Policy Committee - 28 November 2018 Attachments

Minutes of a meeting of the Policy Committee held in the Council Chamber at Philip Laing House, Dunedin on Thursday 18 October 2018, commencing at 1:00 pm

Membership

Cr Gretchen Robertson	*(Chairperson)*
Cr Michael Laws	*(Deputy Chairperson)*
Cr Graeme Bell	
Cr Doug Brown	
Cr Michael Deaker	
Cr Carmen Hope	
Cr Trevor Kempton	
Cr Ella Lawton	
Cr Sam Neill	
Cr Andrew Noone	
Cr Bryan Scott	
Cr Stephen Woodhead	

Welcome

Cr Woodhead welcomed Councillors, members of the public and staff to the meeting.

1. APOLOGIES

NIL

2. LEAVE OF ABSENCE

No Leave of Absence were advised.

3. ATTENDANCE

Sarah Gardner	*(Chief Executive)*
Nick Donnelly	*(Director Corporate Services)*
Tanya Winter	*(Director Policy, Planning and Resource Management)*
Sian Sutton	*(Director Stakeholder Engagement)*
Gavin Palmer	*(Director Engineering, Hazards and Science)*
Scott MacLean	*(Director Environmental Monitoring and Operations)*
Sally Giddens	*(Director People and Safety)*
Ian McCabe	*(Executive Officer)*
Lauren McDonald	*(Committee Secretary)*
Anita Dawe	*(Manager Policy) Items 10.1, 11.1*
Rachael Brown	*(Senior Policy Analyst) Item 10.1*

4. CONFIRMATION OF AGENDA
The agenda was confirmed as tabled.

5. CONFLICT OF INTEREST
No conflicts of interest were advised.

6. PUBLIC FORUM
No public forum was held.

7. PRESENTATIONS
No presentations were held.

8. CONFIRMATION OF MINUTES
Resolution

That the minutes of the meeting held on 13 September 2018 be received and confirmed as a true and accurate record, with the correction noting Cr Kempton's vote against the motion.

Moved: Cr Hope
Seconded: Cr Kempton
CARRIED

9. ACTIONS
Status report on the resolutions of the Policy Committee.

Amendment 2 (National Environmental Standards for Plantation Forestry) to the Regional Plan: Water for Otago	13/06/2018	*b) Make Amendment 2 (NES Plantation Forestry) operative from 1 July 2018.* *c) Publicly notify Amendment 2 (NES Plantation Forestry) on Saturday 30 June 2018*	OPEN
Air Quality Strategy	13/06/2018	*c) That a paper on implementation be brought to the Policy Committee in the next 2-3 months*	OPEN
Draft Biodiversity Strategy - Feedback	13/6/2018	*c) That a paper on implementation be brought to the Policy Committee in the next 2-3 months*	
Director's Report on Progress to 13 June 2018: Minimum Flow Plan Change Manuherikia, Arrow and Upper Cardrona catchments	13/6/2018	a) *That 31 August is confirmed for notification subject to Minimum Flow figures and missing section 32 components being completed and brought to the Council and brought to the communities.*	
Minimum Flow Plan Change Update	1/8/18	That the CEO engage an appropriately qualified facilitator to help consultation associated with Priority Catchments Minimum Flows and Residual Flow Plan Change. (Mrs Gardner advised this action was in process, with a facilitator to be appointed.	

10. MATTERS FOR COUNCIL DECISION

10.1. Biodiversity Action Plan

The report sort approval to discuss the Council's draft *Biodiversity Action Plan/ Te Mahi hei Tiaki i te Koiora* with Runaka and key stakeholders, to enable targeted feedback, ahead of the plan approval by the Council.

Mrs Anita Dawe, Manager Policy and Ms Rachael Brown, Senior Policy Analyst in attendance.

Ms Winter advised that the strategy was developed in consultation with Iwi, a wide range of agencies and non-governmental organisations (NGOs), and communities. Consultation had indicated that there was widespread support for the Council taking a stronger role in strategic leadership, coordination and in active management to maintain, protect and enhance Otago's biodiversity. She advised that the strategy is largely intended to improve biodiversity outcomes through support for community-based programmes and by addressing gaps in areas of biodiversity work

Ms Brown outlined the Biodiversity Action Plan, its five key priorities and actions.

Resolution

That the Committee:

a) ***Approve*** *the draft Biodiversity Action Plan in Attachment 2 for consultation with iwi and key stakeholders before a final draft is brought back to this committee for approval on 28 November 2018.*

Moved: Cr Woodhead
Seconded: Cr Scott
CARRIED

10.2. South Dunedin Collaboration

The report outlined the 2018/28 LTP provision for ORC to support Dunedin City Council (DCC) in the South Dunedin Future programme in the years 2018/19 to 2021/22, including technical work to assist inform of stormwater management, climate change and natural hazards adaptation decisions for South Dunedin and Harbourside.

Discussion was held on governance partnership with the DCC to establish a vision and foundation for a pathway forward on technical investigations.

Motion:
That through the Chairperson and the CE, we initiate discussion around forming a governance group on South Dunedin including councillors.

Moved: Cr Kempton
Seconded: Cr Deaker

Discussion on the motion:

- Formation of a governance to include the Mayor, Chairperson together with one councillor and one staff member from each council.

- That ORC take a leadership role rather than a partnership role to advance.
- For ORC to have clarity on its vision, timetable and role for addressing the groundwater and sea level rise issues for South Dunedin.
- Improved liaison with DCC re infrastructure.

Cr Kempton (Right of Reply) sought for the motion to replace report recommendation (b) and that recommendation (c) be removed, as below:

(a) This report is received and noted.
(b) The commitment of ORC to work collaboratively with DCC on the management of natural hazards and the effects of future climate change for South Dunedin/Harbourside is reaffirmed.
(c) The Chairperson, Chief Executive and relevant staff engage with the Mayor, Chief Executive and relevant staff of DCC to discuss and agree the basis for continued collaboration including the process and timeframe for developing a joint vision and programme of work, and community and stakeholder engagement

Resolution

That the Committee:
a. This report is received and noted.
b. *That through the Chairperson and Chief Executive that ORC initiate discussion around forming a governance group on South Dunedin, including councillors.*

Moved: Cr Woodhead
Seconded: Cr Deaker
CARRIED

A request was made for Dr Palmer and Ms Winter to provide a report on ORC's legal responsibilities for South Dunedin in regard to policy, climate change and hazards to the Policy Committee as soon as possible.

11. MATTERS FOR NOTING

11.1. Director's Report on Progress

'The report detailed policy responses, ORC: Policy, Plans and Strategies, and Water Quantity Plan Changes.

Ms Winter provided feedback from the recent Lower Waitaki Plains Aquifer meeting and advised that group had engaged Aqualinc to undertaken technical work on containment loads and irrigation for them.

Ms Winter advised that a report would be provided to the next Policy Committee meeting around the Ministry for the Environment (MfE) guidance on the implementation of the National Policy Statement for Freshwater Management (NPSFM).

Waste Plan
Ms Winter advised staff were undertaking a review of the Waste Plan to TW advised we looking at a review of waste plan to connect with the review of the Water Plan to identify gaps in the plan for land

It was agreed the need for clarity of the Waste Plan rules with the public and how this fitted in with attributes of other plans, e.g. Water, Air.

Resolution

That a paper be brought to this table detailing issues or gaps of the Waste Plan that need to be addressed. The report to include comment on the statutory responsibility as regard to waste for ORC.

Moved: Cr Scott
Seconded: Cr Brown
CARRIED

Resolution

a) That this report be noted.

Moved: Cr Woodhead
Seconded: Cr Hope
CARRIED

11.2. Government's New "Essential Water" Policy Framework
The report outlined the Government's new "Essential Water" policy framework announced on 8 October 2018.

Resolution:

a) That Council note this report; and

b) That Council ask the Director Policy, Planning and Resource Management to provide an analysis of the impacts of this new policy framework for Otago and this Council to its Policy Committee in November 2018.

Moved: Cr Neill
Seconded: Cr Deaker
CARRIED

12. NOTICES OF MOTION

No Notices of Motion were advised.

13. CLOSURE

The meeting was declared closed at 03:15 pm.

Chairperson

Proposed detailed work programme

Key priorities

The **key priorities** ORC will focus on are:

- Encouraging efficient use of compliant burners
- Phasing out non-compliant burners
- Encouraging low impact heating (ultra-low burners, pellet fires, heatpumps etc.):
    - In new developments and
    - When people change their heating appliance, including to become compliant with rules
- Reducing outdoor burning.

Priority areas remain Air Zone 1 towns (Arrowtown, Cromwell, Clyde and Alexandra) and Milton; as well as Mosgiel and the region's high growth areas.

ORC will nonetheless ensure that all sources of emissions are appropriately dealt with, and that good air quality is achieved throughout the region, as indicated in the strategy.

Activities

Communication and engagement

Building a coherent message and air quality "brand"

The success of ORC's air quality programme will depend on the coherence of each component of the programme, and the coherence of the message that is put forward to the community.

A successful re-branding of ORC's air quality programme would signal changes to the ORC approach, and would support all elements of the air quality programme. It should also align with the public' aspirations and goals; and introduce positive messaging. Environment Canterbury has for example put the emphasis on heating when adopting their "warmer cheaper" home.

Getting the community engaged

Communication with the general public

The ORC will use active public communication and promotion campaign to raise awareness on Otago's air pollution issues, and to provide all necessary information on:

- Low impact heating;
- Good burning practices;
- All available financial assistance and any other council's initiatives.

Those campaigns will involve the review of all information and education material, their format and their scope.

To reach as wide an audience as possible in the whole region, those campaigns will use engaging content and media, and any other innovative solutions, to reach as wide an audience as possible. A specific website could be created to "tell the story" of air quality in Otago, what the council does, and integrate all information on good burning, clean appliances, funding available etc. Examples of such websites include Environment Southland's "Breathe Easy" website (http://www.breatheeasysouthland.co.nz/), and ECan's "Warmer Cheaper" (https://www.warmercheaper.co.nz/).

ORC will seek a more active community involvement in priority towns (Air Zone 1 towns and Milton), for example by promoting school science projects, promoting citizen science, and developing a medium for people to share their experiences of air quality in their towns. Wherever possible, the ORC will showcase and demonstrate the benefits of "cleaner" heating appliances with live example, and will, as much as possible, recruit ambassadors among early adopters of those technologies in the community; and among suppliers.

Efficiency will be realised by taking opportunities for partnerships and shared content with other entities, including other regional councils.

Communication with suppliers

ORC will liaise with suppliers of heating appliances and wood/fuel suppliers, to ensure they can inform their customers of the issues, of the rules and available financial assistance, and also to get informed of any issue or constraints with supply chains that could inform ORC's initiatives.

Similarly, when it comes to new buildings and new developments, the ORC will liaise with developers to promote community heating and efficient buildings.

Communication with the rural community

Similarly, the ORC will liaise with rural industries to gain greater understanding of outdoor burning practices, advise on the impact of outdoor burning and on available alternatives. This will also be an opportunity to better understand the use of chemicals and hazardous substances in Otago's rural community.

Financial assistance

According to our estimates, there are around 2,510 inefficient burners in Arrowtown, Alexandra, Milton and Mosgiel[1]. The cost of ultra-low emission burners vary between $5,500 and $11,000, excluding installation costs. While the upfront costs of pellet fires and heatpumps are lower (approx. $5,000), they have higher running costs.
Otago's household are likely to require financial assistance to be able to transition towards those low impact heating appliances.

The current "Clean Heat Clean Air" programme has a few limitations, which will need to be addressed:

- It focuses on compliant appliances, which, we now know, will not deliver the region's air quality objectives
- It focuses on the current air zone boundaries. Those boundaries are now outdated, due to urban growth in Central Otago and Queenstown lakes;
- It does not focus on worst emissions and highest needs, and on providing the most adequate level of assistance to households depending on their resources.

The programme therefore needs to be reviewed and refocused. This will also be the opportunity to:

- Promote low impact heating appliances better;
- Identify "gaps" in funding and work with funding partners to ensure that available funds provide a comprehensive package to Otago's households for warmer homes and emission reduction;
- Re-assess how ORC and Cosy Home Trust work together, to ensure that the trust receives the support they need to deliver ORC's specific objectives, and set clear boundaries over lines of responsibility;

[E]Estimation based on Emissions inventory 2016

- Specify success indicators to be able to adapt the programme to ensure its effectiveness.

The review will cover:

- The re-design of the financial subsidy for 2018-2019 within the boundaries set by the Long-Term Plan and existing reserve funding, including a re-assessment of the time period over which the current reserve amount (approx. $ 300K) is expected to be fully used;
- The re-development of a new programme and its funding regime, for the following years, to be adopted along with the annual plan; including:
    - The form of the financial assistance ORC will offer (grant, or loan)
    - The total amount of subsidy which will be offered every year, and how it will be funded (general rates/targeted rates)
    - Eligibility criteria and administration processes.

Compliance and enforcement

Compliance and enforcement campaigns on the rules on domestic heating appliances in Air Zone 1 will be performed in close coordination with education and information; and will be integrated to ORC's local air quality programmes.

Enforcement and compliance will be based on:

- A pre-identification of possible rule breaches, from the screening of existing information, including EECA data, building consent data, clean heat clean air, and complaints;
- Weekly field monitoring of domestic emissions between 7am and 4pm in targeted areas.

The principle of "no harm" will guide all enforcement and compliance procedures and decisions. This principle has two dimensions:

- Enforcement does not put undue pressure on households and does not threaten people's ability to heat their homes;
- Enforcement processes does not put ORC's officers at risk when performing their duties.

In practice, this means that:

- Appropriate assistance is provided to ensure households have the resources to be compliant while appropriately heating their homes;
- Response to identified breaches is appropriately escalated, with, as a starting point, an informal notice informing the householder of rules and of the assistance available to meet those rules, before any formal action is undertaken. The escalation process and the time given for people to comply with rules will be adapted to the known circumstances of the people responsible for the breach;
- Inspections will be performed in pairs, and staff will be briefed prior to the start of monitoring campaigns. A risk assessment will assess the likelihood of harm and consequences. Staff will be reminded that their own safety is paramount in all situations.

As mentioned above, ORC's latest estimates have shown that the current rule requirements on domestic burners will not be sufficient in achieving air quality objectives; and that even cleaner heating will need to be widely installed. As a result, even though compliance and enforcement will be focused on getting people to meet rule requirements, the assistance offered to households will strongly encourage them to transition towards cleaner forms of heating.

In areas where no local programme has been developed, compliance will focus on responding to complaints and consents' audits.

Local air quality programmes

The premise of the air quality strategy is that, to make a difference, ORC must be active "in communities", and work in partnership with local partners as much as possible, for the broader goal of healthy homes and healthy air.

Local air quality programmes will be developed in all priority towns, and will involve, as a first step:

- Actively engaging with the community to better understand all issues underpinning high emissions, and all obstacles for cleaner heating and better burning;
- Harnessing and supporting community's energy and resources and support community-led initiatives for good air quality and healthy homes;
- Approaching households which are likely in breach of rules, or have smokey chimneys, to inform them of the rules, of any financial or other assistance that are available to them, and of opportunities to input into ORC's programme;
- Enlisting the help of partners (including district councils, community boards, local trusts and Cosy Home Trust), to establish a holistic programme for healthy homes and healthy air.

ORC's communication and compliance approach will also be reinforced as part of those local programmes, as highlighted in the compliance and engagement sections above.

The nature of ORC's intervention and its local approach will evolve as time goes on, and local circumstances change.

The development of local air quality programmes will be staged over time. Arrowtown is a good candidate to trial the development of such a programme due to the smaller size of the town, and the community's interest in getting involved in air quality issues.

After recent exchanges with community members and the town's Village Association, it is apparent that work with the community should not be delayed, and should start this financial year, even though it was not part of the Long-Term Plan.

Establishing a coherent management and regulatory framework

The strategy highlights that, alongside community engagement and compliance, a coherent and robust regulatory and planning framework must be put in place. This will involve both changes to the operative Air Plan; and co-ordination with city and district councils, and other agencies to improve coherence across legislative texts.

Air plan reviews

The strategy highlights that the Air Plan needs to be changed to:

- Set stricter emission requirements on new buildings, especially in priority areas;
- Recognise urban growth in air zone and airshed boundaries;
- Review provisions on outdoor burning within and close to townships.

Local air quality programs and community engagement will assist in identifying other areas of the plans that needs to be changed, for a fuller review of the Air Plan.

A review of relevant provisions on discharges of chemicals will be completed as part of a fuller review of the use and discharges of hazardous substances and chemicals across all receiving environment, and should inform parallel changes to the Air Plan, Coast Plan and Water Plan.

The Air Plan review will require further technical investigation, especially to review boundaries of airsheds and air zones, to better understand the effects of outdoor burning, and of chemicals on the environment.

Improving policy coherence across agencies

A number of plans and regulation have an influence on air quality outcomes. Those include:

- City and district plans, for the management of growth, and the adverse effects of land use (including dust, nuisance, reverse sensitivity etc);
- Building standards and the building code
- Fire and Emergency's management
- Waste management by city and district councils
- Transport planning and management
- The Environmental Protection Authority's hazardous substances' regulation.

The ORC will liaise with those agencies on all those topics. Particular focus will be put on working with city and district councils to:

- Align regional and district plan requirements and promote community heating systems in new developments
- Ensure waste minimisation plans provide viable alternatives to the burning of waste organic material and other waste materials;
- Develop a management framework for the control of dust, to ensure that roles and responsibilities are clearly allocated and that processes are put in place for effective coordination
- Engage on major programme of works in the region, early in the planning, to ensure that dust will be effectively controlled
- Ensure that proposed subdivisions and developments provide for public transport (where relevant), footpaths and cycleways.

The ORC will also discuss with the Regional Transport Committee's Technical Advisory Group over the potential upgrade of gravel roads to reduce dust. Those discussions will be based on an investigation to identify the region's hotspots where people are most likely to be exposed to the nuisance effect of dust from gravel roads.

Lastly, the ORC will continue to promote multi-modal and sustainable transport, through its provision of public transport.

Monitoring and reporting effectiveness

To be effective, ORC will need to demonstrate agility, and adapt its programme to the partnerships it enters into, and to the specific challenges that are reported by the community. This will be managed by:

- Ensuring that budgets provide for "unplanned" activities, if the need arises;
- Clear and appropriate delegation to adapt the work programme to new opportunities, risks or information;
- Regular monitoring and reporting, including:
    - An end-of-winter report outlining the winter's monitoring results and other research carried out, the year's activities on air quality and feedback received; and recommendations over how ORC's programme could be improved
    - A 5-yearly report at a region-wide scale, and for each priority area, assessing the overall effectiveness of the programme based on the indicators of success outlined below.

Indicators of success

- Air quality monitoring trends
- Number of complaints received, including on outdoor burning
- Emission inventory trends (total emissions, types of fuel used etc.)
- The proportion of new buildings with low impact heating, community heating systems etc.
- The number of consented boilers replaced or upgraded
- Uptake of low impact heating (from building consent information or suppliers report)
- Changes in public awareness of air quality issues, good burning practices, and reported heating preferences and home warmth
- People's satisfaction with council's approach.

Resourcing

Overall resource needs over 10 years

The table below provides a preliminary approximation of the resourcing which may be needed for the strategy's implementation. It is based on strong assumptions, including that local air quality programmes will require the equivalent of 1 FTE in Central Otago from Sept 2019 to Sept 2024, and 0.5 FTE after that date and of 1 FTE in Dunedin from Sept 2020 to Sept 2024, and 0.5 FTE after that date.

The table includes preliminary estimates for ORC's financial assistance, on the basis that ORC would offer grants for the full replacement of heating appliances at an average cost of $7,000. This budget estimate is bound to change as ORC will be re-developing the details of its financial assistance this financial year.

Preliminary estimates of resourcing needed

	Local air quality programme	Financial assistance	Regulatory review	Region-wide communication	TOTAL
2018/2019	96,500	255,000	55,000	49,000	478,200
2019/2020	184,500	351,125	189,000	46,000	770,625
2020/2021	367,500	452,160	485,000	46,000	1,350,660
2021/2022	347,500	555,000	447,000	46,000	1,395,500
2022/2023	322,500	705,000	442,125	46,000	1,515,625
2023/2024	282,500	905,000	242,000	46,000	1,475,500
2024/2025	237,500	1,005,000	-	46,000	1,288,500
2025/2026	207,500	1,205,000	-	46,000	1,458,500
2026/2027	207,500	1,305,000	-	46,000	1,558,500
2027/2028	207,500	1,405,000	-	46,000	1,658,500
TOTAL	2,461,000	8,143,285	1,860,125	463,000	12,950,110

Resourcing implementation in 2018 -2019

As already noted, ORC has the opportunity to commence the strategy's implementation in Arrowtown this financial year.

The table below compares what would be needed to carry out the work that is proposed for this financial year with the 2018-2019 budget. It also sets out what how Council's team are expected to be

involved. It is based on the assumption that the implementation of the strategy will be led by Science, to reflect the current programme's ownership.

The budget is expected to be over-spent by 263hrs staff time and $141K overall. The assumption that the uptake of the financial subsidy will be higher than anticipated accounts for 40% of the $141K gap.

No time has been budgeted for Policy and Environmental Services for the strategy's implementation. The over-budgeting of Community Liaison's staff time partially compensates this resource gap.

	Budget		Estimate		Comments
	Hrs	**$**	**Hrs**	**$**	
CORPORATE		145,000	50	200,000	▪ Expected increase in the uptake of the subsidy (from $100,000 in current budget to $155,000 in estimate – funded through reserves) ▪ Time for legal support in the drafting of the MOU with Cosy Home Trust and administration of clean heat clean air
SCIENCE	484	26,800	435	50,000	▪ Time allocated for the coordination of the strategy's implementation and the oversight of science studies ▪ Assumes the outsourcing of science studies
COMMUNITY LIAISON	778	13,120	600	13,000	▪ Budget for the development and deployment of region-wide communication campaign and support in organising public meetings and other events/consultation ▪ The campaign will be managed to budget
POLICY			270	2,700	The estimated time corresponds to the review and redevelopment of the clean heat clean air subsidy, and more general support in the implementation
ENVIRONMENTAL SERVICES			150		The estimated time corresponds to the identification of non-compliant burners and active monitoring of Arrowtown's domestic emissions
OTHER				15,000	Travels and venue hire for Arrowtown programme
TOTAL	**1,262**	**184,920**	**1,525**	**325,700**	

Year-by-year programme

Year 1: 2018-2019

Nov | Dec | Jan 2019 | February | March | April | May to August | September

ARROWTOWN LOCAL AIR QUALITY PROGRAMME

Stakeholder meeting
- Deciding on programme activities for winter with key partners
- QLDC, SDHB, CHT, Village Association, NIWA (?), EECA (?), EnviroSchools

Building relationships with wood merchants, sellers of heating appliances, installers, flu cleaners, QLDC and other partners

Healthy Home Fair
- Fair in partnership with other agencies
- Focus on healthy homes and good air quality
- Info on winter programme (incl. compliance) & subsidy sign up

Winter activities
- Identifying likely breaches + smokey chimneys
- Home visits + mailing campaign
- Informing of rules and support available
- Other activities as agreed with partners

Assessment
- Winter report with the community
- Public meeting to get feedback on winter's activities and on the challenges met by affected people

OTHER IMPLEMENTATION ACTIVITIES

- Re-developing and re-designing the “clean heat clean air” subsidy
- Signing a MoU with Cosy Home Trust establishing our relationships, accountabilities and reporting

Communication on changes to agreed suppliers and the public

Administration of the rebranded, re-purposed financial assistance programme

Liaising with other regional councils for the sharing of material, resources which could be used for education etc.

Developing a region-wide communication plan on air quality:
- Building an engaging and coherent brand for air quality
- Defining the mix of media and platforms to be used
- Developing materials etc.

Carrying out region-wide communication on air quality and emissions

Science base for air plan review
- Establishing a work programme with Public Health South for the assessment of the impact of air pollution on public health in Otago
- Mapping areas where air quality is likely to worsen due to urban growth
- Identifying outcomes and issues for outdoor burning around urban areas and map areas where outdoor burning is likely to impact on towns’ overall pollution
- Identify area most at risk from dust from gravel roads

Key

Local air quality programmes | **Financial assistance** | **Region-wide communication** | **Regulatory and management review**

From June 2019 to Sept 2021

June 2019-Sept 2020	June 2020-Sept 2021	Beyond
Continuing, strengthening and adapting Arrowtown's local air quality programme		
Developing local air quality programmes for: Alexandra,and Clyde	Continuing, strengthening and adapting Alexandra and Clyde's local air quality programme	
	Developing local air quality programmes for Cromwell, Mosgiel and Milton	Continuing, strengthening and adapting local air quality programmes for Cromwell, Mosgiel and Milton
Promoting and administering the new "Clean Heat Clean Air" programme		
Carrying out region-wide communication on air quality and emissions		
Engaging with the farming community on outdoor burning and chemical spraying • Better understanding of their constraints and management practices • Promoting best practices	Engaging with the construction industry on dust management • Better understanding of their constraints and management practices • Promoting best practices	
Reviewing legislative framework ▪ Assessing effectiveness of Air Plan with particular focus on airshed and airzone boundaries, rules for new developments and outdoor burning ▪ Identifying key legislative changes which would support air quality outcomes for advocacy ▪ Engagement with city and district councils for better alignment between district plans, regional plans, waste minimisation plan, and infrastructure strategy; and to clarify responsibilities for dust management ▪ Integrating air quality and transport strategies ▪ Researching the use and effects of the use of chemical and hazardous substances in Otago	**Air Plan Review**	
	Advocacy (Building standards, financial assistance for better housing, waste management, land use controls on dust and nuisance, controls on chemical etc.)	
	Continued engagement with TAs to improve integration of plans and policies	

Key

Local air quality programmes | **Financial assistance** | **Region-wide communication** | **Regulatory and management review**

Appendix 1

2017 Amendments to the NPSFM 2014 to Improve Water Quality for Primary Contact

- **A national target** that 80 percent of specified rivers and lakes[1] will be swimmable by 2030, and 90 percent by 2040 (Appendix 6).
- **A requirement to develop draft regional swimming targets** by 31 March 2018, and final targets by 31 December 2018, which will contribute to the national target (Policy A6).
- **An objective to improve (not maintain)** freshwater management units so they are suitable for primary contact more often, in terms of *Escherichia coli (E. coli)* in rivers and lakes and cyanobacteria in lakes and lake-fed rivers (Objective A3).
- Policies requiring **more specific plan content, stating how specified rivers and lakes and primary contact sites will be improved** (Policy A5).
- **Reporting requirements** to track the efficacy of planning and progress towards regional targets over time (Policy E1(g)).
- **Surveillance monitoring** requirements at primary contact sites, which refers to weekly monitoring of identified primary contact sites through the summer months (Appendix 5).

This report addresses the second point above on regional swimming targets, however there are strong links with the other provisions, which are all intended to work together as a package to improve water quality for primary contact/swimming.

[1] Specified rivers and lakes includes rivers of fourth order or above and lakes with a perimeter of 1.5 km or greater. For further explanation see Appendix 6 of the NPSFM (**Attachment 1**).

Attachment 1 : Regulatory Responses

1.1 National Plans, Policies, Strategies

Commented [A1]: This needs updated for the current month but should go as an appendix at the back rather than in the main body of the report.

The following were received over the period to 9 November 2018:

Agency	Number	Document
Ministry of Business, Innovation and Employment	1	Discussion Document: Healthy Homes Standards.
Treasury	1	Consultation: New Independent Infrastructure body
Local Government New Zealand	1	"Cost estimates for upgrading wastewater treatment plants to meet objectives of the NPS Freshwater." report

The following responses were made over the period to 9 November 2018:

Proposal	Response Type	Issues
Ministry of Business, Innovation and Employment: Discussion Document: Healthy Homes Standards.	Submission	ORC submitted reflecting on Otago's challenges and initiative to meet air quality standards, and provided comments on options to address approaches to achieving warm, dry homes.
LGNZ "*Cost estimates for upgrading wastewater treatment plants to meet objectives of the NPS Freshwater.*" report	Feedback	ORC provided feedback on Otago's affected population and both growing and declining population centres will find the NPS challenging from a cost perspective with risks as well as opportunities for growth areas. ORC agreed with Environment Southland that the report did not appear to recognise overall the practical realities of the challenges and risks to many communities.

Commented [A2]: Warren will email to Justine to append

1.2 Territorial Authority District Plan Changes and Reviews

The following summarises the current situation regarding changes and reviews of District Plans:

District or City	Change or review	Current situation
DCC	2GP: District Plan Review	Decisions version of the plan was released on 7 November 2018 The period for appeals closes 19 December 2018
CODC	Review pending	Proposed to notify review late 2018

QLDC	District Plan Review	Stage 1 of 4: Notified: 12 February 2016 Stage 1 decisions released 7 May 2018. Stage 2 notified 23 November 2017. Submissions closed 23 February 2018 ORC has appealed the decision on Stage 1, specifically the Subdivision and Development and Natural Hazards chapters, as the decisions do not give effect to the proposed Regional Policy Statement. Furthermore, under section 274 of the RMA, ORC has joined several appeals of other parties where those appeals are of interest/concern to ORC.
WDC	Review pending	Stage 1: Initial consultation underway Proposed Notification: 2018
CDC	Plan changes 39 – 41 Residential and Industrial Zoning areas for Balclutha, Stirling and Milton. Further review pending of PC41 (Milton)	ORC has had pre-(re)notification discussion with Calder Stewart in relation to its plans and how these may be relevant to ORC. Awaiting CDC re-notification of PC41.

1.3 Territorial Authority and Regional Council Resource Consent Applications

The following were received over the period to 9 November 2018:

Agency	Number	Document
DCC	1	Resource Consent application Issues: small subdivision and development
QLDC	3	Resource Consent application Issues: Subdivision and commercial developments of small to large scale
CDC	1	Resource consent application Issues: development in flood prone area

The following responses were made over the period to 9 November 2018:

Proposal	Response Type	Issues
None		

1.4 Other Proposals

Proposal		Issues
Future Development Strategy	Working group (QLDC, NZTA, CODC)	technical reports covering framework for selecting sites and guiding design for urban development. These reports will inform a Future Development Strategy (FDS) to be published by QLDC in December 2018.
Waitaki Whitestone Geopark Trust	Request for support	The Trust approached ORC to provide a written letter of support for its application to UNESCO for global Geopark status.

1.5 Other Responses

Proposal	Response Type	Issues
Future Development Strategy	Working group (QLDC, NZTA, CODC)	ORC staff provided feedback to the technical reports covering comments around provision for natural hazards, 3 waters resources, air quality and that any review of the FDS should align with LTP and infrastructure strategy processes.
Environment Southland	Submission	ORC provided a submission in support of Environment Southland's proposed Regional Pest Management Plan. The Director Environmental Monitoring and Operations will speak to this.
Waitaki Whitestone Geopark Trust	Letter of support	A copy of the letter is appended to this report.

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Report for Hawke's Bay Regional Council

TANK plan change: Barriers and risks to the adoption of proposed mechanisms to coordinate management action

June 2018

Report by:

Justin Connolly **Director, Deliberate**

HBRC Contract #SD-18-007

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June 2018

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The author also extends warm thanks to those people who made themselves available to be a part of this research. Without the willingness of such people to be involved there would be no research, let alone any plan resulting from a stakeholder process such as that being carried out in the TANK catchments.

This contact was part funded by the Ministry for the Environment.

Version

Date	Comments	Authorised by
19 July 2018	Draft report issued to HBRC for review and comment.	Justin Connolly Director, Deliberate
27 August 2018	Final report issued after minor comments from HBRC received and incorporated, where relevant.	Justin Connolly Director, Deliberate

Executive Summary

This research was commissioned to identify perceived barriers to the adoption of any of the three mechanisms proposed in the draft plan change for the Tutaekuri, Ahuriri, Ngaruroro and Karamu catchments (known as 'TANK'). It was commissioned by the Hawke's Bay Regional Council (HBRC) for use in the implementation of their plan. This plan change require farmers, growers and foresters to agree work (with Council) that is required on their properties through one of the following mechanisms:

- An individual farm plan;
- An industry programme; or
- By working collectively within local catchment collectives.

A mixed methods approach was used in the research, with a quantitative survey and a semi-structured interview being undertaken. Nineteen people were interviewed covering a range of involvement with the TANK plan change: either directly in the TANK stakeholder group; with the Farmers Reference Group; or as an employee of Council.

Many barriers were identified, as were a number of risks to the success of the mechanisms, which are also noted as in the future they may become barriers themselves. The groupings identified for these barriers are as follows:

- the need for mechanisms to be objective-focused and simple,
- ensuring appropriate expectations (everyone is on the same page to begin),
- ensuring access to the right support,
- interpersonal risks (catchment collectives only), and
- transparency of accountability (catchment collectives only).

A total of 43 recommendations have been made across these five groupings. Each has been given a scale of importance of Low, Medium, High or Critical. More than half of the recommendations (23) applied to all mechanisms. Additionally, one barrier was identified specifically for Industry Programmes; while the remainder (19) were found to specifically apply to Catchment Collectives. A summary of these are shown is shown in Table ES1.

Table ES1. Summary of recommendations made in relation to the barriers and risks identified in this research.

Grouping of barriers	Number of recommendations			
	Critical	High	Medium	Low
RECOMMENDATIONS RELATING TO ALL MECHANISMS				
The need for mechanisms to be objective-focused and simple		4	1	
Ensuring appropriate expectations (everyone is on the same page to begin)	4	6	4	
Ensuring access to the right support	3	1		
A RECOMMENDATION SPECIFIC TO THE INDUSTRY PROGRAMME MECHANISM				
The need for mechanisms to be objective-focused and simple		1		
RECOMMENDATIONS SPECIFIC TO THE CATCHMENT COLLECTIVE MECHANISM				
The need for mechanisms to be objective-focused and simple	3	1		
Ensuring appropriate expectations (everyone is on the same page to begin)		1	1	
Ensuring access to the right support	5			
Interpersonal risks		1	2	1
Transparency of accountability	4			
TOTALS	**19**	**15**	**8**	**1**

Many of the recommendations deal with actions that will improve perceptions or relationships between parties involved. Some of them recommend action that will not be perceived as direct activity 'on the ground', yet these are considered important enablers for the success of any activity that will occur. Further, the burden for delivering on the recommendations falls predominantly with Council, rather than the primary producers. This highlights the complex inter-related nature of factors that will enable such plans to be a success, and the need for Council to ensure that the 'groundwork' is laid for successful implementation of the plan.

While this research has identified a rich volume of potential barriers and provided recommendations, it recognises that many of these are likely to have already been discussed as part of the TANK process or may already be on Council's 'radar'. The recommendations provided in this report are provided to Council in the hope that their formulation and ranking might reinforce the importance of some barriers to be dealt with. It is expected that this will contribute to the successful implementation of the plan change.

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1 Introduction

Recent years have seen an increase in the development or revision of Regional Council plans relating to freshwater. While this is partly due to an increasing awareness that New Zealand's freshwater resources are coming under more pressure, it predominantly reflects the need for Regional Councils to respond to the *National Policy Statement for Freshwater Management 2014 (Amended 2017)* (Ministry for the Environment, 2014; 2017).

