatea, with mild climate forest types present in lower elevations and wetland surrounding the upper estuary (Leathwick *et al,* 2012). Today, indigenous forest / scrub areas consisting of kānuka, mānuka, matagouri, and other grey shrub species collectively cover approximately 1% of the catchment. These remnants of indigenous forest are mostly clustered in areas surrounding the estuary and through steeper parts of the south-eastern aspect of the catchment. Threatened and At-Risk plant species previously recorded in the catchment include climbing groundsel and desert broom (both At Risk – Declining; de Lange et al. 2018; Ahikā Consulting Ltd, 2023).

Hawkesbury Bush represents the only moderately large QEII covenant in the catchment, covering 10 hectares of native forest remnants located near the southern extent of the catchment. Restoration planting undertaken by ORC, Kāti Huirapa Rūnaka ki Puketeraki, and the local landowners as part of the Toitū Te Hakapupu project has established approximately 68,000 plants and 27 km of fencing for freshwater enhancement, contributing to the biodiversity values in the area.[1]

ESTUARY WETLAND BIODIVERSITY

The wetland and estuary, known as Te Hakapupu Pleasant River estuary wetland complex, is predominantly an estuarine system covering approx. 84 hectares (~0.6% of the catchment). The estuary wetland complex comprises of mostly salt marsh, saltmeadow, mud flat, and sandspit, supporting vegetation including glasswort (*Salicornia quinqueflora*), saltgrass (*Puccinellia* spp.), rekoreko (*Selliera radicans*), sea primrose (*Samolus repens*), and saltmarsh ribbonwood (*Plagianthus divaricatus*). It is the largest wetland in the North Otago Freshwater Management Unit, and, as an estuary, is a naturally uncommon ecosystem (Williams et al. 2007; Ahikā Consulting Ltd, 2023).

eDNA analysis of fish species in the three main tributaries within the catchment indicated ten species of freshwater fish and seven estuarine / marine species. Of these species, four freshwater fish are considered mahika kai species (īnaka and tuna / longfin eel; At Risk-Declining; and banded kōkopu, and tuna / shortfin eel; Not Threatened). All three estuarine species are considered mahika kai species (kahawai, pātiki / sand flounder, and aua / yellow-eyed mullet).

The estuary and wetland complex provides important habitat for birdlife within the catchment, including kuaka / bar-tailed godwit, pohowera / banded dotterel, tōrea / South Island pied oystercatcher, tarāpuka / black-billed gull and tara / white-fronted tern (all At Risk – Declining), tōrea pango / variable oystercatcher (At Risk - Recovering), as well as poaka / pied stilt and matuku moana / white-faced heron (both Not Threatened; Ahikā Consulting Ltd. 2023).

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[1] Toitū Te Hakapupu planting and fencing figures are based on ORC reporting for December 2024 – Successes: planting, fences, and sediment traps.

Table 1: Fish species of the Hakapupu catchment, threat status based on the New Zealand Threat Classification system, and mahika kai status

	SPECIES	THREAT CLASSIFICATION	MAHIKA KAI
Freshwater Migratory	Banded kōkopu	Not Threatened	✓
	Bluegill bully	At Risk – Declining	
	Common bully	Not Threatened	
	Īnaka (inanga)	At Risk – Declining	✓
	Tuna / longfin eel	At Risk – Declining	✓
	Redfin bully	Not Threatened	
	Tuna / shortfin eel	Not Threatened	✓
Freshwater Non-Migratory	Upland bully	Not Threatened	
	Brown trout	Introduced	
	European perch	Introduced	
Marine Estuary	Estuary clingfish	Not assessed	
	Kahawai	Not assessed	✓
	Pātiki / sand flounder	Not assessed	✓
	Spotty	Not assessed	
	Thornfish	Not assessed	
	Aua / yellow-eye mullet	Not Threatened	✓

FISH PASSAGE

An assessment of potential fish passage barriers in the Hakapupu catchment was conducted by Kāti Huirapa Rūnaka Puketeraki and ORC in 2024 (Dale & Rata te Raki, 2024). In total, 20 instream structures were assessed for fish passage across the Hakapupu catchment, with 7 structures considered to be of high priority for replacement or remediation. The Toitū Te Hakapupu project is currently working to improve or replace five of these high priority structures to improve fish passage.

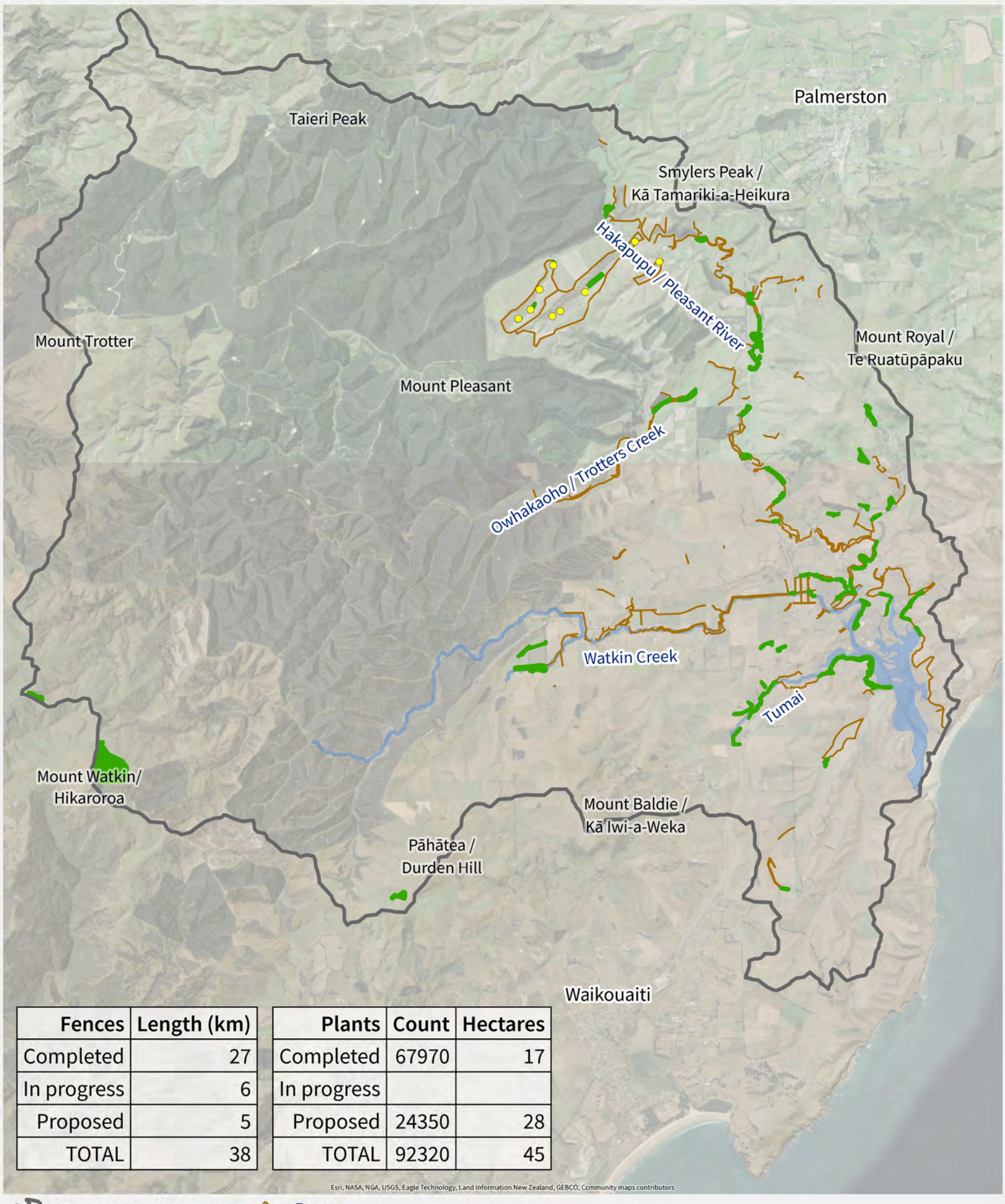
PEST SPECIES

The most prominent pest plants in the wider catchment include gorse and broom. Within the estuarine area, vast meadows of spartina can form causing a build-up of sediment, increasing flood risk. ORC undertakes spartina control work but can also issue notices requiring occupiers to eliminate spartina infestations on their land. Other pests include willows and alders, which disrupt the natural flow characteristics of the waterways under high flow conditions, exacerbating flooding. However, these species are also valued by some in the local community, on the basis that these trees provide riparian shade, stabilise riverbanks and reduce bank erosion. Community feedback has also described high number of pigs and deer coming out of forestry areas in the upper catchment, causing damage to pasture.

Toitū Te Hakapupu

Successes: plantings, fences and sediment traps

Otago Regional Council



Fences	Length (km)
Completed	27
In progress	6
Proposed	5
TOTAL	38

Plants	Count	Hectares
Completed	67970	17
In progress		
Proposed	24350	28
TOTAL	92320	45

Esri, NASA, NGA, USGS, Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Pleasant River Catchment
Plantings
Fences
Completed Sediment Traps (9)

0 1.5 3
kilometres

Information on this map may not be used for the purposes of any legal disputes. The user should independently verify the accuracy of any information before taking any action in reliance upon it.
This map was generated for A3 printing on 5/12/2024 at the scale of 1:50,000.

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APPENDIX 5: LANDSCAPE CONTEXT

TE HAKAPUPU PLEASANT RIVER CATCHMENT

DECEMBER 2024



LANDSCAPE CONTEXT

The concept of ‘landscape’ forms a foundation through which Nature-based Solution (NbS) interventions in Te Hakapupu Pleasant River catchment have been considered within this feasibility study.

Current professional best practice landscape guidance (Te Tangi a Te Manu, NZILA, 2022) sets out the following understanding of landscape in terms of the nature of relationships between people and place conceptualised as three overlapping dimensions:

- **Physical:** the physical environment—its collective natural and built components and processes
- **Perceptual:** how we perceive and experience places
- **Associative**: the meanings and values we associate with places

This guidance also notes that character and value are different but interdependent and that all landscapes have character and value.[1] Identifying each landscape’s values is fundamental to its management.

VISUAL AMENITY

Visual matters are integral to landscape. As set out in Te Tangi a Te Manu, the concept of landscape is relevant to both the quality of the environment and amenity values. Terms such as ‘visual amenity’ and ‘rural amenity’, refer to landscape values that contribute to amenity values.

It is also noted that sections 7(c) and 7(f) of the RMA refer to maintenance and enhancement, providing for positive effects including restoration and rehabilitation.[2]

NATURAL CHARACTER

Natural character is the term used to describe the degree of naturalness in an area, and includes the natural elements, patterns, processes, and experiential qualities attributes of an environment. The natural character of the coastal environment, and freshwater bodies and their margins, is comprised of a number of key attributes which include:

- **Abiotic systems**: physical processes, geomorphology, topography, landform, and water quantity/quality
- **Biotic systems:** species, communities, habitats, and ecological processes

Experiential attributes - the ways in which people, including tangata whenua, experience the natural elements, patterns, and processes.

The degree of natural character present in an area is commonly described on a continuum. Areas of very high natural character are due to the lack of human induced modification. In other areas, there may be little natural character remaining due to extensive human modification.