Since 2012 the Hawke's Bay Regional Council (HBRC) has been working with a representative stakeholder group to look at ways of better managing the waterways of the Tutaekuri, Ahuriri, Ngaruroro and Karamu catchments. This project is referred to as 'TANK', an acronym of the four catchment names. The TANK project is expecting to deliver a proposed plan change in the second half of 2018.

In April 2018, Deliberate was commissioned to undertake qualitative research focusing on identifying perceived barriers to farmers support for; involvement in; and implementation of the three main mechanisms proposed in the draft plan change to guide mitigation action. These three options are:

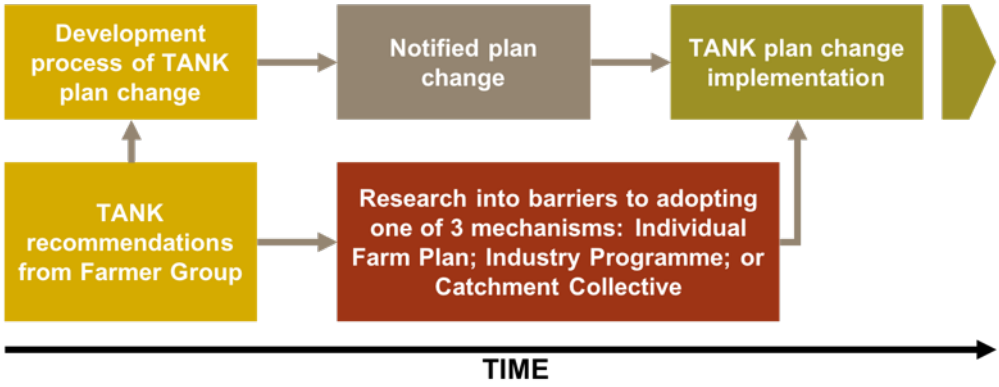
- To work individually through farm plans
- To work within industry programmes
- To work collectively within local catchment collectives

The TANK process has been progressing for some time and like many freshwater projects, it has been dealing with some protracted and difficult to understand issues. It is understood that because of challenges relating to uncertainties around data; difficulties with being able to establish firm contaminant limits at a property level; and the heterogeneity of issues across the catchments; a range of mechanisms for coordinating and managing improved environmental management are proposed, rather than a prescriptive list of mitigations. Also, in part because of this and in part because of the direct involvement of farmers through a Farmers Reference Group, this plan change has resulting in one of the mechanisms proposed being a 'Catchment Collective' (M-A. Baker, personal communication, April 2018). A Catchment Collective is a self-organising group through which collective environmental action can be taken, and the action agreed by the group is the means by which the members of the group are held accountable to council.

This research was commissioned and part funded by the Ministry for the Environment (MfE). It was completed within the ambitious and challenging timeframe of approximately 2.5 months. HBRC have an obvious direct interest in understanding the perceived barriers to adoption of the mechanisms and will use this research to inform the implementation stage of the plan

change (Figure 1). MfE have an interest in understanding barriers to adoption of such mechanisms more widely across the country.

Figure 1. Process diagram demonstrating how this research will inform the implementation plan of the TANK plan change



While this research has been planned by HBRC and MfE for some time (M-A. Baker, personal communication, April 2018), the fact that the particularly novel mechanism of the catchment collective has been proposed simply adds to the interest in this research from all parties involved. At the time of writing this is understood to be one of the first instances of this type of self-organising and collective approaches for dealing with *water quality* issues in the country. Therefore, it is expected that this research may be of potential interest to a number of Councils in New Zealand.

This report is structured in the following way:

- Firstly, a literature review is undertaken (section 2). In relation to Individual Farm Plans and Industry Programmes, this summarises the existing knowledge about the barriers and drivers to adopting management practices or mitigations to achieve better environmental outcomes. In relation to the Catchment Collectives, this summarises existing knowledge around self-organising groups.
- Secondly, an overview of the mixed methods research approach is outlined (section 3). A more detailed methodology, including the structure and questions of both the survey and semi-structured interview process, can be found in Appendix 1, Appendix 2 and Appendix 3).
- Thirdly, an overview of the results of the research are presented in section 4), This outlines the demographics of respondents, the results of the survey and the results of coding the data from the interviews. More detailed discussions of the results can be found in the appendices – the survey in Appendix 5 and the coding of semi-structured interviews in Appendix 6.

- Fourthly, the barriers and risks identified in these results are discussed. A range of recommendations are proposed to help minimise them and maximise adoption of the mechanisms (sections 5–9).
- Finally, these recommendations are collated and summarised and the research concluded (section 10).

This is a comprehensive report and much detail has been included due to the leading-edge nature of some of the proposals being made in the plan change, particularly the catchment collective. For this reason, the literature review is considered comprehensive for this type of report. This provides the reader with an opportunity to review a range of important concepts that would be useful to an understanding of the discussions that come later on. If, however, the reader is pressed for time, this section can be skimmed. Reading section 2.5 will provide an understanding of the research framework that has been developed and applied.

Similarly, in order to save some space, the methodology (section 3) and results (section 4) are summarised in the main body of the report, with more detail provided in appendices. A full discussion of the barriers that were identified and the recommendations made to deal with these have been left in the body of the report, for obvious reasons.

2 Literature Review

Freshwater resources across New Zealand have been coming under increasing pressure in recent decades (Gluckman, et. al, 2017; Ministry for the Environment & Stats NZ, 2017; OECD, 2017). The development or review of regional plans that deal with freshwater management continues apace, mostly as a response to the development of national level guidance for water quality in the *National Policy Statement – Freshwater Management* (Ministry for the Environment, 2011; 2014; 2017).

In the Hawke's Bay region, one plan change has already been undertaken in the Tukituki catchment (Hawke's Bay Regional Council, 2015). A second is currently underway concurrently in the four catchments of the Tutaekuri, Ahuriri, Ngaruroro and Karamū – collectively known as the "TANK" catchments (Hawke's Bay Regional Council, 2017).

The nature of the proposed TANK plan change means that this literature review will be focused on two main areas of literature: farm plan and innovation adoption; and the enablers/barriers to the success of institutions for collective action. Given the restricted timeframe available for this research (see Introduction), this literature review is pragmatic and applied, focusing on these two areas. The intent of this literature review is to build an understanding of the key components of these mechanisms, to inform the survey and semi-structured interviews that will investigate the barriers to adoption of these types of mechanisms.

2.1 The background to industry programmes and farm plans.

New Zealand has a long history of farm planning for erosion control. This was the main reason that Catchment Boards were set up in the 1940's and was the basis for the development of the 8-class Land Use Capability (LUC) system (Ministry for the Environment, 2003). Such plans have usually mainly focused on soil conservation and water management issues, such as riparian management, stream protection and run-off control. There was a distinct drop off in farm planning in the 1980's after central government funding was discontinued and further, local government amalgamation and restructuring resulted in most of the catchment board functions being vested in the newly constituted regional and unitary councils (Ministry for the Environment, 2003).

The popularity of farm plans, be they driven by regulators or industry groups, has been increasing again since the 1990's (Ministry for the Environment, 2003). Their reintroduction is often leveraged around the greater awareness of issues, like sedimentation and erosion from high impact weather events (AgResearch (2016) discusses the resulting farm planning after the 2004-05 storm and flooding events). Their increasing popularity is also due to their ability

to allow farmers to own their own farm practice improvements and provide increased autonomy from industry. They can also be a useful non-regulatory tool, allowing the relationship between farmers and Regional Council to evolve in a non-regulatory manner.

As New Zealand's economic activities continue to push towards its environmental limits and impact on freshwater quality (Gluckman et. al (2017); Ministry for the Environment & Stats NZ (2017); OECD (2017)) then they are likely to continue to be an increasingly common feature of environmental policy.

Most primary industries in New Zealand have also recognised the need to better support on-farm practice in relation to environmental practices. This has resulted in a range of industry programmes run by the various industry representative bodies, that are applied at a nationwide level. These include (but are not limited to):

- Sustainable dairying – water accord (dairy industry)
- Good management practices: A guide to good environmental management on dairy farms (DairyNZ)
- Land and Environment Plan (sheep and beef industry)
- NZGAP (horticultural industry)
- Sustainable winegrowing (wine industry)

Being familiar with the details of industry programmes such as these is not within the scope of this research. Rather, what is of interest, is the perceived barriers to their adoption, from the perspective of the farmer – particularly in light of the TANK plan change and their perceived ability to contribute to the objectives sought by that plan change.

2.2 Barriers to adoption of environmental mitigations

At their core, both industry programmes and environmental farm plans collate or prescribe a range of *management activities* to be undertaken, with the intention of achieving or moving towards a *desired environmental objective*. In other words, one way of viewing both industry programmes and farm plans may be to view them as a tool for *collating and/or coordinating* activities that have been identified as required, or beneficial. Therefore, understanding the barriers to adoption of these activities is of use. Given this commonality, the literature associated with the adoption of environmental farm plans and/or industry programmes is considered here together.

A range of factors identified in the literature are discussed below.

2.2.1 Personal values and identity

Obviously farmers' personal views and values strongly influence adoption of mitigations. However, the various ways in which this occurs is of interest.

It would be logical to assume that farmers with a greater environmental focus will be more willing to adopt better environmental practice. Yet in a comprehensive study of the farm planning in the Manawatu region of New Zealand, it was found that for both adopters and non-adopters of farm plans enhancing the natural environment ranked the top-equal (adopters) or very close second (non-adopters) value or priority, next to consistent economic profits from their farm (Horizons Regional Council, 2016). This is consistent with research findings in Australia where there was little difference in the stated level of environmental 'stewardship' between adopters and non-adopters of conversation cropping techniques (Cary et al., 2001). This would indicate that the stated preference of farmers in relation to their level of environmental stewardship while insightful, is likely to be a misleading indicator for predicted levels of adoption.

Kerr & Dorner (2013) propose three "C's" in relation to adoption of mitigations: That *concern* (the drive and desire to make a change) must firstly be built; as well as *capabilities* (the methods) to deliver the mitigation; and that both these must occur before any *contracting* (actual delivery of the mitigations) can occur. It is the first of these "C's", concern, that is seen as aligning with the personal values and identity motivators discussed here.

So what values, beliefs or traits *are* of use for understanding adoption of good environmental practice? The motivations of farmers are not singularly environmental and are often a complex inter-related range of drivers (Ministry for the Environment, 2003). While much further research in this area is required to understand this overlapping complexity, the existing research does provide some useful insights.

For instance, the views of farmers on the private/public goods and the role of the state has been found to be an influencing factor. That is, the extent to which farmers believe that 'the state' (i.e. a council) has a place in influencing the activity that occurs on private land, which is itself derived from the fact that individual activity on private land may contribute to wider social public goods (e.g. flood mitigation or other environmental benefits) (Horizons Regional Council, 2016).

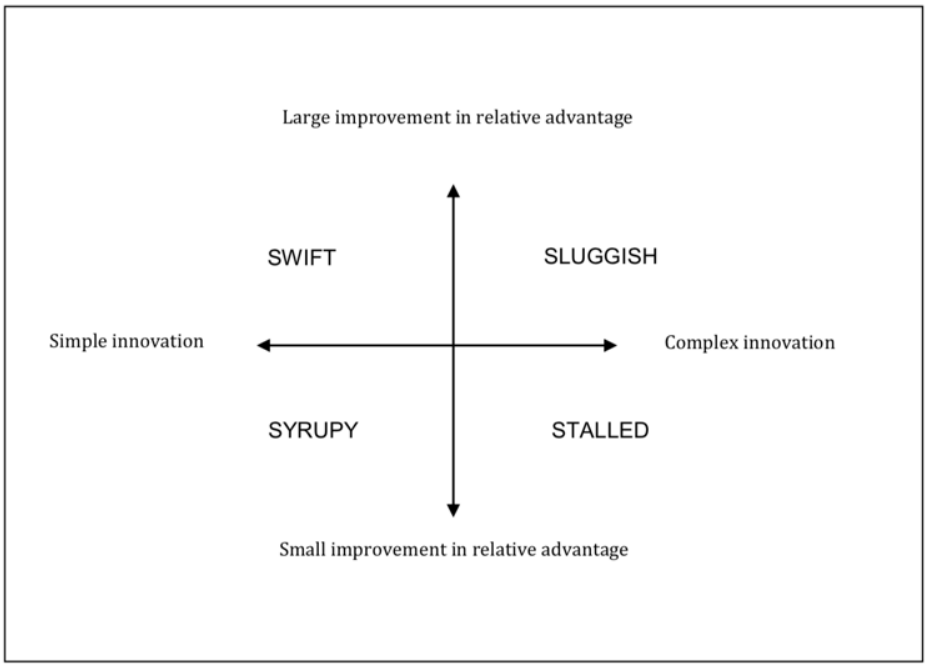
Similarly, the timeframe over which farmers frame their relationship with the land can have a large impact on behaviour (Pannell et al., 2006). The longer that they view their relationship with the land, the more they act in accordance with considering investments from a longer-term perspective – in other words, their actions reflect considering investments in the context of a low discount rate (Ostrom, 1990).

It is also worth noting that the type of farming that a particular farmer *identifies with* is also an important factor. Pannell et al. (2006) found that non-adoption of good environmental practice can sometimes mean more substantial changes in farm practice, or even an entire conversion to a different farm system and/or product. The identity of farmers in such situations can be a huge source of resistance to adoption. An example is, “all my friends are wheat farmers, I am a wheat farmer too, it is what I like doing, it is what I’m good at, it is what my family does, it is an important and respectable occupation for me” (Pannell et al., 2006).

2.2.2 Relative advantage and farm profit

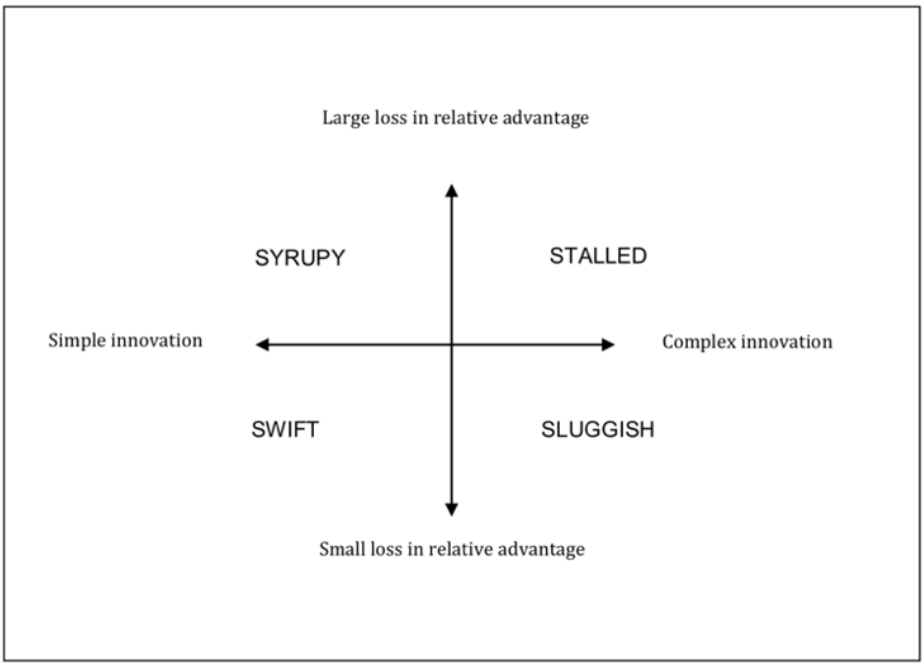
The previous section outlines a range of factors relating to personal values and identity which are important to adoption of farm mitigations. Notwithstanding these factors, it is difficult to ignore the fact that the primary motivator for farmers is that farming is a business and they are driven to ensure continued growth in farm profits (Horizons Regional Council, 2016; Ministry for the Environment, 2003). Two good perspectives on this are provided by literature at least partially influenced by economics. Pannell et al. (2006) talk about adoption being, at least in part, a function of the *relative advantage* provided by a proposed management practice and the *trialability* of that practice (trialability is discussed in more detail in section 2.2.4). Kaine & Wright (2017) also view relative advantage as a key factor in whether a management practice is voluntarily adopted, suggesting adoption is a factor of *relative advantage* and *complexity* of the management practice or innovation. They use the economic concept of ‘stickiness’ to describe the various types of adoption behaviours that may be observed in the context of these factors, where stickiness is the rapidity with which a certain management practice may be adopted. The stickiness in the rate of adoption is described as varying from ‘swift’ at the rapid end of the scale (high relative advantage and low complexity); through ‘sluggish’ (high relative advantage and high complexity) and ‘syrupy’ (low relative advantage and low complexity); to ‘stalled’ (both low relative advantage and high complexity) at the slow or stagnant end of the spectrum. These various profiles are shown in Figure 2.

Figure 2. Stickiness in the rate of adoption (Kaine & Wright, 2017)



They further demonstrate that the scale of relative advantage can apply when the adoption is not voluntary and is instead mandatory (or as part of *compliance*). The stickiness values remain the same on the complexity scale, but are reversed on the *relative advantage* scale, as shown in Figure 3.

Figure 3. Stickiness in the rate of compliance (Kaine & Wright, 2017)



Regardless which of the framework outlined above is used, the important thing to note is the impact that the *relative advantage* of a management practice for the farm, and therefore the farm profitability discussed earlier, that is of importance.

While relative advantage of a management action may be viewed as the 'benefit' that a management action might provide, the financial 'cost' of the action is equally important. The subsidisation (and therefore low cost) of farm planning undertaken in the Manawatu was identified as the primary reasons for its adoption in the last decade (Horizons Regional Council, 2016). Other reviews of farm planning in New Zealand has found that there is little financial incentive to adopt farm plans, especially in the dairy sector and that the reduction of direct government subsidies for farm planning in the 1980's was at least partially responsible for a significant drop in farm planning at that time (Ministry for the Environment, 2003). In short, the immediate cost is still very important, even if it leads to a longer-term benefit.

2.2.3 Demographic and structural variables

In addition to the personal values/identity and the relative advantage/cost of management practices that have been discussed, there are a range of demographic and structural variables which also need to be considered.

For example, the influence of the age of farmers on their adoption behaviour has often been investigated and mixed results found. Some found age to be closely related to the other factors already identified, such as identity and long-term view (Pannell et al., 2006); while other research has found little evidence for a correlation between the age of farmers (Cary et al., 2001); or even that some younger farmers were more focused on maximising production and profitability and perhaps less so on environmental outcomes (Horizons Regional Council, 2016). While it is difficult to disentangle the impact of age, it is perhaps most usefully viewed in association with the need for and progress with succession planning. The status of any succession planning has been found to be highly germane to older farmers (Horizons Regional Council, 2016) and, as this contributes to an intergenerational view around a resource, it is likely to affect the perceived discount rate applied to an investment decision (Ostrom, 1990).

Structure of the farm business has been found to be influential in adoption in dairying. Sharemilking is a common practice in dairying and this results in a contractual separation between the means of production on the farm (the cows and the sharemilkers); and the responsibilities of land owners (the land and the land owners) under environmental regulation (Ministry for the Environment, 2003). This is less of a feature on high country sheep and beef farms.

While there is some correlation between the level of farmers formal education and mitigation action adoption (Pannell et al., 2006), there is a stronger correlation between the amount of recent vocational training that a farmer has been on or been exposed (Cary et al., 2001; Pannell et al., 2006).

2.2.4 Trialability and observability of mitigations

The preceding sections outline human and system factors and their impact on the adoption of environmental management practices. These include things such as personal values and views; relative advantage and farm profit; and demographic and structural variables. This section will consider physical features of the environmental practices themselves such as their *trialability* and the *observability* of their impact/results.

The trialability of a management practice relates to the extent to which it can be implemented as a trail to begin, ideally with minimal restrictive capital investment and without necessary disruption to the other parts of the farming system (Pannell et al., 2006). This staged approach to adoption has been seen as important for farmers who may generally identify as conservative in their investment views (Pannell et al., 2006), and who are by nature cautious (Horizons, Regional Council, 2016). This also resonates with Kerr & Dorners second “C”, which is the need to build capability to deliver on mechanisms. The ability to trial mitigations and observe their outcomes are a way of building this capability.

The observability of the impacts of any management actions has also been identified as important to its adoption. Farmers respond better when they can *see* the impact of their actions (Pannell et al., 2006; Cary et al., 2001), again in the context of a conservative view on investment, but also importantly in the context of needing to develop trust that the action will work as anticipated. Trust is explored further in the following section.

2.2.5 Trust and communication

The final subset of factors being considered under industry programmes and farm plans is trust and communication. This has in part been left until last as it begins to cross over into factors that will be discussed in a subsequent section on collective groups (see section 2.4). Factors discussed here include the role of trust and the role of positive relationships, proximity and communication.

Trust and the relationship between field officers and farmers is a key factor in enabling the adoption of farm plans (Horizons Regional Council, 2016). This is not only trust between the farmer and the bureaucracy responsible for mandating or encouraging them, but also in the results that the mitigations achieve (Pannell et al., 2006).

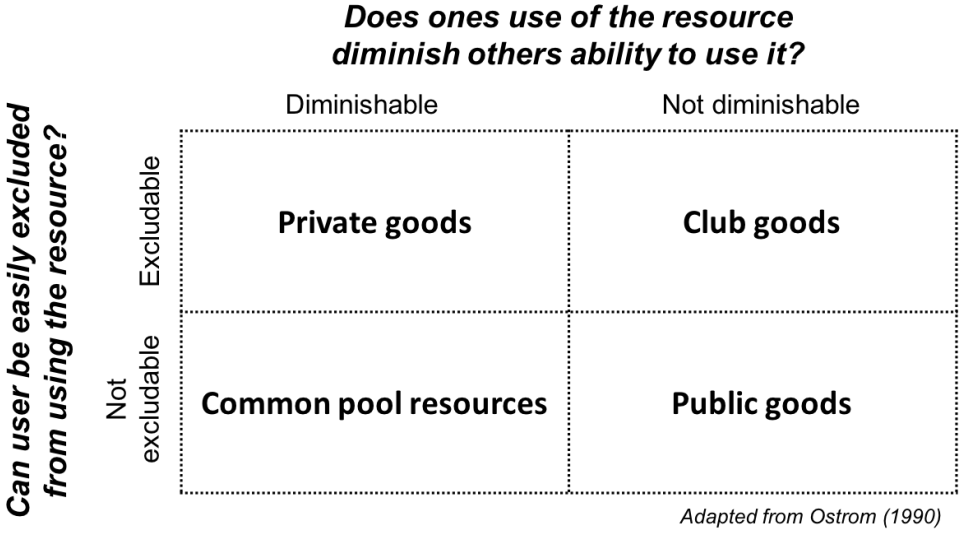
There is often a divide between the way farmers perceive their action and the way science perceives them (Duncan, 2015). This has to be bridged before higher levels of trust can be built with farmers. Investment in strong relationships with field officers, good communication and a commitment to transparency is one way of achieving this (Horizons Regional Council, 2016). Another way that such understanding and trust is built is via the network of farmers themselves, where adopters and non-adopters mix with each other, sharing views and building trust. The proximity of farmers to each other and the extent to which they tend to interact in their everyday lives has been found to be an enabler of this type of trust and awareness (Pannell et al., 2006).

Having considered a range of factors that enable or impinge on the adoption of good environmental management practices in the form of industry programmes or farm plans, it is now time to consider the factors that enable or inhibit collective groups to achieve positive environmental outcomes in relation to a common pool resource.

2.3 The background to self-organising groups and collective action in relation to common pool resources

The literature on collective action in relation to common pool resources draws heavily from political theory and economics. One of the obvious reasons for this is that the term common pool resources (or CPR), as most often used in natural resource management, is drawn from economic theory. In this, a CPR is a resource that is diminishable the more multiple actors use it, and from which it is difficult to exclude actors from using (Ostrom, 1990). This contrasts with other types of resources which are defined within a matrix of excludability on one axis and diminishability on the other axis. These are outlined in Figure 4.

Figure 4. Different types of resources according to excludability and diminishability.



The conflicts related to the use of these resources create social dilemmas and classical economic theory has long assumed that, when it comes to common pool resources, individuals will always act rationally and in their self-interest, which leads to an inevitable overuse and destruction of a resource (Hardin, 1968; Ostrom, 1990). In other words, because it is difficult to exclude people from using a particular resource, yet it is in the individual's best interests to keep using it at an *individual* level, this inevitably leads to deterioration or exploitation of the resource. This is sometimes called the 'tragedy of the commons' (Hardin, 1968).

This view was widely held until the work of Elinor Ostrom, who observed that there were many examples of self-organising groups that had chosen, of their own free will, to work in a way that preserved the integrity of a common pool resource (Ostrom, 1990).

Ostrom identified research that studied a number of self-organising groups of resource users who attempted to manage CPRs collectively. Many successful and unsuccessful case studies were compared across differing resources such as forestry's, fisheries and freshwater management schemes (i.e. for irrigation). From this work she identified 8 principles that she argued seemed to be present in all of the successful case studies (Ostrom, 1990). Further research revised these principles, splitting several of them (Cox et al., 2010). The resulting 11 principles are described in Figure 5.

These principles are of relevance to the TANK project. This is because the catchment collective option in the proposed plan change provides an opportunity for landowners to *self-organise* and determine their own course of action, under the jurisdiction of the Hawke's Bay Regional Council. Rather than *prescribe* a blanket range of activities to be undertaken, this

mechanism within the proposed plan change allows landowners to self-organise and *determine their own activities*, although they do need to receive final approval from HBRC.

Figure 5. 11 revised principles for successful institutions for collective action (Cox et al., 2010)

Principle	Description
1A	**User boundaries:** Clear boundaries between legitimate users and nonusers must be clearly defined.
1B	**Resource boundaries:** Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.
2A	**Congruence with local conditions:** Appropriation and provision rules are congruent with local social and environmental conditions.
2B	**Appropriation and provision:** The benefits obtained by users from a common-pool resource (CPR), as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.
3	**Collective-choice arrangements:** Most individuals affected by the operational rules can participate in modifying the operational rules.
4A	**Monitoring users:** Monitors who are accountable to the users monitor the appropriation and provision levels of the users.
4B	**Monitoring the resource:** Monitors who are accountable to the users monitor the condition of the resource.
5	**Graduated sanctions:** Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and the context of the offense) by other appropriators, by officials accountable to the appropriators, or by both.
6	**Conflict-resolution mechanisms:** Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7	**Minimal recognition of rights to organise:** The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
8	**Nested enterprises:** Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organised in multiple layers of nested enterprises.

While the 11 principles above are useful for guiding discussion around whether arrangements to manage common-pool resources may be successful, there remains the question as to whether water quality can be considered a CPR. Certainly, the *allocation* of water for use is a common example of a CPR, along with such things as forestry and fisheries – these are all easily demonstrable as diminishable if more people use them. But can water quality or, put another way, the capacity of a water body to *absorb pollution*, be viewed as a CPR?

It is argued here that it can be. For a resource to be considered a CPR it must be *salient* to the livelihood of the resource users (Ostrom, 2008, as cited in Parsons, 2016) and if pollution occurs in a water body then it can impact the resource user directly (for example through poisoned water) or indirectly (for example through the resource user incurring a tax or fine

from a governing body) (Parsons, 2016). Furthermore, even the *threat* of more comprehensive regulation or a greater tax/fine can be enough to make the damage being done to the water body more salient to the resource user (Kingi, Park & Scarsbrook, 2012, as cited in Parsons, 2016).

2.4 Factors of successful collective groups

Having established that the ability of a water body to absorb pollution can be viewed as a CPR, attention is now turned to the factors that have been identified as barriers or enablers to the adoption of collective action. The 11 revised principles have been applied in many literatures including political and social theory, and they have at least in part informed, and been informed by, experimental economics. While it is beyond the scope of this report to review any of these literatures in depth, a range of useful insights from work undertaken since Ostrom is provided in the sections that follow.

Oliver Parsons (2016) provides a useful summary of the increasingly complex variety of experimental economics games that can be played in relation to public goods and CPRs. While a detailed analysis of these is not considered of benefit here, it useful to note that they increase in complexity from linear trade-offs to non-linear trade-offs as the games progress from public goods to CPRs. Put another way, the choice for the individual becomes less binary and more complex as the games move from public goods to CPRs, especially when multiple people (players) are involved. Such experiments provide evidence that classic economic formulas that predict the maximisation of individual or public benefit are not sufficient to account for the variety of decisions that individuals will take in relation to CPR. What they have found to be important in the management of CPRs is the importance of having good communication and agreement on actions, as well as being aware of 'free-riders' and being able to manage somehow with sanctions (Parsons, 2016).

2.4.1 Communication and the covenant (agreement)

The importance of trust and communication as an enabler for successful industry programmes and farm plans was discussed earlier (see section 2.2.5). It is not surprising that in an environment where groups are self-organising to manage a resource, communication and agreement between parties should feature strongly.

A strong correlation between communication and success of institutions governing CPR's has been found, especially when face-to-face communication is the main method of communication as it has been found to be far more effective (Parsons, 2016). Much like in the adoption of industry programmes and farm plans, communication allows participants the

important opportunity to ask questions (Ostrom et al., 2012) and establish social norms by which to operate (Ostrom et al., 1992). It is also seen as an important mechanism for building trust between parties (Ben-Ner & Putterman, 2009, as cited in Parsons, 2016). Trust being one of the important things that the agreements (or covenants) made between parties will hinge upon (Ostrom et al., 2012).

One of the important factors that Ostrom repeatedly found to underpin successful agreements was that participants took a long-term view – that is, in economics parlance, they took decisions with a *low discount rate* in mind (Ostrom, 1990; Ostrom et al., 2012).

It was also found to be very important for the participants to be able to develop reciprocity and autonomy within any institution or agreement, these were related to the building of trust and are themselves important building blocks of a strong institutional arrangement (Ostrom et al., 2012).

2.4.2 Free-riding and the need for monitoring and punishment (sanctions)

Having identified strong communication and a foundation of trust as important factors, attention is now focused on the factors where a large amount of the experimental literature is focused: incorrect resource use (or 'free-riding'); monitoring the resource; and the ability to impose punishments (or sanctions). Free-riding is a ubiquitous feature of CPRs and much research has focused on the impact that punishments have on free-riding, and the corresponding impact on the efficient use of the resource (Parsons, 2016).

An exploration of free-riding, monitoring and punishment (sanctions) is important for the discussion relating to the TANK plan change for several reasons. Firstly, self-organising groups seeking to better manage water quality issues have not been a feature of New Zealand policy development, certainly as far as the author is aware. Further, given the lack of track record of this approach, there is a corresponding lack of awareness as to the nuances of such mechanisms. Intuiting the subtleties of these from the international literature indicates that conditional co-operators, or actors who maintain their activity only on the condition that other actors maintain a similar level of activity within a group (Parsons, 2016), are likely to feature in any groups developed in the TANK area.

In their seminal paper *Covenants with and without a sword: self-governance is possible*, Ostrom, Walker & Gardiner (1992) tested the impact of different combinations of communication and sanctions on the efficient use of a CPR. Communication by itself was found to provide an opportunity to establish social norms and limit free-riding use of a resource; while punishments by themselves (i.e. in the absence of communication and social norms) were surprisingly still freely used – even when there was a cost to those people

instigating the punishment – but not in a manner that maximised the efficient use of the resource. In the game where both communication AND punishment were allowed, actors were found to be able to both *discuss and agree an investment strategy* (a covenant), as well as appropriately and efficiently punish actors who did not adhere to the rules (punishment/sanctioning).

Other research has since reinforced this, finding that the ability to punish by itself (in the absence of communication) was much less successful at managing a public good than simply having the opportunity to communicate (without punishment) (Cason & Gangadharan, 2016).

While communication itself may be the stronger variable on its own, it is the use of both communication *and* punishment in combination that is necessary. Research has found that the punishment of free-riders is important for several reasons. Not only does it stop the *direct impact* of free-riding itself, it also stops the *indirect impact* that free-riding has on other rule-abiding members cooperating in a group. Many of the actors will be what is known as *conditional cooperators*, that is, they are willing to cooperate in a system of resource management so long as *other actors continue to operate* in the way that is expected of them (Parsons, 2016). In other words, free-riders will only be tolerated, unpunished, for so long before other group members wonder why they are adhering to the rules when others are getting away without having to. In effect, any non-punishment of free-riders may erode any social capital established in the group (good will and trust) and any agreements (covenants) made.

While instigating or administering a punishment itself has a cost, it has been found that so long as there is a significantly greater cost to the *punished* over the *punisher* (approximately a ratio of 1:4 (punisher:punished), there is a higher likelihood that the punishment will be effective (Parsons, 2016). In other words, a punishment has to be strong enough to be desirable for the instigator to initiate, and for the punished to feel suitably chastised.

Having established that both communication and punishment are important aspects of CPR, the extent that these both depend on *monitoring* is now considered.

Monitoring both the CPR condition and the behaviour of actors in its use were the core of Ostrom's original fourth principle (Ostrom, 1990). This was refined by Cox et al. (2010) into two separate principles: 4A – the actual *use* of the resource by the actors needs to be monitored; and 4B – the actual *condition* of the resource itself needs to be monitored.

The ability to clearly monitor the condition of the resource has been identified as one of 4 enabling factors of what is known as an ambient pollution scheme (Segerson, 1988). In these schemes it is argued that, in the absence of being able to determine and monitor individual activities that are impacting on a CPR (e.g. water pollution), the impact can be managed by a

collective tax/fine system (e.g. collective tax/fine everyone within a catchment). This is so long as there is a clear ability to accurately measure the *aggregate* condition of the resource; along with only being a small number of polluters; who are relatively homogenous in their activities; and the impacts have minimal lag time between farm activity and the resulting impact on the resource.

While there may be potential for some of these conditions to be met in the TANK project area, the clear ability to monitor the resource is a key weakness, as is the heterogeneity of actors in the lower catchments. So, while an ambient tax is unlikely to work on its own, if any kind of ambient tax was considered this should be in conjunction with a certain amount of peer punishment (Cason and Gangadharan, 2013, as cited in Parsons, 2016).

Yet, the experimental literature highlights an important paradox between public good and CPR situations that is difficult to explain, Casari and Plott (2003) call this the spite/altruist paradox. This is that in public good environments, actors tend to cooperate to a level higher (altruism) than that predicted by rational self-interest (selfishness); yet in CPR environments, they tend to cooperate to a level lower (spitefulness) than that predicted by rational self-interest (selfishness). That is, as soon as actors are dealing with a *diminishable* resource, they tend to operate in a way that is *spiteful* to other actors, usually in a way that is detrimental to their own net benefit. It is almost as if their motivation was: “well if I can’t use it (the resource), then neither can you!”. The reasons for this are not particularly well understood.

A useful example of a CPR institution that dealt with spitefulness by melding the factors of monitoring and punishment together very well, is known as ‘Carte di Regola’. This managed forestry and pasture in the Italian alps for 500 years until it was disbanded by Napoleon, yet was well documented and has been recreated under experimental conditions in the behavioural economics lab (Casari and Plott, 2003). These findings are worth discussing.

It was found that the heterogeneity of actors behaviour (i.e. altruistic, selfish or spiteful) was not a barrier, as the structure of the ‘Carte di Regola’ channeled these behaviours to their best use. It does this by providing the *actor that instigates the inspection* of another actor’s farm, as well as the *inspector*, a portion of any fine collected from that inspection/infringement.

When the punishments were weak in the game, the predominant instigators of inspections were those with a spiteful profile, whereas when the punishments were strong, the predominant instigators had altruistic profiles. While this may seem counter-intuitive, it is explained by some of the infringement paid also going to the *inspector*. When the punishment is stronger, the spiteful people are more frustrated (they don’t like others in the group benefiting at their expense), so they temper their behaviour and instigate less inspections and using the resource more efficiently. It is also noted that because the inspectors receive a

portion of any infringement paid, there is no incentive for free-riders to bribe other actors, as if they did they may need to keep bribing them, or bribe multiple people, which would end up costing them more (Casari and Plott, 2003).

While the relationships between these components are complex, it is apparent that a successful CPR regime is likely to be a well-balanced combination of appropriate monitoring (of both the resource and the users) and a suitable – and enforced – peer punishment scheme.

One final point to discuss is whether group size has an impact on the success of punishment in CPR schemes. While there can be a slight 'bystander effect' – where actors do not intervene when there are many people that could, as they think someone else will – an increasing group size has not been found to be a limiting factor in CPR monitoring. In fact, where monitoring can occur passively and by more than one other party, it can be highly beneficial in minimising free-riding (Carpenter, 2007).

2.4.3 Nested institutions

In the previous section the complex relationships between free-riding, monitoring and punishment were explored, in this section the ability of institutions to be nested is explored.

In her eighth principle Ostrom talked about the ability for different *functions* of the CPR institution to be incorporated in *nested enterprises* (also variously called *nested institutions*) (Ostrom, 1990). What she meant was that a 'one-size-fits-all' or 'top-down' institutional approach to the provision of services was usually unlikely to work and that the various functions required should reflect the scale at which they were required. Further, different scales could apply to different functions within the same scheme. For example, a resource might be managed, monitored and peer punished at a micro or medium scale, but relevant information may be provided by a larger regional institution and conflict resolution may be provided by a different sized institution again (for example at a local, regional or even national scale).

The nesting of systems or institutions was one of the more important principles that Ostrom reflected on towards the end of her career (Ostrom, 2012). The refinement of the principles by Cox et al. (2010) agreed and further added to the definition by suggesting that systems could be nested *horizontally* as well as *vertically*, as originally suggested by Ostrom.

2.5 Summary and insights for this research

There is a growing appreciation that freshwater resources in New Zealand are coming under increasing pressure and, as a result, various freshwater policy initiatives are underway across

the country such as the TANK plan change in the Hawke's Bay region. Rather than focusing on prescribing a range of required mitigations, the proposed TANK plan change provides landowners the choice of three mechanisms by which they can determine and coordinate appropriate mitigations measures: Individual Farm Plans; Industry Programmes; and Catchment Collectives.

While Individual Farm Plans and Industry Programmes have a more established history in New Zealand, institutionally recognised self-organising groups such as the Catchment Collectives proposed in this plan change do not. Furthermore, their success is informed by varying literatures: Insights to barriers to Individual Farm Plans and Industry Programmes is informed mainly by the literature around barriers to environmental mitigations (predominantly informed by Pannell (2006) and Kaine & Wright (2017)); while for Catchment Collective this comes from the literature relating to the design principles identified in self-organising groups who manage common pool resources (predominantly informed by Ostrom (1990) and Cox et al. (2010)).

For this research to be useful and for the results to be comparable across all three mechanisms being investigated, these various literatures need to be drawn together into a single analytical framework. When the elements of these literatures are viewed from the perspectives of a primary producer, they can be arranged into four groupings:

1. the attitudes of the producer as an individual,
2. the relationships of the producer to the resource,
3. the relationships of producer to other producers, and
4. the relationships between the producer and wider society.

These groupings and the elements of the literatures that inform them are shown in Figure 6. The reader will notice a gap in two of the three columns on the right, in the 'Producer to producer' section. This gap is explained by the fact that the literature relating to the interactions between producers is predominantly drawn from the work of Ostrom, particularly the concepts of monitoring and punishment of others within groups. This only applies only to the catchment collectives.

This framework is utilised further to develop a comprehensive survey and set of interview questions. See the detailed methodology in Appendix 1 and the survey and interview questions in Appendix 2 and Appendix 3 respectively.

Figure 6. A framework for researching proposed barriers to the mechanisms proposed in the TANK plan change.

		Literatures					
		Common Pool Resources and the Design Principles of self-organising groups. (Ostrom (1990); Cox et al. (2010))	Barriers to environmental mitigations. (Pannell (2006), Kaine & Wright (2017))	Line of questioning	Individual Farm Plans	Industry Programmes	Catchment Collectives
The producer as an individual	2A	**The DEMANDS on the resource and FOR MITIGATION are appropriate for the environment**		General background. General views of the farmer on the resource and the need for action.	✓	✓	✓
	2B	**The RETURN ON INVESTMENT from management is appopriate for the users**	**Relative advantage**	Views on risk and length of return on investment. What relative advantage does any one mechaism provide in your day-to-day decision-making?	✓	✓	✓
			Trialability	Trialibility, upskilling and potential disruption.	✓	✓	✓
			Complexity	Complexity and compatibility with existing farm practices/structures.	✓	✓	✓
The producer and the resource	1B	**Clearly defined RESOURCE**		How clearly is the resource defined and how clearly is that understood? How possible is it to monitor the resource and how comfortable would people be operating in an environment WITHOUT monitoring, if need be?	✓	✓	✓
	4B	**The RESOURCE ITSELF can be monitored**			✓	✓	✓
Producer to producer	1A	**Clearly defined USERS**		How clearly are the 'users' of the resource defined? How well is that understood? Questions relating to the monitoring and punishment of colelctive members. How might conflict resolution be dealt with?			✓
	3	**Those involved CAN INFLUENCE the outcome**					✓
	4A	**USERS of the resource can be monitored**					✓
	5	**Appropriate PUNISHMENT for violations**					✓
	6	**CONFLICT RESOLUTION mechanisms**					✓
The producer and wider society	7	**Level of PERMISSION to self-organise**		What are the wider relationships between communities and institutions like? What impact will that have on the level of trust and permission granted to operate in a self-organising way?	✓	✓	✓
	8	**Institutions & organisations are appropriate and WORK WELL TOGETHER**			✓	✓	✓

Note: The numbers listed on the left relate to the relevant Design Principles outlined by Ostrom (1990) and Cox et al. (2010).

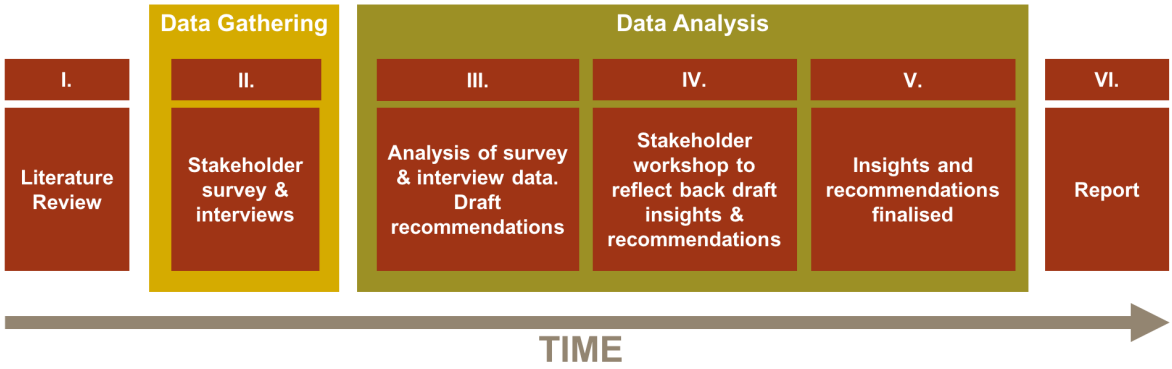
3 Overview of methodology

A mixed methods approach was used for this research, combining both qualitative and quantitative methods. As it is research into people's perceptions of the mechanisms proposed in the plan change, the majority of the research was focused on the qualitative data analysis. This was supported by some quantitative data analysis. A detailed description of the methodology is provided in Appendix 1, and an overview is provided here.

The research was divided into six stages (see also Figure 7):

I. Literature Review
II. Stakeholder survey & interviews (data gathering)
III. Analysis of survey & interview data and draft recommendations (data analysis)
IV. Stakeholder workshop to reflect back insights and recommendations (data analysis)
V. Interventions finalised (data analysis)
VI. Final report

Figure 7. Methodology outline



The Literature Review (Stage I) provided context for the research, informing the structure of interviews and much of the content (see section 2.5, previously). As described earlier, the questions were structured around: the producer as an individual; the producer and the resource; producer to producer and; the producer and wider society.

Data gathering was undertaken through semi-structured interviews of selected stakeholders (Stage II) who had some familiarity with the content of the proposed plan change and the mechanisms within it. As the main object of this research was to identify potential barriers to the adoption of the three mechanisms proposed in the plan change – Individual Farm Plans, Industry Programmes, and Catchment Collectives – interviewing people who were familiar with the mechanisms was necessary. This meant that interviewees were drawn from the Farmer Reference Group, the TANK Group and some Council staff who had been involved with the project.

There were also time constraints on when the results and recommendations from this research were to be delivered. This was in part driven by project timelines, and in part driven by a need to ensure that these insights were available for the development of an implementation plan for the plan change. This was being developed while the plan change itself was being finalised and agreed. The interviews were carried out over April and May 2018.

An initial analysis of the survey and interview data was then undertaken (Stage III). The analysis of the survey data was quantitative, while the analysis of the interview data was qualitative. The qualitative analysis consisted of both *deductive* and *inductive* coding of interview data. *Deductive* coding is where the data is analysed with a certain code or theme in mind, for example you may be interested in the role of group size, so you will look for comments relating to the size of groups. *Inductive* coding on the other hand, is where the data is analysed and a common code or theme is identified from the data. For example, multiple interviewees may talk about the role and importance of technology, so 'technology' may become a code.

This identified a range of draft barriers and interventions which were then reflected back to the Farmer Reference Group at one of their meetings in June 2018 (Stage IV). Following this the insights to barriers and recommendations were finalised (Stage V) and then the final report was written (Stage VI).

4 Summary of results

4.1 Participant demographics

The complete tabulated and graphed results of the individual farm and demographic data gathered from the survey is provided in Appendix 4. These results are summarised here.

Participants were predominantly male, over the age of 51 and having worked in primary production for more than 26 years. Nearly all participants were farm owners (or joint owners) and they were predominantly sheep and beef farmers, with some dairy farmers and fruit orchardists. The majority had been farming in New Zealand for more than 4 generations of their family.

The farms provided the majority (over 80%), if not all of the household income. They were predominantly profitable over the last two years and around half of the farms had successors identified who were their own children.

Most participants had some form of tertiary level education, through Certificate; Diploma; Bachelor's degree; to Post Graduate Diploma or Certificate. Around half of the participants also had post-secondary education in agriculture.

While it is difficult to compare due to the variety of farm types, the average farm size was 880 Hectares, while the median farm size was 750 Hectares. 14 participants answered the questions around nutrient and industry farm plans. Of these, 8 had nutrient management plans and 6 were members of their industries environmental programme.

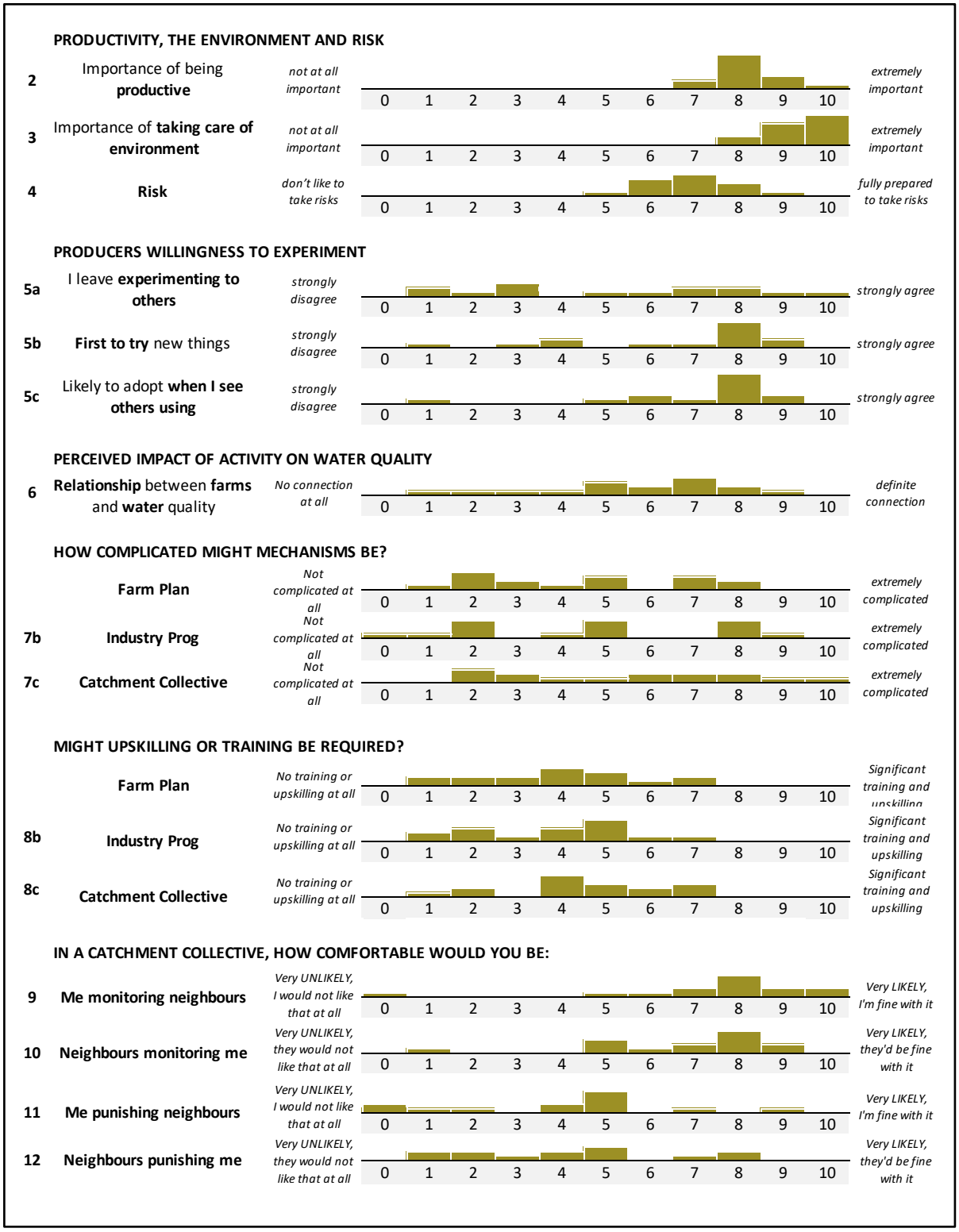
4.2 Survey data

While the survey was the lesser part of the data gathering, the data provides valuable quantitative insight to most of the four parts of the research framework outlined in section 2.5 (the producer as an individual, the producer and the resource, producer to producer, and the producer and wider society). An overview summary of the survey data is provided below, while a more detailed discussion is provided in Appendix 5. A summary of the survey results are provided in the graphs in Figure 8.

Firstly, the perspectives of producers as an individual are considered. Generally, the producers strongly identified as being environmentally focused, slightly more so than being production focused, and with a reasonable appetite for risk (questions 2-4). The strong self-identified tendency towards an environmental focus is likely to be the result of the small sample

size and it being drawn from those producers who have been proactively involved in the development of the plan.

Figure 8. Summary of survey questions - graphed.



While the appetite for experimentation was quite spread across respondents (question 5a), there was a general skew towards them being one of the first to try new things (question 5b);

and them being highly likely to adopt something if they saw other people doing it (question 5c).

In relation to the perceived complexity of the mechanisms (question 7a-c) proposed in the plan (individual farm plans, industry programmes or catchment collectives), opinion was quite divided. Each was varyingly seen as relatively simple, complex, or a mixture of both.

Similarly, in relation to the perceived need for additional training or upskilling for the proposed mechanisms (questions 8a-c), each was varyingly seen as either requiring little training through to requiring a moderate amount. For a more detailed discussion of these issues of complexity and training/upskilling, see Appendix 5.

Secondly, the relationship between the producer and the resource is considered. Only one survey question directly related to whether there was perceived a connection between the activity on a producers' farm (or farm like theirs) and water quality (question 6). Responses to this were highly varied, although there was a small grouping of respondents around the 5-8 mark on the scale (where 10 was 'definite connection').

Thirdly and finally are the questions relating to the relationships of producer to producer. These questions *only* related to the catchment collectives and sought to gauge how comfortable producers would be with two things: monitoring their neighbours in an informal way and/or them being monitored by their neighbours; and punishing their neighbours for inappropriate behaviour in the group and/or being punished by their neighbours.

While the importance of these concepts was identified in the Literature Review (section 2) which lead to their involvement in the survey, their inclusion generated some discomfort and much discussion with participants, often requiring some clarifying. For clarity, 'monitoring' should be thought of as a passive 'keeping an eye on each other over the fence' rather than an active auditing of each other's activities. Whereas 'punishment' should be thought of a 'holding each other accountable', however that might be determined and agreed by a group (e.g. a fine or some other mechanism).

There was a much greater acknowledgement that monitoring would be required, although there was a slight bias towards people being more comfortable with monitoring their neighbours then they perceived their neighbours would be monitoring them. There was a much lower level of comfort with the concept of people punishing their neighbours or their neighbours punishing them, with most respondents returning answers in the middle or lower end of the scale for this question. Again, see Appendix 5 for a detailed discussion of these results.

No survey questions responded directly to the producer and wider society component of the framework. Data for this was gathered in the semi-structured interviews.

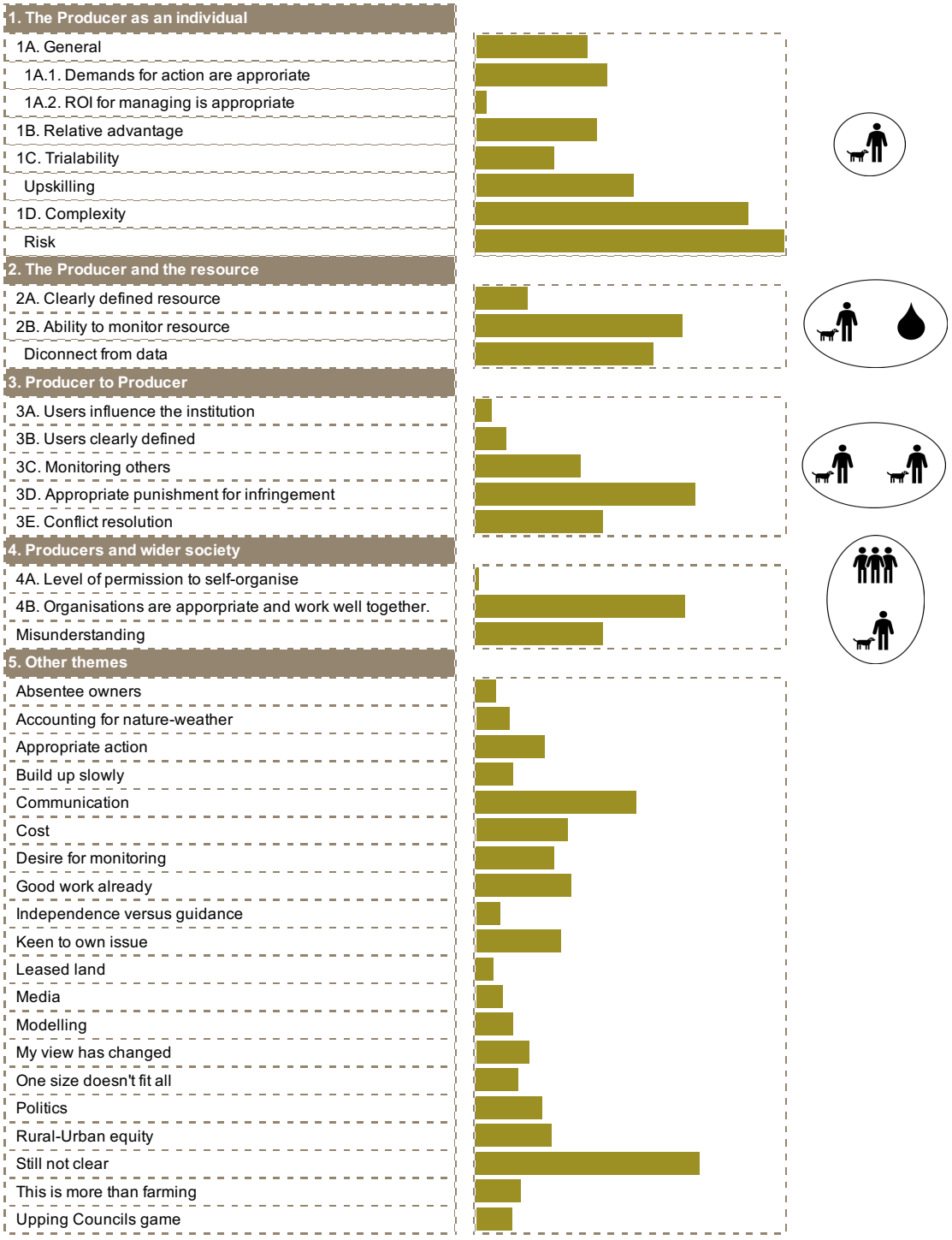
4.3 Coding of semi-structured interview data

The thematic structure used in the coding process is described in Appendix 1. This section provides an overview of the coding results.

Firstly, the level of coding that occurred in each part of that thematic structure, independent of any particular mechanism or attitude, is shown in Figure 9.

These data indicate that the largest volume of comments seem to have been coded from the first section of the interview (part 1 of Figure 9). While larger spikes of coded data occur in the other semi-structured areas of interview (parts 2-4 of Figure 9), it is also noted that there were a significant number of comments coded to various inductively developed themes (part 5 of Figure 9).

Figure 9. Overall level of coding attributed to thematic structure, independent of mechanism or attitude.

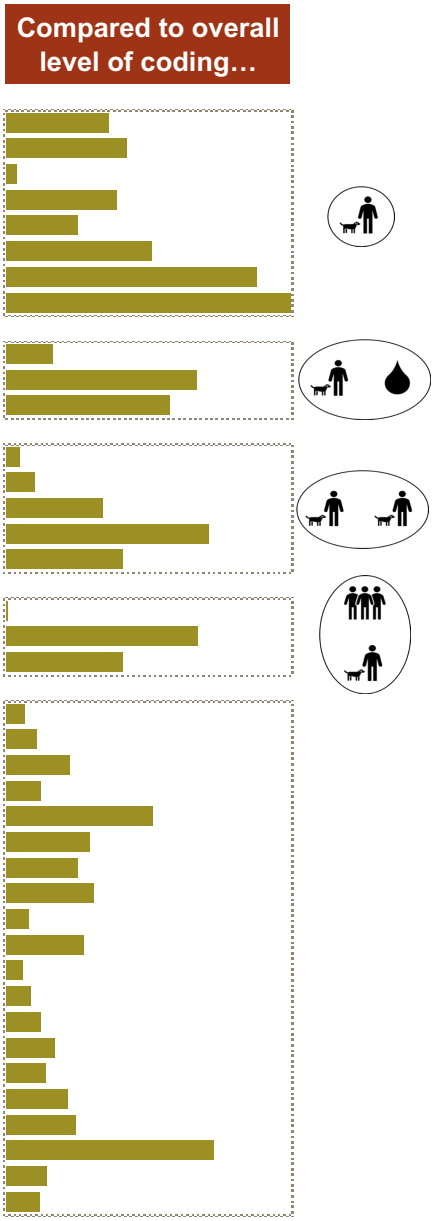


The green bars indiate the volume of total comments coded for each theme.
The images to the right match the images provided for each part of the interview structure against their relevant graphs, for visual consistency.

When the attitudinal coding of the overall number of comments is added (see Figure 10 below), a more comprehensive picture of the type of data from the interviews emerges.

Figure 10. Coding attributed to thematic structure by attitude (positive, neutral, negative) compared against overall level of coding.

Coded theme	☺	😐	☹
1. The Producer as an individual			
1A. General	23	23	5
1A.1. Demands for action are approriate	18	16	27
1A.2. ROI for managing is appropriate	2	3	0
1B. Relative advantage	36	8	14
1C. Trialability	20	6	12
Upskilling	30	21	22
1D. Complexity	35	41	50
Risk	41	45	55
2. The Producer and the resource			
2A. Clearly defined resource	7	7	11
2B. Ability to monitor resource	19	31	47
Diconnect from data	6	17	57
3. Producer to Producer			
3A. Users influence the institution	5	0	2
3B. Users clearly defined	4	7	4
3C. Monitoring others	16	12	19
3D. Appropriate punishment for infringement	26	26	52
3E. Conflict resolution	29	17	11
4. Producers and wider society			
4A. Level of permission to self-organise	1	0	0
4B. Organisations are apporpriate and work well together	29	23	46
Misunderstanding	4	16	38
5. Other themes			
Absentee owners	1	0	9
Accounting for nature-weather	2	3	10
Appropriate action	13	11	9
Build up slowly	5	11	1
Communication	33	20	20
Cost	11	11	23
Desire for monitoring	9	9	17
Good work already	29	4	11
Independence versus guidance	5	6	0
Keen to own issue	33	5	2
Leased land	1	1	6
Media	0	2	10
Modelling	2	6	9
My view has changed	18	7	1
One size doesn't fit all	3	4	14
Politics	1	4	27
Rural-Urban equity	2	4	28
Still not clear	13	51	40
This is more than farming	9	6	9
Upping Councils game	1	4	13



A range of clusters of comments are worth describing in summary.

The highest number of comments were coded to the risk and complexity themes in the interviews. While most of these were negative, a large number were positive or neutral, indicating that some things were not seen as being complex or risky.

The ability to monitor the resource and the level of connection (or disconnection) that people have with the data were areas that generated a large amount of coding. While there were some positive and neutral comments, these tended to be negatively skewed, particularly those relating to a 'disconnect' from the data, which was an inductively (bottom up) generated theme

that highlighted a level of disconnection from, or understanding of, the data that was understood to be available.

Many comments were also coded around monitoring others in a catchment collective; holding other members of a catchment collective to account; and conflict resolution within a catchment collective. For the first two of these the larger number of comments were negative, although importantly there were a comparatively moderate amount of positive comments, too. For the last of these, conflict resolution, the *majority* of comments were positive, indicating that people viewed this as something that was important, would be useful, or even necessary.

Another significant cluster of comments was coded to the 'still not clear' theme. By far the majority of these were neutral or negative, indicating that many things still required clarity. The relationships between groups, organisations or society also garnered many coded instances. Half of these were negative compared to a quarter each of positive and neutral, indicating that not all relationships were viewed as working well.

Two other areas of significant coding were the upskilling or training that may be required and communication. Both of these had higher levels of positive comments, indicating that they tended to be viewed as advantageous or low risk areas.

A much more detailed discussion of the coding is provided in Appendix 6, which covers:

- An overview of results by representative affiliation,
- An overview of results by mechanism and attitude,
- Detailed results by mechanism and interview structure (deductive coding), and
- Detailed results by other identified themes, by mechanism (inductive coding).

A reading of this detailed discussion will provide the reader with a deeper understanding of the discussion in the following sections, where barriers are identified and recommendations made to address these. If the reader has time to read these appendices they are recommended, but not necessary.

5 How the results are discussed and the structure for recommendations

The previous section summarised the results from the surveys and interviews of participants. This section will outline how those results will be discussed in subsequent sections.

The remainder of this report is divided into four main sections: Positives that have been identified in the research; Barriers and risks that apply to all mechanisms; A specific risk identified with the Industry Programme mechanism; and Additional barriers and risks to the Catchment Collectives.

The Catchment Collectives are given their own specific section for several reasons. Firstly, they are the more novel mechanism proposed, so there is less research available to guide what barriers might exist to these. Secondly, they are the only collective mechanism at a property level, so there are several barriers that relate specifically to this.

Supporting imagery is used within the subsequent sections to support the explanation of some of the barriers and recommendations. The images used to refer to each of the three mechanisms are shown in Figure 11. Here, the name of the mechanism is underneath, the image on the left is intended to represent the type of mechanism it is, and the 'check-list' on the right of the image is intended to demonstrate that each mechanism results in a list of things to do on farm.

Figure 11. Images for the three mechanisms.

It is also worth noting that while this research was commissioned to identify potential *barriers* to the adoption of the mechanisms in the plan change, the discussion will talk about both *barriers and risks*. A *barrier* is defined as something that will inhibit the *uptake or adoption* of something. A *risk* is defined as something that may inhibit the *success* of a particular mechanisms or course of action once it has been adopted, or which may inhibit the *future continued adoption or roll out* of a particular mechanism.

Whilst this is a subtle distinction, it is an important one to make as both were identified in the wealth of insight from this research and the impact that risks may have on the *future* success of adoption of a mechanism warrants their inclusion in the following sections.

Firstly though, the next section (section 6) articulates a number of positives or strengths that were identified during this research. Section 7 outlines some barriers and risks identified as being applicable to *all mechanisms* and is divided into three areas: The need for mechanisms to be objective-focused and simple; Ensuring appropriate expectations (everyone is on the same page to begin); and ensuring access to the right support. Section 8 discusses a specific risk to the Industry Programme mechanism. Finally, Section 9 discusses additional barriers and risks specifically identified as applicable to the Catchment Collective mechanism. Section 9 considers barriers and risks specific to the Catchment Collectives in five sections. The same three discussed in section 7 - The need for mechanisms to be objective-focused and simple; Ensuring appropriate expectations (everyone is on the same page to begin); and Ensuring access to the right support – as well as two additional groupings: Interpersonal risks; and Transparency of accountability.

At the end of each section or sub-section, the recommendations made are summarised as numbered dot points in a coloured box, with a priority rating beside it. The priorities are Low (green); Medium (yellow); High (orange); and Critical (red).

Many of the recommendations made in the following sections, through information gathered from the participants, build on discussions that appear to have been ongoing within the TANK process for some time. In that regard, they may not be perceived as a 'new' insight or recommendation, *per se*. Council are likely to already aware of them, although some may be new. Where they are already familiar with them, they should be regarded as being further reinforced and supported by the research that has been undertaken here. This may lend weight to the need to support them and provide additional impetus for them to be further developed and implemented.

6 Strengths identified in the research

Because this research seeks to identify barriers it can be viewed as negative research, focusing on the challenges without acknowledging the positives. Therefore, before exploring the barriers and risks that have been identified, the *positive* things that were identified in the research are recognised first. Most of these are indirectly related to the barriers and risks that have been identified. They provide a base upon which further positive change in relation to environmental management in the TANK catchment may be built.

- Firstly, there was a strong desire amongst those that were interviewed to take ownership of the problem and the solution. Rather than being told what to do, there was a genuine desire to be a proactive part of the solution.
- Secondly, there was also a large amount of good work that had already been done with regards to improving environmental performance. Many participants talked about the level of planting that had been going on across the district, the good practices that were already in place, or the amount of land that had been proactively retired.
- Thirdly, farming has a proven and celebrated history of innovation and problem solving, partly which underpins the first and second points.

All of these three positive points indicate that there is the desire, the ability and a proven track record to support the further environmental management improvements that the plan change seeks.

There are several other positives that are also worth noting.

- Fourthly, the research identified many examples where respondents' views had evolved or changed over their time of their involvement in the TANK process. This indicates that participants were willing and able to develop new ways of thinking and working, which are skills that are likely to be required as the plan change is implemented.
- Fifthly, many participants noted that all types of farm planning were good for a producers' business, as they made them more aware of their constraints and opportunities, and better helped them learn about and subsequently adapt business, not only in the environmental sense.
- And finally, there is perceived potential for both Individual Farm Plans and Catchment Collectives to tailor environmental management specifically as it is required, rather than drive generic actions. This was seen as potentially very efficient, effective and also potentially engaging.

7 Barriers and risks to all mechanisms

The previous section outlined some of the positives about the mechanisms proposed in the plan change, or the situation or people in the TANK catchments. This section will discuss a range of potential barriers to adoption and risks to success that were identified as applying to ALL mechanisms proposed in the plan change. That is, Individual Farm Plans; Industry Programmes; and Catchment Collectives.

7.1 The need for mechanisms to be objective-focused and simple

The single most significant barrier to adoption and risk to success is that the mechanisms proposed in the plan change are **not appropriately focused or not simple**. The core concepts of this are explored here further: Does the mechanism actually address the problem? (i.e. the danger of it not being appropriately focused); reduce their perceived complexity (i.e. keep it simple); and being clear about the longer-term requirements of the mechanisms (i.e. don't 'move the goalposts').

7.1.1 Does the mechanism actually address the problem?

Most of the interviews reflected themes of conversations that had already occurred throughout the TANK process. Many participants stressed that discussion had consistently come back to the question "What are we trying to achieve?", to which the answer was "improve water quality". There was a consistent perception that there was a danger the plan change may become more focused on ensuring everyone was undertaking action of some kind, rather than *appropriate action* in *appropriate areas* that actually addressed the water quality issues. There was widespread concern that a "one-size-fits-all" approach would not be appropriate and that blanket requirements across the catchments would not be useful, eroding trust and goodwill in the Council in the longer term. Many respondents referred to the recent experience in the Tukituki plan change as evidence of this risk. Many of these comments tended to be coded in the 'risk' or 'appropriate action' codes.

Multiple respondents talked about the need for a pragmatic risk-assessment based approach to determining appropriate action on the ground, informed by the relative issue(s) being experienced in the different catchments. This would likely be based on an observational assessment of the land, its condition and use, as well as a consideration of the farm practices currently being utilised. While Industry Programmes will have their own approach to risk assessment, there is an opportunity to align any risk-assessment based approach developed for both the individual Farm Plan and the Catchment Collectives (see Figure 12). Any risk-

assessment developed should be consistent across both, so that this is eliminated as a potential area for confusion and does not become an influencing factor in choosing between these two mechanisms (and therefore potentially a barrier to one of them).

Figure 12. Recommendation to keep risk assessments consistent across both Individual Farm Plans and Catchment Collectives.

Keep structure of risk-based assessment consistent across Individual Farm Plans and Catchment Collectives.