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[1] Ibid, para 5.28
[2] Ibid, paras 5.56-5.58

POLICY FRAMEWORK

RESOURCE MANAGEMENT ACT 1991

The assessment of landscape, natural character and visual effects addresses the following relevant Resource Management Act 1991 (RMA) matters:

- **Section 6(a):** Preserving the natural character of wetlands, streams, rivers, and their margins
- **Section 6(b):** Protection of outstanding natural features and landscapes
- **Section 7(c):** Maintain and enhance amenity values
- **Section 7(f):** Maintain and enhance the quality of the environment

OTAGO REGIONAL PLANS

The Te Hakapupu Pleasant River catchment is subject to provisions in the following Plans:

- Partially Operative Otago RPS 2019
- Proposed Regional Policy Statement 2021
- Regional Plan: Water for Otago

Provisions most relevant to landscape matters are summarised below.

- **Partially Operative Otago RPS 2019**
  Objective 3.1 of the Partially Operative Otago RPS (PORPS) relates to recognising, maintaining, or enhancing where degraded, the values of natural resources.

  The values (including intrinsic values) of ecosystems and natural resources are recognised and maintained or enhanced where degraded.

This is supported by the following relevant landscape-related policies:

Policy 3.1.11 Natural features, landscapes, and seascapes
Recognise the values of natural features, landscapes and seascapes are derived from the biophysical, sensory and associative attributes in Schedule 3.

Schedule 3 provides a list of criteria for the identification of natural features, landscapes and seascapes based on the dimensions recommended in Te Tangi a Te Manu:

1. Biophysical attributes

a. Natural science factors, including geological, topographical, ecological and dynamic components

b. The presence of water including in seas, lakes, rivers and streams

c. Vegetation (native and exotic)

2. Sensory attributes a. Legibility or expressiveness—how obviously the feature or landscape demonstrates its formative processes

b. Aesthetic values including memorability and naturalness

c. Transient values including presence of wildlife or other values at certain times of the day or year

d. Wild or scenic values

3. Associative attributes

a. Whether the values are shared and recognised

b. Cultural and spiritual values for Kāi Tahu, identified by working, as far as practicable, in accordance with tikanga Māori; including their expression as cultural landscapes and features

c. Historical and heritage associations

Policy 3.1.12 Natural character in the coastal environment
Recognise the values of natural character in the coastal environment are derived from one or more

of the following attributes:

a) Natural elements, processes and patterns;

b) Biophysical, ecological, geological and geomorphological aspects;

c) Natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, estuaries, reefs, freshwater springs and surf breaks;

d) The natural movement of water and sediment;

e) The natural darkness of the night sky;

f) Places or areas that are wild or scenic;

g) A range of natural character from pristine to modified;

h) Experiential attributes, including the sounds and smell of the sea; and their context or setting.

Objective 3.2 relates to the identification of significant and highly valued resources and their protection or enhancement where degraded. Policies 3.2.3 and 3.2.5 relates to identifying outstanding natural features landscapes (RMA Section 6b) and highly valued natural features and landscapes.

The Hakapupu catchment is not identified as part of any outstanding natural feature or landscape however Te Hakapupu Pleasant River estuary wetland complex is identified as a Regionally Significant Wetland in the Regional Water Plan (summarised below).

The PORPS has been developed to give effect to the National Policy Statement for Freshwater Management (NPSFW) requirements. PORPS policy 3.1.1 requires freshwater to be managed to *"maintain or enhance as far as practicable"*, amenity and landscape values of rivers and wetlands among other matters.

PROPOSED REGIONAL POLICY STATEMENT 2021

Objective CE–O2 relates to maintaining or enhancing highly valued natural features and landscapes areas of the coastal environment.

Objective CE–O3 relates to protecting areas of natural character, natural features, landscapes and seascapes within the coastal environment and encouraging restoration is encouraged where the values of these areas have been compromised.

Objective NFL-O1 of the Proposed Regional Policy Statement (Proposed RPS 21) relates to the protection of outstanding natural features and landscapes and maintenance and enhancement of highly valued natural features and landscapes, including promoting restoration where those areas or values have been reduced or lost.

REGIONAL PLAN: WATER FOR OTAGO

Work is currently underway to prepare a new Land and Water Regional Plan (LWRP) for the Otago region however, at the time of writing, this plan has yet to be notified.

There are a number of key provisions relevant to this assessment that relate to the preservation of the natural character of waterbodies and their margins and protection from inappropriate use and development (RMA Section 6.a). These include protecting their natural character, maintaining, or enhancing their amenity values, having particular regard to features such as natural flow characteristics, water colour and clarity, aesthetic values, and recreational opportunities among others.

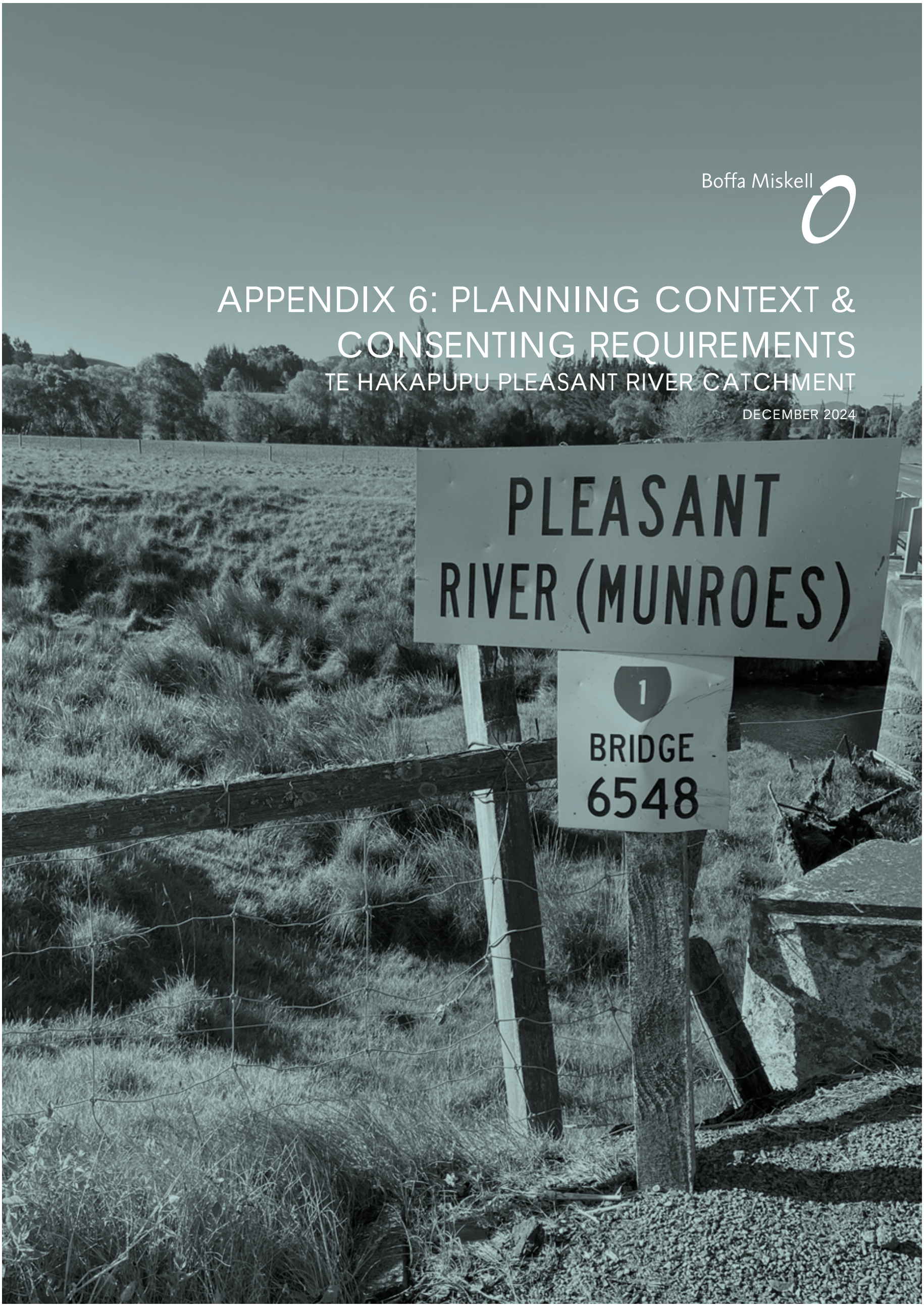
Policy 8.7.1 directs the promotion of the creation, retention, and enhancement of appropriate riparian vegetation.

DISTRICT PLANS

Te Hakapupu Pleasant River catchment is mostly within the Waitaki District Plan, apart from an area to the south of the estuary and part of Mt Watkin which are within the Dunedin 2nd Generation District Plan.

Within the Waitaki District, the catchment is largely within the rural zone, with some inland areas within the ‘rural scenic’ zone. Catchment areas within the Dunedin District Plan are also largely within the rural zone, except for a small rural residential area to the south of the estuary. The six volcanic peaks within the catchment are identified as Significant Natural Features in the Waitaki District Plan.

Te Hakapupu Pleasant River estuary wetland complex is identified as a Significant Natural Feature and an Area of Significant Nature Conservation Value under the Waitaki District Plan. The estuary wetland complex contains a range of values, including habitat for threatened species and mahika kai species, recreational opportunities, and landscape aesthetic qualities. Additionally, mana whenua values are associated with the estuary wetland complex.



APPENDIX 6: PLANNING CONTEXT & CONSENTING REQUIREMENTS

TE HAKAPUPU PLEASANT RIVER CATCHMENT

DECEMBER 2024

PLANNING CONTEXT & CONSENTING REQUIREMENTS

PLANNING REQUIREMENTS

There are a range of potential regulatory requirements that may require various consents and authorisations to be obtained in order to enable the types of activities that relate to the Nature-based Solution (NbS) interventions considered in this feasibility report.

Most of these requirements stem from regulatory documents under the Resource Management Act (RMA), but other authorisations may be required under statutes such as the Wildlife Act 1953, the Building Act 2004, and the Conservation Act 1987.

A high-level overview of the regulatory instruments under the RMA that are likely to be relevant to the NbS under consideration in Te Hakapupu Pleasant River catchment is set out below. Further details about the potential consents and authorisations that would be required for the individual NbS solutions are provided later in this report.

RESOURCE MANAGEMENT ACT 1991

The Resource Management Act (RMA) is New Zealand's principal environmental statute. It sets the scene as to how the use and development of land, air and water should be managed, and a range of regulatory instruments are promulgated under the RMA, including National Policy Statements (NPS); National Environmental Standards (NES); Regional; and District Plans.

Any resource consents that are required to authorise the proposed NbS will be assessed in terms of the provisions of the Resource Management Act and the relevant regulatory instruments. The following matters are likely to be relevant for NbS in terms of the regulatory framework established under the RMA:

- The restoration and enhancement of indigenous biodiversity; wetlands; and freshwater environments.
- Managing the effects of climate change and natural hazards.
- Taking, using, damming, and diverting water.
- Introduction of planting into the beds of lakes and rivers, riparian margins, and wetlands.
- Remediation of barriers to fish passage.
- Earthworks and the associated management of sediment discharges.
- Managing contaminated land.

NATIONAL POLICY STATEMENTS

NPS are intended to provide national direction for matters of national significance which are related to achieving the sustainable management purpose of the RMA. Consent authorities are also required to have regard to any relevant national policy statement when considering an application for a resource consent. NPS do not include rules.