	Recommendation	Priority
1.	A clear risk-assessment should be developed to identify *appropriate* action in response to relevant freshwater quality objectives at a catchment level.	High
2.	Ensure the risk-assessment is applied consistently across both Individual Farm and Catchment Collective plans. This removes confusion around how action is decided.	High

7.1.2 Reduce the perceived complexity of each mechanism (i.e. keep it simple)

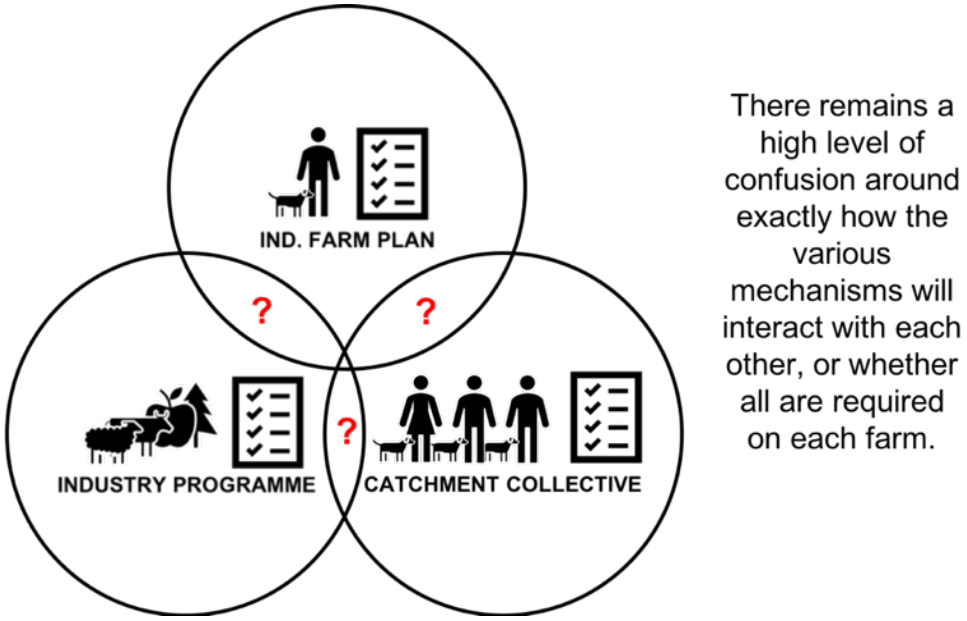
Hand-in-hand with comments from participants about ensuring any action was *appropriate*, were comments calling for any action to be *simple* and easy to understand. Complexity was seen as a key barrier and risk, which is consistent with the findings of both Pannell at al. (2006) and the matrices developed by Kaine and Wright (2017). There was a clear concern amongst interviewees that the mechanisms being developed could become cumbersome, burdensome, and an effective 'tick-box' exercise. Ensuring the mechanisms developed were concise, accessible and understandable were seen as key enablers of their use.

Therefore, hand-in-hand with the recommendations to develop a risk-assessment approach to determining action, recommendations to keep that risk-assessment and all elements of any of the mechanisms as simple as possible are outlined below. Again, as the Industry Programmes are developed by Industry, the below recommendations are targeted at those mechanisms that Council will develop (Individual Farm Plans and Catchment Collectives).

Firstly, (recommendation #3) a clear process is outlined for what each of these mechanisms entails and how they are developed. This will provide a clear outline of the effort required to develop a plan under either and will enable to clear comparison of the relative advantages/disadvantages of both to the producer.

Secondly, (recommendation #4) there remains a high level of confusion around how each of the mechanisms overlap (or not) and how they will (or will not) operate and work together (see Figure 13). While this is not surprising given the early stage of development for some of these mechanisms, it does highlight that confusion is a key risk and may be a powerful barrier to adoption of the most appropriate mechanism.

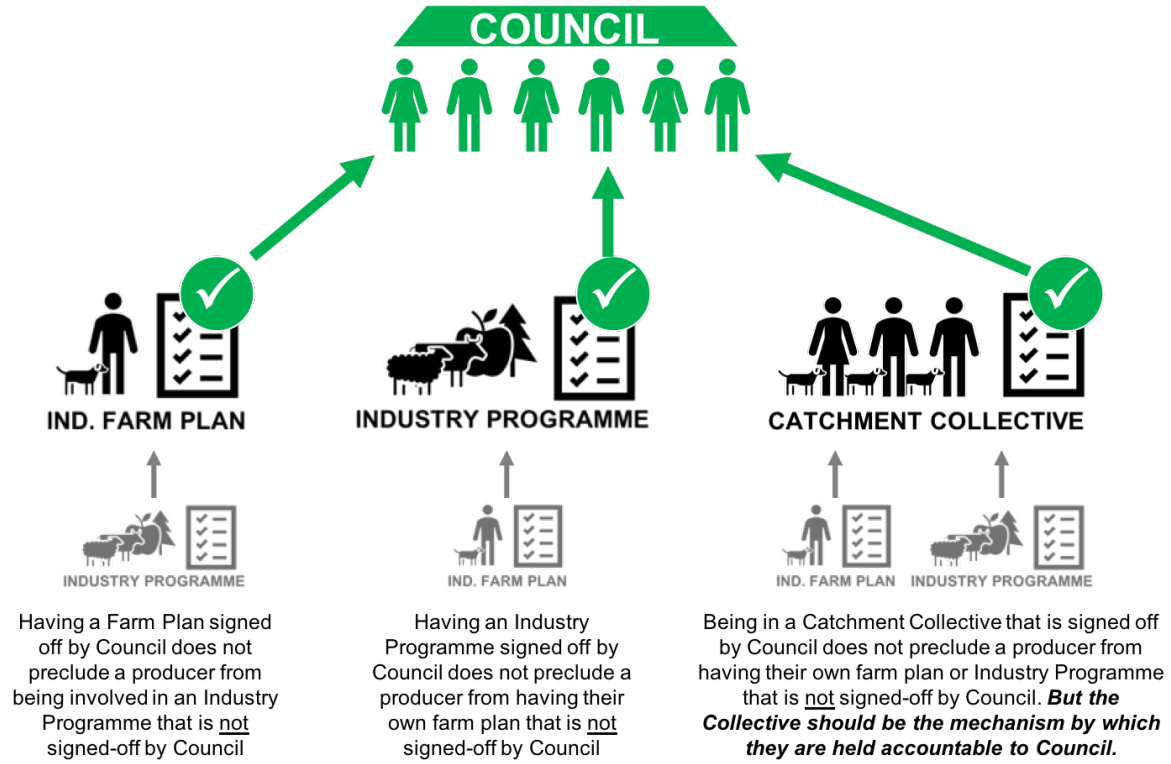
Figure 13. Lack of clarity around how the mechanisms work together



Interviews from participants (largely coded to the 'still not clear', 'complexity', or 'risk' themes) indicated that there were inconsistent views on this and varying degrees of understanding. The core element of this confusion seemed to be that only one mechanism would require the sign-off of Council and the means by which they (individually or jointly) would be held accountable to Council. It would appear that the extent to which one producer may in fact be utilising a range of mechanisms is more widespread than expected, yet it is the lack of clarity around which ones would be used to hold someone accountable to Council that may be problematic. For example, many people talked about already doing some of the various components of a farm plan, such a nutrient budget, which they would still do even if they were part of a Catchment Collective. Others spoke of how they expected that members of a Catchment Collective would *each need to have* an individual farm plan as a way of both developing the individual commitments that they would make to a Catchment Collective (e.g. nutrient allocations), or to deliver on the promises each made individually to a Catchment

Collective. Similarly, Industry Programmes were seen as something that many people may have alongside an Individual Farm Plan or a Catchment Collective, either because they may already be in one, or because that may be required as a pre-requisite for access to a certain product market. A visual demonstration of this is provided in

Figure 14. A visual representation of how the mechanisms that producers could still be involved with, depending on the mechanisms they use to sign-off with Council.



It is unlikely that all the mechanisms will ever be mutually exclusive at a property level, and nor should they be. Yet to reduce the barrier of confusion around how they all fit together it should be made clear that while producers may actually be involved with many of these mechanisms, only one will require sign off from Council. Further, only the Catchment Collective should take precedence in a hierarchy. In other words, if not involved in a Catchment Collective the producer may decide the mechanism to sign off with council (e.g. Farm Plan or Industry Programme). If a producer *is* involved in a Catchment Collective, then that becomes the mechanism by which they become accountable to Council.

	Recommendation	Priority
3.	Outline a clear framework for how to develop both an Individual Farm Plan and Catchment Collectives. These should be accessible and consistent where there are common elements, so that an easy comparison between the relative advantage/disadvantage of both can be made.	High
4.	Be clear that producers can be involved in multiple mechanisms but only one needs to be signed off by Council. If involved in a Catchment Collective, that takes precedence as the mechanism that is required to be signed off by council.	High

7.1.3 Be clear about what the likely longer-term requirements of the mechanisms may be (i.e. don't 'move the goalposts')

This sub-section discusses a potential consequential barrier that may result from keeping action focused and simple. While keeping things focused and simple is a proactive way of only dealing with the most pressing issues first and not overwhelming a producer(s) with too many actions at once, returning to secondary and tertiary priority actions in the future may be viewed as 'moving the goalposts' if those priorities are not clearly recalled. Given the length of time (i.e. multiple years) that is likely to be involved with dealing with a priority area (e.g. sediment) before changing focus to a secondary issue (e.g. nutrients).

The extent to which this may be an issue will depend on the issues within each catchment. Yet being clear about immediate as well as longer term priorities in any of the mechanisms (particularly the Individual Farm Plans and the Catchment Collectives because they are driven by Council) will go a long way to maintaining trust between parties in the longer term (recommendations #5).

	Recommendation	Priority
5.	Be clear about longer term objectives and how a different contaminant may be the focus of attention in the future, once a higher priority objective has been dealt with. This will reduce the chance that a change of focus in the future will be viewed as 'moving the goalposts'.	Medium

7.2 Ensuring appropriate expectations (everyone is on the same page to begin)

The previous section outlined a range of barriers related to ensuring that the focus of any action is appropriate, and that the mechanisms are kept as simple as possible. This section will consider a range of barriers and risks that relate to the various levels of access of

understanding that different parties have of monitoring, data, and the activities or each other, how this may cause an issue, and recommendations for dealing with this.

7.2.1 Distance from monitoring (awareness of and access to council data)

One of the two inductive codes added to the deductive codes determined by the interview structure was called 'Disconnect from data'. This was added because it became apparent when the interview discussed water quality monitoring that many participants felt that there was a significant gap of data when there may well have been data available and they were simply unaware of it. The author understands that unless respondents were directly involved with the TANK group and many of the presentations made there, they were unlikely to be aware of what data there was.

It is beyond the scope of this research to assess the level of data that is held and whether that is appropriate for the requirements of producers in the TANK catchment, yet it has identified that there is a potential disconnect between the producers and the data that *does* exist, regardless of whether it is sufficient or not. This is seen as a barrier to the potential evolution and alignment of producers' personal views on the nature of the problem and therefore their support for any action that may be required, and the mechanisms that will be used to deliver it. If considered through the framework of Kerr & Dorner (2013), this is an opportunity to increase the level of *concern* that producers have about the problem which, in conjunction with a *capability* to undertake action, can lead to more successful *contracting* via one of the mechanisms in the plan.

While the interviews with Council staff indicated that effort was certainly being put into this area, it was acknowledged this could be more effective or perhaps made a higher priority. The following are suggested as areas to explore to potentially reduce this barrier and increase concern and understanding.

	Recommendation	Priority
6.	Explore additional, user friendly ways, of sharing Councils existing longitudinal monitoring data with the public. Consider an increased use of science communication expertise in Council operations.	Medium
7.	Actively work with farmers to identify ways that are more accessible for them to access and understand longitudinal monitoring data.	Medium
8.	Explore the viability of 'catchment champions' for data communication from within the catchments (i.e. in addition to Council staff). This is to help understand and communicate it, not defend it. For example, as part of environmental programmes with local schools.	Medium

7.2.2 Potential lack of understanding of what can be monitored and the role of modelling

While the previous section explored the *disconnect* between producers and data that already exists (***what*** monitoring there is), this section explores a perceived lack of understanding of *what is able to be monitored* and the *role of modelling* (***how*** things are monitored).

The interviews highlighted that producers were generally very tangible people with a higher level of trust and motivation for action when they could clearly draw a connection between the cause and effect of an issue. In other words, they tended to believe something was contributing to an issue when they saw it themselves. Because there was a disconnect from the data, many respondents did not perceive a strong connection between activity on their land and issues with water quality or whether action itself was widely justified (see Appendix 6). Therefore, there tended to be a strong desire for more monitoring, which is discussed further in section 7.2.3. This was coupled with a strong desire to take ownership of the issue and proactively be involved in monitoring at a community level with some participants asking to be shown how to take monitoring samples so that they could do so.

Yet whether this desire was driven by enthusiasm or the need to develop a property level data set for future self-preservation purposes, there were high expectations around what *could* be monitored. There were quite different expectations around what could be meaningfully monitored at a community level; and the level of scientific rigour that was required for Council to use any data as evidence of the success of the plan change (or any State of the Environment (SOE) reporting). In other words, while many people may be motivated to gather samples at a property level, these are unlikely to meet the scientific standards required by Council to prove their plan efficacious or use as evidence in any legal process.

If unaddressed this perception gap will remain or may even grow, reducing the ability to develop *concern* for action (Kerr & Dorner, 2013) or worse, increasing pessimism in the mechanisms. It is recommended that Council seek to build understanding of the scientific standards required for monitoring; actively discuss the role of citizen science and community generated data; and clearly outline what data will be collected and how it will be used, as relevant for each mechanism.

Recommendation	Priority
9. Build an understanding with producers of the scientific standards of monitoring processes, particularly the need for longevity and frequency of sampling for statistical relevance. Also build an understanding of how data is used in legal processes. Be open to innovation in this area, if any is identified through working with the community.	High
10. Council to prioritise discussing the role that 'citizen science' or 'crowdsourced data' may play in monitoring, both internally within council and externally with producers/communities. Expectations around this are unlikely to align and highly likely to pose a large risk to establishing and maintaining strong relationships moving forward.	High
11. Whatever monitoring protocols are agreed when mechanisms are agreed, these should be clearly outlined in agreements so that all parties are aware of them from the beginning.	High

7.2.3 Possibly unrealistic expectations of the quantity of future monitoring

That monitoring warrants three sub-sections indicates its importance. The previous two sub-sections relating to monitoring and data discussed the disconnect between ***what*** data already exists; and the potential lack of understanding around ***how*** water quality was monitored and the scientific rigour required. These may potentially increase the risk of unrealistic expectations around the capability of monitoring, which may become a barrier to adoption. This section specifically considers the potential unrealistic expectations around the *quantity* of future monitoring and the risk this may post to the mechanisms. In other words, ***how much more*** monitoring will be undertaken.

It is well known that producers are 'hands-on' operators and respond better when the results of action are observable (Pannell, 2006), and the findings of this research are consistent with that. It was found that there were high levels of expectation that the *amount* of monitoring (whether done by Council or otherwise) would significantly increase. Many of these comments were captured in the 'demand for monitoring' code and highlights a potential barrier to successfully adopting the mechanisms in the plan change.

The producer interviews consistently highlighted high expectations of monitoring. Yet the (admittedly lesser number of) interviews with Council staff indicated that those expectations are highly likely to be mal-aligned with the actual capacity of Council to be able to deliver such levels of monitoring (both in terms of staff and financial cost). This may present a barrier to adoption in that it may increase reluctance to be involved in any mechanisms, if there is not a high level of confidence that the results of any action will be able to be measured.

It is therefore recommended that Council develop a clear understanding of the establishment and ongoing costs (including staff costs) of monitoring stations and regimes (recommendation

#12). It is acknowledged that this may already be well known. This information will form supporting information that can be used to have a constructive and informed discussion with producers and the community around what future level of monitoring is able to be committed to, and the role that modelling will continue to play.

Recommendation	Priority
12. Council to calculate the average establishment AND ongoing operational costs of various types of monitoring stations and regimes. This should combine both direct capital costs and indirect costs of staff time. This can then be used in correlation with expectation setting discussions with the community around the ongoing level of monitoring that will occur.	Critical
13. Supported partly by the results of recommendations #10 & #12, Council to proactively work with the community to build an understanding of what is technologically and cost-effectively possible to monitor, as well as a clear understanding of how modelling will continue to play a role in the future. It should be noted that this will be linked to the formation of the Catchment Collectives, as monitoring will play an important role in determining their area.	Critical

7.2.4 The expectation that Council needs to 'up its game' (traditional non-enforcement)

Having considered monitoring issues in the previous sections, this section looks at the identified need for Council to improve its own track record of enforcement.

Many producers highlighted the fact that the proposed plan change would create a huge demand for action on producers, as one person put it "Council are asking a lot of us". When discussing this point there was a notable sense of frustration amongst many producers that Council was asking them to increase the amount that they did, when it was considered that Council itself was not currently doing all that it could do. Examples were given of Council being resistant to enforcement action; or that some farmers' bad practice or activity had been reported and Council had done nothing about it.

Such comments indicated that this had eroded the level of confidence that producers had of Council. The implication was that unless there was an equitable increase in effort from Council, when they were asking so much of producers in the plan, future confidence in Council would continue to decline and pessimism regarding the plan change would continue to rise. This would create a loner term barrier to the adoption of the mechanisms in the plan.

One of the potentially contributing factors to this that was identified in interviews with Council staff, was the counter-intuitive nature of Council policies for enforcement staff. It is understood that there is a requirement for enforcement staff to recover the costs of virtually all their time against come kind of chargeable code, as very little of their overhead costs are covered from

the general rates collected by Council. In effect, the attention of enforcement officers is likely to only go where there is either: an existing consent whose fee covers the cost of regular monitoring and site visits (i.e. time can be recovered directly from that consent fee); or an infringement is likely to be bad enough that it will result in a successful prosecution, which will result in cost recovery through some kind of penalty.

While such a policy may have good intentions, it is potentially driving counter-intuitive behaviour in that this means that enforcement officers only tend to visit consented activity, they are likely to be reactive and are less likely to be proactive. As there is no ability to recover costs from permitted activities, there is no incentive for enforcement officers to visit or monitor permitted activities. Below is a quote from a Council interviewee that describes this tension:

> *"compliance... need to be able to charge back most of their time to a consent. So, there's not much running around finding people, working out whether people are doing the right or wrong thing, just because they don't have anyone to charge for that. You need to find a thing. You can't guarantee that you're going to find something, so… and then you don't have anything to charge to [if you don't find anything]…"*

This does appear to be impacting producers' perception of Council as an effective organisation, with an implication that Council need to take some responsibility for an improvement in their own performance. Two other producers described it as below, when talking about some bad practice observed on another farm:

> *"And the regional council have done NOTHING to stop it...*
> *They've almost, like they turned a blind eye to it. So, they are going to start policing that thing now? Or is it not the problem that I perceive it to be? I just… I think it's [the plan change] going to put the regional council in a whole different light, really."*

> *"But the point I'm making is the regional council are going to have to be the policemen and they're going to have to show some balls which they haven't shown before. And the silly part about it is that if they'd done something 10 years ago, and there's an example of it, that person that I'm talking about up there, would be "Okay, remember so-and-so? He got done by the regional council for doing less than what you've done. If you want to go down that road fine" and "oh... okay". An example should have been made somewhere along the line and when this comes in if they make an example of someone everybody will know about it and I reckon that'll be the best form of compliance of the whole lot. [laughs] Everybody knows that the Regional Council is weak."*

This report does not suggest that Council is unaware of this perception, yet it does seek to highlight it as an area that requires attention. While this plan change is developed within one part of Council and compliance/enforcement sits in another part, there is no difference to how Council is viewed by producers. Therefore, for some in the community, this means that Council is perceived as ineffectual or weak.

This section is intended to highlight the need to ensure that the plan change is considered from a wider organisational perspective. Therefore, it is recommended that Council highlight and discuss internally the potential counter intuitive impacts of the need for compliance/enforcement staff to recover the costs of their time from consents (recommendation #14). Further, Council need to be prepared to be publicly seen to take more corrective and enforcement action (recommendation #15).

Recommendation	Priority
14. Council should highlight and discuss internally the unintended consequences of requiring compliance and enforcement staff to recover the cost of their activities. This is contributing to the perception within the wider community that Council are ineffectual or weak.	Critical
15. To ensure that Council are seen to be equitably improving their own performance, whilst asking producers to improve theirs, Council should be prepared to take more public corrective and enforcement action against bad practice. It will be important to do this consistently across the region.	Critical

7.2.5 Continued misunderstanding between the different rural industries and the urban areas

A lack of understanding of what producers did – both by other types of producers as well as urban communities – was a consistent theme. Most producers did not believe that activity from their own land was having a major effect, while at the same time most held strong views around which other production activities they perceived were having a major effect. At the same time, an increased disconnection between urban people from farms was noted and lamented, in part because the number of people with relatives on – and therefore access to – farms had declined.

For all of these examples it was perceived that this lack of connection has reduced familiarity, resulting in more misunderstanding around what actually happens on farms/orchards/forests. This is important as it has reduced levels of trust both between industries and rural/urban areas. In turn, this may increase resistance to the adoption of the plan mechanisms, as there is a strong feeling that some industries are being “picked on”.

This is a very systemic and big-picture issue, and in part would be aided by improved science communication already discussed in recommendations #6, #7 and #8. Some additional novel recommendations are suggested here that may help decrease this risk. Firstly, inter-industry 'open gate days' (recommendation #16), where industries can become more familiar with each other and their practices, with a view to building familiarity and trust in the longer term. These are marked as 'High' importance as they should be prioritised in catchments where there are likely to be both Catchment Collectives AND heterogeneity of producers. Secondly, over the much longer-term, there may be an opportunity to continue to build understanding between urban and rural communities by exploring peer-to-peer partnerships between rural and urban schools, and by linking school learning activities to coordinated farm visits (recommendation #17).

It is acknowledged that schools may have existing programmes like this, and it has not been within the scope of this report to investigate the level to which such programmes already exist.

Recommendation	Priority
16. Consider inter-industry 'open-gate days' or 'familiarisations' as a way of building familiarity and understanding of different practices between rural industries.	High
17. To improve longer-term understanding between rural and urban communities, Council might consider supporting an educational programme that connects urban schools with rural schools or industries. For example: farm visits associated with urban and rural school studies (primary and secondary school); or peer to peer school partner programmes between rural and urban schools.	Medium

7.2.6 Equity of action across both rural and urban areas

Two of the lesser prevalent inductive codes were called 'rural-urban equity' and 'politics', both of which were dominated by negative comments. While these codes did not feature highly in the overall analysis of the results discussed earlier, they are worth revisiting here.

The comments coded to rural-urban equity tended to highlight the consistent feeling that farmers were being 'singled out' or were being asked to carry a disproportionately high burden of corrective action and mitigation, in relation to water quality. This is important as like many of the challenges highlighted in the previous sub-sections, this perception may lead to an erosion of social capital supporting the plan change and increase barriers or resistance to the adoption of the mechanisms. As noted by one Council respondent:

> *"So, I do think the farmers get a lot of the blame and it's not that… those issues shouldn't be raised with them, but there is certainly a lot of issues that the urbanites haven't confronted yet."*

This links with the comments coded to 'politics' as many producers felt that the high level of misunderstanding of producer operations, particularly between rural and urban communities (see section 7.2.5), was resulting in the politicisation of the water quality issues. This only reinforced the feeling of being 'singled out' and would continue to erode any wider appreciation or support for action that is generated and is so important (Kerr and Dorner, 2013).

Determining what impact rural areas are having on water quality compared to urban area, and what action may be required by urban areas to improve water quality, is obviously well beyond the scope of this report. However, it is recommended that Council ensures that whatever action is required is perceived to be equitable across all parties, proportionate to the perceived contribution that they make (recommendation #18).

Recommendation	Priority
18. Council should ensure any action required across both rural and urban areas is perceived as being equitable and proportionate to that parties perceived contribution to the problem. This will ensure social capital in the plan is maintained and no particular party feels 'picked on'.	High

7.2.7 The good work that has already been done is not recognised or appreciated

Having dealt with a number of perception issues in the previous sub-sections, this sub-section looks at the perception that good work that has already been done, is not recognised. Acknowledging the self-selection bias of the sample group that was discussed in the detailed methodology (Appendix 1), many producers talked about the proactive and progressive action that they had been taking on water quality issues (either intentionally or consequentially due to other activities) over a number of years.

During the interviews, several talked about the frustration of being expected to do work when they had already been doing a lot of work that was not recognised or appreciated. In effect, some of the more proactive farmers were frustrated that with the plan change the benchmark from which all future improvements would be measured was very high. This was perceived as limiting the potential future marginal improvements in water quality that they could make, thus biasing support and the perception of progress towards less proactive farmers. For example, some spoke of the concept of providing financial support to less proactive farmers to plant or fence parts of their property. Such a move was not seen as fair as it rewarded those who had not done work (with subsidies) and ignored the costs that were already sunk by more proactive farmers at their own expense. Further, if detailed measurement only began with plan implementation, then those that had done no work previously would demonstrate a greater marginal improvement.

Like the challenges noted in the previous sections, this has the potential to erode the level of social capital supporting the plan change. Further, it may bias the adoption of some mechanisms over others. For example, while some proactive farmers were keen to be involved in the Catchment Collectives, they also acknowledged that it would be easier for them to simply develop an Individual Farm Plan or an Industry Programme, because they would likely already be enacting most of the appropriate practices.

It is therefore recommended that Council explore ways of recognising or rewarding the good work that has already been done by proactive farmers. This would help to maintain support for all mechanisms equally, enabling proactive farmers to be recognised leaders in collective groups, and not biasing them towards the individual mechanisms (farm plans and industry programmes).

Recommendation	Priority
19. Council to consider some kind of reward and/or recognition for the good work that has already been undertaken by proactive farmers. For example, an awards programme; rates relief; or reduced future consenting/monitoring costs.	High

7.3 Ensuring access to the right support

Pannell (2016) identified a range of potential barriers to the adoption of mitigation practices. The main elements of those that have been incorporated into the framework for this research are complexity, the potential level of upskilling and training required, and the ability of a mechanism to be trialed before being adopted more widely. As discussed in section 4, Appendix 5 and Appendix 6, this research found mixed views as to whether all of the mechanisms were viewed as complex; whether a large amount of upskilling or training was required; and how trialable they were perceived to be.

Council should ensure that appropriate support is provided to producers, so these potential barriers are minimised for all mechanisms. Many interviewees noted that ‘support’ had been pledged from Council in the proposed plan change, yet it was still unclear exactly what that would be. It is likely that Council and producer expectations around this will differ and indeed reasonably divergent levels of expectation were described by different interviewees. Council should prioritise discussion around what type and level of support that it considers appropriate and then decide how to resource that. This will set expectations earlier and avoid the potential risk of mal-aligned expectations once mechanisms are adopted.

Setting the expectations around the provision of expertise that is expected from Council (e.g. erosion control, riparian planting, guidance on plan writing, etc) is a two-step process. Firstly,

Council should consider what level of that type of support would be appropriate across all properties. Importantly, this should be independent of the current level of staff (recommendation #20), as at the time of writing this was currently being reviewed and restructured. Secondly, once a reasonable level of support is determined then Council should assess whether this can all be provided with existing in-house resource; whether there is a case for expanding the number of Integrated Catchment Management staff; or whether the existing Council staff could be supplemented with contracted external resource (recommendation #21).

In addition to Council expertise, support from other experts may help reduce these barriers, particularly around complexity and upskilling/training. Council should consider whether there is a case for providing limited financial support for producers to procure relevant expertise that is NOT in line with Council areas of expertise (e.g. farming advice), so long as that is acting equitably across the region (recommendation #22).

One additional and quite specific area of potential complexity that was identified in the interviews related to leased land. There was confusion amongst interviewees around whether the ultimate responsibility for meeting the plans objectives rested with the landowner or the lessee, or both (many of the interviewees operated leased land themselves, in addition to that which they owned). Regardless, it was considered important to ensure that lease documents enabled appropriate action agreed in any of the mechanisms to be passed on to the lessee.

To minimise this area of complexity and risk, it is recommended that Council consider providing landowners a set allowance of time for legal advice to ensure lease agreements are appropriate and reflect actions agreed to in any of the mechanisms (recommendation #23). This might be provided by Council legal staff or an approved external provider paid for by Council.

Once Council has determined an appropriate level of internal and possibly external support that it is comfortable providing, the appropriate expectations can be set with the community.

These recommendations should be considered in conjunction with some additional specific recommendations of a similar nature for the Catchment Collectives (see section 9.3).

	Recommendation	Priority
20.	Council to undertake an assessment of what level of Council expert advice would be considered an appropriate expectation across all properties. This calculation should be made independently of the constraints of current resource, as it is intended to scope up the level of resource that may be required, regardless of whether it is currently available.	Critical
21.	In-house expertise: Once #20 has been assessed, Council to assess whether this can be achieved with existing internal resource; whether that team needs to be expanded; or whether Council provision of this can be supplemented by contracted external resource.	Critical
22.	External expertise – general: Council should consider whether there is a case for providing limited financial support for producers to procure relevant expertise that is NOT in line with Council areas of expertise (e.g. farming advice), so long as that is acting equitably across the region. This could also be provided through an allowance of time available to each property (e.g. X hours) from an agreed list of experts that is paid for by Council.	Critical
23.	External expertise – leases: Council to consider providing landowners a set allowance of time for legal advice to help write appropriate lease agreements. This could be either from council legal staff or from approved providers paid for by council. This will ensure that, where required, lease agreements are appropriate and transfer any responsibility for relevant mitigations agreed in the chosen mechanism to the lessee.	High

8 A risk specific to the Industry Programme mechanism

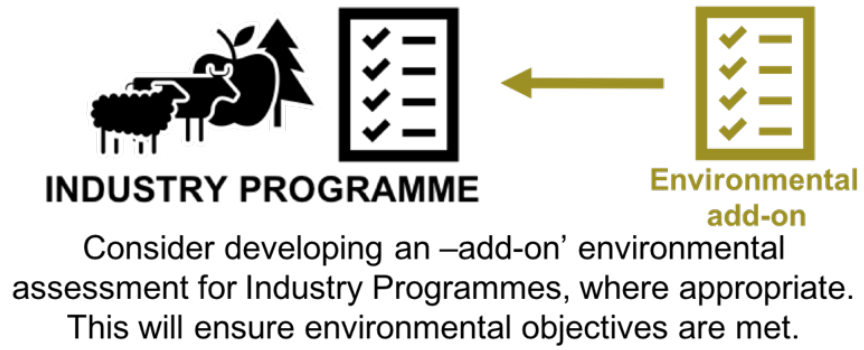
The previous section looked at barriers and risks that applied to all three of the mechanisms proposed in the plan change. This section looks at one barrier specifically relating to Industry Programmes, which relates to the need for mechanisms to be simple and focused.

8.1 The need for mechanisms to be objective-focused and simple

A consistent risk highlighted by interviewees was that Industry Programmes tended to be product, rather than environmentally, focused. While they may include things that may result in environmental benefits, it was generally not perceived as their main focus.

This is not a barrier to adoption in itself. Yet, if many producers choose an Industry Programme as their mechanism to be held accountable to Council, there is a perception that the desired environmental outcomes may not be achieved. This would erode confidence in the plan and be a barrier to the adoption of other mechanisms in the longer-term. It is therefore recommended that Council investigate the development of an 'add-on' environmental assessment to go with Industry Programmes (recommendation #24), where the environmental component is not considered to be covered well enough within the Programme itself. This is demonstrated visually in Figure 15.

Figure 15. Recommendation to develop an 'add-on' environmental assessment for Industry Programmes, where appropriate.



	Recommendation	Priority
24.	Investigate the development of an 'add-on' environmental assessment for Industry Programmes, arranged by HBRC with the various industry bodies, where appropriate. This would ensure that the generally product-orientated Industry Programmes achieve the desired environmental objectives. Any such 'add-on' should be aligned with the risk-assessment discussed in recommendations #1 & #2 for Individual Farm Plans and Catchment Collectives, to ensure consistency.	High

9 Barriers and risks specific to the Catchment Collective mechanism

The previous sections outlined a range of barriers and risks that applied to all the mechanisms, as well as a specific risk that applied to the Industry Programmes. This section outlines a range of specific risks that apply to the Catchment Collectives. As they are the only collective mechanism and the most novel, a range of barriers and associated recommendations have been identified. There are grouped according to the three sub-sections that have been consistent across the previous two sections: the need for mechanisms to be simple and focused; ensuring appropriate expectations (everyone is on the same page to begin); and ensuring access to the right support. In addition, two further sub-sections have been identified: interpersonal risks; and transparency of accountability.

In some instances, the barriers and risks are substantially or completely covered by recommendations made elsewhere. Where this is the case the barriers are still articulated, and the recommendations are cross-referenced.

9.1 The need for mechanisms to be objective-focused and simple

In addition to the barriers and risks relating to simplicity and focus identified in section 7.1, the following have been identified as more specific risks in relation to the Catchment Collectives: administrative burden; a simple and clear collective agreement; the need for a staged approach.

9.1.1 Administrative burden

One of the consistent concerns identified in the interviews was that the administration of Catchment Collectives may be a burden. This was clearly viewed as potentially complex (Pannell, 2006) and a barrier to adoption.

While this is articulated as a specific barrier, it is considered that recommendations made elsewhere would ensure that this is minimised, specifically recommendations #20, #21, #22, #23, #25, #26 and #34.

9.1.2 A simple but clear collective agreement

In addition to the possible administrative burden, a range of barriers around the potential perceived complexity of what is agreed in a collective; how it operates; and who is responsible for what, was identified in the interviews.

While some of these specific barriers are addressed with recommendations in other sub-sections, the primary way of coordinating all of the membership, objectives, agreed actions and expectations of members is through a simple but clear collective agreement. This should articulate a range of pertinent factors relating to the collective. These are shown visually in Figure 16 and listed in Table 1 below.

Figure 16. Recommended components of a Catchment Collective agreement – diagram

Table 1. Recommended components of a Catchment Collective agreement – table

Component		Description	Recommendation(s)
Governance		How the group is governed	#26
Objectives		Clear outcome-based objectives	#25
Risk-based assessment		A clear risk-assessment to determine *appropriate* action	#1 and #2
Agreed action	**Works**	The physical works that has been agreed	#25 and #30
	Practices	The farm practices that have been agreed	#25 and #30
Monitoring (& how it will be used)		The monitoring that has been agreed. Also, how it will be used and what influence it has.	#25 and #29
Reporting		Reporting lines, frequency, data and standards agreed.	#25 and #29
Conflict resolution, enforcement & expulsion		Clear process for conflict resolution, enforcement action, and possible expulsion from the group (if required) are agreed.	#26

One of the inductive codes identified from the interviews was 'one size doesn't fit all', in which most comments were negative. This was because there was a strong feeling that a 'blanket' approach to action was usually not appropriate and did not reflect the subtleties of individual property characteristics. Yet some interviewees did think that some guidance, even prescription, was useful depending on the context. Many of these comments were captured in the inductive code called 'independence versus guidance', which highlighted the desire for independence and the benefit provided by prescription.

In this vein, interviewees perspectives on the extent to which components of the Catchment Collective should be prescribed or not, were divided. Certainly, there was the desire that many of the *outputs* from the Catchment Collectives should be consistent. Yet views on whether this was best achieved by prescribing things (which tended towards a one-size-fits-all approach), or by allowing flexibility, varied. Therefore, the components of the Catchment Collective listed in Table 1 can be divided into two groups: Components where a high level of prescription is

required to ensure consistency across Catchment Collectives and usefulness of data; and components where several prescribed options may be offered, so as to minimise the complexity, while still allowing for bespoke solutions to be developed by individual collectives.

Components where prescription is required include: the *process* for describing the objectives (even though the actual objectives will differ per collective); the *format* for recording agreed works and practices (even though these will differ per group); the *processes and standards* for monitoring of water quality and the provision of that data (whoever does it); and the *format, standards and frequency* of reporting about the collective (recommendation #25).

There are two main components where it is recommended that some prescribed options should be offered but bespoke solutions should still be allowed, so long as they respond to the required need. The first of these is *Governance*. 2-3 options for governance structure should be provided for collectives to choose from, as it is unlikely that one model will suit all collectives developed. Yet collectives should still be allowed to develop their own – so long as it meets the needs of Council. The second area is *Conflict resolution, enforcement & expulsion*. 2-3 examples of processes for resolving conflict within a collective might be provided for collectives to choose from. Yet, again, groups could still develop their own – so long as it clearly sets out a process for members of a collective to follow in the event of conflict resolution and how any non-conforming behaviour will be dealt with or enforced (recommendation #26).