The policy direction set out in NPS is relevant to informing the consenting strategy for the proposed works as they inform the way in which the use and development of land, water, and other resources should be undertaken. Of the NPS currently in effect, the following are likely to be of most relevance to the NbS under consideration:

- National Policy Statement for Freshwater Management 2020 (NPS-FM)
- National Policy Statement for Indigenous Biodiversity 2023 (NPS-IB)
- National Policy Statement for Highly Productive Land 2022 (NPS-HPL)

NATIONAL ENVIRONMENTAL STANDARDS

National Environmental Standards (NES) are regulations made under the RMA and set out technical standards, methods or requirements relating to certain activities and their effects that apply throughout the country. They contain rules that must be complied with, and consents are required if compliance cannot be achieved. These standards do not include any policy provisions.

Of the NES currently in effect, the following are likely to be of most relevance to the NbS under consideration:

- National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011 (NES-CS)
- National Environmental Standards for Freshwater 2020 (NES-F)
- National Environmental Standards for Commercial Forestry 2017 (as amended in 2023) (NES-CF)
- National Environmental Standards for Sources of Human Drinking Water (NES-DW)
- Freshwater Farm Plans Regulations 2023
- Stock Exclusion Regulations 2020

A NOTE ON RESOURCE MANAGEMENT LAW REFORM

Resource management law has been subject to ongoing reform over the past few years and is continuing to face reform under the current Government. Various amendments to the RMA have already been proposed and are currently going through the parliamentary process, with further amendments yet to come. Ultimately the current Government has signalled that it will seek to repeal the RMA and replace it with a statute based on the enjoyment of private property rights. In this context, it will be important to keep abreast of legislative changes that may affect the delivery of the NbS outlined in this report.

OTHER REGULATORY REQUIREMENTS

There is the potential for the NbS to require authorisations under other legislative requirements as follows:

- A wildlife permit under the Wildlife Act 1953
- An archaeological authority to damage, destroy or modify any archaeological sites that may be unearthed during the course of any project works
- Ensuring that any instream structures meet the relevant regulatory requirements in relation to fish passage; and
- A requirement for any dams to obtain consent under the Building Act 2004.

NATURE-BASED SOLUTIONS CONSENTING REQUIREMENTS

Based on a high-level assessment of the likely works associated with each NbS intervention within Te Hakapupu Pleasant River catchment, a summary of the potential consenting requirements associated with these activities under the relevant regulatory instruments is set out in the tables below.

LAND COVER MANAGEMENT

Table 1: Potential consenting requirements associated with landcover management. Potential consenting requirement identified are coloured green where they activities are permitted, yellow where activities are controlled, orange where activities are discretionary, and red where activities are prohibited.

ACTIVITY COMPONENT	WAITAKI DISTRICT PLAN	DUNEDIN DISTRICT PLAN
Earthworks		
Within riparian area	Discretionary activity for earthworks in riparian areas in rural zones.[1]	Restricted discretionary activity within various riparian areas. [2]
Other locations	Permitted or controlled in the rural zone depending on scale and location.[3]	Permitted or restricted discretionary depending on scale and location, and subject to conditions.[4]
Vegetation planting		
Within riparian areas	Potential permitted activity pathway provided that: No exotic tree planting or amenity tree planting in specified riparian areas. [5] Limits to planting trees within 15m of a neighbouring site boundary without their permission. [6] Tree planting is required to not shade roads or residential units.[7]	‘Conservation’ activities in the Rural Zone are generally permitted. [8]
Other areas		

[1] Waitaki District Plan Rule 4.4.7(2)
[2] Dunedin District Plan Rule 10.3.3
[3] Waitaki District Plan Rules 4.3.1(14) and 4.3.2(1)
[4] Dunedin District Plan Rules in chapter 8A
[5] Waitaki District Plan Rule 4.4.7
[6] Waitaki District Plan Rule 4.4.9
[7] Waitaki District Plan Rule 4.5.2
[8] Dunedin District Plan Rule 16.3.3.32.
‘Conservation’ is defined in the District Plan as “the use of land for the establishment, maintenance or enhancement of indigenous vegetation and/or habitat for indigenous fauna. Examples of component activities of conservation are:

- restoration planting
- pest and weed control
- track construction and maintenance; and
- fencing.

RIVER & STREAM NATURALISATION

Table 2: Potential consenting requirements associated with river naturalisation in Te Hakapupu catchment. Potential consenting requirement identified are coloured green where they activities are permitted, yellow where activities are controlled, orange where activities are discretionary, and red where activities are prohibited.

ACTIVITY COMPONENT	WAITAKI DISTRICT PLAN	DUNEDIN DISTRICT PLAN
Vegetation removal/ clearance		
Within riparian areas	Could be permitted in rural zone depending on scale, vegetation type, and location.[9] Generally limits on clearance of indigenous vegetation.	Ranging from permitted to restricted discretionary depending on scale, vegetation affected, and location. [10]
Earthworks		
Within riparian area	Discretionary activity for earthworks in riparian areas in rural zones.[11]	Restricted discretionary activity within various riparian areas. [12]
Other locations	Permitted or controlled in the rural zone depending on scale and location.[13]	Permitted or restricted discretionary depending on scale and location, and subject to conditions.[14]
Vegetation planting		
Within riparian areas	Potential permitted activity pathway provided that: No exotic tree planting or amenity tree planting in specified riparian areas. [15] Limits to planting trees within 15m of a neighbouring site boundary without their permission. [16] Tree planting is required to not shade roads or residential units.[17]	‘Conservation’ activities in the Rural Zone are generally permitted. [18]
Other areas		

[9] Waitaki District Plan Rule 4.4.7 and 4.4.8
[10] Dunedin District Plan Standards in chapter 10, Rules in 16.3.4; and standards in 16.6.11
[11] Waitaki District Plan Rule 4.4.7(2)
[12] Dunedin District Plan Rule 10.3.3
[13] Waitaki District Plan Rules 4.3.1(14) and 4.3.2(1)
[14] Dunedin District Plan Rules in chapter 8A
[15] Waitaki District Plan Rule 4.4.7
[16] Waitaki District Plan Rule 4.4.9
[17] Waitaki District Plan Rule 4.5.2
[18] Dunedin District Plan Rule 16.3.3.32.
‘Conservation’ is defined in the District Plan as “the use of land for the establishment, maintenance or enhancement of indigenous vegetation and/or habitat for indigenous fauna. Examples of component activities of conservation are:

- restoration planting
- pest and weed control
- track construction and maintenance; and
- fencing.

WETLAND RESTORATION & CONSTRUCTION

Table 3: Summary of potential consenting requirements associated with wetland restoration and construction. Potential consenting requirement identified are coloured grey where they are not applicable or not stated, green where they activities are permitted, yellow where activities are controlled, orange where activities are discretionary, and red where activities are prohibited.

ACTIVITY COMPONENT	NES-F	ORC REGIONAL PLAN: WATER	WAITAKI DISTRICT PLAN	DUNEDIN DISTRICT PLAN
Restoration and enhancement of the existing wetland	See specific rules below but generally permissive consenting pathway for associated activities.	Not applicable	Not applicable	'Conservation' activities in the Rural Zone are generally permitted. [19]
Construction of new wetland areas	N/A	Not applicable	Not applicable	
Earthworks				
Within wetland	Permitted subject to conditions[20]	Not applicable	Discretionary activity for earthworks in riparian areas in rural zones.[21]	Restricted discretionary activity within various riparian areas. [22]
Within riparian area				
Other locations	Not applicable		Permitted or controlled in the rural zone depending on scale and location.[23]	Permitted or restricted discretionary depending on scale and location, and subject to conditions.[24]

[19] Dunedin District Plan Rule 16.3.3.32
'Conservation' is defined in the District Plan as "the use of land for the establishment, maintenance or enhancement of indigenous vegetation and/or habitat for indigenous fauna. Examples of component activities of conservation are:

- restoration planting
- pest and weed control
- track construction and maintenance; and
- fencing.

[20] NES-F Regulation 38(2)
[21] Waitaki District Plan Rule 4.4.7(2)
[22] Dunedin District Plan Rule 10.3.3
[23] Waitaki District Plan Rules 4.3.1(14) and 4.3.2(1)
[24] Dunedin District Plan Rules in chapter 8A

ACTIVITY COMPONENT	NES-F	ORC REGIONAL PLAN: WATER	WAITAKI DISTRICT PLAN	DUNEDIN DISTRICT PLAN
Vegetation removal/ clearance				
Within wetland	Permitted subject to conditions[25]	Permitted subject to conditions.[26]	Could be permitted in rural zone depending on scale, vegetation type, and location.[27]	Ranging from permitted to restricted discretionary depending on scale, vegetation affected, and location. [28]
Within riparian areas		Not applicable		
Aquatic pest plant removal - rivers	Not applicable	Permitted subject to conditions, certain species.[29]		
Aquatic pest plant removal – wetlands		Controlled subject to conditions, certain species.[30]		
Vegetation planting				
Within wetland	Not applicable	Permitted subject to conditions.[31]	Not applicable	Not applicable
Within river	Not applicable	Permitted subject to conditions. [32]	Not applicable	Not applicable
Within riparian areas	Not applicable	Not applicable		*See Conservation activities above*
Other areas	Not applicable	Not applicable		
Introduction of listed pest plant species (including aquatic plants)	Not applicable	Certain species are prohibited.[33]		Includes rules limiting certain tree species being planted. [34]
Pest management				
Aquatic pest plants	Not applicable	Disturbance of the bed of a lake or river and associated discharge – permitted subject to conditions.[35]	Not stated	Not stated

[25] NES-F Regulation 38(1)
[26] Otago Regional Plan: Water, Rule 13.5.1.5A
[27] Waitaki District Plan Rule 4.4.7 and 4.4.8
[28] Dunedin District Plan Standards in chapter 10, Rules in 16.3.4; and standards in 16.6.11
[29] Otago Regional Plan: Water, Rule 13.7.1.1
[30] Otago Regional Plan: Water, Rule 13.7.2.1
[31] Otago Regional Plan: Water, Rule 13.5.1.5A
[32] Otago Regional Plan: Water, Rule 13.6.2.1
[33] Otago Regional Plan: Water, Rule 13.6.1.1
[34] Dunedin District Plan Rule 10.3.4
[35] Otago Regional Plan: Water, Rule 13.5.1.5

ACTIVITY COMPONENT	NES-F	ORC REGIONAL PLAN: WATER	WAITAKI DISTRICT PLAN	DUNEDIN DISTRICT PLAN
Taking, using, damming, diversion, and discharges of water				
Taking, using, damming, or diverting water	**Taking, using, damming or diverting water** associated with wetland restoration and enhancement permitted subject to conditions[36]	**Damming and diversion** permitted subject to conditions (but must not be in a regionally significant wetland). [37]	Not applicable	Not applicable
Discharging water	Permitted subject to conditions[38]	Not applicable		

[36] NES-F Regulation 38(3)
[37] Otago Regional Plan: Water, Rule 12.3.2.1
[38] NES-F Regulation 38(3)

Nature-based Solutions for Flood Resilience

Engagement Study

July 2025



Exploring landowner perspectives, barriers and opportunities around Nature-Based Solutions (NbS) implementation in Otago.

Beca

Prepared by

Natalie Dixon, Engagement specialist, Beca Ltd

Contributors

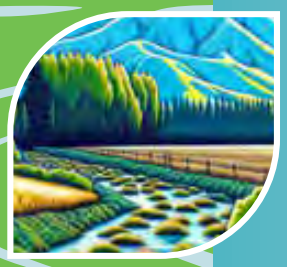
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THIS DOCUMENT MAY BE REFERENCED AS:

Beca Ltd, 2025. Nature-based Solutions for Flood Mitigation: Exploring landowner perspectives, barriers and opportunities around Nature-Based Solutions (NbS) implementation in Otago.