Further detailed suggestions on how conflict resolution might be *resourced* with the appropriate skills is provided in section 9.3.

The risk-assessment component of the Catchment Collective has already been addressed in recommendations #1 and #2. Some recommendations relating to the transparency of accountability and being able to ensure enforcement action can be taken by Council against collective members is discussed in section 9.5.

	Recommendation	Priority
	Recommendations for a clear risk assessment to inform objective-focused activity have been discussed in recommendations #1 and #2.	
25.	Determine the aspects of a Catchment Collective agreement where prescribed approaches MUST be used to ensure consistency. For example: the *process* for describing the objectives; the *format* for recording agreed works and practices; the *processes and standards* for monitoring and the provision of that data; and the *format, standards and frequency* of reporting about the collective.	Critical
26.	Determine the aspects of a Catchment Collective agreement where prescribed approaches ARE OFFERED BUT NOT COMPULSORY, allowing bespoke options to be developed, as long as they respond to Council's need. For example: *Governance* structures; *Conflict resolution, enforcement & expulsion* processes and protocols.	Critical

9.1.3 The need for a staged approach

Staged or incremental implementation is often required in the successful adoption of mitigations or new technologies, with the need for trialability and direct sight of proven results often being cited (Pannell, 2006). The findings of this research are consistent with that identified need for staged and incremental progress.

Many respondents highlighted the long-term nature of their businesses and the need to stage implementation, reinforcing that progress towards improved water quality was a journey not a single step. A rushed or hurried implementation of collectives across the entire region may prove to be a barrier to the more widescale adoption of them in the longer term.

While it is understood that Council plans to stage the implementation of the collectives, two specific recommendations are made in relation to that. Firstly, Council should prioritise catchments based on the level of environmental risk AND the perceived level of societal acceptance/success of the Catchment Collective approach (recommendation #27). Secondly, the Council should actively identify 1-3 trial catchments in which to pilot the collective approach. This could be done during the notification period of the plan change before it becomes operative and could in effect be a 'trial' for the TANK area – thus building confidence in the approach with a wider range of producers. When piloting the collectives, a range of catchments that represent the diversity of likely land-uses and issues should be considered. In other words, a mixture of catchments dealing with sediment versus nutrients; and a mixture of catchments with homogenous as well as heterogenous land use (recommendation #28).

Recommendation	Priority
27. Prioritise catchments based on the level of environmental risk AND the perceived level of societal acceptance/success of the Catchment Collective approach	High
28. Actively identify 1-3 trial catchments to pilot the collective approach before the plan change becomes operative. This provides a 'trial' that the wider community can observe. A range of catchments that represent the diversity of likely land-uses and issues should be considered, such as a mixture of contaminant issues; as well as homogenous versus heterogenous land use.	Critical

9.2 Ensuring appropriate expectations (everyone is on the same page to begin)

The previous section considered specific issues relating to Catchment Collectives being simple and focused. This section considers specific issues relating to ensuring everyone is on the same page.

Three key issues were identified here in the research. Firstly, a strong barrier to adoption and a critical risk to success of the collective mechanisms, is the probable mal-alignment between producers' high expectations around monitoring of water quality and the actual level of monitoring that is likely to be affordable. This has already been discussed in earlier sections and those recommendations are considered relevant here (see recommendations #6 to #13).

The second expectation issue that may prove to be a barrier to the collective mechanism relates to how natural disasters and severe weather events will be accounted for. This is considered more relevant for the collective option as this is likely to be more closely tied to collective monitoring trends in a waterway (rather than an agreed list of actions at a property level). The variability of nature was highlighted as one of the key risks that producers consistently face in their lives. While producers may collectively have excellent land management practices, high impact natural events may impact the monitoring data to an extent that trends are difficult to determine. It is recommended that pragmatic ways of accounting for natural disasters and extreme weather events are investigated that are in addition to narrative recording (recommendation #29). This may provide data to supplement and perhaps estimate their impact on formal monitored results.

Thirdly, the issue of properties that may physically sit in multiple catchments remained an area of confusion and a potential barrier. Certainly, there was no desire by producers to belong to more than one Catchment Collective, as this was seen as an administrative burden. Yet the objective-focused (and therefore locally relevant) action of the Catchment Collectives may mean that neighbouring catchments are dealing with different issues. In addition, if a property

is physically located in several Catchment Collectives, but is only a signed-up member of one, then all of the governance and conflict resolution mechanisms of the collective that that property is a member would apply. This poses a serious risk of confusion between catchments and a barrier to the adoption of this mechanism. If producers are keen to belong to only one Catchment Collective, it is recommended that any works or practices agreed by that property is noted as applying to which geographic area in their catchment agreement (recommendation #30).

This allows for the producer to only be involved in one collective, while it also allows for objective-focused action to be nuanced to the needs of the individual catchment. The producer may then benefit from only being involved in one collective, while the other collectives who this property may have an impact on have transparency of accountability for the action that property owner will be undertaking in relation to their catchment.

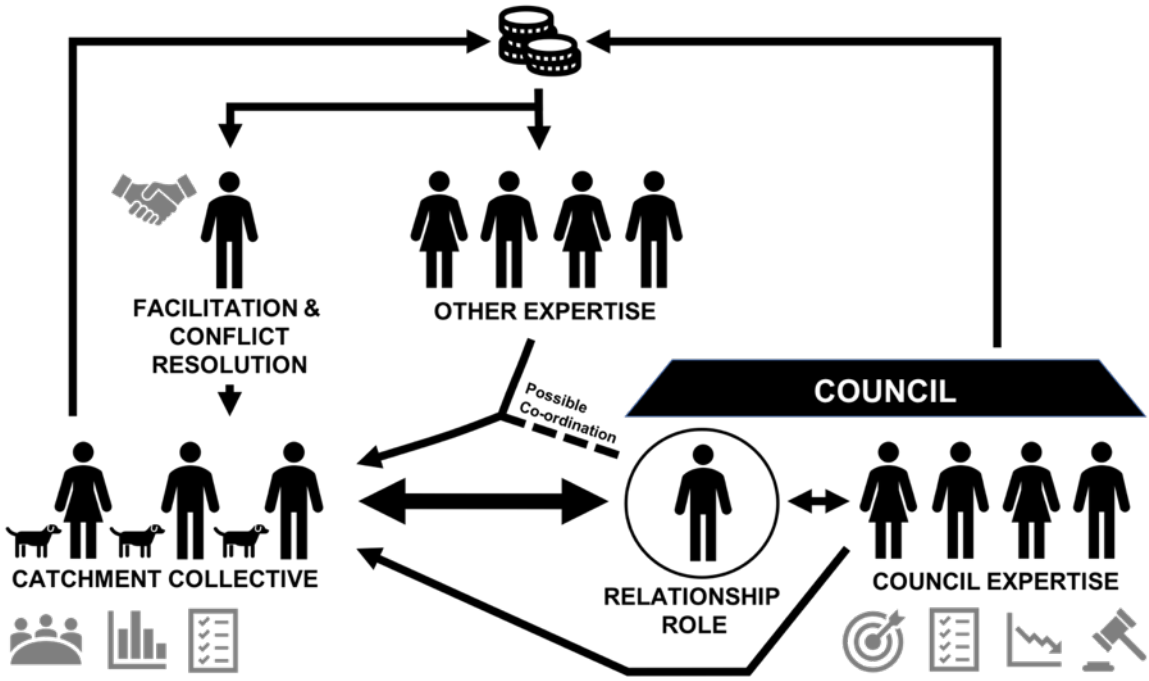
Recommendation	Priority
The malalignment of expectations around monitoring of the resource are covered by recommendations #6 to #13	
29. Investigate pragmatic ways of accounting for natural disasters and extreme weather events in addition to narrative recording. This may provide data to supplement and perhaps estimate their impact on formal monitored results.	Medium
30. If properties cross catchment boundaries and the producer chooses to only be involved in one single Catchment Collective, any works or practices agreed for that property should be recorded by geographic area. That way, if they apply to a different Catchment Collective, there is a transparency of what action is occurring, even if a property is not a member of the other collective.	High

9.3 Ensuring access to the right support

Ensuring access to the right support has already been discussed as a way of reducing the complexity of potential mechanisms, and a range of general recommendations have already been made (section 7.3). Given the novel nature of the Catchment Collectives and the potential barriers that additional complexity of working with others may result in, a range of additional recommendations are made here.

Firstly though, a visual representation of how it is recommended that the Catchment Collectives interact with other individuals or organisations is described. This provides context for the information in this and the next section (9.4 Interpersonal risks).

Figure 17. Visual representation of how the Catchment Collectives should operate in conjunction with other individuals and organisations.



Five main nodes of people (group or individuals) are identified in the diagram: The Catchment Collective itself, Council expertise; a *relationship role* at Council (which is shown in a circle to highlight its importance; other expertise; and independent facilitation and conflict resolution. The elements highlighted in grey indicate the various elements of the possible Catchment Collective agreements described in Table 1.

9.3.1 The relationship management role(s) between Council and Catchment Collectives

In the development of the proposed plan change it was widely accepted that Council would resource some kind of role to liaise between Council and the Collectives, supporting them in their development. There was a consistent perception amongst interviewees that this role would be critical to the success of collectives. While called various things in the interviews, it is recommended that the role is a r*elationship management* role, not a role responsible for the actual *facilitation* of the groups (recommendation #31).

Views on whether this role should be responsible for the direct *facilitation* of groups or to help them *resolve internal conflict* were varied. Given the regulatory role of Council; the importance of coordinating expertise and other support for Collectives; and the possible role that Council may need to have in enforcement, it is recommended that the skills for facilitating the groups and helping them resolve internal conflict (if this is required) comes from outside of Council (recommendation #32). This separates any potential conflict of interest in that role between

the skills of facilitation and conflict resolution; and the possible need for Council to require enforcement as a regulatory authority.

Council should explore various ways to potentially resource this role. While they will be representing Council, it was seen as important by interviewees that this person was familiar with the *realities of farming and different farming practices*. Key characteristics that should be explored by Council in this role are: a) broad familiarity and experience with farming/growing, rather than experience with Council, and; b) likely longevity in the role, given the expected long relationships with Catchment Collectives (recommendation #33).

Recommendation	Priority
31. Establish an HBRC role(s) responsible for the proactive relationship management of the Catchment Collectives and connecting them with appropriate expertise. This role(s) would likely be actively involved in the Collectives but does not facilitate them.	Critical
32. Any *facilitation and support for internal conflict resolution* within a collective should be provided independent of Council. This recognises and seeks to not confuse the proactive relationship management, regulatory and enforcement role that Council has.	Critical
33. Council to explore sourcing an appropriate resource(s) for this relationship management role(s) via direct employment or contracting (e.g. appropriately skilled NGO). Several key attributes that should be considered are: a) Broad familiarity and experience with farming/growing, rather than experience with Council. b) Likely longevity in the role, given the expected long relationships with Catchment Collectives.	Critical

9.3.2 Additional funding for Catchment Collectives

The interviews highlighted a strong desire from many producers to proactively own the issues moving forward. Catchment Collectives were seen as a key way of achieving this, yet their lack of track record may prove a barrier to their adoption; and the need for potential support to help them navigate this new space is a key risk to their success.

Many interviewees stressed the fact that while the Catchment Collectives had multiple benefits for both producers, they did for Council too. Most notably it would save them a huge administrative burden in terms of the amount of staff time required to manage one mechanism delivering action (e.g. a Catchment Collective), as opposed to managing all properties in that area via Individual Farm Plans. There is a risk that the Catchment Collective mechanisms may be viewed as Council trying to abrogate its responsibility to producers, which could be a barrier to their adoption. To mitigate this risk, it is recommended that Council recognise the benefits this mechanism provides to their operation and establish a financial fund that can be used to support the collectives with the appropriate expertise they need: for example, specialist

farming or growing advice; reporting and plan writing; facilitation; or conflict resolution (recommendation #34).

Guidance on what this advice can be used for should be provided by Council. Allowing the collective the independence to determine how they may use those funds is seen as a way of encouraging independence and innovation, within the predetermined limits of their allocation (recommendation #35). It will be important to allocate funds in an equitable way across collectives, and this also allows collectives to spend their own money on additional support as required as well.

Recommendation	Priority
34. Council consider establishing a fund ('Collective support fund') to financially support Catchment Collectives. This could be a pool of funds that is available for all range of things (expert advice, reporting, plan writing, facilitation, conflict resolution etc).	Critical
35. Allocate money from this support fund in a way that is equitable across Collective groups of varying sizes. Further, allow what it is spent on to be at the discretion of the individual Collective (up to their allowed limit), as this both provides support from Council but allows collectives to be innovative and efficient with how they use those funds. Collectives can then also use their own funds if they wish.	Critical

9.4 Interpersonal risks

One of the key barriers to Catchment Collectives identified was the perceived potential for personal conflict between individuals within the collectives. While there was broad support for the collective approach, when potential challenges relating to conflict and conflict resolution were explored in the interviews, there was generally a high level of discomfort around dealing with those types of issues, as they tended to be individualistic by nature. As one farmer put it:

"Farmers, on average, are individual people, that's why they went farming.
So, they are more than happy with their own company"

There is a risk that if *one* Catchment Collective has a bad experience, this may become a well-known example in the community and become a barrier to the adoption of this mechanism in other catchments.

9.4.1 Build familiarity with the collective approach across the wider producer community

From the point of view of building support for the collective approach, previous recommendations have already highlighted the need for collectives to be prioritised in

catchments where they can be piloted and are more likely to be adopted (recommendations #27 and #28). In addition, working proactively with the farming media (e.g. industry magazines or Country Calendar) may be a way of both generating familiarity with the approach and documenting the journey of the first collectives (recommendation #36).

Recommendation	Priority
36. Consider working with farming media (e.g. industry magazines or Country Calendar) to document the journey of the pilot collectives and build familiarity with the collective approach across a wider audience. This may help build familiarity and acceptance in the longer term.	Low

9.4.2 The danger of conflict within groups

Even if there was wider awareness and adoption of the mechanism, it remains a critical risk that collectives are adequately supported to ensure that they can deal with internal conflict as best they can. The potential for internal conflict within collective groups was explored at length in the interviews. This was because the ability of a self-organising group to 'keep an eye on each other' (monitor) and 'hold each other accountable' (punish) has been found to be critical within the CPR literature (Ostrom, 1990; Cox et al., 2010; Parsons, 2016).

While it was acknowledged that questions around how such issues would be dealt with had often been raised in the TANK process, it was still unclear in most interviewees minds as to how this would actually be dealt with, short of referring such matters to Council. These comments made up a significant amount of those coded to 'risk', 'still unclear', 'monitoring others' and 'appropriate punishment for infringement'.

As noted in the results section, it was also a predominant view that most producers would be uncomfortable dealing with interpersonal conflict within their groups. Yet many did recognise the importance of this and suggested or were open to such expertise being provided from outside the group. A range of recommendations have already supported this. The need for the independent provision of group facilitation and conflict resolution skills has already been highlighted in recommendation #32, while the ability to resource this with funds from Council has been covered by recommendations #34 and #35. Further, recommendation #26 outlined that some prescribed options for conflict resolution should be provided to Catchment Collectives to choose from, as well as allowing them the opportunity to develop their own.

One additional recommendation is made to help make conflict resolution as clear as possible. Any conflict resolution processes that are developed for the set of prescribed options available to Catchment Collectives should be developed with professional conflict resolution expertise (recommendation #37). The benefit of such conflict resolution expertise talking to nascent

Catchment Collectives when they are beginning, so as to provide an overview of the types of things to avoid, should also not be under-estimated. This may reduce the need for their services later.

Recommendation	Priority
37. Ensure appropriate conflict resolution expertise is utilised when developing a set of prescribed processes for dealing with internal conflict for Catchment Collectives.	High

9.4.3 Absentee owners

One final area of interpersonal risk within Catchment Collectives identified in the research, was perceived challenges with absentee owners. Many interviewees spoke negatively of absentee owners (predominantly in pastoral farming areas), perceiving them not to be as personally invested in the outcomes that were being sought. In other words, they were not seen to care and would likely take the minimum amount of action that they could get away with in order to be compliant with Council rules. In catchments where absentee ownership features this may be a barrier to the collective approach, as the perceived attitude of these owners may result in resistance to the collective approach from other farmers.

Several recommendations are made to attempt to mitigate this risk. Firstly, in areas where Catchment Collectives are likely to be used (predominantly the high-country areas), Council should try to assess where landowners may be absentee (recommendation #38). This is not to imply that all absentee landowners may be resistant to the collective approach, but it does provide guidance on which landowners may benefit from more targeted and personalised information about the collective, as they are less likely to have heard about it in the community.

Secondly, Council should consider a direct marketing campaign targeting absentee landowners (recommendation #39). This can familiarise them with the plan, the desired objectives and the mechanisms – particularly the Catchment Collectives.

Recommendation	Priority
38. Council to assess (if possible) where landowners may be absentee landowners within the likely Catchment Collective areas. They are less likely to have heard about the collectives in the community and can be provided more targeted and personalised information.	Medium

Recommendation	Priority
39. Consider a direct-marketing campaign targeted at absentee landowners designed to familiarise them with the plan, the mechanisms (particularly the Catchment Collectives) and what they seek to achieve. This would likely involve a number of foreign landowners as well as domestic absentee landowners, so may require specialist support (e.g. language advice) where appropriate. *Various industry groups (e.g. Beef & Lamb, Dairy NZ) or government departments (e.g. NZTE) that have regular foreign interactions may be able to provide advice here.*	Medium

9.5 Transparency of accountability

Several of the key areas of confusion around how Catchment Collectives may work have been explored in the previous sections. Conflict resolution is seen as critical and best provided by an external resource (section 9.3.1) and part funded by Council (section 9.3.2); the administrative burden and potential confusion around how Catchment Collectives may operate will be reduced through the use of a simple but clear Catchment Collective agreement (sections 9.1.1 and 9.1.2); and the role of a relationship manager employed (or contracted) by Council has been clearly recommended (section 9.3.1). One final area relating to reducing barriers to adoption of the Catchment Collectives relates to ***being clear around who has committed to doing what action, and how that can be enforced***.

While this section may be last chronologically, it deals with some of the ***most critical risks and important recommendations*** in relation to Catchment Collectives.

It was noted earlier that there may be a need for enforcement action against members of a collective, if they were not implementing work or practices that had been agreed within a group. It has also been noted that such enforcement action is clearly seen by interviewees as the role of Council, both because they are the regulatory body; and because for the collective to do it may be disruptive to the wider fabric of the rural communities in which they operate.

The draft plan change states that collectives need to articulate a process for expelling people from the group. If that were to occur (likely only in extreme cases of disharmony), then it would become a clear and simple process for the Council to then require that person to develop an Individual Farm Plan or and Industry Programme, which would then need to be signed off by Council. This provides Council a clear opportunity to ensure that any required action is appropriate to that property and provides a mechanism for them to be held accountable.

So, it is well known that expelling someone from a collective would enable Council to make them accountable.

Yet there was also a clear expectation from many interviewees that Council would be the entity taking any kind of enforcement action against a member of a collective, if required, *while that person was also a member of the collective*.

Crucially, however, it is not clear how Council may take enforcement action against a member of a collective, without the collective first expelling that person.

Obviously, Council has a regulatory responsibility to enforce the rules in its own plan. Yet if the plan rule being enforced is a one where a group has come together and ***collectively*** agreed a list of actions, then how can Council only take enforcement action against one member of that group? It is beyond the scope of this report and the expertise of the researcher to provide legal guidance on whether this is possible or not. However, having been highlighted in the research it is noted as a *critical risk* to the potential operation of the collectives, and therefore a *key potential barrier* to further adoption of this mechanism.

Several recommendations are provided to get greater clarity around this issue and minimise its potential impact.

Firstly, it is recommended that as part of the Catchment Collective agreements, any physical works or farming practices agreed to by individual producers in a collective are clearly articulated and ascribed to the relevant property. This will ensure that there is transparency of accountability for specific actions both within the collective, and outside of it if required (recommendation #40).

Secondly, it is recommended that Council seek legal advice as to whether it is possible for them to take any kind of corrective or enforcement action against a member of a collective, where it is requested by the collective, while that person/property is still a member of a collective AND, crucially, they *will remain so* after the enforcement action has been taken (recommendation #41).

Thirdly, it is important that clear internal conflict resolution processes are developed for each collective that clearly articulate how conflict resolution and enforcement action will be taken against a member of the collective, while they are a member. These should also clearly outline the process for expelling someone from the collective (recommendation #42).

One final risk was identified to the success of the Catchment Collectives, and therefore a potential barrier to their adoption in the longer-term. That was the risk of a property within a Catchment Collective changing ownership. In reality, this is a fairly likely scenario, and so some thought should be given to how this may be dealt with. It is recommended Council seek legal advice as to whether it is possible to transfer the actions agreed by one owner, as part

of a collective agreement, to a subsequent owner. If this is possible, this should also be clearly stated in Collective agreements (recommendation #43).

Recommendation	Priority
40. Ensure actions agreed by members of a Catchment Collective are clearly recorded, transparent and allocated against relevant members/properties within the Catchment Collective agreements. This is to ensure that if corrective action is required by Council for individual collective members (while they are still part of the collective), this can be done clearly and simply.	Critical
41. Council should seek legal advice as to whether they are able to take corrective action of any kind against a member of a collective, where it has been requested by the collective, while that person/property is still a member of the collective AND will remain so after the enforcement action has been taken.	Critical
42. Clear internal conflict resolution processes should be developed for each collective and should be appropriate for that collective. These will articulate processes for conflict resolution; how corrective or enforcement action will be taken against a group member while they are a member of the group; and the process for expelling members from the collective.	Critical
43. Council to seek legal advice as to whether it is possible to transfer the actions agreed by one owner (as part of a collective agreement) to a subsequent owner if that property changes ownership. If this is possible, this should also be clearly stated in Collective agreements.	Critical

10 Summary and conclusion

This research has investigated the barriers and risks to the adoption of the three mechanisms proposed in the TANK plan change for coordinating management action, in relation to water quality. These mechanisms are Individual Farm Plans, Industry Programmes, and Catchment Collectives. A mixed methods approach has been used, with a quantitative survey and a semi-structured interview being undertaken. The sample included a range of people who have been involved with the TANK plan change, either directly in the TANK stakeholder group; with the Farmers Reference Group; or as an employee of Council.

The resulting data set was analysed by collating quantitative survey results and by thematically coding interview data to identify barriers and risk according to a range of deductive and inductive themes. The majority of the data analysis was via the qualitative coding process.

Many barriers and risks were found and a large number of these could be categorised as applying to all mechanisms. Additionally, one barrier was identified specifically for Industry Programmes specifically, while a number of additional potential barriers were found to apply specifically to Catchment Collectives.

For all mechanisms and the additional barrier specific to the Industry Programme, these barriers can be grouped as follows:

- The need for mechanisms to be objective-focused and simple
- Ensuring appropriate expectations (everyone is on the same page to begin)
- Ensuring access to the right support

For the Catchment collectives, these three groupings also applied, as well as the following additional groups:

- Interpersonal risks
- Transparency of accountability

A total of 43 recommendations have been made across these five groupings. Each has been given a scale of importance – Low, Medium, High or Critical. These recommendations are summarised in Table 2 below.

Table 2. Summary of recommendations made in relation to the barriers and risks identified in this research.

Grouping of barriers	Number of recommendations			
	Critical	High	Medium	Low
RECOMMENDATIONS RELATING TO ALL MECHANISMS				
The need for mechanisms to be objective-focused and simple		4	1	
Ensuring appropriate expectations (everyone is on the same page to begin)	4	6	4	
Ensuring access to the right support	3	1		
A RECOMMENDATION SPECIFIC TO THE INDUSTRY PROGRAMME MECHANISM				
The need for mechanisms to be objective-focused and simple		1		
RECOMMENDATIONS SPECIFIC TO THE CATCHMENT COLLECTIVE MECHANISM				
The need for mechanisms to be objective-focused and simple	3	1		
Ensuring appropriate expectations (everyone is on the same page to begin)		1	1	
Ensuring access to the right support	5			
Interpersonal risks		1	2	1
Transparency of accountability	4			
TOTALS	19	15	8	1

The 43 recommendations are also collated into three tables in order of priority at the end of this section: Critical (Table 3); High (Table 4); and Medium & Low (Table 5).

This research has identified a rich volume of potential barriers & risks and has provided recommendations to address these. It recognises that many of these are likely to have already been discussed as part of the TANK process or may already be on Council's 'radar'. They are commended to Council here in the hope that the formulation and ranking of recommendations might reinforce the importance of some barriers to be dealt with and that this may help guide implementation action in this regard.

This research has been focused on barriers and risks. While this has an obvious negative focus, it is for a positive reason. A huge amount of effort has already been collectively invested by Council and a number of supporting stakeholders to develop the TANK plan change. The success of that plan in the longer-term is heavily dependent on the successful adoption of the mechanisms proposed. The recommendations outlined here are intended to assist with the successful uptake of whatever mechanism an individual may choose. A significant amount of

goodwill, positive energy and a desire to make progress as a community was also identified in this research. Ensuring such goodwill is maintained will be key to the success of the mechanisms proposed in the plan change. If that goodwill is able to continue, supported by the recommendations in this report, the future of action taken to address the water quality issues in the TANK catchments looks positive.

Table 3. Critical recommendations across all groupings of barriers.

Recommendation	Priority
RECOMMENDATIONS RELATING TO ALL MECHANISMS	
Ensuring appropriate expectations (everyone is on the same page to begin)	
12. Council to calculate the average establishment AND ongoing operational costs of various types of monitoring stations and regimes. This should combine both direct capital costs and indirect costs of staff time. This can then be used in correlation with expectation setting discussions with the community around the ongoing level of monitoring that will occur.	Critical
13. Supported partly by the results of recommendations #10 & #12, Council to proactively work with the community to build an understanding of what is technologically and cost-effectively possible to monitor, as well as a clear understanding of how modelling will continue to play a role in the future. It should be noted that this will be linked to the formation of the Catchment Collectives, as monitoring will play an important role in determining their area.	Critical
14. Council should highlight and discuss internally the unintended consequences of requiring compliance and enforcement staff to recover the cost of their activities. This is contributing to the perception within the wider community that Council are ineffectual or weak.	Critical
15. To ensure that Council are seen to be equitably improving their own performance, whilst asking producers to improve theirs, Council should be prepared to take more public corrective and enforcement action against bad practice. It will be important to do this consistently across the region.	Critical
Ensuring access to the right support	
20. Council to undertake an assessment of what level of Council expert advice would be considered an appropriate expectation across all properties. This calculation should be made independently of the constraints of current resource, as it is intended to scope up the level of resource that may be required, regardless of whether it is currently available.	Critical
21. In-house expertise: Once #20 has been assessed, Council to assess whether this can be achieved with existing internal resource; whether that team needs to be expanded; or whether Council provision of this can be supplemented by contracted external resource.	Critical

Recommendation	Priority
22. External expertise – general: Council should consider whether there is a case for providing limited financial support for producers to procure relevant expertise that is NOT in line with Council areas of expertise (e.g. farming advice), so long as that is acting equitably across the region. This could also be provided through an allowance of time available to each property (e.g. X hours) from an agreed list of experts that is paid for by Council.	Critical
RECOMMENDATIONS SPECIFIC TO THE CATCHMENT COLLECTIVE MECHANISM	
The need for mechanisms to be objective-focused and simple	
25. Determine the aspects of a Catchment Collective agreement where prescribed approaches MUST be used to ensure consistency. For example: the *process* for describing the objectives; the *format* for recording agreed works and practices; the *processes and standards* for monitoring and the provision of that data; and the *format, standards and frequency* of reporting about the collective.	Critical
26. Determine the aspects of a Catchment Collective agreement where prescribed approaches ARE OFFERED BUT NOT COMPULSORY, allowing bespoke options to be developed, as long as they respond to Council's need. For example: *Governance* structures; *Conflict resolution, enforcement & expulsion* processes and protocols.	Critical
28. Actively identify 1-3 trial catchments to pilot the collective approach before the plan change becomes operative. This provides a 'trial' that the wider community can observe. A range of catchments that represent the diversity of likely land-uses and issues should be considered, such as a mixture of contaminant issues; as well as homogenous versus heterogenous land use.	Critical
Ensuring access to the right support	
31. Establish an HBRC role(s) responsible for the proactive relationship management of the Catchment Collectives and connecting them with appropriate expertise. This role(s) would likely be actively involved in the Collectives but does not facilitate them.	Critical
32. Any *facilitation and support for internal conflict resolution* within a collective should be provided independent of Council. This recognises and seeks to not confuse the proactive relationship management, regulatory and enforcement role that Council has.	Critical

Recommendation	Priority
33. Council to explore sourcing an appropriate resource(s) for this relationship management role(s) via direct employment or contracting (e.g. appropriately skilled NGO). Several key attributes that should be considered are: a) Broad familiarity and experience with farming/growing, rather than experience with Council. b) Likely longevity in the role, given the expected long relationships with Catchment Collectives.	Critical
34. Council consider establishing a fund ('Collective support fund') to financially support Catchment Collectives. This could be a pool of funds that is available for all range of things (expert advice, reporting, plan writing, facilitation, conflict resolution etc).	Critical
35. Allocate money from this support fund in a way that is equitable across Collective groups of varying sizes. Further, allow what it is spent on to be at the discretion of the individual Collective (up to their allowed limit), as this both provides support from Council but allows collectives to be innovative and efficient with how they use those funds. Collectives can then also use their own funds if they wish.	Critical
Transparency of accountability	
40. Ensure actions agreed by members of a Catchment Collective are clearly recorded, transparent and allocated against relevant members/properties within the Catchment Collective agreements. This is to ensure that if corrective action is required by Council for individual collective members (while they are still part of the collective), this can be done clearly and simply.	Critical
41. Council should seek legal advice as to whether they are able to take corrective action of any kind against a member of a collective, where it has been requested by the collective, while that person/property is still a member of the collective AND will remain so after the enforcement action has been taken.	Critical
42. Clear internal conflict resolution processes should be developed for each collective and should be appropriate for that collective. These will articulate processes for conflict resolution; how corrective or enforcement action will be taken against a group member while they are a member of the group; and the process for expelling members from the collective.	Critical
43. Council to seek legal advice as to whether it is possible to transfer the actions agreed by one owner (as part of a collective agreement) to a subsequent owner if that property changes ownership. If this is possible, this should also be clearly stated in Collective agreements.	Critical

Table 4. High priority recommendations across all groupings of barriers.

Recommendation	Priority
RECOMMENDATIONS RELATING TO ALL MECHANISMS	
The need for mechanisms to be objective-focused and simple	
1. A clear risk-assessment should be developed to identify *appropriate* action in response to relevant freshwater quality objectives at a catchment level.	High
2. Ensure the risk-assessment is applied consistently across both Individual Farm and Catchment Collective plans. This removes confusion around how action is decided.	High
3. Outline a clear framework for how to develop both an Individual Farm Plan and Catchment Collectives. These should be accessible and consistent where there are common elements, so that an easy comparison between the relative advantage/disadvantage of both can be made.	High
4. Be clear that producers can be involved in multiple mechanisms but only one needs to be signed off by Council. If involved in a Catchment Collective, that takes precedence as the mechanism that is required to be signed off by council.	High
Ensuring appropriate expectations (everyone is on the same page to begin)	
9. Building an understanding with producers of the scientific standards of monitoring processes, particularly the need for longevity and frequency of sampling for statistical relevance. Also build an understanding of how data is used in legal processes. Be open to innovation in this area, if any is identified through working with the community.	High
10. Council to prioritise discussing the role that 'citizen science' or 'crowdsourced data' may play in monitoring, both internally within council and externally with producers/communities. Expectations around this are unlikely to align and highly likely to pose a large risk to establishing and maintaining strong relationships moving forward.	High
11. Whatever monitoring protocols are agreed when mechanisms are agreed, these should be clearly outlined in agreements so that all parties are aware of them from the beginning.	High
16. Consider inter-industry 'open-gate days' or 'familiarisations' as a way of building familiarity and understanding of different practices between rural industries.	High

Recommendation	Priority
18. Council should ensure any action required across both rural and urban areas is perceived as being equitable and proportionate to that parties perceived contribution to the problem. This will ensure social capital in the plan is maintained and no particular party feels 'picked on'.	High
19. Council to consider some kind of reward and/or recognition for the good work that has already been undertaken by proactive farmers. For example, an awards programme; rates relief; or reduced future consenting/monitoring costs.	High
Ensuring access to the right support	
23. External expertise – leases: Council to consider providing landowners a set allowance of time for legal advice to help write appropriate lease agreements. This could be either from council legal staff or from approved providers paid for by council. This will ensure that, where required, lease agreements are appropriate and transfer any responsibility for relevant mitigations agreed in the chosen mechanism to the lessee.	High
A RECOMMENDATION SPECIFIC TO THE INDUSTRY PROGRAMME MECHANISM	
The need for mechanisms to be objective-focused and simple	
24. Investigate the development of an 'add-on' environmental assessment for Industry Programmes, arranged by HBRC with the various industry bodies, where appropriate. This would ensure that the generally product-orientated Industry Programmes achieve the desired environmental objectives. Any such 'add-on' should be aligned with the risk-assessment discussed in recommendations #1 & #2 for Individual Farm Plans and Catchment Collectives, to ensure consistency.	High
RECOMMENDATIONS SPECIFIC TO THE CATCHMENT COLLECTIVE MECHANISM	
The need for mechanisms to be objective-focused and simple	
27. Prioritise catchments based on the level of environmental risk AND the perceived level of societal acceptance/success of the Catchment Collective approach	High
Ensuring appropriate expectations (everyone is on the same page to begin)	

Recommendation	Priority
30. If properties cross catchment boundaries and the producer chooses to only be involved in one single Catchment Collective, any works or practices agreed for that property should be recorded by geographic area. That way, if they apply to a different Catchment Collective, there is a transparency of what action is occurring, even if a property is not a member of the other collective.	High
Interpersonal risks	
37. Ensure appropriate conflict resolution expertise is utilised when developing a set of prescribed processes for dealing with internal conflict for Catchment Collectives.	High

Table 5. Medium and low priority recommendations across all barriers.

Recommendation	Priority
RECOMMENDATIONS RELATING TO ALL MECHANISMS	
The need for mechanisms to be objective-focused and simple	
5. Be clear about longer term objectives and how a different contaminant may be the focus of attention in the future, once a higher priority objective has been dealt with. This will reduce the chance that a change of focus in the future will be viewed as 'moving the goalposts'.	Medium
Ensuring appropriate expectations (everyone is on the same page to begin)	
6. Explore additional, user friendly ways, of sharing Councils existing longitudinal monitoring data with the public. Consider an increased use of science communication expertise in Council operations.	Medium
7. Actively work with farmers to identify ways that are more accessible for them to access and understand longitudinal monitoring data.	Medium
8. Explore the viability of 'catchment champions' for data communication from within the catchments (i.e. in addition to Council staff). This is to help understand and communicate it, not defend it. For example, as part of environmental programmes with local schools.	Medium

Recommendation	Priority
17. To improve longer-term understanding between rural and urban communities, Council might consider supporting an educational programme that connects urban schools with rural schools or industries. For example: farm visits associated with urban and rural school studies (primary and secondary schools); or peer to peer school partner programmes between rural and urban schools.	Medium
RECOMMENDATIONS SPECIFIC TO THE CATCHMENT COLLECTIVE MECHANISM	
Ensuring appropriate expectations (everyone is on the same page to begin)	
29. Investigate pragmatic ways of accounting for natural disasters and extreme weather events in addition to narrative recording. This may provide data to supplement and perhaps estimate their impact on formal monitored results.	Medium
Interpersonal risks	
36. Consider working with farming media (e.g. industry magazines or Country Calendar) to document the journey of the pilot collectives and build familiarity with the collective approach across a wider audience. This may help build familiarity and acceptance in the longer term.	Low
38. Council to assess (if possible) where landowners may be absentee landowners within the likely Catchment Collective areas. They are less likely to have heard about the collectives in the community and can be provided more targeted and personalised information.	Medium
39. Consider a direct-marketing campaign targeted at absentee landowners designed to familiarise them with the plan, the mechanisms (particularly the Catchment Collectives) and what they seek to achieve. This would likely involve a number of foreign landowners as well as domestic absentee landowners, so may require specialist support (e.g. language advice) where appropriate. Various industry groups (e.g. Beef & Lamb, Dairy NZ) or government departments (e.g. NZTE) that have regular foreign interactions may be able to provide advice here.	Medium

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Appendix 1. Detailed methodology

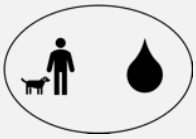
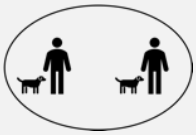
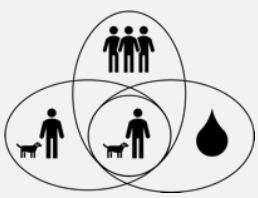
This appendix provides a detailed description of the methodology. It describes both the quantitative and qualitative data analysis undertaken; discusses the sampling method; and talks about some identified limitations of the methodology.

The four areas of data gathering and analysis

As outlined in the Literature Review (section 2.5), a framework was developed for how the survey and interviews would be undertaken. This focused around the areas of: the individual producers' perspectives on their work; the producers' view on the resource (water quality); the producers' perspectives of and relationship with other producers; and the producers' perspectives of and relationship with wider society. Imagery for each of these areas was developed and is shown in Figure A1.

These images will be used throughout this report and provide some visual reference for the data being discussed or analysed.

Figure A1. The four areas of the data gathering and analysis framework

Image	Area of data collection
	**The individual producers' perspectives on their work.**
	**The producers' view on the resource (water quality).**
	**The producers' perspectives of and relationship with other producers.**
	**The producers' perspectives of and relationship with wider society.**
	**A visual demonstration of the four areas combined with the individual farmer at the centre.**

Quantitative data analysis

While the quantitative survey data is a small amount of the data that was gathered and analysed, it remains an important *self-reported* component of the data.

With the exception of data relating to whether producers had an existing farm plan, and the profile data for the producer and their property, all the questions were on an 11-point Likert scale from 0 – 10. A full copy of the survey can be found in Appendix 2.

Some questions used were drawn from the Survey of Rural Decision-Makers (SRDM), a biennial survey run by Manaaki Whenua – Landcare Research in collaboration with other research, governmental and industry organisations[1]. This survey has been run three times, in 2013; 2015 & 2017. Some questions that reflected the interests of this research were drawn from this survey, to enable the possible comparison with a section of that wider national dataset (although this was not undertaken as part of this research).

Some of the survey questions are outlined in the following tables. These indicate what area of the data gathering and analysis framework the questions respond to and whether the questions were original or were drawn from the SRDM.

The majority of the quantitative questions relate to individual producer perspectives (Table A1), this includes a question relating to their individual perspective on their relationship with the resource of water (question 6). Four relate specifically to producers' perspectives of their relationships with other producers (0).

Table A1. Survey questions relating to individual producer perspectives

	**Questions relating to: Individual producer perspectives** **(relevant Likert scale follows each grouping)**	**Source**	
		Original	**SRDM**
2.	How important is being a **highly productive** farmer/forester/grower to your sense of **self-identity**, i.e., your sense of who you are? On a scale of 0 to 10, where 0 means 'not at all important' and 10 means 'extremely important', how do you see yourself?		✓
3.	How important is being a farmer/forester/grower **who takes good care of the environment** to your sense of **self-identity**, i.e., your sense of who you are? On a scale of 0 to 10, where 0 means 'not at all important' and 10 means 'extremely important', how do you see yourself?		✓

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Not important at all										***Extremely important***

[1] More information can be found on the Survey of Rural Decision-makers at:
https://www.landcareresearch.co.nz/science/portfolios/enhancing-policy-effectiveness/srdm

	**Questions relating to: Individual producer perspectives** **(relevant Likert scale follows each grouping)**	**Source**	
		Original	**SRDM**
4.	Are you generally a person who is fully prepared to take risks or do you like to avoid taking risks? On a scale of 0 to 10, where 0 means 'don't like to take risks' and 10 means 'fully prepared to take risks', how do you see yourself?		✓

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Don't like to take risks										***Fully prepared to take risks***

5a.	'I prefer to leave experimenting with new ideas to someone else'		✓
5b.	'I am always one of the first in the district to try something new'		✓
5c.	'When I see new practices and technologies being successfully used by other farmers/foresters/ growers, then I am also likely to adopt the new practice or technology'		✓

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Strongly disagree										***Strongly agree***

6.	How strong do you believe the relationship is between activities that occur on farms/forests/land like yours, and the water quality issues that are being experienced in the TANK catchments?	✓	

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
No connection at all										***Definite connection***

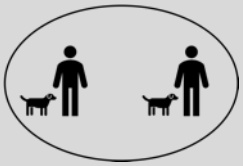
7a.	How complicated do you think it would be set up a **Farm Environmental Management Plan**?	✓	
7b.	How complicated do you think it would be set up an **Industry Programme** on your farm?	✓	
7c.	How complicated do you think it would be set up a **Landowner Collective Group**?	✓	

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Not complicated at all										***Extremely complicated***

8a.	What level of upskilling or additional training would you require to implement a **Farm Environmental Management Plan** on your farm?	✓	
8b.	What level of upskilling or additional training would you require to implement an **Industry Programme** on your farm?	✓	
8c.	What level of upskilling or additional training would you require to implement a **Landowner Collective** involving your farm?	✓	

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Not complicated at all										***Extremely complicated***

Table A2. Survey questions relating to individual producer perspectives

	**Questions relating to:** **Producers' perspectives on their relationships with other producers** **(relevant Likert scale follows each question)**	**Source**	
		Original	**SRDM**
9.	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **you would be** to tell the other members of the collective if **one of your neighbours** did not manage something the way **they** were supposed to?	✓	
0 1 2 3 4 5 6 7 8 9 10 ***Very UNLIKELY, I would not like that at all*** ... ***Very LIKELY, I'm fine with it***			
10.	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **your neighbours would be** to tell the other members of the collective when **you** did not manage something the way you were supposed to?	✓	
0 1 2 3 4 5 6 7 8 9 10 ***Very UNLIKELY, They would not like that at all*** ... ***Very LIKELY, They'd be fine with it***			
11.	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **you would be** to **agree to punish your neighbour**, as part of a collective management agreement? For example, your group may agree a fining system (or some other kind of punishment) for not adhering to agreed practice.	✓	
0 1 2 3 4 5 6 7 8 9 10 ***Very UNLIKELY, I would not like that at all*** ... ***Very LIKELY, I'm fine with it***			
12.	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, how likely do you think **your neighbours would be** to **agree to punish you**, as part of a collective management agreement? For example, your group may have an agreed fining system (or some other kind of punishment) for not adhering to agreed practice.	✓	
0 1 2 3 4 5 6 7 8 9 10 ***Very UNLIKELY, They would not like that at all*** ... ***Very LIKELY, They'd be fine with it***			

Qualitative data analysis

This section outlines how the qualitative data gathered in the semi-structured interviews was coded and analysed.

Acknowledging the subjective frame (bias) of the researcher

As qualitative research is the result of the interaction of people, it is impossible to fully remove the researcher from the process. Consequently, it is important to acknowledge and state the subjective frame, or the inherent bias, of the researcher and what view they are approaching the research from (Malterud, 2001).

The researcher has significant experience in the local government industry where he has been involved with a range of both infrastructure and policy development projects. He has worked on a wide range of freshwater policy development projects like the TANK project. This research comes from an *interpretivist* perspective, primarily seeking to understand participants' *perceived* barriers to the adoption of the mechanisms within the proposed plan change.

Overview of the qualitative coding methodology

The coding of transcribed text is considered a suitable way of analysing these data as it requires searching for and identifying repetition, metaphors, similarities and differences (Bryman & Bell, 2015). Words or phrases are considered important to code when they *recur*; they are *repeated* by the interviewee; or they are used *forcefully* (Owen, 1984).

The coding of the data undertaken was a mixture of deductive and inductive coding. Deductive coding is 'top down'; while inductive is 'bottom-up' (Braun and Clarke, 2006). Deductive coding is undertaken with a certain interest in mind or within a particular theoretical framework – in other words, they are sought out within the data. In this research deductive coding was undertaken around a range of themes within the interview structure outlined earlier. Inductive coding means that themes are identified within – and therefore strongly linked to – the data themselves. In other words, these codes or themes are identified within the data with no preconceptions in mind. The codes used in this research are outlined in Table A3.

Table A3. Codes (or themes) used within this research.

Code (or theme)	Description	Code type	
		Deductive	Inductive
Attitude			
Positive	Positive comments.	✓	
Neutral	Neutral comments.	✓	
Negative	Negative comments.	✓	
Mechanism			
Individual Farm Plan	Relating to the Individual Farm Plan mechanism in the plan change.	✓	
Industry Programme	Relating to the Industry Programme mechanism in the plan change.	✓	
Catchment Collective	Relating to the Catchment Collective mechanism in the plan change.	✓	
1. The Producer as an individual			
1A. General	General comments relating to personal perspectives that do not fit into the other categories.	✓	
1A.1. Demands for action are appropriate	Relating to whether the public demand to act on water quality is perceived as justified.	✓	
1A.2. ROI for managing is appropriate	Relating to the perceived return on investment from managing water quality.	✓	
1B. Relative advantage	To do with the perceived relative advantage that using one of the mechanisms will provide to a producer in their day-to-day decision-making.	✓	
1C. Trialability	Relating to how trialable a mechanism(s) is perceived as.	✓	
Upskilling	Relating to the level of upskilling perceived as being required, or not, for a mechanism(s).	✓	
1D. Complexity	Relating to the perceived complexity of a particular mechanism(s).	✓	
Risk	Relating to the perceived risk of a particular mechanism(s).	✓	
2. The Producer and the resource			
2A. Clearly defined resource	Relating to how well the definition of water quality as a resource (the assimilative capacity of a waterway) is perceived to be understood.	✓	
2B. Ability to monitor resource	Relating to the ability and need to be able to monitor the resource (water quality) in order to be able to manage it.	✓	
Disconnect from data	An *inductive code* that was established to code comments that indicated a distance, disconnect, or general unawareness of the data that was available.		✓

Code (or theme)	Description	Code type	
		Deductive	Inductive
3. Producer to Producer (these codes were designed especially for comments regarding the Catchment Collectives)			
3A. Users influence the institution	Relating to the perceived ability to have an influence over the institution that is established to manage the resource.	✓	
3B. Users clearly defined	Relating to how easy it was to determine the 'users' of the water quality resource. That is, those individuals that use up the assimilative capacity of the water body.	✓	
3C. Monitoring others	Relating to the concept of members of a Catchment Collective **informally 'monitoring'** each other. In other words, passively keeping an eye on each other 'over the fence'. Not in a formal audited way.	✓	
3D. Appropriate punishment for infringement	Relating to the concept of members of a Catchment Collective **formally 'punishing'** each other. In other words, keeping each other accountable via some process or mechanism that is agreed by the group when it is set up.	✓	
3E. Conflict resolution	Relating to the process of internal conflict resolution, within a self-organised group. That is, without defaulting back to council.	✓	
4. Producers and wider society			
4A. Level of permission to self-organise	Relating to the perceived level of permission granted by the overarching institution to allow groups to self-organise to manage the resource.	✓	
4B. Organisations are appropriate and work well together.	Relating to the extent that the different institutions or groups within society are appropriate and work well together.	✓	
Misunderstanding	An *inductive code* that was established to code comments that indicated a perceived lack of understanding or appreciation of the reality of the producer's world (or vice versa) from other groups in society.		✓
5. Other themes			
Absentee owners	Relating to absentee owners or corporate owners.		✓
Accounting for nature/weather	Relating to the ability or need to be able to record, report and account for natural events (such as earthquakes) and significant weather events to be taken into account. This was considered important when monitoring progress on an issue in a waterway.		✓
Appropriate action	Related to making sure that any actions are objective and outcome driven. In other words, is the right thing being done?		✓
Build up slowly	Relating to the need to build up/scale up activity slowly and progressively.		✓

Code (or theme)	Description	Code type	
		Deductive	Inductive
Communication	Relating to communication between the various parties involved.		✓
Cost	Relating to cost.		✓
Desire for monitoring	Relating to the expressed *desire* for monitoring of the resource. This is different to the perceived need for monitoring and is more aligned with a self-professed desire for monitoring, either for or against.		✓
Good work already	Relating to the good work that has often already been undertaken or is being undertaken in relation to actions/practices to improve water quality.		✓
Independence versus guidance	Relating to the tension between the desire to self-organise and take ownership of the problem; and the expressed desire for clear guidance, consistency or direction at the same time.		✓
Keen to own issue	Comments indicating how keen interviewees were to take ownership of the issue.		✓
Leased land	Relating to leased land.		✓
Media	Relating to the media, their reporting and the relationship with the media.		✓
Modelling	Relating to technical modelling undertaken on the TANK project.		✓
My view has changed	Comments indicating that the view or perspective of interviewees has changed from one point to another. Usually in relation to things learned in the TANK process.		✓
One size doesn't fit all	Comments highlighting the belief that 'one size does not fit all'. Similar to but different from the *'independence vs guidance'* code.		✓
Politics	Relating to politics, regional or national.		✓
Rural-Urban equity	Relating to the equity of any action required across the different industries of social groupings involved. For example: rural vs rural (e.g. sheep & beef farming vs forestry); or rural vs urban (e.g. municipal versus pastoral farming).		✓
Still not clear	Comments indicating that some components, concepts or elements are still not clear.		✓
This is more than farming	Comments indicating that the mechanisms proposed in the plan change are not simply just related to farming. They are related to the community fabric of the districts.		✓
Upping Councils game	Relating to perceived areas where Regional Council will be required to improve its performance in light of the improvement that it is expecting from others.		✓

There are also several other important things to note about the coding process. Not all data are coded; codes are not mutually exclusive; and coding *instances* do not indicate the *size* or the *relative importance* of the pieces of data that are coded.

Firstly, not all comments or data are coded. While a mixture of deductive and inductive coding has been used, there are some data that are not considered relevant to the interests of the research and/or do not fall into a deductive code or indicate an important inductive code.

Secondly, codes or themes are not mutually-exclusive, and this should be remembered when reading the other sections and appendices of this report. For example, a comment may be both positive AND relating to Catchment Collectives – in which case it would be coded to both the *positive* and *Catchment Collective* codes. A further example may be that someone makes a negative comment about the cost of all three mechanisms – in which case the comment may be coded to the *negative* code; all three mechanism codes (*Individual Farm Plans, Industry Programmes* and *Catchment Collectives*); AND it may also be coded to the *Cost* code, five in total.

Finally, the *number* of coded instances does not provide a direct indication of the *size* of the coded instances. A single sentence or several paragraphs may both be coded as a single instance of code. This also does not account for the forcefulness or weight that an interviewee may have put on the comment. Therefore, some interpretation of this is required by the researcher when collating final insights.

Sampling and validity

This section outlines the approach taken to sampling as well as discussing validity and reliability

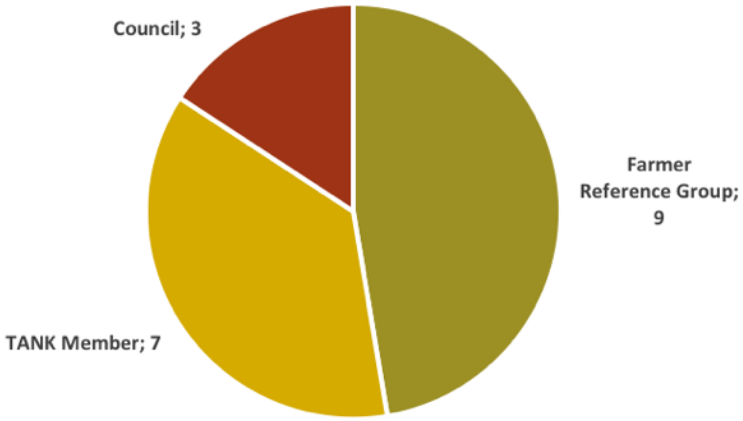
Sampling

The main object of this research is to identify potential barriers to the adoption of the three mechanisms proposed in the plan change: Individual Farm Plans; Industry Programmes; and Catchment Collectives. The Catchment Collective mechanism in particular had its genesis within the Farmer Reference Group and was put to the wider TANK Group as a recommendation. Therefore, the people with a high enough level of familiarity with the mechanisms to be interviewed was limited to the Farmer Reference Group, the TANK Group and some Council staff who had been involved with the project.

Because of this purposive sampling was used. The eligibility criteria were a conversant level of knowledge relating to the mechanisms proposed in the plan change; and a range of primary

industries were sought to provide perspectives on the issue from as many angles as possible. The limited pool of available interviewees and the limited time available for the research meant that a sample size of 19 was used. Nine of these came from the Farmer Reference Group, seven from the TANK Group and three from the Council perspective (one person was immediate ex-staff). (see Figure A2)

Figure A2. Make up of research sample from the TANK project



Pastoral farming (Sheep & Beef, Dairying) were strongly represented given the dominance of the sampling from the Farmer Reference Group. Importantly, efforts were made to ensure these representatives were geographically dispersed across the TANK area. An effort was made to ensure that horticulture was also represented by those TANK Group members that were interviewed.

The majority of the sample was male (16), with only three females in the sample.

Validity and reliability

Validity and reliability are important components of any research and there are minor risks with the validity and reliability of this research. These have been mitigated as best as possible in the ways described below.

Firstly, content validity seeks to ensure that the content of the research is appropriate to the objectives of this research. Are the semi-structured interview questions aligned with the objectives of the research? This risk was mitigated by seeking a peer review of the literature review and at the stage of the formation of the semi-structured interview questions. As outlined in the literature review the question structure is strongly aligned with the relevant perspectives from the literature, so this risk is considered to be minimised.

Construct validity seeks to ensure that the perspectives gained from the research are representative of what would be expected if the research was scaled up across a wider range

of people. Given the purposive nature of the sampling and the limited number of people familiar enough with the mechanisms to comment, this was difficult to achieve. This has been mitigated by presenting a draft of the research findings and recommendations to the Farmer Reference Group.

Reliability is ensuring that if a *different* researcher was to carry out the *same* research again, they would reach consistent results (Yin, 2014). The chances of this occurring are increased if the same protocols are followed. Namely, these are to: undertake the interview in person wherever possible; record the interview for accurate transcription; Have the interviewee fill out the survey (around 10 minutes) *before* undertaking the interview (around 1.5 hours); and ensuring that the interview is focused on the three mechanisms of interest by consistently referring back to them and ensuring interviewees are providing answers with these in mind.

Limitations

There are some possible limitations to this research that need to be outlined.

The primary limitations of this research are the limited sample size and the self-selection bias of those involved in the groups from which the research sample was drawn. That is to say, the research could only really interview people who were in the Framer Reference Group, the TANK Group or were Council staff familiar with the project. With the Farmer Reference Group and the TANK Group in particular, it is noted that many of these people have self-selected to be involved in those groups.

In general, they represent a group of people who are more motivated to be involved in such groups and who have been comfortable taking a more proactive involvement in the development of the mechanisms discussed. In other words, as these mechanisms (and the Catchment Collectives in particular) have been developed by the Farmer Reference Group and endorsed by the TANK Group, this research has largely 'interviewed the converted'. This should be recognised as an important limitation and the views and concerns identified in this research should be considered as being from those who are more engaged with the recommendations being made in the plan change.

Appendix 2. Copy of survey

Name: _____ Date: ___/___/_____

FARM PRACTICE

1 What is your experience with some of the practices being proposed in the TANK plan change. Have you already adopted the following practices on your farm/forest/growing operation?

1a Do you currently have a nutrient management plan?

☐ Yes ☐ No ☐ Does not apply to my farm/forest/growing operation

1b Are you currently a member of your industry's environmental programme?

☐ Yes ☐ No ☐ Does not apply to my farm/forest/growing operation

1c If 'Yes', what is the name of that programme?

2 How important is being a **highly productive** farmer/forester/grower to your sense of **self-identity**, i.e., your sense of who you are?
On a scale of 0 to 10, where 0 means 'not at all important' and 10 means 'extremely important', how do you see yourself? *(circle one)*

not at all important										extremely important
0	1	2	3	4	5	6	7	8	9	10

3 How important is being a farmer/forester/grower **who takes good care of the environment** to your sense of **self-identity**, i.e., your sense of who you are?
On a scale of 0 to 10, where 0 means 'not at all important' and 10 means 'extremely important', how do you see yourself? *(circle one)*

not at all important										extremely important
0	1	2	3	4	5	6	7	8	9	10

4 Are you generally a person who is fully prepared to take risks or do you like to avoid taking risks?
On a scale of 0 to 10, where 0 means 'don't like to take risks' and 10 means 'fully prepared to take risks', how do you see yourself? *(circle one)*

don't like to take risks										fully prepared to take risks
0	1	2	3	4	5	6	7	8	9	10

5 The following questions are about your willingess to experiment, innovate and learn from others.
How do you rate yourself against the following statements on a scale of 0 to 10, where 0 is 'strongly disagree' and 10 is 'strongly agree'.

5a 'I prefer to leave experimenting with new ideas to someone else' *(circle one)*

strongly disagree					neutral					strongly agree
0	1	2	3	4	5	6	7	8	9	10

5b 'I am always one of the first in the district to try something new' *(circle one)*

strongly disagree					neutral					strongly agree
0	1	2	3	4	5	6	7	8	9	10

5c When I see new practices and technologies being successfully used by other farmers/foresters/ growers, then I am also likely to adopt the new practice or technology' *(circle one)*

strongly disagree					neutral					strongly agree
0	1	2	3	4	5	6	7	8	9	10

6 How strong do you believe the relationship is between activities that occur on farms/forests/land like yours, and the water quality issues that are being experienced in the TANK catchments? *(circle one)*

No connection at all										definite connection
0	1	2	3	4	5	6	7	8	9	10

COMPLEXITY AND SKILLS REQUIRED

7 The below questions seek to understand how complicated or difficult you think it may be to set up one of the new farm plans, industry programmes, or a landowner collective group:

7a How complicated do you think it would be set up a **Farm Environmental Management Plan**? *(circle one)*

Not complicated at all — **extremely complicated**

0 1 2 3 4 5 6 7 8 9 10

7b How complicated do you think it would be set up an **Industry Programme** on your farm? *(circle one)*

Not complicated at all — **extremely complicated**

0 1 2 3 4 5 6 7 8 9 10

7c How complicated do you think it would be set up a **Landowner Collective Group**? *(circle one)*

Not complicated at all — **extremely complicated**

0 1 2 3 4 5 6 7 8 9 10

8 The following questions seek to understand what level of upskilling and additional training you think **YOU MIGHT NEED** to implement one of the three programmes on your farm/forest/land:

8a What level of upskilling or additional training would you require to implement a **Farm Environmental Management Plan** on your farm? *(circle one)*

No training or upskilling at all — **Significant training and upskilling**

0 1 2 3 4 5 6 7 8 9 10

8b What level of upskilling or additional training would you require to implement an **Industry Programme** on your farm? *(circle one)*

No training or upskilling at all — **Significant training and upskilling**

0 1 2 3 4 5 6 7 8 9 10

8c What level of upskilling or additional training would you require to implement a **Landowner Collective** involving your farm? *(circle one)*

No training or upskilling at all — **Significant training and upskilling**

0 1 2 3 4 5 6 7 8 9 10

MONITORING AND PUNISHMENT - LANDOWNER COLLECTIVE GROUPS ONLY

9 If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **you would be** to tell the other members of the collective if **one of your neighbours** did not manage something the way **they** were supposed to? *(circle one)*

Very UNLIKELY, I would not like that at all — **Very LIKELY, I'm fine with it**

0 1 2 3 4 5 6 7 8 9 10

10 If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **your neighbours would be** to tell the other members of the collective when **you** did not manage something the way **you** were supposed to? *(circle one)*

Very UNLIKELY, they would not like that at — **Very LIKELY, they'd be fine with it**

0 1 2 3 4 5 6 7 8 9 10

11 If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **you would be** to **agree to punish your neighbour**, as part of a collective management agreement?
For example, your group may agree a fining system (or some other kind of punishment) for not adhering to agreed practice. *(circle one)*

Very UNLIKELY, I would not like that at all — **Very LIKELY, I'm fine with it**

0 1 2 3 4 5 6 7 8 9 10

12 If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **your neighbours would be** to **agree to punish you**, as part of a collective management agreement?
For example, your group may have an agreed fining system (or some other kind of punishment) for not adhering to agreed practice. *(circle one)*

Very UNLIKELY, they would not like that at — **Very LIKELY, they'd be fine with it**

0 1 2 3 4 5 6 7 8 9 10

DEMOGRAPHIC QUESTIONS

13 How many years do you have working on farms/forests/growing? *(circle one)*

0-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40 41-45 46-50 51-55 56-60 61+

14 What is your age?

☐ <40 ☐ 41-50 ☐ 51-60 ☐ 61+

15 How many generations of your family have been farming in New Zealand.*(circle one)*

1 2 3 4 5 6+

16 What is your highest level of education?

☐ Some Secondary School ☐ Completed Secondary School ☐ Tertiary: Certificate (level 1-6)
☐ Tertiary: Diploma (level 5-7) ☐ Tertiary: Bachelors degree ☐ Tertiary: Post Grad dip/cert
☐ Tertiary: Master's degree ☐ Tertiary: Doctoral degree

17 What is your highest level of formal training in agriculture or business?

☐ Secondary or some secondary education ☐ Post-secondary education in another field
☐ Post secondary education in agriculture

What is your primary role on the farm?

☐ Farm owner/joint owner ☐ Equity partner ☐ Farm manager/corporate
☐ Share milker ☐ Trust representative ☐ Leasee
☐ Other

FARM TYPE, PROFITABILITY AND SUCCESSION

18 What type of farm do you have?

☐ Sheep/Beef ☐ Grazing ☐ Veg/Flower ☐ Fruit/nuts
☐ Dairy ☐ Other stock ☐ Kiwifruit ☐ Forestry
☐ Deer ☐ Arable ☐ Wine grapes

19 What is the apporximate size of your farm? (in hectares)

☐

20 Profitability of the farm over the previous 2 years

☐ Unprofitable ☐ Break even ☐ Profitable

21 Succession planning. Which of the following categories best describes the profile of the successor on your farm:

☐ My own child/children ☐ Family Trust ☐ Other
☐ Another family member ☐ A mix of my own children and others ☐ None identified
☐ Someone who works on the farm but is not related

22 What is the relative percentage of income earned by your household on your farm, relative to off farm? *(circle one)*

0% 0-10% 10-20% 20-30% 30-40% 40-50% 50-60% 60-70% 70-80% 80-90% 90-100%

Appendix 3. Copy of semi-structured interview questions

	Ostrom	Pannell	Possible quant questions	Farm Plans	Industry Programmes	Collective Groups
Individual farmer	2A **The DEMANDS on the resource and FOR MITIGATION are appropriate for the environment**		Perspectives on the individual farmer - How long have you been in farming? - Tell me about your (and your families) connection with farming? - Why were you keen to be involved in the Farmer Reference Group? - What role if any do you believe that council (or other forms of government) should have in the management of resources? - What is your view on where and how that overlaps with the ownership and management of your farm? - What is your view of the current condition of the environment and the issues in the TANK area with water quality? How much of an issue is it? - To what extent do you believe that the activity on farms like yours may be connected to the water quality issues being experienced? How has your view on this evolved over time? - To what extent do you believe that the current demands for action are appropriate? Should water quality be maintained? - How impoant is water quality to the activities on your farm and others like it? - How appropriate are the demands for the management of the resource?	✓	✓	✓
	2B **The RETURN ON INVESTMENT from management is appopriate for the users**	**Relative advantage**	- What is your appetite for risk? - Do you take a short- or a long-term view to investments? Which predominantes? - Are returns in your industry more likely to be short or long term? - What is the perceived relative advantage of doing one of the three new stuctures (farm plan, industry programme or landowner collective) compared to what you are doing now? * explain: When I talk about RELATIVE ADVANTAGE, I mean the benefit to your farm practice of doing the new practice, compared to what you are doing currently. Is that view widely held?	✓	✓	✓
		Trialability	- How trialable are the mechanisms? - Would much farmer upskilling would be required? - What type of upskilling would be required? - How much would potential new structures DISRUPT the current farm system? If so, would this be a dramatic shift in practice?	✓	✓	✓
		Complexity	- How complex do you think the new mechanisms might be? How difficult migh they be to implement? - How risky do you think the proposed mechanisms might be? - How compatible will these potential new structures be WITH existing practices?	✓	✓	✓
			From an individual farmer perspective - what other things may be a barrier to the adoption of one of the three mechanisms for implementing mitigations?			

Farmer to Resource	1B **Clearly defined RESOURCE** 4B **The RESOURCE ITSELF can be monitored**	- How clearly do you think the resource is defined? How clearly is it understood by farmers in the area? - How important do you think is the need to monitor the resource in order to be able to manage it? - How clear is monitoring at the moment? How contentious (or not) is this currently? - How possible do you think it might be to be able to monitor the actual resource (the assimilative capacity of the resource)? - How POSSIBLE do you think it would be to operate one of the three proposed mechanisms WITHOUT clear monitoring? - How COMFORTABLE do you think it would be to operate one of the three proposed mechanisms WITHOUT clear monitoring? What would the challenges be?	✓ ✓	✓ ✓	✓ ✓
		From the perspective of the farmer to the resource - what other things do you think might be a barrier for the adoption of the one of the three mecahnisms for implementing mitigtions?			
Farm to Farm	1A **Clearly defined USERS** 3 **Those involved CAN INFLUENCE the outcome** 4A **USERS of the resource can be monitored** 5 **Appropriate PUNISHMENT for** 6 **CONFLICT RESOLUTION mechanisms**	- How clearly do you think are "users" of the resource are defined? - To what extent do you think that they have influence over the quality of the resource (water quality)? ***THESE NEXT QUESTIONS RELATE TO THE LANDOWNER COLLECTIVES ONLY*** - How comfortable would you be monitoring your peers? Why/Why not? - How comfortable do you think your peers would be with you monitoring them? Why/why not? - How comfortable would you be with imposing punishment ON YOUR PEERS, as part of a collective group? Why/why not? - How comfortable would YOU PEERS be with imposing punishment ON YOU, as part of a collective group? Why/why not? - How would you describe the level of TRUST between YOU AND THE OTHER FARMERS in your catchment/immediate area? - What might make this trust more difficult? - If you were working in a collective group, what support might a group need to help resolve conflicts?			✓ ✓ ✓ ✓ ✓
		From a farm to farm perspective - what other things do you think may be a barrier to the adoption of one of the three mechanisms for implementing mitigations?			
Farm to Society	7 **Level of PERMISSION to self-organise** 8 **Institutions & organisations are appropriate and WORK WELL TOGETHER**	- How woud you describe the relationship between farmers like you and the wider community (wider Hawkes Bay)? - How would you describe your relationship with Council? - How would farmers in the area generally describe their relationship with council? What sorts of things would improve that relationship? From their side? From your side? - How would you rate your level of TRUST with council? - How do you think Council would rate its level of TRUST with you? - How do you think society would rate its level of TRUST with you?	✓ ✓	✓ ✓	✓ ✓
		From the farm to society perspective - what other things do you think might be a barrier to adopting any of the three mechanisms for implementing mitigations?			

Appendix 4. Summary demographic data from interviewees

This appendix includes the results of the farm specific and demographic questions asked in the survey. These are shown in combined table and graph form. For a copy of the survey see Appendix 1.

Q1a: Do you currently have a nutrient management plan?

Yes	No	Does not apply to my farm/forest/growing operation	*n*=
8	6	-	14

Q1b: Are you currently a member of your industry's environmental programme?

Yes	No	Does not apply to my farm/forest/growing operation	*n*=
6	6	2	14

Q13: How many years do you have working on farms/forests/growing?

0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61+	*n*=
-	-	-	1	-	2	3	2	2	3	-	-	2	15

Q14: What is your age?

<40	41-50	51-60	60+	*n*=
1	3	8	3	15

Q15: How many generations of your family have been farming in New Zealand?

1	2	3	4	5	6+	*n*=
2	-	3	3	4	1	11

Q16: What is your highest level of education?

Education level	No.
Some Secondary School	1
Completed Secondary School	3
Tertiary: Certificate (level 1-6)	3
Tertiary: Diploma (level 5-7)	2
Tertiary: Bachelors degree	3
Tertiary: Post Grad dip/cert	2
Tertiary: Master's degree	-
Tertiary: Doctoral degree	-

n=14

Q17a: What is your highest level of formal training in agriculture of business?

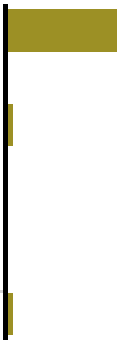
Education level	No.
Secondary or some secondary education	2
Post-secondary education in another field	3
Post seconday education in agriculture	8

n=13

Q17b: What is your primary role on the farm?

Primary role	No.
Farm owner/joint owner	12
Equity partner	-
Farm manager/corporate	1
Share milker	-
Trust representative	-
Leasee	-
Other	1

n=14



Q18: What is your type of farm?

Farm type	No.
Sheep/Beef	**9**
Dairy	**2**
Deer	**-**
Grazing	**-**
Other stock	**-**
Arable	**-**
Veg/Flower	**-**
Kiwifruit	**-**
Wine grapes	**-**
Fruit/nuts	**3**
Forestry	**-**

n=14

Q19: What is the approximate size of your farm? (in Ha)

Farm sizes, where noted, are listed below				
14	43	365	400	500
700	750	870	995	1,200
1,250	1,400	2,956		

Average farm size: 880 Ha.

Median farm size: 750 Ha.

Q20: Profitability of the farm over the last 2 years.

Unprofitable	Break even	Profitable
1	**1**	**11**

Q21: Which of the following categories best describes the profile of the successor on your farm?

Succession plan	No.
My own child/children	7
Another family member	-
Someone who works on the farm but is not related	-
Family Trust	2
A mix of my own children and others	1
Other	1
None identified	2

n=15

Q22: What is the relative percentage of income earned by your household on your farm, relative to off farm?