Prepared by Beca for the Otago Regional Council.

Executive summary

Around the world, Nature-based Solutions have been credited with saving billions of dollars in flood damage costs - by working with nature instead of trying to control it.

Nature-based Solutions are practical approaches that harness nature's own processes to address climate challenges. They include restoring wetlands to absorb floodwaters and filter pollutants, using bioretention techniques that combine plants and specialised soils to soak up rainfall, planting to prevent erosion, and naturalising rivers and streams to improve water flow and stability.

Nature-based solutions are embedded in key global and national frameworks, and are included in ORC's guiding framework (Strategic Directions 2024 - 2034) as tools for climate resilience, ecosystem restoration, and community wellbeing.

There is an opportunity, and growing expectation, for the Otago Regional Council (ORC) and other councils to play a role in regional delivery.

This report is part of the ORC's efforts to explore how Nature-based Solutions could play a part in reducing the effects of flooding in Otago, helping to protect people, infrastructure and property.

It is part of a wider Nature-based Solutions Study - 'Wai i te reporepo, wai i te wao: What Nature tells us about how to understand and prepare for flooding' and was funded through the Ministry for the Environment's Essential Freshwater Fund and Jobs for Nature programme.

This report highlights the value of working with willing partners, embedding nature-led responses, and unlocking co-benefits through integrated planning, funding and leadership.

By enabling locally led delivery, aligning policy and funding streams, and actively brokering partnerships, ORC can help transform exploratory interest into measurable results. The opportunity now is to move from insights to action – building a more resilient Otago through shared leadership, transparent co-investment and nature-based design.

Engagement study purpose

Around the world, Nature-based Solutions are implemented across both public and private land. Collaborative projects involving landowners, government, iwi, and community groups deliver benefits that extend beyond property boundaries —protecting ecosystems, infrastructure, and people.

This Engagement Study is part of a national Ministry for the Environment (MfE) initiative exploring how Nature-based Solutions could support flood mitigation across Aotearoa New Zealand. Focusing on Otago, the study sought to understand landowner perspectives and uncover challenges and opportunities for implementing Nature-based Solutions on private land.

The study is exploratory —not formal consultation — and is designed to inform. Through interviews, surveys, and review of existing reports, it builds a regional picture of awareness, motivation, barriers, and opportunities.

This report offers a starting point for future collaboration, consultation, and initiatives that support the further integration of Nature-based Solutions into Otago Regional Council (ORC) strategies and actions.

Readers are encouraged to consider how these findings might support regional planning, partnership and funding development, and policy design — and to reflect on their role in enabling Nature-based Solutions for flood resilience.

Findings

The Engagement Study highlighted the region's strong history and shared commitment to working with natural systems to solve challenges.

People are aware of the flood risks and are interested and open to having a conversation about Nature-based Solutions for flood mitigation. Almost everyone could see the benefits and supported ORC investigating them further.

Most people were either open to having a hypothetical Nature-based Solution on their property or interested in discussing it further. They wanted to understand costs and funding, maintenance or access agreements, and to better understand data and modelling. Some landowners indicated they had land they were ready to offer for discussion and potential implementation now, signalling strong early-stage interest.

There were firm ideas about who should lead future work, with the majority suggesting a catchment- or community-led approach, and ORC's role being to provide a regulatory framework, funding, and technical advice.

Some preferred ORC to take the lead, noting the in-house technical expertise that exists.

There were also suggestions to form regional or catchment-level partnership groups, including mana whenua, landowners, non-government organisations (NGOs), and private organisations—that could contribute funding, technology solutions (e.g., AI), and technical expertise to overcome challenges.

The study revealed significant opportunities to ‘work with the willing’ and build on the region’s enthusiasm for natural solutions. There are significant opportunities to weave Mātauranga Māori and contemporary science together. Co-designing processes that pair cultural indicators (tohu) with scientific datasets would unlock deeper, place-based understanding of flood resilience.

By fostering collaboration and addressing gaps in funding, governance, and technical expertise, Nature-based Solutions could begin to be implemented on privately owned land - helping to create a more resilient and adaptable Otago.

The following themes, along with others, are explored further in this report.

Barriers

Awareness gap (flood benefits): People already value the environmental benefits of Nature-based Solutions however initial awareness of their potential for flood mitigation is low.

Technical language: Technical terms, including ‘Nature-based Solutions’, and unfamiliar phrasing can be a roadblock to understanding. People suggested talking about individual solutions (wetlands, river naturalisation) rather than using the term ‘Nature-based Solutions. Graphics and images were seen as helpful.

Trust and relationships: Building trust with landowners is key to implementing Nature-based Solutions. ORC could consider partnering with third party groups, like NZ Landcare Trust, to support engagement.

Regulatory uncertainty: Inconsistent and evolving regulations create challenges and pessimism, with landowners seeking stability and set rules to enable long-term planning and investment.

Lack of local evidence: A lack of local data, modelling, and New Zealand case studies undermines confidence in Nature-based Solutions for flood management.

Expert advice: Free or subsidised access to technical experts could help landowners confidently implement Nature-based Solutions.

Financial constraints: Compensation was not a primary driver for all landowners, with both productive and unproductive land already being fenced off or offered for projects led by catchment groups and other organisations. For some, however, cost-related concerns remain a significant barrier.

Land access and maintenance concerns: Some people want to discuss possible access, maintenance, and reporting agreements with ORC before considering Nature-based Solutions on their property.

Opportunities

Mātauranga Māori and contemporary science: Conversations with members of the Ōtākou and Puketēraki hapū and whānau highlighted the need to merge Māori environmental knowledge and science. Co-designing processes and pairing cultural indicators (tohu) with contemporary datasets can unlock a deeper understanding of flood resilience.

Build on existing enthusiasm: Many landowners are already engaged with wetland and planting projects and are open to future initiatives, if supported with clear guidance and funding.

Scalable implementation: A tiered approach, where ORC leads high-risk interventions and community groups manage smaller or medium-sized projects, could create a balanced strategy. Identifying natural areas to protect can be as important as finding areas to create new projects.

Clear communications campaign and case studies: Providing local case studies will build confidence and interest among landowners. People emphasised the need for short non-technical documents and videos they could understand quickly. A communications campaign was suggested by some landowners.

Strengthen strategic partnerships: Nature-based Solutions can help various people meet their goals - from flood resilience, water quality, biodiversity to building social licence. Partnering with diverse groups can open up new pathways for implementing Nature-based Solutions.

Crown landowners and larger Otago landowners: Focus on Crown landowners such as NZ Transport Agency Waka Kotahi (NZTA), Department of Conservation (DOC), Pamu and other councils, along with larger Otago landowners such as Ngāi Tahu / Kāi Tahu, forestry, stations and those with land in the upper catchments to scale-up Nature-based Solutions.

Provide clear, practical guidance: Developing plain language resources that explain the benefits, planning and consent processes, and practical steps for implementing Nature-based Solutions will help landowners navigate implementation.

‘Normalise’ Nature-based Solutions: Integrate Nature-based Solutions into council functions. Prioritise or include green infrastructure in investment decisions and ensure funding supports delivery.

Innovative funding and co-investment: Explore new ways to fund projects, including private investment, co-funding and alternative government funding.

Introduction and context

The climate is changing and so must our responses. Globally and in Aotearoa, more frequent and intense weather systems are already impacting communities and ecosystems.

Local landscapes, coastal systems, and freshwater catchments are facing pressure, and the interconnected risks of climate change, biodiversity loss, and land degradation demand integrated solutions.

Nature-based Solutions are recognised, nationally and globally, as effective tools for climate adaptation. Often described as ‘Indigenous knowledge in action’, they offer practical and adaptable additions to complement traditional and often rigid ‘hard engineering’ flood mitigation options.

They are included in national direction, with Te Mana o te Taiao – Aotearoa New Zealand Biodiversity Strategy, the National Adaptation Plan, and the Climate Change Strategy all calling for their integration into adaptation planning. Globally, they are aligned with frameworks such as the Kunming–Montreal Global Biodiversity Framework, which prioritises equitable, nature-led responses to climate impacts. They are also highlighted in ORC’s Strategic Directions 2024–2034 as key tools for building climate resilience, restoring ecosystems, and supporting community wellbeing across Otago.

Strengthening climate responses through nature

In late 2023, the Ministry for the Environment provided funding to allow 15 councils to explore how nature-based interventions might be used to mitigate river or coastal flood risk.

The Otago Regional Council (ORC) commissioned two related studies:

- a **Feasibility Study**, modelling the potential flood mitigation benefits of three Nature-based Solutions interventions in Te Hakapupu / Pleasant River catchment, and
- this **Engagement Study**, exploring landowner perspectives on implementing Nature-based Solutions on private land.

The Engagement Study and this report build insight from surveys, interviews, and existing reports. It reveals high interest in exploring Nature-based Solutions for flood mitigation but also highlights where systems are not yet ready—whether due to the lack of national direction, policy and funding, policy ambiguity, lack of knowledge and technical guidance, or gaps in long-term funding pathways.

The focus is primarily on freehold land, though the findings may have relevance for leasehold, Māori land, and Crown-owned areas, particularly where collaborative or catchment-level approaches are possible.

The study, and this report is intended to start conversations and inform ORC’s strategic planning and investment, support region-wide implementation efforts, and contribute to the broader national conversation about how systemically enabled, locally led Nature-based Solutions can build climate resilience in Aotearoa.

Facing the future

Flooding is Otago’s most frequent Civil Defence emergency, threatening homes, land, infrastructure, and the environment. ORC is seeking smarter, more sustainable ways to manage and reduce this risk.

For generations, iwi, landowners and communities in Otago have worked with nature—restoring wetlands, planting, and managing land—to protect waterways and biodiversity. While not always aimed at flood resilience, these efforts show a strong local legacy of using natural systems to solve complex challenges.

ORC’s strategy already blends hard infrastructure (like culverts and floodbanks) with natural tools (like planting and river restoration), supported by drainage management, community education, and emergency response.

As climate change intensifies flood risks, traditional engineered solutions alone won’t be enough. They’ll need to be supported by adaptable approaches - like Nature-based Solutions - that can flex, absorb, and respond to a changing environment.

Flooding is Otago’s most frequent Civil Defence emergency—putting homes, land, and infrastructure at risk.

What are Nature-based Solutions?

Nature-based Solutions harness the power of nature to tackle environmental challenges like flooding, erosion, and water quality issues.

By working with natural systems instead of trying to control or override them, Nature-based Solutions offer practical, sustainable ways to help protect people, property, and ecosystems.

These solutions involve actions like restoring wetlands to soak up floodwater, planting trees to stabilise soil and reduce sediment runoff into rivers and estuaries or creating riparian buffers to protect riverbanks from erosion and improve water quality. But they don't stop there, Nature-based Solutions often bring extra benefits, like boosting biodiversity, creating habitats for native species, and even supporting new economic opportunities through eco-tourism or sustainable farming.

Nature-Based Solutions don't just manage water, they can help restore mahinga kai, enhance biodiversity, and regenerate native habitats. They also support opportunities for eco-tourism and regenerative farming.

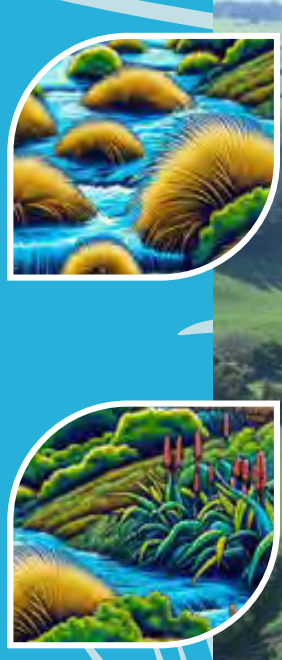
Flood mitigation

Flood mitigation is a prime example of how Nature-based Solutions can be put into action. These solutions work by harnessing ecosystem services (the benefits provided by healthy natural systems) to manage water flow, reduce flood risks, and protect people, property, and infrastructure.

Examples of Nature-based Solutions for flood mitigation include:

- **Wetland restoration:** Wetlands act as natural sponges, absorbing excess water during heavy rainfall and reducing flood peaks downstream.
- **Planting trees:** Trees in catchment areas help slow water runoff, stabilise soil, and reduce the impacts of flash floods.
- **River naturalisation:** Restoring rivers to their natural courses allows them to meander and overflow into floodplains, reducing the impact of flooding downstream.









A nature-based approach to flood resilience in Otago

The diagram below, shared with participants during the Engagement Study, highlights the types of Nature-based Solutions that could support flood mitigation in Otago.



Potential additional benefits

Nature-based Solutions improve water and air quality and enhance biodiversity by creating space for threatened native species. Internationally, we've seen benefits to farmers and communities, and opportunities in areas such as restoration, sustainable farming and eco-tourism.



Elasticity in flood management

Unlike traditional flood infrastructure, which is built for fixed capacity, Nature-based Solutions are integrated into the landscape and designed to absorb, store, and redirect excess water. While they also have a maximum capacity, their placement often means that overflow affects less critical areas, such as fields or pasture, rather than infrastructure, homes and businesses. They can work alone or alongside floodbanks, drains, and other hard-engineered structures, easing pressure on these systems during intense rainfall. This layered approach reinforces existing flood defences, helping them cope with changing conditions while reducing long-term damage. By working with natural processes, it can also make flood management more durable, cost-effective, and environmentally sustainable.

Adaptive resilience means strengthening existing flood defences so they can respond to change—not just withstand it. It's about bending with the pressure, absorbing shocks and adjusting to reduce long-term costs and damage.



The official definition

Ministry for the Environment
Manatū Mō Te Taiao

Te Mana o te Taiao-Aotearoa New Zealand Biodiversity Strategy 2020 defines Nature based Solutions as "solutions that are inspired and supported by nature, cost effective and simultaneously provide environmental, social and economic benefits and help build resilience."

UN environment assembly

Internationally, the Fifth Session of the United Nations Environment Assembly formally adopted (in its UNEA-5 resolution) the definition of Nature-based Solutions as "actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits". The UNEA recognises that Nature-based Solutions "respect social and environmental safeguards, including those for local communities and Indigenous Peoples".

Case studies

There are hundreds of case studies globally which showcase how governments and landowners have collaborated to significantly reduce flood risks.

Websites such as this provide an overview: www.nature4climate.org/nature-in-action/case-studies/



This image of a digital case study map from the Nature4Climate website showcases global examples of nature-led flood mitigation.

Whangārei Urban Awa Project – New Zealand

Lead agency

Northland Regional Council (in partnership with Whangārei District Council, hapū, and community groups

Approach

Collaborative urban stream restoration using riparian planting, fencing, and landowner engagement to improve water quality and flood resilience.

Land use

Mix of public and private land across four urban catchments, with up to 80% subsidies offered to landowners for fencing and planting.

Outcome

Improved flood buffering, reduced sediment and nutrient runoff, enhanced biodiversity, and strong community ownership of local waterways.

Lower Danube Green Corridor – Bulgaria, Romania, Ukraine, Moldova

Lead agencies

World Wildlife Fund (WWF) and four national governments

Approach

A multi-country restoration of floodplains and wetlands along the Danube River to reduce flood risk and support local economies.

Land use

Governments worked with landowners to re-flood former agricultural lands, often through voluntary agreements or compensation to re-introduce natural flooding patterns in areas that were previously drained.

Outcome

Over 600,000 ha of floodplain restored or protected, reducing flood peaks, improving water retention, and boosting biodiversity across four countries.

Wallasea Island Wild Coast Project – United Kingdom

Lead agency

Royal Society for the Protection of Birds (RSPB) in partnership with UK government and Crossrail

Approach

Managed realignment of coastal land to create wetlands, mudflats, and saltmarshes for flood protection.

Land use

Agricultural land was purchased and repurposed for habitat restoration and flood mitigation.

Outcome

It's one of Europe's largest coastal habitat restoration projects, reducing flood risk while enhancing biodiversity.

Darkwoods Forest Carbon Project – Canada

Lead agency

Nature Conservancy of Canada

Approach

Large-scale land purchase to prevent development and restore natural forest and watershed functions.

Land use

Privately owned land was purchased to protect 17 watersheds and improve flood resilience.

Outcome

Enhanced water regulation and biodiversity protection across 54,000+ hectares.

Gathering insights - how we engaged

This engagement study set out to capture a high-level snapshot of perspectives on Nature-based Solutions.

Rather than aiming to represent every stakeholder or landowner, the study gathered indicative insights to inform next steps and spark further conversations and collaboration.

Because of the exploratory nature of the project our engagement strategy was to:

- Build on the relationships ORC has in Te Hakapupu / Pleasant River catchment and work with the Partnership Group.
- Involve organisations or individuals already working with ORC, within catchment groups or on regional projects such as Hill Country Erosion and Wetland Mapping.
- Ask people we interviewed to share the survey and suggest others to take part in interviews.
- Include larger landowners or organisations ORC might want to partner with in the future.
- Share information via ORC and partner communication channels, encouraging people interested in taking part to contact us.

A targeted list of landowners, individual members of the Ōtākou and Puketēraki hapū and whānau and key organisations was developed with ORC staff and catchment advisors. Of those approached, most agreed to take part, resulting in 26 interviews.

Responses have been anonymised and grouped into key themes. This ensures individual privacy while still reflecting the valuable insights shared during the engagement process.

A digital survey was shared via ORC channels such as Onstream and to individual landowners via the catchment coordinators, with 18 people filling in the survey. Some of the individuals who were interviewed also shared the survey with contacts and other individual landowners. The survey was live from January until 30 June 2025.







Interviews

In-depth interviews with landowners and regional stakeholder representatives.

Digital survey

Shared via catchment groups, people we interviewed and targeted landowners.

Communication channels

- ORC and partner newsletters
- Social media posts
- Media release

Past insights, present perspectives

This report also draws on insights from past engagement and existing reports.

Sources reviewed include:

- Toitū Te Hakapupu Restoration Project
- Otago Catchment Stories Summary Report
- Forestry Catchment Plan
- Indigenous Pacific Approaches to Climate Change: Aotearoa/New Zealand (2018)
- NIWA Literature Review
- MfE NbS for Flood Mitigation Workshop Summary
- ORC NbS Engineering Approach and Strategic Plans

Insights from hapū: Foundations for collaboration

Insights were gathered from individual members of the Ōtākou and Puketēraki hapū and whānau, contributing personal perspectives to the engagement process. While these voices reflect lived experience and local knowledge, further co-design and consultation with Iwi and hapū will be required.

What people told us

"Aren't we really talking about traditional indigenous knowledge? Are Nature-based Solutions our indigenous knowledge put into practice?"

"We need councils to make it easier for landowners to use Nature-based Solutions for flood protection. Right now, the planning and consent process feels designed for big developers, not locals trying to protect their land."

"This kind of thing is already happening but not for flood resilience. If some mapping were done and some places found that could make a difference, with a bit of funding we could do this ourselves. Maybe government and council is the technical support and funder rather than the leader?"

"I think the response from the community would be positive."

"They need to be in the upper parts of the catchments to help reduce flood risk in the lower catchment."

"Building trust with landowners would be crucial. There is often suspicion towards council and the government. There is too much change. We start things, then things get stopped and it is hard to trust. I'd even suggest government and council take a back seat on this."

"It is a hard ask for farmers to take on another responsibility, if they were expected to maintain a Nature-based Solution on their farm, unless the financials stacked up."

"Our environment can teach us how to adjust if we pay attention to it. How do we better merge science and traditional knowledge?"

"Do we really know how effective they are? That seems important."

"Maintenance of the solution in terms of weed or pest control, access by the public and the legal structure of how ownership of the land might change are my worries."

"There is a constant 'flip-flop' on government regulations, which makes work for ORC and landowners. People are tired of keeping up. Is this just the next shiny thing? If I put effort into this, will it lead somewhere?"

"I have a lot of land that I have been wanting to plant out, but I just have not got the spare money. I believe there are lots of us who would do more of this type of work ourselves if there was more funding"

"I would want proof, not from other parts of the world but from New Zealand. Does this stuff really work and would it work here in Otago? How much would it cost and is it worth investing in?"

"ORC has a poor reputation amongst some landowners, partly due to compliance and enforcement roles conflicting with technical advisory roles. This has led to trust issues, which could make this a challenge. Getting the right staff involved and senior leaders will help with this."

"Honestly, if the consent form template was better set-up for community and catchment groups rather than developers and this stuff was strategically fast-tracked it wouldn't be so painful, and more people would just do it. There is a fair bit of unproductive land out there that would make sense to do this on, and we all worry about our property and our community."

"Regional rates have increased dramatically in Otago and farmers are concerned about where that is heading. I'm not sure whether Nature-based Solutions for flood mitigation is the best use of ratepayers' money, or if they were best implemented by ORC."

What people told us

"These solutions are not new to Māori. They reflect a chance to return to what we had and there are opportunities to include mātauranga Māori in them"

"I think most people will be happy to put some skin in the game for the good of the region, if ORC and others put some in too."

"Maintenance could be an issue, although landowners do sign maintenance agreements for other projects to get funding, so it is possible."

"My first thought is: 'Sure, I could retire this piece of land, but what am I getting in return?'"

"They can take up space that can be used for farming, it reduces land you can make an income from and growing native plants in central Otago climate is slow and expensive. Anything built needs to fit in with and complement the core basics of farming."

"It would be good to take a more holistic view and be ready to adapt. I worry about all the concrete and how that will adapt to our changing climate."

"Flood risk is not a primary concern for forestry landowners in Otago due to the location of forestry estates, which are typically not in low-lying wetland areas. Work could be done to educate and engage forestry about the broader impacts of flood risk and the benefits of Nature-based Solutions for water management, but we would need solid proof it works."

"I support ORC looking into Nature-based Solutions, but I think the final fix will be a mix of these and traditional methods. I suspect it will be hard for those who have seen other methods work to be open to rates and effort going to something else."

"I do not need data and more and more research. We know this works, let's focus on the outcomes and do it. Instead of spending money on gathering more and more proof."

"I'd want to know if the land would still belong to me or if council or the general public would have access to it before I went too far."

"I'm definitely worried about flooding and forestry slash. Our stream is a trickle but rages at times. We have moved the fencing to suit. Others are doing the same."

"I think this is a good approach but there are a lot of fine details to consider."

"We want solutions that work with the land, not against it, but right now the system isn't set up to support us. Make Nature-based Solutions easier and more accessible, and we'll do the rest."

"Financial constraints are huge. We have done some environmental projects on the farm and have a list of others but can't do them all because of money."

"I think myself and a lot of others would be open to this, but a real concern is who would come on our properties, when and what for. I wouldn't want someone from council or the community showing up whenever they liked. Having agreements around this would make it possible and wouldn't be too hard to agree on."

"I think language is important. You call it a Nature-based Solution, I call it a swamp where I lose my lambs most years. I'd be happy to have someone sort it out, especially if would help with flooding down the way."