0%	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	n=
-	-	-	1	-	-	-	1	1	2	7	12

Appendix 5. Detailed results – survey data

This section provides a detailed overview of the results from the survey in two parts: A tabulated overview; and graphed results grouped into related blocks of questions. A summary of results from the semi-structured interview data is in the following section.

Survey results – tabulated overview

The below table (Table A4) summarises the quantitative results from the survey that required an answer on an 11-point numerical scale. The meaning of the scale varied across the questions, as is indicated in the table, with most being Likert-type questions.

Table A4. Summary of questions requiring an answer on an 11-point scale

	Survey question	0	1	2	3	4	5	6	7	8	9	10	n=
		Not important at all										*Extremely important*	
Q2	How important is being a **highly productive** farmer/forester/grower to your sense of **self-identity**, i.e., your sense of who you are?	0	0	0	0	0	0	0	2	8	3	1	14
Q3	How important is being a farmer/forester/grower who takes **good care of the environment** to your sense of **self-identity**, i.e., your sense of who you are?	0	0	0	0	0	0	0	0	2	5	7	14
		Don't like to take risks										*Fully prepared to take risks*	
Q4	Are you generally a person who is fully prepared to take risks or do you like to avoid taking risks?	0	0	0	0	0	1	4	5	3	1	0	14
		Strongly disagree										*Strongly agree*	
Q5a	'I prefer to leave experimenting with new ideas to someone else'	0	2	1	3	0	1	1	2	2	1	1	14
Q5b	'I am always one of the first in the district to try something new'	0	1	0	1	2	0	1	1	6	2	0	14
Q5c	'When I see new practices and technologies being successfully used by other farmers/foresters/ growers, then I am also likely to adopt the new practice or technology'	**0**	1	0	0	0	1	***2***	1	7	2	0	14
		No connection at all										*Definite connection*	
Q6	How strong do you believe the relationship is between activities that occur on farms/forests/land like yours, and the water quality issues that are being experienced in the TANK catchments?	0	1	1	1	1	3	2	4	2	1	0	16
		Not complicated at all										*Extremely complicated*	
Q7a	How complicated do you think it would be set up a **Farm Environmental Management Plan**?	0	1	4	2	1	3	0	3	2	0	0	16
Q7b	How complicated do you think it would be set up an **Industry Programme** on your farm?	1	1	4	0	1	4	0	0	4	1	0	16
Q7c	How complicated do you think it would be set up a **Catchment Collective Group**?	0	0	3	2	1	1	2	2	2	1	1	15
		No training or upskilling at all										*Significant training and upskilling*	
Q8a	What level of upskilling or additional training would you require to implement a **Farm Environmental Management Plan** on your farm?	0	2	2	2	4	3	1	2	0	0	0	16
Q8b	What level of upskilling or additional training would you require to implement an **Industry Programme** on your farm?	0	2	3	1	3	5	1	1	0	0	0	16
Q8c	What level of upskilling or additional training would you require to implement a **Catchment Collective** involving your farm?	0	1	2	0	5	3	2	3	0	0	0	16
		Very UNLIKELY I would not like that at all										*Very LIKELY I'm fine with it*	
Q9	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **you would be** to tell the other members of the collective if **one of your neighbours** did not manage something the way they were supposed to?	1	0	0	0	0	1	1	2	5	2	2	14
		Very UNLIKELY They would not like that at all										*Very LIKELY They'd be fine with it*	
Q10	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **your neighbours would be** to tell the other members of the collective when **you** did not manage something the way **you** were supposed to?	0	1	0	0	0	3	1	2	5	2	0	14
		Very UNLIKELY I would not like that at all										*Very LIKELY I'm fine with it*	
Q11	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **you would be** to **agree to punish your neighbour**, as part of a collective management agreement? For example, your group may agree a fining system (or some other kind of punishment) for not adhering to agreed practice.	2	1	1	0	2	5	0	1	0	1	0	13
		Very UNLIKELY They would not like that at all										*Very LIKELY They'd be fine with it*	
Q12	If you were part of a **collective group** that was seeking to improve environmental practice and was **'self-policing'**, **how likely** do you think **your neighbours would be** to **agree to punish you**, as part of a collective management agreement? For example, your group may have an agreed fining system (or some other kind of punishment) for not adhering to agreed practice.	0	2	2	1	2	3	0	1	2	0	0	13

Note that the number of people that responded to each question varied (see column "n=" in Table A4). Not all participants were landowners – usually Council staff or industry representatives – therefore they did not feel they could answer questions related specifically to an individual style of farm or farming. These tended to be the questions that related to: how importantly productivity or environmental stewardship was to their self-identity *as a farmer*; their appetite for *risk*; or how comfortable they would be *monitoring or punishing other participants* if they were part of a *collective group*.

Questions that all participants were able to answer were related more specifically to their *perceptions* of the mechanisms or other farmers: how strongly they saw *farming activity connected to water quality*, in general; how potentially *complex* they perceived the different mechanisms; and how much additional *training or upskilling* they thought was required for each of the mechanisms.

Council staff were not invited to answer the survey as they were not producers, but the themes within the survey were consistent with the structure of the interviews, so their perceptions were captured by the qualitative analysis.

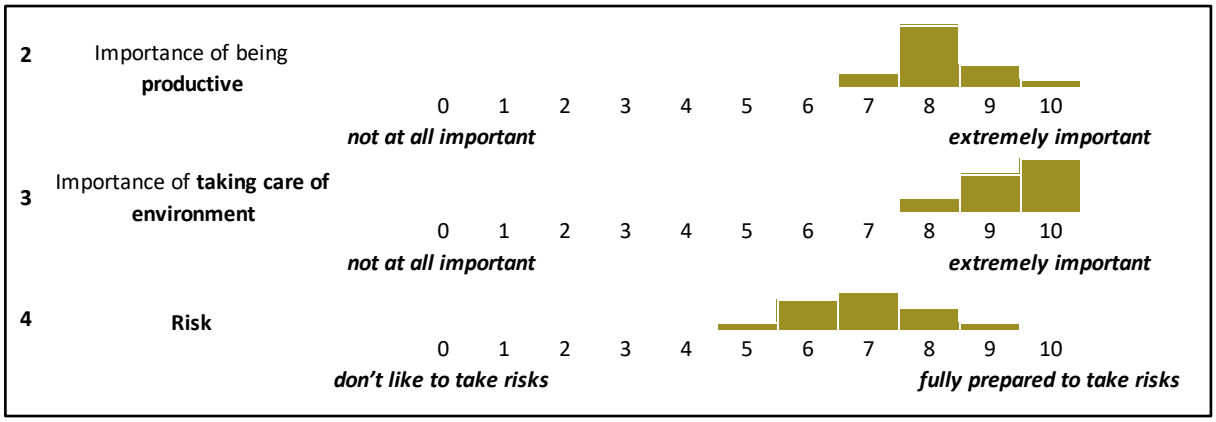
Survey results - graphed

Each are of these results is discussed briefly below and presented graphically. They are in part supported with comments from participants that were made while these questions were being filled out.

Producers Self-identity – productivity, the environment and risk

Questions 2, 3 and 4 provided the clearest results of all of the scale questions (see Figure A3).

Figure A3. Graphed results for questions relating to productivity (Q2); environment (Q3); risk (Q4).



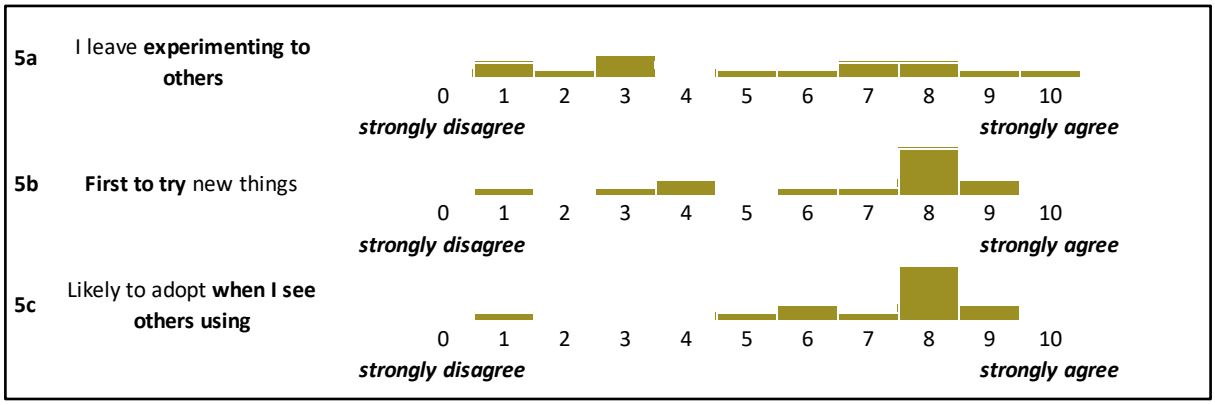
Most people saw being productive as very important (most marking 8) yet interestingly they tended to rank the importance of environmental stewardship to their self-identity higher (with nearly all either 10 or 9, respectively). Comments that were made when participants were filling in these questions related to them perceiving themselves as the current caretakers of the land for the next generation. One or two even noted that while productive farmers, they did not 'push' the land as hard as they recognised that they could, in order to maintain a better environmental result.

Most farmers indicated that they had a reasonable appetite for risk, with most responding in the 6-8 range. When filling this question in, most indicated that they preferred calculated risks. Many also noted that there some risks that were within their control (such as farm decisions) and there were some that were outside their control (such as the climate). This reinforced that a certain amount of risk was an inherent part of being a farmer.

Producers willingness to experiment

With the questions relating to participants willingness to experiment, innovate and learn from others, the results become more distributed and varied (see Figure A4).

Figure A4. Graphed results for questions relating to experimentation and adoption (Q5a-c).



When asked to agree to disagree with the statement that they leave experimenting to others, participants responses ranged fairly evenly from strongly disagree to strongly agree. This indicated that some were much more comfortable experimenting that others.

In terms of whether participants considered themselves the first to try new things in their district, more respondents tended to agree, with a spike of answers around 8. However, there were a couple of notable exceptions towards the disagree end of the spectrum, indicating that at least some preferred to let others be the first to try something new.

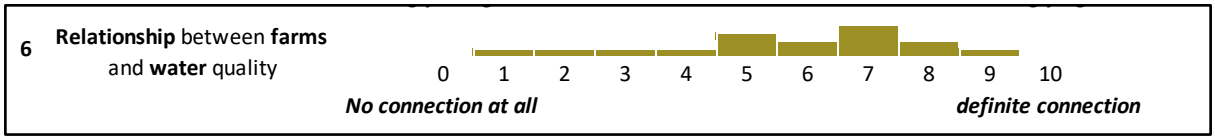
Most participants were very likely to adopt new practices and technologies if they saw them in action, with most answers correlating to the strongly agree end of the spectrum for this statement.

It is noted that there was one notable outlier in this question, with one participant selecting 1, indicating that they strongly disagreed that they would adopt a new technology or practice if they saw others using it. As this is not what was expected, the potential that this respondent perhaps misunderstood the scale and chose towards the opposite end that intended should not be discounted. While the scale of these questions remained the same (0-10), the terms for the different questions often changed and perhaps some people found this confusing.

The perceived impact of activity on water quality

It was important for this research to attempt to determine how strongly farmers and growers felt the activity on farms *like* theirs (in general – not specifically theirs) was related to the water quality issues being experienced in the TANK catchments. Question 6 attempted to do this (see Figure A5).

Figure A5. Graphed results for question relating to the strength on relationship between activity on farms and water quality (Q6).

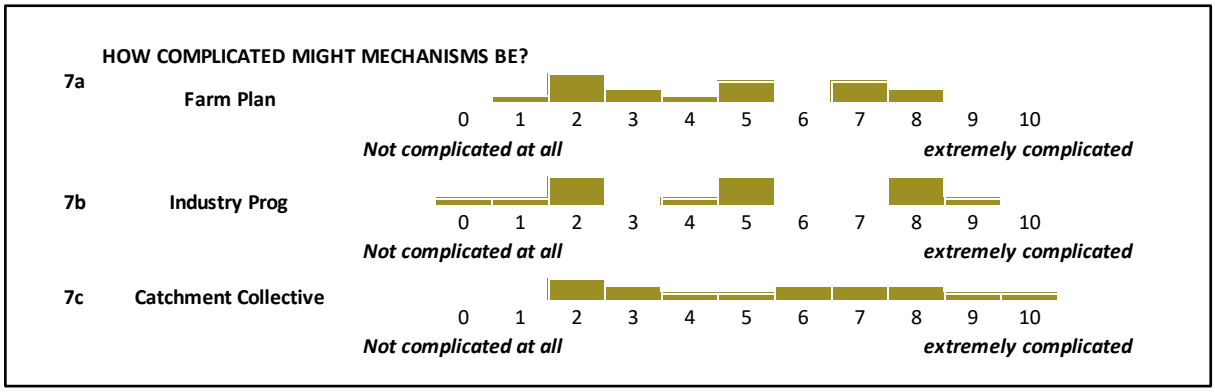


Perceptions were definitely varied in relation to this, with at least one respondent for every step of the scale between 1-9, and multiple respondents for 5 through 8 (with actual numbers for each being 3, 2, 4 and 2 respectively). This indicates that most people at least saw some connection between farm activity and water quality, however comments when people were filling out this question clearly indicated that most felt that while there was a connection, the actual contribution that farming and growing was making was fairly minimal. This was consistent across all industries represented. It should be noted that this question did not seek to *quantify the strength* of that relationship, which was considered beyond the scope of this research.

Perceived complexity of proposed mechanisms

When asked about the perceived complexity of the different mechanisms, responses again tended to range from a perception that they could be quite complicated or quite simple (see Figure A6).

Figure A6. Graphed results for questions relating to the perceived complexity of the proposed mechanisms (Q7a-c).



For Individual Farm Plans, those that saw them as being simple indicated that much of the work required of them was already being done by most farmers (e.g. nutrient budgets or good winter cropping practices). Those that perceived them as potentially complex indicated that they may need to be detailed, requiring skills not available on farm, and that they may become very prescriptive, cumbersome documents. Those respondents that sat in the middle (around the 5 mark) tended to indicate that for the range of reasons already list above they could be complex or not, and that it would depend heavily on the person involved and the nature of their farm.

Responses relating to Industry Programmes tended to be slightly more binary. Those that saw them as being very simple supported this by commenting that they were effectively 'off the shelf' products; that they were made to be easily understandable; and importantly for some people, that they often came with support from the relevant industry body to help complete them (or continue to collect information ongoing). Those that saw them as complex tended to note that, like farm plans, they were likely to be quite prescriptive and perhaps difficult for an individual to work though without support. There were also a few respondents that chose the middle of the scale, commenting that they again thought it would depend on the individual, the industry and the actual environmental problem seeking to be addressed. With the Industry Programmes it is important to note that many respondents perceived them as not being particularly well suited to the environmental needs of the TANK plan change. Rather, they tended to be more focused around the resulting quality of the product rather than the environment.

In relation to both Individual Farm Plans and Industry Programmes, several participants commented that they viewed these mechanisms as potentially being quite 'lonely'. It was perceived figuring out how to do something that was unfamiliar and probably quite paperwork-intensive was seen as something that could be quite frustrating, if done without help. Respondents were describing that these were perceived as isolating, leaving one to figure it

out by themselves rather than as a group. Some indicated that this was also part of the reason they viewed them as potentially complex.

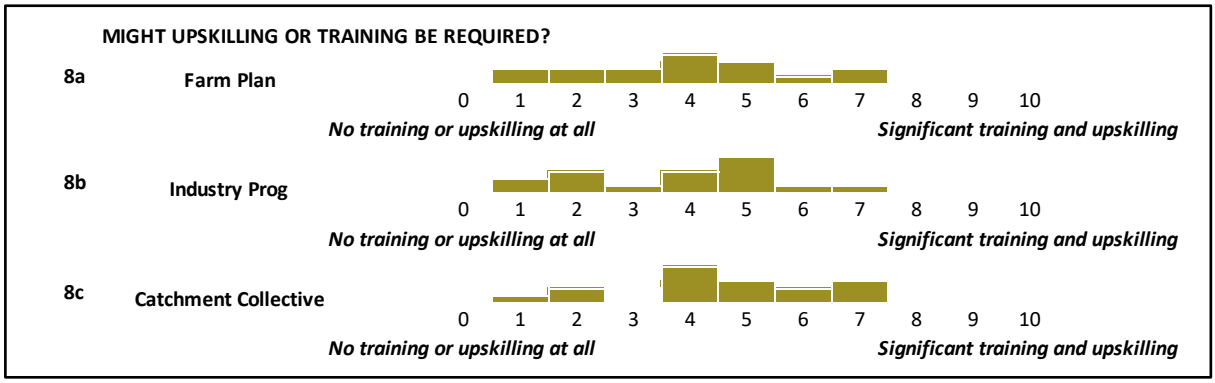
Respondents perceptions of the complexity of the Catchment Collectives was much more evenly spread. There was at least one respondent on every step of the scale from 2-10, with a small cluster around 2-3 (less complex) on the scale and again around 6-8 (more complex). The reasons given for the collectives being perceived as less complex included the view that they would be quite social, unlike the other mechanisms, and that participants would be able to draw on the experience of other farmers/growers, thus making their own challenges easier to deal with. They were also perceived as more pragmatic, activity orientated (rather than developing a plan that would just 'sit in a drawer') and easier to administer. They were perceived as less complex where the respondent considered that their community was a strong community that was functioning well.

Those that perceived them as potentially more complex tended to indicate that this was based on the fact that by nature they have to then deal with a range of other farmers or growers. Where respondents did not feel that they had a strong or vibrant community they tended to see this as potentially more complex. Some also saw them as potentially more complex due to the potential for *conflict* between farmers/growers, and *lack of clarity* around how they would work, and what *level of power* one farmer may have over another, or the governance group of a collective over members of a collective. In other words, while many were happy to work together, it was unclear who may be able to tell who what to do, which was perceived as potentially more complex.

The perceived need for additional training or upskilling

Results relating to the extent that participants saw a need for training or upskilling for any of the three mechanisms were also quite varied. None of the mechanisms were viewed as requiring significant training and upskilling, with the highest response for all only being 7 (see Figure A7).

Figure A7. Graphed results for questions relating to the perceived need for upskilling or training for the proposed mechanisms (Q8a-c).



For Individual Farm Plans the perceptions were fairly evenly distributed from 1-7, with a small clustering of responses around 4-5. While some viewed them as very straight forward (indeed, some respondents already had them), while others suggested that a reasonable level of technical upskilling may be required. This was often seen as either in the administrative side of putting it together (e.g. computer and writing skills), or additional technical knowledge required for specific areas.

Perspectives on Industry Programmes also covered a range from 1-7, with a cluster around 4-5 and a smaller cluster around 1-2. Those that perceived these as requiring little upskilling noted that they were set up to be guided through in quite a straightforward manner. While others noted that they would still likely require a certain level of upskilling, particularly around technical aspects more than the administrative side.

Responses for Catchment Collectives also ranged from 1-7, with the highest score being 4 and a continued cluster through to 7. While several people perceived that this would also be an approach requiring little additional training, others were more cautious and noted that some level of upskilling and support may be required for the 'human' side of this mechanism. The potentially challenging dynamics of the group situation was a common comment.

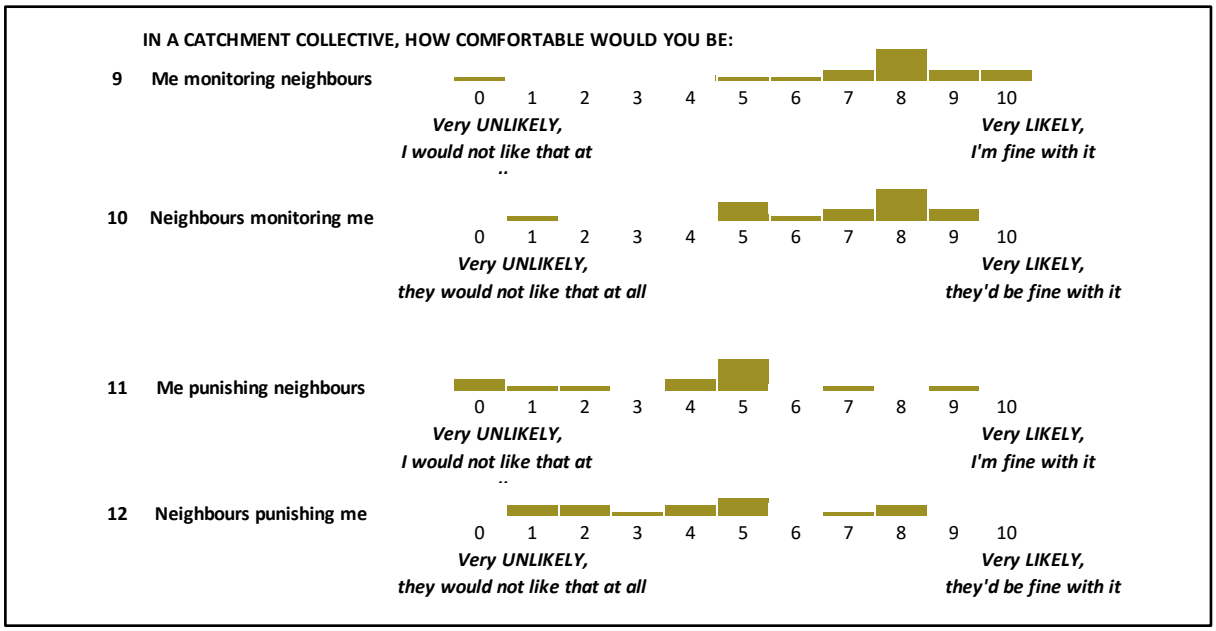
Monitoring and punishment of others in a Catchment Collective

Questions 9-12 all related solely to the Catchment Collective mechanism. These were designed to explore respondent's level of comfort with two things: *passively monitoring* other people in the collective; and *having to punish* them if they did not adhere to the rules (whatever they were for that group). In other words, if people were in a group that was seeking to be 'self-policing', how comfortable were they 'keeping an eye on' each other and potentially holding other members of that group to account if they did not do what had been agreed by the group? (see Figure A8)

These questions definitely generated the most comments and/or discussion when participants were filling in the survey. Many of these comments were revisited and explored in more detail in the discussion that followed and are therefore covered in the subsequent qualitative analysis and coding sections of this document. However, some key points are worth noting.

Firstly, consider the responses to the monitoring questions (9 & 10). Generally, participants were fairly comfortable with the concept of passively keeping an eye on other people in the group – who were likely to be their neighbours – with most responses clustering around 8. The level of comfortable that respondents perceived *others* had monitoring *them* was slightly lower. Although there was still a cluster around 8 with a smaller cluster around 5. It was acknowledged and noted by many that there was often already a reasonable amount of passive monitoring going on and a certain amount of proactive prompting that was already being provided. Several respondents talked about the role that informal social interactions already played, such as 'giving each other stick' at the pub on a Friday night.

Figure A8. Graphed results for questions relating to the perceived comfort of monitoring or punishing other in a collective group (Q9-12).



The punishment questions were read with a much lower level of comfort and clearly made some people quite uncomfortable. It is important to note here that the researcher often took the time to explain these questions so that people were quite clear. Because the question described fining other collective members as an example of how 'punishment' might occur, some participants took this to mean that was literally what was being proposed. The research took time here to highlight that these questions were designed to help determine participants level of comfort with the *concept* of punishment, or holding each other accountable, regardless of how a group may actually determine to do that for itself.

Responses to these questions were mostly spread across the lower range of the scale (0-5) with a couple around 7, 8 or 9. There tended to be a cluster around 5 for both questions (how comfortable they would be and how comfortable they thought their neighbours would be). Most respondents did not view 'punishment' as the role of the collective group and clearly saw this as the role of Council. However, once they understood that the question sought their level of comfort with the *concept* of holding each other accountable, regardless of how that was actually achieved, some respondents could see merit in having some kind of conflict resolution process in place that was pre-determined and agreed when entering into the group.

Appendix 6. Detailed results – coding of semi-structured interview data

This appendix presents greater detail of the thematic coding of interview data. The codes used and an explanation of whether they were deductive or inductive is provided in Appendix 1. Further qualitative data is drawn on in the discussion section. This appendix will: provide an overview of the results according to participants TANK Group affiliations; provide an overview of results by mechanism and attitude (positive, neutral, negative); provide a detailed summary of the deductive coding results by mechanism grouped by the structure of the research framework; and provide a detailed summary of the inductive coding results, by other themes.

Overview results by representative affiliation

This section presents some initial overview perspectives on the coded data according to which TANK group they were affiliated to. While the insight that these data provide into the source and broad nature of many of the comments, this analysis of the coded data should be viewed with a lower weighting than the qualitative comments, given the small sample size.

The relevant TANK groups were: the TANK stakeholder group itself; the Farmer Reference Group; and the Council. While data was also collected by industry type and gender, the small sample size prevents that data being presenting, due to the difficulty of maintaining the anonymity of some respondents. Therefore, only data relating to TANK affiliation is presented.

Firstly, the volume of comments from all affiliations was heavily weighted towards the Catchment Collectives (see Table A5). This is not surprising and is a result of the interview approach. This research was interested in *barriers* to the adoption of the mechanisms, and as discussed in the literature review and methodology sections, one entire part of the interview was focused solely on the Catchments Collectives. Also, given the semi-structured nature of the interview and the fact that the Catchment Collective was the most novel of the mechanisms proposed (Individual Farm Plans and Industry Programmes already have a long history), it is not surprising that a greater volume of the discussion was focused in this area.

Table A5. Volume of comments relating to plan mechanisms by TANK affiliation

	Individual Farm Plan	Industry Programme	Landowner Collective
Farmers Reference Group	56	44	208
TANK Member	37	45	155
Council	21	28	82

While not all comments were coded to a mechanism or a theme, most were coded to an attitude which reflected the tone of the comment (positive, neutral, negative). When only the *attitude* of the comments is tabulated according to TANK affiliation (Table A6) it can be seen that while no single attitude had an overall majority, the bulk of comments were negative (approximately 40%), followed by positive (approximately 35%) and also a large were also neutral (approximately 25%).

Again, it is important to keep these data in context as this does not necessarily mean that the majority of the discussions were negative. The research was interested in *barriers* to adoption so when potential barriers, areas of discomfort or confusion were identified in the interviews, these were discussed further. This was to better understand the potential risk they may have posed. Consequently, it should be expected that a range of negative or neutral comments were identified.

Table A6. Volume of comments by attitude (positive, neutral, negative) and TANK affiliation

	Positive	Neutral	Negative
Farmers Reference Group	189	155	245
TANK Member	159	101	165
Council	64	58	78

When both mechanism AND attitude are tabulated by TANK affiliation, a clearer picture of the discussions begins to develop (see Table A7). The volume of comments from participants who affiliate with the Farmer Reference Group continue to make up the bulk of the sample, followed by TANK Group members and then Council staff, which is proportionally consistent with the sample. What is of greater interest though is that some other insights become apparent.

Firstly, for both the Individual Farm Plans and the Industry Programmes, there were slightly more negative comments made by members of the Farmer Reference Group and the TANK Group. This may be an indication of a slightly more negative view on these mechanisms by these groups.

Secondly, for the Catchment Collectives, all affiliations made slightly more *positive* comments than *negative* ones. While the negative comments are of interest to help understand potential barriers, it is important to note that there were many positive comments made. This additional layer of granularity in the data is useful, as by only considering the volume of comments or the volume of attitude weighting, it could be easy to assume that the majority of comments were negative.

Thirdly, it is important to note that the Council affiliated respondents were the only one who made more *positive* than *negative* comments on ALL of the mechanisms. While this was only

slightly so for the Catchment Collective (31 positive vs. 30 negative), it would suggest that all were viewed as providing some benefit to Council. Whereas it could be inferred that Individual Farm Plans and Industry Programmes were seen as less appealing by farmers and growers themselves.

Table A7. Volume of coded comments for each mechanism AND attitude (positive, neutral, negative), according to participants TANK affiliation

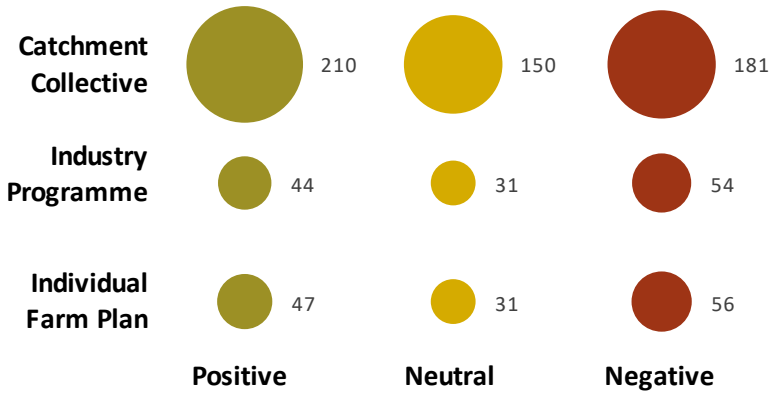
TANK affiliation	Individual Farm Plans			Industry Programmes			Catchment Collective		
	😊	😐	☹	😊	😐	☹	😊	😐	☹
Farmers Reference Group	20	11	27	15	7	25	83	58	75
TANK Member	13	7	20	16	15	17	72	36	52
Council	10	9	3	13	8	7	31	25	30

Overview results by mechanism and attitude

The previous section presented the results of coding according to the affiliation of participants within the TANK plan change process. This section provides an overview of the volume of coded comments for each mechanism according to attitude, independent of industry or organisation affiliation.

By far the largest volume of comments coded related to the Catchment Collective mechanism. For each attitude (positive, neutral, negative), even when the number of comments coded to the other two mechanisms are combined (Farm Plans and Industry Programmes) they only total around 40-60% of the comments coded to Catchment Collectives (see Figure A9).

Figure A9. Proportional number of coded references for each plan mechanism and attitude (positive, neutral, negative)



Numbers beside each bubble indicate the number of comments made.

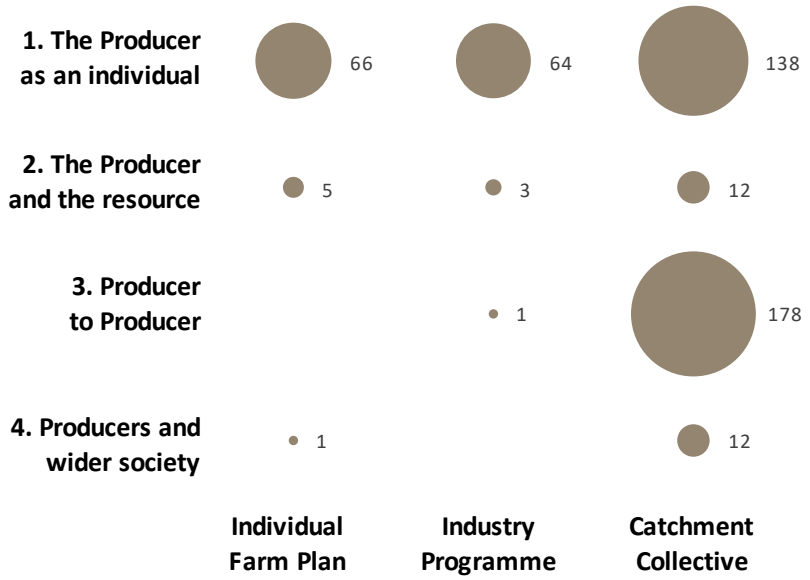
For each of the mechanisms the distribution profile of comments is similar. Neutral comments are the smallest grouping for each mechanism, yet they still make up a reasonable amount of comments. For the Individual Farm Plans and Industry Programmes there are slightly more negative comments than there are positive. For the Catchment Collective there are slightly more positive comments than there are negative comments.

Detailed results by mechanism and interview structure (deductive coding)

The previous section provided an overview of the volume of coded comments for each mechanism according to attitude only. This section presents more detailed results for each mechanism according to codes that reflect the general structure of the semi-structured interviews, and the attitudes that they were coded to. This section is divided into sections that mirror the interview structure: the producer as an individual; the producer and the resource; producer to producer; and producers and wider society.

To begin, the volume of comments coded to the relevant general structure of the semi-structured interviews is shown in Figure A10. When considering this information, it is important to remember the way that this interview structure was arrived at (see the literature review). The first part of the interview structure was designed to investigate potential barriers to all mechanisms, while the subsequent sections, particularly the third section (producer to producer) was designed to more specifically explore the potential barriers to the Catchment Collective mechanism.

Figure A10. Proportional number of coded references for each plan mechanism within correlated with each part of the semi-structured interview structure.



Numbers beside each bubble indicate the number of comments made.

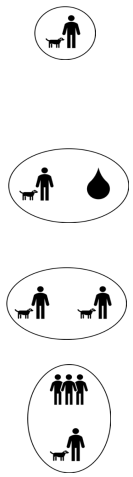
Given this information it is not surprising to see that comments relating to all mechanisms were made in the first part of the interview, which was where issues such as complexity, trialability, upskilling & training and risk were explored. The latter parts of the interview tended to generate much greater comments relating to the Catchment Collectives. The majority of discussion relating to the catchment collectives tended to be in the third part of the interview, where producer to producer relationships were explored. This was where the concepts of monitoring and 'punishing' other members of a Catchment Collective were explored.

The lack of coded comments in the other parts of the interview structure did not mean that general comments were not made, they were just not ascribed to any particular mechanisms. Comments that were made here are likely to be code to 'other themes' discussed later (see *Detailed results by other identified themes, by mechanism (inductive coding)* later in this appendix).

Further insight can be gained if the comments are broken down in more detail by the structure of the interview, the mechanism and the attitude, as shown in Table A8 below.

Table A8. Volume of comments by interview structure, mechanism and attitude

Coded theme	Individual Farm Plans			Industry Programmes			Catchment Collective		
	☺	😐	☹	☺	😐	☹	☺	😐	☹
1. The Producer as an individual									
1A. General	0	0	0	0	0	0	1	0	0
1A.1. Demands for action are approriate	0	0	0	0	0	0	0	0	0
1A.2. ROI for managing is appropriate	1	0	0	1	0	0	1	0	0
1B. Relative advantage	13	5	6	6	4	3	28	7	10
1C. Trialability	9	0	5	12	1	5	12	3	6
Upskilling	4	5	8	6	4	4	23	6	7
1D. Complexity	11	8	14	9	13	15	20	30	30
Risk	3	4	15	2	3	15	7	16	32
2. The Producer and the resource									
2A. Clearly defined resource	0	0	0	0	0	0	0	0	0
2B. Ability to monitor resource	2	1	3	1	0	2	4	3	7
Diconnect from data	0	0	1	0	0	0	0	0	1
3. Producer to Producer									
3A. Users influence the institution	0	0	0	0	0	0	3	0	1
3B. Users clearly defined	0	0	0	0	0	0	0	1	2
3C. Monitoring others	0	0	0	1	0	0	13	11	16
3D. Appropriate punishment for infringement	0	0	0	0	0	0	21	21	46
3E. Conflict resolution	0	0	0	0	0	0	29	15	10
4. Producers and wider society									
4A. Level of permission to self-organise	0	0	0	0	0	0	0	0	0
4B. Organisations are appropriate and work well together	1	0	0	0	0	0	4	2	3
Misunderstanding	0	0	0	0	0	0	0	2	0



The producer as an individual

All mechanisms received more positive comments in relation to their relative advantage than they did neutral or negative. While the volume of comments were made about the Catchment Collective, it is important to note that all mechanisms were seen as having their own relative advantage in some way. For Individual Farm Plans these comments tended to be around it being a discrete piece of work that a farmer could own themselves and be accountable to council to, while also providing valuable insight to their business. For Industry Programmes these comments included the fact that farmers learned more about their business and that there were economies of scale to be gained by being part of a larger group supported by their industry. For Catchment Collectives, there was a very strong skew towards positive comments, these tended to indicate that people saw these a way of both learning about their business like the other options provided, but also learning from each other and gaining from a wider pool of valuable knowledge within their community. There were also strong social benefits perceived with this mechanism if it was run successfully.