Survey snapshot

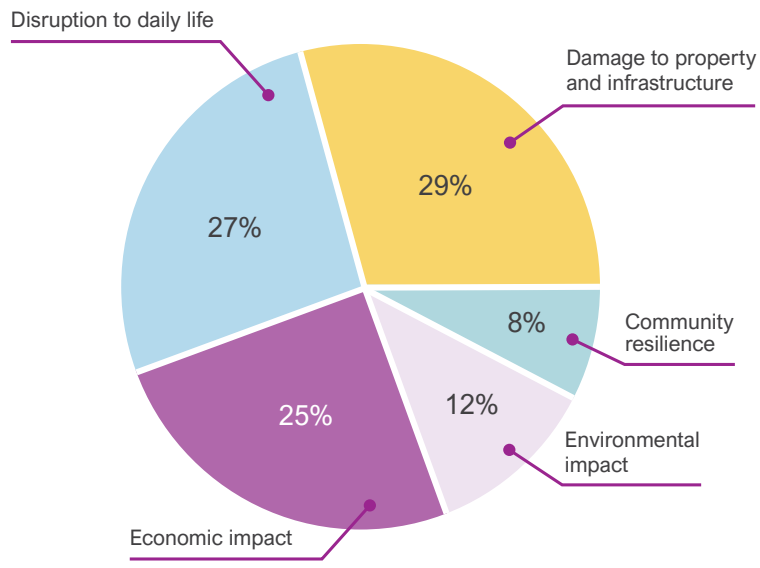
These graphs highlight some of the insights from the digital survey.

Most participants have experienced flooding on their property and expressed support for a variety of Nature-Based Solutions. People felt Nature-based Solutions could work together with existing or new flood infrastructure.

Many also showed interest in participating in education initiatives or pilot projects, in collaboration with iwi and community groups.

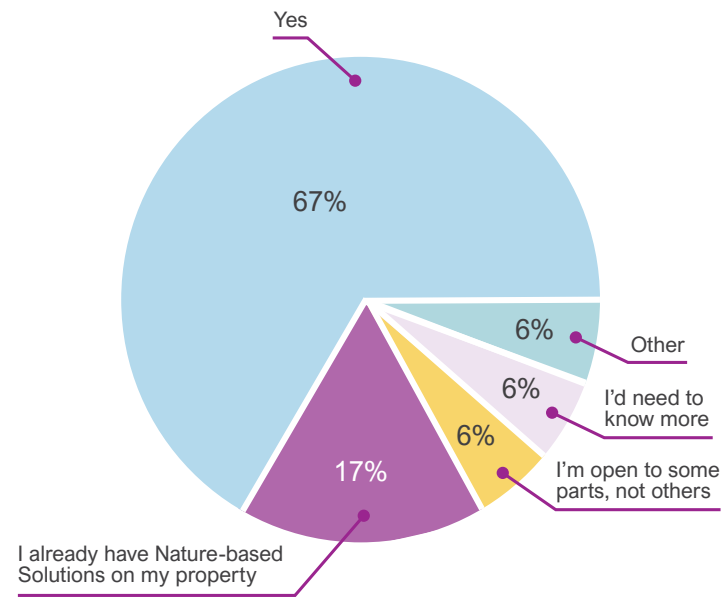
What specific concern(s) do you have about flooding and its impact on you or your community?

The most frequently selected concerns included damage to homes, businesses, infrastructure, and public facilities, power outages, and general disruption. Most participants were less concerned about environmental impacts and biodiversity loss. Highlighting how Nature-Based Solutions can help protect homes and infrastructure by slowing and holding water could help ORC gain support for future projects.



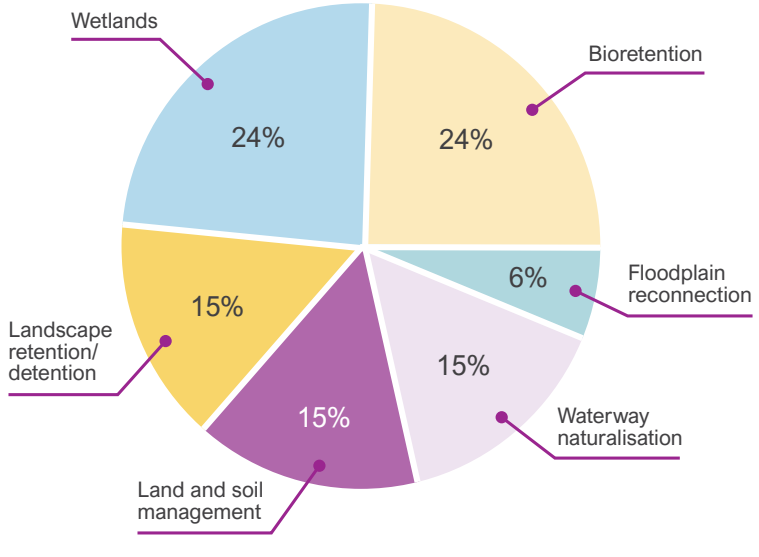
Assuming you were adequately compensated, would you consider making some of your land available for Nature-based Solutions, if it could help reduce flood impacts in the Otago region?

The majority of people would consider making land available, if they were adequately compensated.



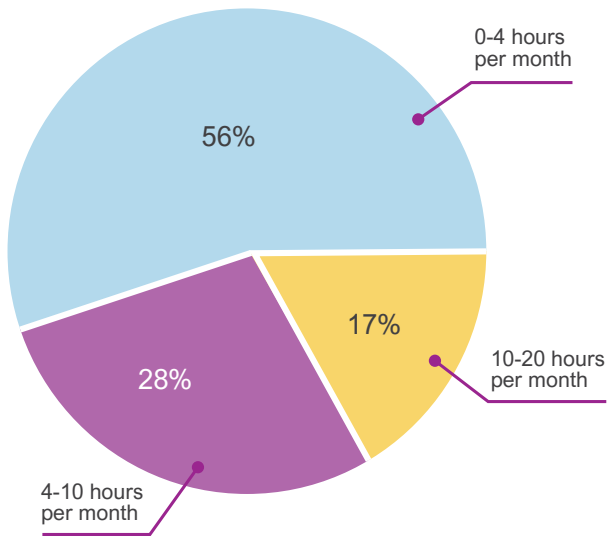
What types of Nature-based Solutions (e.g. wetlands, riparian buffers) might you be open to having on your property?

People shared the kinds of Nature-based Solutions they'd be open to on their land, revealing openness across a range of options.



Assuming you were adequately compensated, how much time and effort would you be willing to put into maintaining a Nature-based Solution(s) on your property?

Most people would be happy to put in their own time to maintain a project on their property. More than half of participants felt that up to four hours a month would be fair, with others happy to do more. Answers to another question in the survey showed more than half of the respondents would be open to allowing council staff or volunteers onto their property to maintain a Nature-based Solution for flood mitigation.





Key findings: Barriers

Limited awareness of flood mitigation benefits

Most landowners were familiar with the environmental benefits of Nature-based Solutions and the various approaches (bioretention systems, wetlands and planting) but some were unaware of or had not considered their flood mitigation potential.

During the interviews and conversations, it did not take long to build understanding, especially with those who work with catchment groups or who had experienced flooding.

Private property access, liability and maintenance

Access, liability, and ongoing maintenance present significant barriers to implementation on certain lands, particularly for forestry and farms. Concerns centre on legal and safety implications when permitting external activities. Some landowners prefer to establish formal agreements - such as MOUs - outlining liability, safety, and maintenance responsibilities before considering access for projects. Others are open to exploring existing models, highlighting successful private land projects and agreements as reference points. Developing clear frameworks that address these concerns collaboratively will be essential.

Lack of local evidence

Locally relevant data, modelling, and case studies were important to some landowners. They are interested in finding out more about global case studies, but the lack of local 'proof' limits some landowners' confidence in adopting Nature-based Solutions for flood management.

Some landowners expressed a desire to see modelling to better understand value.

Some suggested modelling existing projects not originally meant for flood mitigation to gather data about benefits.

Others felt it was more important to be outcomes-focused and 'just get on with it'. There were concerns about spending money on constant investigations when funding could go towards interventions and pilot projects.

Financial considerations

Some landowners highlighted the need for financial incentives to offset the upfront costs associated with implementation. They expressed interest in grant programs, rates relief, subsidies, or tax breaks that could help reduce any financial burden.

Others need to see clear financial benefits or financial support to justify any kind of participation, even future engagement.

Some people raised concerns about loss of income from productive land, issues with future buyers if they sold their land and the cost of their time if they got involved. Some landowners noted that they already engage with ORC and other groups for free, when others are paid for their time.

However, compensation was not a primary driver for all landowners. In Otago, land is proactively being fenced off or offered to catchment groups for projects.

Some landowners we spoke to have land that they would discuss giving up for a Nature-based Solutions to benefit the wider community if there was help to cover the costs of implementation (materials, some labour and professional expertise).

Regulatory uncertainty

New, complex and changing regulations from central and local government, and the uncertainty and complexity they create is a real challenge.

"Look over here, now look over here, now this way. No, back here now."

Inconsistent and evolving regulations create challenges and pessimism, with landowners seeking stability and clear, consistent strategy and policies around Nature-based Solutions to enable long-term planning.

Councils are not seen as always being equipped to provide the necessary technical support and guidance because central government changes so often. The cost of this to ratepayers and councils, along with wasted time and effort was highlighted often, with landowners commenting on how tired they are.

Accessing technical expertise

Landowners highlighted the complexity of implementing Nature-based Solutions, particularly when involving technical aspects like soil management, wetland restoration, or riparian planting. Some lack the knowledge and skills to effectively design and implement these.

Some people would like to 'get stuck in' but want to check things first to avoid wasting money.

Having access to technical experts quickly and in a more casual environment would be helpful. MfE's Access to Experts, which offered free technical advice, was seen as a successful tool in the Otago region.

Councils are not always seen as equipped to provide the necessary technical support and guidance needed. Or if they are, there are not enough staff to go around. Some landowners noted that ORC staff had the technical ability but some felt that they could not provide advice due to liability issues. Clarifying the type of technical advice ORC staff can give, and which staff can offer expert advice would be beneficial.

> ***"Sometimes I just want to have a 10-minute coffee with someone to check that I'm on the right path. It can be hard to find the right person and I don't want to wait for months or end up with a $20,000 report. I've moved on already."***

Technical language

Many people find the term Nature-based Solutions confusing or too technical. They suggested using plain language and focusing on specific examples such as wetlands, river naturalisation, native planting, or bioretention. Clear, community-friendly definitions, supported by visuals and video, were seen as essential for effective communication.

Different landowners are motivated by different outcomes: some by resilience, property protection, and cost-effectiveness; others by water quality and biodiversity. Tailoring messages to reflect what people care about, and avoiding jargon, will support better understanding and uptake.

> ***"We have enough in our heads, please don't make us learn a new language. Help us understand quickly and we will be keen."***

Trust and relationships

Building more trust and being transparent with landowners is crucial. Suspicion towards the government, ORC and other regulatory bodies could hinder collaboration.

Many individual ORC staff are highly trusted and have good relationships in the community but there is some distrust towards the organisation as a whole.

Landowners are open to discussing Nature-based Solutions further but some fear regulatory repercussions or loss of control over their land if they participate in future projects. Someone asked if ORC or the government could take a role as funders and let community or catchment groups, or an organisation like Landcare take the lead on implementing Nature-based Solutions.

There is a need to foster long-term relationships with key landowners and build trust to get support. ORC could choose staff with solid existing relationships to lead the work or collaborate with trusted third parties or organisations, such as NZ Landcare Trust, Fish & Game or catchment groups and allow them to take the lead on landowner engagement.

Bureaucratic challenges or perceptions of challenges

Regulatory processes are complex and not always fit for purpose.

Landowners said that consent forms and paperwork often feel designed for developers, not for community groups or individuals. Even the perception of difficulty can deter action. Some had tried and found it hard; others had not looked into it because it seemed too complex.

People asked whether councils could make it easier to get approval for projects that protect land and communities from flooding. Suggestions included simplifying guidelines, updating templates, and exploring fast-tracking for Nature-based Solutions. The Fast-track Approvals Act 2024 was mentioned as a missed opportunity, with some wondering why Nature-based Solutions aren't included.

Developing catchment-wide consents for Nature-based Solutions such as planting and wetland restoration was suggested.

Key findings: Opportunities

Leverage existing networks and allow others to lead

People emphasised the importance of leveraging existing networks and community groups to facilitate outreach and support for Nature-based Solutions.

Organisations like Fonterra, Landcare, Ravensdown, Fish & Game are already working in this space, and are well respected and connected.

People noted that allowing others to own relationships, working with catchment advisors and catchment groups, or using trusted third parties can make projects move faster.

Some believe initiatives should be community-led or driven entirely by catchment groups.

Embed Māori environmental knowledge

> ***“ This is not new to us. It is a return to what was. ”***

Insights were gathered from individual Ōtākou and Puketēraki hapū and whānau members, who emphasised the importance of incorporating mātauraka Māori into decision-making from the outset. Meaningful integration requires involving Māori leaders in strategy development and working alongside Māori researchers and institutions from the start.

Participants highlighted the need to acknowledge whakapapa and honour the deep ancestral relationships Māori hold with land, water, and ecosystems. These connections should guide how Nature-based Solutions are designed and implemented.

There is strong interest in partnering with Otago Regional Council to explore ways of weaving contemporary science with Māori environmental knowledge, unlocking a deeper, more holistic understanding of flood resilience.

> ***“ It is not science or traditional environmental knowledge - it is science AND traditional environmental knowledge together. ”***

RAG the region

Some landowners and community groups are ready to take action, especially in lower-risk areas with the appropriate support. ORC’s existing RAG (Red-Amber-Green) framework offers a practical way to prioritise catchments by risk level. This could be strengthened by explicitly integrating Nature-based Solutions.

- **Red Areas (High Risk):** ORC takes the lead in managing NbS projects in critical zones with high exposure to natural hazards, such as flood-prone areas near infrastructure or dense populations.
- **Amber Areas (Moderate Risk):** ORC collaborates with trusted groups like catchment organisations, iwi, and environmental groups to co-design and implement NbS projects.
- **Green Areas (Low Risk):** Community groups, landowners, and organisations lead initiatives, with ORC providing guidance, resources, and occasional oversight.

Funding and technical assistance would be tailored to risk levels, empowering landowners to take action while ensuring ORC’s resources are focused where they are most needed. This aligns with global best practices that advocate for a diverse portfolio of Nature-based Solutions to address various scales and contexts of flood risk.

Clear and consistent strategy and regulations

There is a need for clear, consistent policies that support Nature-based Solutions.

Some people suggested that Nature-based Solutions be added to Regional and District Plans and make them the go-to option for resource consents. Others emphasised the need for regulatory certainty and alignment across planning functions.

> ***“ I would help, but not if there is a paperwork hurdle around every corner from council or government – the very people asking me to do it. Clear the path for us. ”***

ORC has started reviewing policy and strategy frameworks to better support Nature-based Solutions.

GIS and data

People noted the amount of data that is readily available which could help identify high-priority sites for future intervention:

- **Wetland and riparian areas** – Existing wetlands, potential restoration sites, and buffer zones.
- **Flood-prone locations** – Historic flood data, hydrology models, and floodplain maps.
- **Historic wetlands** – GIS layers identifying historic wetlands that could be restored to act as natural buffers
- **Catchment insights** – Land use, soil permeability, terrain, and water flow patterns.
- **Interested landowners** – Mapping those keen to take part in Nature-based Solutions projects.
- **Existing research** – Studies like Dr. Sami Khan's wetland work for Otago and Hill Country Erosion.
- **Mātauranga Māori perspectives** – Incorporating Māori knowledge of ancestral flood pathways, wetlands, and traditional ecological indicators to align NbS efforts with cultural and environmental values.

By combining these layers and partnering with Crown and private researchers, ORC could pinpoint priority sites for wetland restoration, reforestation, and river naturalisation—creating a targeted, data-backed plan for flood resilience.

A spatial planning and prioritisation approach, underpinned by GIS tools, would help ORC pilot projects, guide funding decisions, and collaborate effectively with landowners, catchment groups, and experts.

Work with the willing

Many landowners already contribute land and their own funds to wetland and planting projects for biodiversity and water quality.

People said the existing willingness could be expanded to include Nature-based Solutions for flood mitigation with the right guidance, regulatory support and funding.

Catchment groups and organisations such as Fish & Game, Landcare and Fonterra have put out Expressions of Interest for partially funded projects and have been inundated with interested landowners, who in some cases have invested their own time and money to fence off areas and maintain wetlands and other projects.

Explore what exists

People highlighted available resources and existing information that could help implement Nature-based Solutions for flood mitigation, including:

- The University of Canterbury are developing tools to enhance the accuracy and efficiency of flood modelling: **New flood technology to prepare communities | University of Canterbury**
- Other crown researchers (Scion, NZTA) who have flood modelling and data to build a bigger picture.
- $5 from each hunting licence goes towards projects like wetlands, why not expand it to flood resilience - Fish & Game
- Can resilience funding be expanded to include Nature-based Solutions, or can projects be retrofitted to gather proof for future work?
- Expanding the carbon trading system to wetlands and flood resilience projects.
- Opportunities to add flood modelling into wetland projects to act as case studies.
- Focus on natural areas we have already that may play a part in flood mitigation and protect them.

Build awareness and understanding

Landowners emphasised the need for clear and concise information about the potential benefits of Nature-based Solutions. They noted that information is often hard to find, long winded and technical and does not suit the audience. Others noted that information was often in numerous places online.

> ***"I don't want to go looking for it and read these huge reports that are written for some technical expert's ego. I want to talk to someone, watch a 2-minute video or read something short and helpful that fits the situation I am in."***

People suggested the ORC work with others to agree a one-stop shop to host information and compile best practice, case studies and evidence from MfE pilot studies. This should be led by non-technical people or communications experts, who will focus on the audience needs.

Social licence and community perception

Social licence remains a challenge for industries such as insurance, banking, farming, engineering, and infrastructure and forestry. People wondered if Nature-based Solutions could offer an opportunity for these groups to build and strengthen trust and social licence by delivering visible environmental benefits and responding to community concerns.

By actively contributing to (land, expertise or other) or funding Nature-based Solutions projects or research, these groups could be positioned as partners in regional resilience, benefiting them and Otago communities.

Landowner-led Community of Practice

There was strong interest in connecting with other landowners to share knowledge and experiences. Many saw value in learning from both the successes and challenges of others, and expressed support for fostering a community of practice around nature-based solutions (NbS).

Participants were keen to build this community through pilot projects, local and national case studies, and peer-led events. Practical formats such as on-land gatherings, webinars, and 'lunch and learn' sessions were seen as especially useful for encouraging engagement and shared learning.

Normalise Nature-based Solutions

People asked if or how ORC would make Nature-based Solutions an everyday core part of council functions.

One interviewee, who has past experience working in local government, highlighted the importance of embedding Nature-based Solutions in regional and district plans, prioritising them in long-term investment planning and procurement, and ensuring funding streams support delivery.

> ***"It needs to become so normal, so second nature that we do not even name it. That starts from the inside out and flow through every part of government and council."***

Larger landowners and crown land

People discussed larger landowners in Otago and how they could get involved in large scale projects. Some people felt it would be better for ORC to concentrate on these groups, although it was noted that the formal agreements required could slow things down.

The Crown, Ngāi Tahu, privately owned forestry companies, University of Canterbury, and University of Dunedin along with Dunedin City Council (including council-owned City Forests Limited) are some of the larger landowners in Otago.

This 2019 RNZ article provides a comprehensive list of the type of information that is publicly available, and which could support future research: https://www.rnz.co.nz/news/in-depth/401186/nz-s-top50-private-landowners-revealed

Address the finer details

People talked about the need to start looking into the practical things early - like possible access, maintenance, safe access and financial agreements.

There was interest in reviewing global case studies and further engagement to begin to explore possible frameworks, MOU agreements and ideas together.

It was noted that some Otago catchment groups and organisations such as NZ Landcare have experience in this space and can share what works.

For some landowners, less formal agreements were considered suitable, while others (such as forestry) will require formal agreements covering access, liability and other aspects.



Explore financial incentives with landowners

People encouraged ORC to look into funding options—grants, tax breaks, and compensation schemes—that would make it easier for landowners to adopt Nature-based Solutions. A focus group was suggested as a good way to figure out what could work.

Many felt that aligning council funding with Nature-based Solutions would help, with ideas to include them in existing grants, biodiversity funds, and budgets.

Some pointed out that the way funding is structured now makes it harder for landowners to get involved, and that criteria and project evaluation processes need updating.

Expanding Nature-based Solutions eligibility in resilience, climate adaptation, biodiversity, and water quality funding was also mentioned, along with a review of community funding sources like the EcoFund.

Innovative ideas

People highlighted ideas for the government or council to consider, which have been built on below:

- Develop data-driven flood mitigation strategies, combining Mātauranga Māori insights, GIS and AI modelling, and hydrological research
- A region-wide approach to funding applications to access both government and private streams.
- Landowners join a regional flood resilience co-op where councils or government provide equipment, seedlings, hydrology modelling, and technical expertise for projects.
- Councils or government collaborate with insurers to create Nature-based Solutions-linked discounts for landowners who implement flood-mitigation projects.
- Wetlands and riparian buffers reduce flood risks, so insurers could offer lower premiums or risk-sharing incentives for private properties that contribute to resilience.
- Councils or universities help track data and prove effectiveness, making it easier to get funding.



From insight to action: Embedding Nature-based Solutions (NbS)

Make NbS the new normal

Shift NbS from exception to expectation through policy and planning.

Outcome
Policy clarity, regulatory certainty, planning confidence.

Stratetic leadership

Embed NbS into ORC strategy, systems, and staff culture.

Outcome
Visible leadership, internal alignment, a culture that champions NbS.

Grow awareness and understanding

Shift mindsets through plain language, trusted messengers, and hands-on learning.

Outcome
Informed and empowered communities ready to support and deliver NbS.

Practical action

Plan and deliver catchment-scale NbS—practical, visible, and local.

Outcome
Local proof, confidence, scalable models, visible momentum.

Partner with purpose

Build the partnerships needed to solve this shared challenge and unlock NbS potential.

Outcome
Scalable and financially sustainable NbS delivery.

Innovative funding

Tap into public, private, and global capital to unlock co-funding models and investment.

Outcome
Shared ownership, trusted delivery, and enduring, culturally grounded partnerships.

Shaped by Otago voices and global insight, these six streams show what's needed to enable Nature-based Solutions (NbS). Like Otago's braided rivers, they must flow together to support a resilient future. They offer a framework to guide ORC's alignment, partnerships, and future investment in flood resilience.

Strategic leadership

Align ORC strategy, capability, and culture

ORC must lead by example—embedding NbS into its own systems, strategies, and staff culture.

Outcome
Visible leadership, internal alignment, a culture that champions NbS.

Key actions

- Establish a cross-departmental governance group and community of practice with mana whenua representation
- Embed NbS into the LTP, infrastructure strategies, and flood risk frameworks with dual knowledge systems (mātauranga Māori and contemporary science)
- Build internal capability through training, secondments, and shared language across teams.
- Identify ORC-owned land or upcoming projects to demonstrate NbS for flood mitigation
- Draft a relationship matrix for key stakeholders and landowners (compliance and engagement focus) to build trust and clarify roles

Mātauranga Māori is not an add-on

Māori knowledge systems are holistic, place-based, and relational—offering critical insights into land, water, and climate grounded in whakapapa and whenua.

Conversations delete with mana whenua highlighted how place names, oral histories and mātauranga Māori offer critical insights into flood behaviour and land use.

For NbS to be effective, mātauranga Māori must be embedded from the outset, alongside contemporary science, in strategy, planning, and the design processes.

ORC is committed to mana whenua partnership, as outlined in the Significance, Engagement and Māori Participation Policy. Embedding mātauranga Māori into strategy and operationalising it will be a key shift. A move towards NbS and a review of existing systems, and evaluation frameworks alongside mana whenua could support this.

Make NbS the new normal

Shift NbS from exception to expectation through policy, planning and investment.

Outcome
Policy clarity, regulatory certainty, planning confidence.

Key actions

- Integrate NbS into the Land and Water Regional Plan, floodplain strategies, and catchment management frameworks
- Ensure NbS is eligible across climate adaptation, biodiversity, and water quality funding streams
- Prioritise green infrastructure in consenting and infrastructure investment decisions
- Explore a regional catchment strategy using a RAG (Red-Amber-Green) rating system, prioritising high-risk flood zones for larger ORC-led interventions, identify areas where others can lead
- Explore global consents and revise templates to support community- and catchment-scale NbS
- Advocate for a national NbS strategy and long-term regulatory certainty
- Review evaluation frameworks to align with international standards (e.g. IUCN Global Standard) and mātauranga Māori

Grow awareness and understanding

Shift mindsets through plain language, trusted messengers, and hands-on learning.

Outcome
Informed and empowered communities ready to support and deliver NbS.

Key actions

- Launch a regional NbS communications campaign using plain language, local imagery, and relatable stories
- Co-develop “how-to” resources tailored to different audiences, with mana whenua
- Enable on-land learning through training days, drop-in sessions, and peer-to-peer exchanges
- Share case studies and modelling through ORC and trusted partner channels
- Celebrate local leadership through profiles and media opportunities
- Monitor public understanding and support - use the digital survey as a base to track shifts in awareness
- Align with national and other regional campaigns to reinforce messages

Practical action

Plan and implement NbS across whole catchments—integrating hydrology, land use, and community values.

Outcome
Local proof, confidence, scalable models, visible momentum.

Key actions

- Map catchment-wide opportunities (wetland mapping, GIS layers, existing data)
- Retrofit existing biodiversity or water quality projects to include flood resilience outcomes
- Prioritise pilots in upper catchments on large properties to maximise scale, visibility, and co-benefits
- Co-design pilots with landowners and mana whenua; test delivery system (access, maintenance, co-investment)
- Align catchment planning with infrastructure upgrades, climate adaptation, and biodiversity strategies
- Monitor, evaluate, and adapt each pilot to refine policy and delivery models



Partner with purpose

This is a shared problem and strategic partners are essential.

Outcome
Shared ownership, trusted delivery, and enduring, culturally grounded partnerships.

Key actions

- Establish a regional NbS Partnership Forum including mana whenua, Crown landowners (e.g. DoC, NZTA, MfE, LINZ, Kānoa – MBIE, Pamu, private sector and landowners
- Partner with large landowners - Crown, other councils, Ngāi Tahu, universities, stations, forestry and private industry (Santana Minerals) to unlock scale and mutually beneficial opportunities
- Establish catchment-level groups to co-design and co-deliver NbS locally
- Explore flexible leadership models (mana whenua-led, ORC-led, community-led)
- Develop partnership charters or MOUs to guide shared delivery and governance

Innovative funding

Innovative funding and co-investment

Tap into public, private, and global capital to unlock co-funding models and long-term investment

Outcome
Scalable and financially sustainable NbS delivery.

Key actions

- Establish a regional NbS Investment Roundtable with crown, philanthropic, and private sector partners and explore co-investment models and required measurable outcomes
- Host an annual “NbS Investment Forum” with iwi, insurers, philanthropic funders, and businesses to share data, pilot learnings, and co-design funding streams
- Explore co-investment models, ESG-aligned finance, and developer-funded offset schemes
- Co-fund projects with insurers to deliver NbS that reduce flood claims
- Work with central government to apply for global climate grants for large-scale projects (e.g. UNDP, World Bank, Green Climate Fund)
- Identify projects that could be community-led and broker access to funding streams
- Align ORC community funding, and biodiversity/climate grants with NbS outcomes
- Update procurement policies to prioritise NbS and contractors/suppliers who deliver them
- Incorporate climate finance literacy into council and community training
- Bundle projects across multiple catchments. Combine high-risk and medium-risk sites into multi-site funding proposals that attract larger investment pools and demonstrate system-wide impact
- Develop a regional NbS financing roadmap Set out pathways for co-investment, including timelines, partner roles, ROI projections (environmental and financial), and scalability options
- Pilot outcome-based payments and long-term maintenance support for landowners
- Allocate dedicated funding for mana whenua-led NbS projects and monitoring frameworks

Conclusion

On giants' shoulders - building on regional expertise and energy

Iwi, hapū, the ORC and local communities have a long history of working with natural systems to solve challenges in Otago.

While Nature-based Solutions have traditionally been used more to support water quality, erosion control, and biodiversity, this initial engagement shows there is clear interest in scaling up Nature-based Solutions on private property as part of the regional flood resilience strategy.

With some landowners already discussing potential sites on their properties and Nature-based Solutions embedded in national policy, ORC is well positioned to begin to move from exploration and strategy into partnership and delivery.

This is a chance to build on Otago's ecological legacy, enabling practical, locally led solutions through collaboration, innovation, and environmental leadership.



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10.7. Annual Returns of Inactive Subsidiaries

Prepared for: Council

Report No. CS2526

Activity: Governance Report

Author: Sarah Munro, Group Financial Controller

Endorsed by: Nick Donnelly, General Manager Finance

Date: 27 August 2025

PURPOSE

[1] To pass resolutions in lieu of holding annual general meetings for Council's three wholly owned inactive subsidiaries. The resolutions are to not hold an annual general meeting and to not appoint an auditor for each company.

EXECUTIVE SUMMARY

[2] Council is the sole shareholder of three inactive subsidiaries. These shareholdings are retained to ensure the company names cannot be used by anyone other than Council.

[3] Under the Companies Act each company is required to have either an Annual General Meeting, or under Section 122 of the Companies Act the shareholders may pass a special resolution that it shall not be necessary for a company to hold an annual general meeting if everything required to be done at that meeting is done by resolution.

[4] At an Annual General Meeting, the company must decide whether to appoint an auditor. A company need not appoint an auditor if a unanimous resolution is passed by all the shareholders.

[5] Given that the companies are inactive, it is recommended that Council pass two resolutions for each of the companies; the first to not hold an Annual General Meeting, and the second to not appoint an auditor.

RECOMMENDATION

That the Council:

1) ***Approves*** *the following resolutions:*

   a. *That it shall not be necessary for Regional Services Limited to hold an Annual General Meeting under section 120 of the Companies Act 1993.*

   b. *That no auditors be appointed for Regional Services Limited under section 196 (2) of the Companies Act 1993.*

   c. *That it shall not be necessary for Regional Pest Services Limited to hold an Annual General Meeting under section 120 of the Companies Act 1993.*

d. That no auditors be appointed for Regional Pest Services Limited under section 196 (2) of the Companies Act 1993.

e. That it shall not be necessary for Regional Monitoring Services Limited to hold an Annual General Meeting under section 120 of the Companies Act 1993.

f. That no auditors be appointed for Regional Monitoring Services Limited under section 196 (2) of the Companies Act 1993.

BACKGROUND

[6] Due to the significance and profile of Council's previous Regional Services Business Unit, the Council, solely for name protection purposes, registered the following companies in April 2006:

- Regional Services Limited;
- Regional Pest Services Limited;
- Regional Monitoring Services Limited.

[7] The companies are inactive, and do not have constitutions. The companies are owned 100% by the Otago Regional Council, with a share issue of 100 shares in each company. It is considered important to retain these companies, as this will ensure that the names cannot be used by any other party. The use of these names would suggest a linkage to the Otago Regional Council.

[8] Section 214 of the Companies Act 1993 requires that an Annual Return be completed for each of the above companies each year. The Annual Return includes providing information on shareholding, auditors and Annual General Meetings.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[9] There are no strategic framework and policy considerations.

Financial Considerations

[10] There are no financial considerations.

Significance and Engagement Considerations

[11] There are no significance and engagement considerations.

Legislative and Risk Considerations

[12] There are no legislative or risk considerations.

Climate Change Considerations

[13] There are no climate change considerations.

Communications Considerations

[14] There are no communications considerations.

NEXT STEPS

[15] Finance staff will file the Annual Return for the three subsidiary companies.

ATTACHMENTS

Nil

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

1. Confidential Minutes of Council 23 July 2025

3.1 Decision on Electric Charging Depot in Queenstown

3.2 Update on the Proposed Otago Regional Policy Statement

The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter, and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are as follows:

General subject of each matter to be considered	**Reason for passing this resolution in relation to each matter**	**Ground(s) under section 48(1) for the passing of this resolution**
1.1 Confidential Minutes of Council 27 July 2025	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) To enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations) – Section 7(2)(i) To prevent the disclosure or use of official information for improper gain or improper advantage – Section 7(2)(j) To protect the privacy of natural persons, including that of deceased natural persons – Section 7(2)(a)	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 Decision on Electric Charging Depot in Queenstown	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.
3.2 Update on the Proposed Otago Regional Policy Statement	48(1)(a) To maintain legal professional privilege – 7(2)(g). 48(1)(d) a right of appeal lies to any court or tribunal against the final decision of the local authority in those proceedings- (i)	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. and 48(1)(d) that the exclusion of the public from the whole or the relevant part of the proceedings of the meeting is necessary to enable the local authority to deliberate in private on its decision or recommendation in any proceedings to which this paragraph applies.

This resolution is made in reliance on section 48(1)(a) of the Local Government Official Information and Meetings Act 1987 and the particular interest or interests protected by section 6 or section 7 of that Act or section 6 or section 7 or section 9 of the Official Information Act 1982, as the case may require, which would be prejudiced by the holding of the whole or the relevant part of the proceedings of the meeting in public.

It will also be moved that:
Edward Guy (Rationale) ***be permitted to remain at this meeting, after the public has been excluded, because of their knowledge of the Electric Charging Depot in Queenstown. This knowledge, which will be of assistance in relation to the matter to be discussed, and relevant to that matter because of their expertise of the matter.***

and Simon Anderson (Ross Dowling) ***be permitted to remain at this meeting, after the public has been excluded, because of their knowledge of the Proposed Otago Regional Policy Statement. This knowledge, which will be of assistance in relation to the matter to be***

discussed, and relevant to that matter because of their provision of legal advice on the pORPS.

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.