All mechanisms had more positive comments about trialability than negative comments. While it was acknowledged that none of the mechanisms might be very trialable for an individual, they were all acknowledged as being trailed in way or another. For example, some viewed farm plans as having been trialed by many different farmers in different regions over time, and in the Tukituki catchment of Hawke's Bay currently. Other suggested that industry plans were being trialed by other people who were implementing them and could be observed on their

farms. Still others suggested that Catchment Collectives could be trailed by a proactive group in a catchment before council required them to be in place. In fact, several participants talked about an actual example of this that they were involved in within the TANK area.

The need for upskilling was seem as more relevant for Individual Farm Plans rather than Industry Programmes or Catchment Collectives. These comments tended to highlight that because farm plans required a wide range of expertise, one farmer was unlikely to have all of that expertise. Also, if an external provider was used to deliver this, the opportunity for an individual farmer to become upskilled would likely be missed. Industry Programmes were seen as being able to access a wider range of industry support, and so slightly more positive comments were seen in this area. For Catchment Collectives, significantly more positive comments were made over neutral or negative ones. There was a strong view among respondents that the Catchment Collectives were seen as a way of sharing best practice and building a wider level of good practice amongst farmers. They were also seen as likely providing a positive influence in the wider community as well through the passive upskilling and social cohesion that could be gained from farmers interacting more with each other. However, the small number of negative comments that were made in relation to Catchment Collectives are worth noting as they tended to relate to the potential areas of conflict between members. Respondents felt that not all farmers would have the skills to deal with such conflicts and that upskilling may be required on how to deal with your neighbours, when this was not something people had experience in. Some also noted that this might come from outside the collective.

In the complexity and risk themes, all mechanisms had more negative comments coded. The complexities of Individual Farm Plans were seen as the need for specialist support, while the predominant risk was seen as the likelihood that a farmer would not fully gain the insights from the plan if it was done by someone else, that it would be too cumbersome to be of any real day to day benefit and would simply become a ‘check-box exercise’ rather than a ‘living’ document. The positive comments made about them tended to focus on the fact that many farmers were already doing much of what was required, so for some they would be quite easy to achieve.

Industry Programmes were seen as also being quite complex, and the main risks associated with them was that they were not appropriate enough to achieve the desired environmental outcome. The positive comments related to these talked about their potential ease of implementation because of their off-the-shelf nature. Further, likely implementation support provided by an industry organisation was perceived, which would help make the implementation much easier.

Catchment Collectives were seen as potentially very complex and highly risky. Comments here tended to highlight the fact that the way that people would work together in a catchment may make it quite complex, little was known about exactly how they fitted together with the other mechanisms, and whether they would or could replace them. For example, some people talked about already being in an industry programme or having large parts of a farm plan done, yet how they would work in conjunction with a Catchment Collective was not clear (this also features in the 'still not clear' theme in the 'other themes' section). Other risks included interpersonal risks from those involved with the collective, and for many the existing level of cohesion with a community was seen as a strong predictor of how successful a catchment collective was likely to be. Potential conflict within a community was definitely seen as a key risk, a theme that also recurs in the 'this is more than farming' theme in the other themes section.

The producer and the resource

While a reasonable volume of general comments was coded to the themes in the Producer and the resource section, few were coded in relation to specific mechanisms.

Of those that were coded there were slightly more negative comments than positive ones. These generally highlighted the need for accurate monitoring of water quality as a resource so as to be able to measure the impact of any action that was undertaken with these mechanisms.

Producer to producer

After the producer as an individual section, most comments were coded to the producer to producer section. As this was one of the sections designed to explore the Catchment Collectives specifically, most discussion and comments were focused around how a group would interact, specifically the passive monitoring of others; the potential punishment of others; and conflict resolution.

As indicated in the survey results, while not all producers were comfortable with passively monitoring each other, most were more comfortable with this than punishment. While there were slightly more negative comments, there was a comparable number of positive and neutral comments also. These ranged from a reasonable level of discomfort, to discussion and acceptance that some kind of monitoring would be required, to the acknowledgement that a lot of inter-producer comparison and passive monitoring already goes on anyway. The researcher went to lengths to point out that 'monitoring' did not mean any formalised form of

auditing of each other, but that it as a passive practice of “keeping an eye on each other over the fence”.

The discussion around potentially ‘punishing’ a neighbour as part of a collective group generated 2-3 times as many comments. There are two main reasons why there are so many comments in this area. Firstly, respondents were prompt at making comment on this as it was one of the more controversial parts of the interview. Secondly, because the literature indicates that ‘punishment’, or holding each other accountable, is key in self-organising groups, the researcher probed this area of conversation more, exploring it as much as possible to gather as much information.

Comments in this area were predominantly negative. Most participants were uncomfortable with the prospect of potentially having to hold each other accountable, seeing this instead as the role of the Council as the regulatory body. Most negative comments in this area linked strongly with the fact that farming/growing wasn’t just a business, but a way of life, and that to ‘punish’ a neighbor in whatever form, may have negative impacts on the wider community and social cohesion. It was perceived that not only might such action be disruptive to farmer-to-farmer relationships, but wider community relationships also. For example, children of potentially conflicting farmers at school. Some of these comments were also coded to the ‘this is more than farming’ code in the other themes section.

Yet while there was strong discomfort with the concept of punishment, it is also important to note that nearly half of the comments were neutral or positive. Neutral comments tended to highlight the still unknown components of how this mechanism might work. While many viewed the potential power of a collective working together as useful, there was the acknowledgement that if one member was not ‘pulling their weight’ the collective had a role in trying to ensure that person did their part. Some people recognised that the concept of punishment would be important, but they were not sure how that could or should be carried out. Most suggestions provided by respondents for improving the performance of others in a group were more proactive and passive, rather than reactive. For example, they described quiet or anonymous support and ‘getting alongside’ others as more useful approaches than fining people.

The question in the survey provided an *example* of how someone might be punished by providing the example of a fine. It is worth noting at this point that some respondents perceived this as an *actual mechanism* that was being proposed by council. The researcher went to lengths to reassure respondents that this was not the case, but many respondents did seem to have the concept of fining in their minds when this issue was discussed, which may have strengthened their opposition to the *concept*, rather than the *actual mechanism* that might be used.

It is also important to note that there were a similar number of positive comments relating to punishment as there were neutral ones. The positive comments highlighted that some people did see it as important for a collective group to hold its own members accountable. Others highlighted that while they were not keen on fining per se, they did see the collectives as providing an informal mechanism for punishment. It was noted by a couple of people that holding each other accountable was important because there was an existing feeling amongst some farmers, who HAD undertaken a lot of environmental improvements, that they were frustrated when others were not held to the same standard as they were, which in itself caused some frustrations within the community.

The final grouping of comments in this section related to conflict resolution. By far the majority of these were positive and neutral, with the least being negative. The positive comments highlighted that many people saw conflict resolution as an important element of a collective group. Many saw the need for some kind of third-party facilitation support, either just to facilitate or particularly for conflict resolution. There were mixed views over whether this could or should be provided by Council or not. Certainly, the benefit of clear conflict resolution processes was expressed. The neutral comments tended to highlight the lack of clarity that some people had around how some of these processes might work. While again the benefit of clear conflict resolution processes was acknowledged as important, whether they sat with council or the group and how they were funded tended to be the main points of discussion. The negative comments highlighted that the lack of clarity around how conflict resolution might occur could be a problem. They also highlighted that some saw this role as sitting with council, while others saw council paying for it, regardless of where it was resourced from.

Producers and wider society

The final section of the interview was focused on the wider relationships between producers and other parts of society such as wider society, and in particular, council as an organisation. While only a few comments were coded in this area, specifically to Catchment Collectives, they were a mixture of positive and negative. The positive comments tended to focus on the opportunity that existed for council to support and/or be part of the collective groups that were established; while the negative comments tended to focus on the Councils track record of not punishing people previously for bad practice, and that they would need to do this better in the future. This was also a feature of the ‘upping council’s game’ theme in the ‘other themes’ section.

Detailed results by other identified themes, by mechanism (inductive coding)

The previous section presented the results of the coding analysis according to the deductive codes determined by the interview structure, the relevant mechanisms and the attitude of the comment. This section will summarise the *inductive* codes developed from the analysis of the data, according to the mechanism and the attitude of the comment (see Table A9). The predominant areas to be discussed are: appropriate action; build up slowly; communication; cost; the desire for monitoring; independence versus guidance; keen to own the issue; still not clear; and this is more than farming.

Table A9. Volume of comments by other themes, mechanism and attitude

Coded theme	Individual Farm Plans			Industry Programmes			Catchment Collective		
	☺	😐	☹	☺	😐	☹	☺	😐	☹
Other themes									
Absentee owners	0	0	0	0	0	0	1	0	2
Accounting for nature-weather	0	0	0	0	0	0	0	0	0
Appropriate action	2	2	4	2	2	2	9	8	5
Build up slowly	0	0	0	0	0	0	1	6	1
Communication	0	0	2	0	0	0	23	10	2
Cost	1	0	2	1	0	1	7	3	8
Desire for monitoring	0	0	0	0	0	0	2	2	5
Good work already	1	0	0	3	0	0	2	0	0
Independence versus guidance	0	1	0	0	0	0	5	5	0
Keen to own issue	0	0	0	0	0	0	13	1	0
Leased land	0	0	0	0	0	0	0	1	2
Media	0	0	0	0	0	0	0	0	0
Modelling	0	0	0	0	0	0	0	0	0
My view has changed	0	1	0	1	1	0	2	1	1
One size doesn't fit all	0	1	3	1	0	4	3	0	1
Politics	0	0	0	0	0	0	0	0	0
Rural-Urban equity	0	0	0	0	0	0	0	0	0
Still not clear	3	3	2	2	1	5	12	33	28
This is more than farming	0	0	0	1	0	0	5	3	6
Upping Councils game	0	0	0	0	0	0	0	1	2

The appropriate action theme was coded across all mechanisms but predominantly the Catchment Collectives. This related to ensuring that any action was appropriate and a targeted response to help achieve a desired outcome, rather than an action simply being taken for the sake it. This was seen as necessary across all mechanisms and likely to be provided by an appropriate risk-based assessment of the issues on each individual or group of farms. This was particularly seen as a positive component of the Catchment Collectives, where risks could be determined at a catchment level where they were more likely to be able to be dealt with in a coordinated and impactful way.

The need to build action up slowly was seen as important. Many participants made the comment that farmers and growers don't adopt things immediately, and often need to consider things for a while before they adopt them, often after others around them have.

Accommodating this in the implementation was seen as quite important, as was a potential staged roll out of the various mechanisms across the wider TANK area, simply to help make the pure volume of work required more manageable.

Good communication was seen as a very strong benefit and enabler of the Catchment Collectives. The comments in this area were overwhelmingly positive, with a number of neutral comments. The positive comments tended to see this as a key benefit and feature of this mechanism, while the neutral comments tended to note its importance and relevance, not necessarily that it was a skill that was already well developed.

There were a few comments that were coded to the cost theme for Catchment Collectives, with a fairly even split between positive and negative. The negative comments tended to note that Catchment Collectives were likely to incur some administrative costs (such as a facilitator) and that people expected council to pay for, or at least support in paying for, those costs. Neutral comments tended to highlight that the funding mechanism for administrative support was not clear. Positive comments tended to focus on the potential resource and cost savings that Council was likely to realise if most people went into collectives, due to the reduced number of farm plans that would need to be developed and monitored. Some people also noted that they could be cost efficient for the Catchment Collectives themselves too.

A small number of comments were coded to the desire for monitoring. These tended to highlight that there was a strong desire for a highly detailed level of monitoring to be able to support the Catchment Collectives.

The code called independence versus guidance was established to capture comments relating to the level of prescription that should come from council (guidance) versus the level of independence and innovation that the Collectives should generate themselves (independence). This related mostly to the level of prescription that any potential terms of reference for a group might have, or their governance structure, reporting requirements etc. There was a high level of expectation that much of this would be prescribed by council. Yet when the potential conflict between whether a high level of prescription was consistent with the desire of groups to self-organise was raised, many people noted that this was potentially a contradiction, and that while consistency was important, it may only need to apply to certain components or outcomes.

One code where there was a very clear dominance of positive comments was in the code called ‘Keen to own issue’. This captured a range of comments that all indicated the strong desire and high level of enthusiasm that has already been developed by the Farmers Reference Group to be proactive in their ownership of the issue. For many this was not just seen as a good environmental outcome to be proud of, but also a way of proving themselves

to a wider community, whom many viewed as untrusting. Either way, it reflected a high level of social capital that had already been developed in this area.

The most populous theme in all the other themes, was ‘Still not clear’. This was a theme that captured comments from all mechanisms, although predominantly the Catchment Collectives, that highlighted where things were not clear or needed further development. Predominantly these were neutral comments, indicating that people did not yet view this lack of clarity as good or bad, simply that it was a lack of clarity. There were more than double the number of negative comments relating to a lack of clarity than there were positive comments. This would suggest that there remain a larger number of risks in this area than there are opportunities. The types of things that were identified as not being clear included: how all the mechanisms fitted together – whether someone could be in several at once; the size of the catchment collectives; the most appropriate governance and reporting structures; conflict resolution processes; where funding would come from; and whether membership of Catchment Collectives would initially be compulsory or not.

The final theme in this section to be discussed is ‘This is more than farming’. A balance of positive and negative comments were coded to this theme, which tended to reinforce that while these mechanisms (particularly the Catchment Collectives) were being viewed as impositions on a business, they were actually an imposition on a community. While some viewed this as positive others viewed this as negative, likely upon reflection of their experience of their own communities and what the likely impact on them might be.

Waitohi and Waikawa Streams

Characterisation Study

A Report

Project funded by: Ministry for the Environment (MfE)

Project led by: Te Ātiawa Manawhenua Ki Te Tau Ihu Trust (Charitable Trust Registration no. 610596)

Project supported scientifically by: The Marlborough District Council

This report has two sections; Section 1, facilitated by Te Ātiawa Manawhenua Ki Te Tau Ihu Trust, which describes the history and cultural values associated with the Waitohi and Waikawa streams, and, Section 2, which is a separate document, being an interim report by the Marlborough District Council that addresses Water Quality in the Waitohi and Waikawa catchments.

Section 1: A report that describes the history and cultural values associated with the Waitohi and Waikawa streams

Section1 has three distinct parts; an *Overview* of the Waitohi and Waikawa Streams, Part A, which summarizes the background of the migration of Te Ātiawa from Taranaki to the rohe in which the Waitohi River and Waikawa Stream are located, and Part B, which offers the tikanga around the Waitohi River and Waikawa Stream. (Parts A and B have been taken, verbatim, from material provided by Te Ātiawa cultural advisors.)

Overview: The Waitohi and Waikawa Streams

The Waitohi and Waikawa Streams have a special place in the Rohe of Te Ātiawa and have had a close association with Waikawa Marae in Tōtaranui / Queen Charlotte Sound, where Te Ātiawa people are Tangata whenua. As kaitiaki of its Te Tau Ihu rohe, Te Ātiawa people want to ensure that the environment is sustainably managed. They carry a responsibility to protect and care for the environment for future generations.

Waitohi River – is of utmost cultural significance to Te Ātiawa. Before Europeans arrived, the iwi occupied the banks of the Waitohi. The waters of the Waitohi were considered sacred as it came from their maunga, Piripiri, at the head of the catchment. The waters were used for a variety of tikanga, one of which was the preparation of warriors for battle. Post European settlement, and the displacement of Te Ātiawa from Picton, the banks of the Waitohi were developed and its waters polluted by urban and industrial developments. Simply put, there has been no work done on the Waitohi River to indicate its overall health or mauri. The proposed work will provide Te Ātiawa with an assessment of the Waitohi River's current overall health and a tool for the future management/enhancement.

Waikawa Stream – once relocated to Waikawa, Te Ātiawa adopted the Waikawa Stream. It provided freshwater for tikanga, gardens, and other ceremonies. A makeshift marae/community facility was constructed close to its banks and eventually the Waikawa Marae (Arapaoa) was constructed on its banks. Many Te Ātiawa members would identify with the Waikawa Stream, as that is what they have grown up with. Yet, there has been no characterisation work undertaken on the Waikawa Stream, and development has been allowed on its banks unabated. The proposed work would assess the ecological health/state of the Waikawa Stream and provide a benchmark (for Te Ātiawa) to seek improvement/enhancement.

Part A: Te Ātiawa Migration to Te Tau Ihu

Demand for more land and resources and the conquest of Te Tau Ihu

As the numbers of Te Ātiawa increased in the lower North Island, so too did the demand for more land and resources. Inevitably, the Taranaki and Kawhia tribes turned their attention to the South Island. Te Ātiawa took up opportunities with the arrival of the early whalers and traders. They also took advantage of the opportunity to acquire land in Te Tau Ihu.

The conquest of Te Tau Ihu was a joint effort with the Kawhia tribes. Te Manutoheroa, Huriwhenua, Te Koihua, Whitikau and many others led the contingent for Te Ātiawa in a series of attacks. The main attack took place around 1829-1830. The Northern tribes fought battles against Ngāti Kuia, Rangitāne, Ngāti Apa and Tu-mata-kokiri, who were armed with traditional weapons. The local tribes never really stood a chance against the northern tribes who were well armed with muskets. Ngai Tahu did not escape the wrath of the northern tribes either. The Poutini people occupying the West Coast were subdued and those on the East Coast suffered great losses.

Waikato and Manipoto seek revenge, more Ngatiawa head South

In 1832, Waikato and Maniapoto finally executed their threat to seek payment for both the assistance given to the Kawhia tribes at the Battle of Motunui, and for their subsequent loss of chiefs. Attacks were made at Pukerangiora and Ngā Motu. As a result, most of the remaining Ngatiawa people, along with the Europeans who had helped them, decided to migrate South to join their relatives – many of whom were now widely distributed about the Cook Strait District and the Northern South Island. Te Heke Tamateuaua left Taranaki, with around two thousand men, women and children.

Te Ātiawa settlement of Te Tau Ihu was a gradual process. Land was first settled in 1832, and by 1840; Te Ātiawa occupied land from Totaranui (Queen Charlotte Sound) to Mohua (Golden Bay).

Protecting the tribal estate of Te Ātiawa

Many Te Ātiawa returned to Taranaki in 1848 and subsequent heke occurred after the mid1850s. In both cases the return was influenced by concern about the land in Taranaki and, in the latter, as a result of the actions of the Colonial Government. The Taranaki Land Wars, one of the major events of the Nineteenth Century, stemmed

from the desire of Wiremu Kingi Te Rangitaake to protect the tribal estate of Te Ātiawa. In 1860, the first of the country's land wars involving the Crown began and Māori resistance at Parihaka continued through until the end of the century.

Systematic loss of asset base and ability to exercise rangatiratanga

By 1860 Te Ātiawa were more restricted in their movements, largely because huge land purchases had already taken place by this time. In the 1840s and 1850s reserves were established for Te Ātiawa to live on. These reserves were all that remained of their land. Apart from the fact that the reserves were inadequate, in many cases, the land was worthless. Through successive government legislation and policy, Te Ātiawa have been systematically stripped of their main asset base, and the ability to exercise rangatiratanga in accordance with Te Tiriti o Waitangi. (J Ritai, Taranaki Muru Raupatu Wai 143, in A Riwaka (July 2000).)

Part B: Tikanga around the Waitohi River and Waikawa Stream

TE WERANGA O WAITOHI AND TE MAUNGA PIRIPIRI (Researched & Compiled By Kaumātua Mike Taylor)

Te Weranga o Waitohi was the original name for Picton. Waitohi was a ritual (baptismal) or Tohi rite before warriors went into battle, the latter lined the bank of the sacred stream, where as they filed past, the Tohunga dipped the branch of the karamu bush into the stream, striking each warrior on the right shoulder. If a leaf fell off the branch, that warriors chances of returning from battle was quite good, however, if a branch broke then that warriors chance of returning was very remote. Hence:-

Waitohi Te Awa Tapu = The sacred stream which flows from the sacred mountain, Piripiri Te Maunga Tapu. Te Maunga Piripiri is the mountain to the south-east of Waitohi, One meaning of Piripiri is to embrace which could refer to the surrounding hills which embrace Waitohi, but in this case it refers to the scented moss which grows on the high ridges of the mountain. Piripiri was highly prized by the Māori women, who wore it in small kete around their necks, Piripiri gives off a fragrant scent. The following lullaby which refers to this moss, and also to the Taramea (Speargrass), out of which Kakarataramea, a sweet scented gum which was made from the leaves of the Taramea. These were heated to expel the gum and mixed with oil extracted from the Kereru.

Taku hei Piripiri
Taku hei Mokimoki
Taku hei Tawhiri
Taku hei Taramea

My little neck satchel of sweet scented moss
My little neck satchel of fragrant fern
My little neck satchel of odoriferous gum
My sweet smelling neck locket of sharp pointed Taramea.[1]

On researching further on the above I found another use which some of the above were also used. As an anointing oil for deceased persons. Made up as follows:-

[1] Marlborough Archives written on either goat or pig skin parchment.

Mokimoki, a scented fern;
Tarata, a tree producing a strong smelling turpentine;
Kopura, a fragrant moss;[2]
Taramea, the root which was very aromatic[3]

Kati Taramea (receptacle for scent) made of Albatross bone used as receptacle for material charged with taramea scent, worn round the neck over hei-koko (ornament of tui skin, which was scented with piripiri.

Another version of the same lullaby has been recorded by Richard Taylor as follows:- Perfume made from the semitransparent gum of taramea is celebrated in Māori song and proverb, as in this nursery love song: "My necklace of scented moss; My necklace of fragrant fern; My necklace of odorous shrubs; My sweet smelling locket of taramea." It formed the basis of a compound affectionately termed "the grand Māori perfume." As well it was "fixed" in various bird and vegetable fats and suspended around the neck in hei, or neck bands.[4] Many of the plants from which perfume was extracted were known as Piripiri.

There was an instance I remember, when Manaia MacDonald and myself were hunting on Piripiri, we stopped on the high ridge to have something to eat, we sat in between the large roots of the black birch tree which formed an armchair type design. When Manaia said to me what's that perfume you've got on, I said, 'I thought it was you." However, it was the moss on which we sat. On returning home Manaia mentioned it to his wife, and she told us it was Piripiri, and how the Māori girls used to wear it in little kete around their necks. The moss was growing on the south facing (damp) side of the trees.

Past authors of Māori history, especially in connection with Waitohi have continually referred to Waitohi being named after Te Rauparaha's sister Waitohi, dying here, however, she died on Mana Island, Kapiti coast, and this was not until 1839, as recorded in Wakefield's dispatches back to England. Also Memorials are not made to people still living. As Captain William Steine visited the Waitohi on August 14 1832, when he reported that he found 200 Māori living there.[5] Those same authors also refer to Te Wera o Waitohi, which after extensive research the only near reference which these authors seem to have shortened (as many Māori names were shortened, especially in schools and Crown agencies) is Te Wera o Waitohi from Te Weranga o Waitohi, the latter is mentioned in the Waitohi Purchase Deed. None of the afore mentioned authors have written the history from a Māori perspective, it is to be hoped that sometime in the near future this can be done, to ensure that the history our tamariki and mokopuna are learning at school is correct. **Te Weranga o Waitohi refers to the sacred waters.**

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2 Also known as Kopuru.

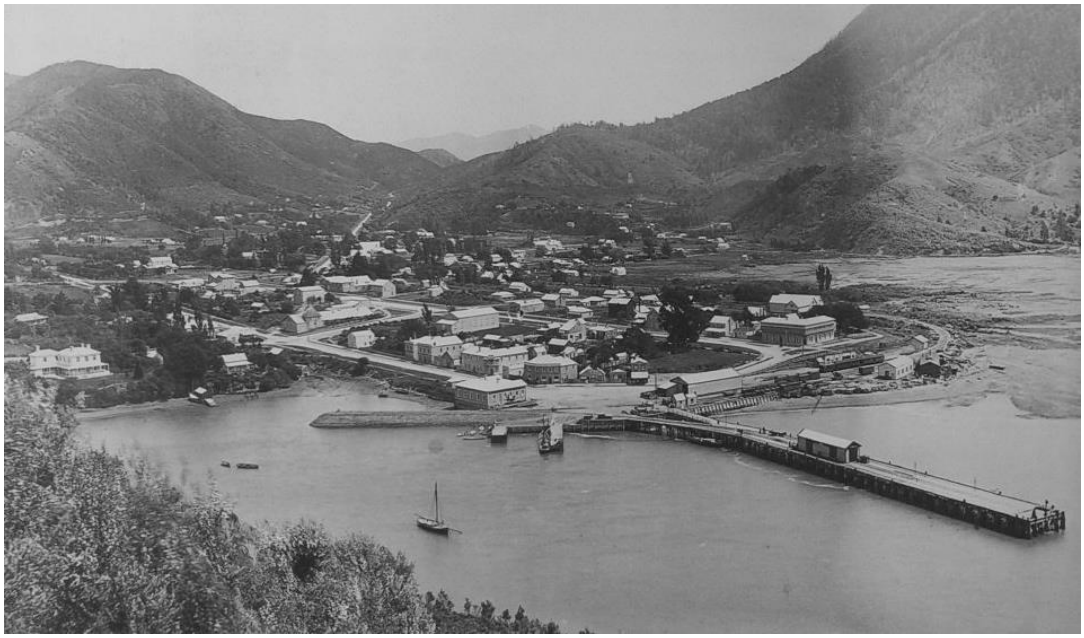
3 Taramea is commonly known as Spear Grass.

4 R. Taylor, Māori Race Notebooks GNZ MSS 297 Taylor Collection Auckland Public Library – Notebook 33.

5 Hobart Town Courier September 14 1832, Steine named Okiwa Bay in the Grove Arm, "Hornes Bay, and the Grove Arm "Queen Adelaide River.

Also the Waitohi Valley which extends from Picton to Tua Marina.

[(related information) Over the past 70 years, the Waitohi Lagoon has been progressively filled in, totally changing the character of the lower Waitohi River, with the main reclamation, to enable the development of the rail yards, occurring in 1971. Ultimately, the lower reaches of the Waitohi River have been extensively culverted, with the seaward end discharging into the Picton Harbour, adjacent to the Interislander Ferry Terminal. The Pictures below show these changes.]



Waitohi (Picton) and the Waitohi Lagoon – the delta of the Waitohi River, extreme right, circa 1895 - Photo: Historic Archive

Looking down on to the Picton ferry terminal. At left is the land reclaimed and in the middle of this area a transporter park will be made. The existing terminal, with the Aramoana departing, can be seen near the middle of the photograph. The No.2 terminal will be between that and the Waitohi Wharf alongside which are two ships

The Waitohi River and the Waitohi Lagoon have disappeared beneath fill and culverting. Photo: Nelson Photo News – No129: July 24, 1971

Currently, the Waitohi River runs to the sea beneath the rail yards, with its outlet approximately in the very centre of this image – Photo: Te Ātiawa Trust, circa 2014

Te Maunga Ko Tara o te Marama
Known as Mount Freeth, this mountain is situated to the west of Waitohi, which according to some is the mountain of the moon. It should also be noted here that the sun rises from the east and sets over Ko Tara o Te Marama, as does the moon.

Tokomaru - Mount Robinson, to the southeast of Picton, behind Piripiri, has a microwave disc on top.

Coming from Blenheim on reaching Tua Marina straight, the mountain directly in front of you is:-

Hine Koareare - Mount Strachan. History states that Hine Koareare is buried on the mountain, she was out gathering raupo roots with other women when a taua came through and she was killed.

Then on the opposite side of Waitohi Valley the highest point is Whitiao.

Other place names that are incorrectly written or shortened in Marlborough are:-

Okaramio	**Orakauhamu**
Onamalutu	**Ohinemahuta - daughter of Tane Mahuta god of Forests**
Ruapaka	**Otokoruapaka**

Waikawa Stream

Piripiri Te Hautapu is the mountain directly behind the Waikawa Marae, not to be confused with Piripiri Te Maunga above, [(related information) and it is from the water catchment dominated by this Maunga that Waikawa Stream rises].

In 1828, the Ngatiawa tribe (Te Ātiawa Iwi) took Tōtaranui (Queen Charlotte Sound) by conquest. Ropoama Te One, a paramount chief of the Ngatiawa, established himself at Waitohi and later negotiated the sale of the pa site which saw the tribe, albeit reluctantly, move to Waikawa [and (related information) all but perish from contaminated local water, arguably including Waikawa Stream. Fortunately, Ropoama Te One found a spring of fresh water which saved the people – see below.].

This stream also comes from a branch of Piripiri, the high point directly behind Waikawa Marae known as "Piripiri Te Hautapu."

Ropoama Te One, a rangitira of Te Ātiawa, was one of the signatories to the Treaty of Waitangi, and one of the main signatories to the Waitohi Purchase, by the New Zealand Company, in 1850.

Negotiations for the Waitohi pa site, as land for the future town of Picton, stretched from December 1848 through to the final deed of sale signed 4th March 1850. The establishment of the Town of Picton, formerly called Waitohi, was gazetted in October 1859.

The Waikawa Stream as is well known, was where our people eeled, and there used to be the native Trout, Koura, and down where it used to run into the sea, whitebait. However, the area was reclaimed over the top of our kaimoana beds.

[(related information) Lower Waikawa Stream has sufferd two major insults in the last 40 years: Firstly, the Marlborough Catchment Board and Regional Water Board undertook works straightening and containing of the lower stream, from what was formerly a wider braded shingle delta, with a view to enabling more land development in Waikawa. This very significant physical intervention totally changed all of the lower habitat /ecological characteristices, and has untimately created a higher velocity lower stream situation that offers a level of flood risk to developed land where the stream formerly meandered. Additionally, because of the changed gradient and velocity of the lower stream, considerably more bed material is being carried into Waikawa Bay, thus changing the benthic characteristics / habitat over an extensive area where Waikawa Stream discharges into the bay.]

[The second major insult to the lower area of Waikawa Stream and the significant remaining kaimoana beds that had evolved as a consequence of the stream's relationship with the intertidal zone and the wider bay over millenia, was the development of the Waikawa Marina. This development completely changed the character of this substantial area in the southwest of Waikawa Bay. Images that show these changes follow]

Early Waikawa Scene, showing Arapaoa House (two story building) at left. At extreme right of photo, shows how far the sea came up. Waitohi Stream delta, upper right. Photo: Mike Taylor Archive

Waikawa Bay looking towards Picton, taken from hill east of Waikawa. Waikawa Stream delta, centre right. Photo: Mike Taylor Archive

Waikawa Marina in the 1990's showing Waikawa School grounds and early development below Cemetery. Photo taken from top cemetery. Waikawa Stream runs from left to right in the centre of the image. Photo: Mike Taylor Archive

[(related information) After the latter the Māori people resident in Waitohi (Picton) moved to Waikawa, and it was soon after this that typhoid broke out amongst them. Māori oral history tells that Ropoama found a spring of fresh water and encouraged his people to use it, so ending the spread of disease. We do not have a date for this particular epidemic, as there were few written records of the Māori population at the time, and the Marlborough newspapers did not start publication until the 1860s.

Ropoama's well. The plaque. Image supplied by Picton Historical Society

Ropoama himself died in 1868, so we know the typhoid outbreak was before this time. However, an event does not have to be written down to have occurred, and it remained strong in the memories of the Kaumātua and was passed down to their children and grandchildren.

In 1978, when there was a strong Māori presence in Picton Historical Society and its President was Meteria (May) Horrey née Tonga Awhikau, the Society decided to mark this unscripted past event with a monument. At that time most people knew from their elders what had occurred, and the Society Minutes of 2 May 1978 record: "After a discussion in Committee it was decided that subject to the approval of the land owner and the Elders of Waikawa the Society would erect a plaque on or near the site of Ropoama's well in Waikawa where fresh water was discovered and broke the Typhoid epidemic that occurred when the Māoris shifted to Waikawa after the Waitohi purchase." This plaque cost the Society $257 that year, a considerable sum for a small voluntary organisation.

It is believed that the actual site of the spring was on the other side of Waikawa Road from where the plaque was placed. The monument remains as the only solid reminder of the episode.] (This story by Loreen Brehaut was first published in Picton in the Seaport Scene.)

Te Ātiawa Manawhenua Ki Te Tau Ihu Trust – 31 May 2018

Appendix 1

The Waitohi and Waikawa Streams

The Waitohi and Waikawa Streams have a special place in Te Ātiawa o Te Waka-a-Māui's Rohe and have had a close association with their marae in Totaranui / Queen Charlotte Sound. As kaitiaki of its Te Tau Ihu rohe Te Ātiawa want to ensure that the environment is sustainably managed and used and have a responsibility to care for the environment for future generations.

Waitohi River – is of utmost cultural significance to Te Ātiawa. Before Europeans arrived, the iwi occupied the banks of the Waitohi. The waters of the Waitohi were considered sacred as it came from their maunga Piripiri at the head of the catchment. The waters were used for a variety of tikanga, one of which was the preparation of warriors for battle. Post European settlement, and the displacement of Te Ātiawa from Picton, the banks of the Waitohi were developed and its waters polluted by urban and industrial developments. Simply put, there has been no work done on the Waitohi River to indicate its health or mauri. The proposed work will provide Te Ātiawa with an assessment of the Waitohi's current health and a tool for the future management/enhancement.

Waikawa Stream – once relocated to Waikawa, Te Ātiawa adopted the Waikawa stream. It provided freshwater for tikinga, gardens, and other ceremonies. A makeshift marae/community facility was constructed close to its banks and eventually the Waikawa Marae (arapaoa) was constructed on its banks. Many Te Ātiawa members would identify with the Waikawa stream as that is what they have grown up with. Yet there has been no characterisation work undertaken on the Waikawa Stream and development has been allowed on its banks unabated. The proposed work would assess the health/state of the Waikawa Stream and provide a benchmark (for Te Ātiawa) to seek improvement/enhancement.

Water Quality in the Waitohi and Waikawa catchments

Interim Report

May 2018

Report Prepared by:
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Preface

The Marlborough District Council has been approached by Te Ātiawa o Te Waka-a-Māui to undertake monitoring of the Waitohi and Waikawa Streams to determine their current “state” of water quality and provide a report to the trust on these waterways. This interim report is aimed to fulfil the requirements as outlined in the funding agreement between Te Ātiawa and the Ministry for the Environment for this project. Due to unforeseen circumstances, such as an unusually wet summer, the Council was unable to complete all monitoring, but has collected sufficient information to provide an initial assessment of water quality in the two catchments. Additional monitoring, including a follow-up fish survey, macroinvertebrate sampling and genetic analysis of E. coli to determine sources of faecal contamination is still to be carried out and will significantly expand current understanding of the water quality. This will allow better management of these waterways in the future. A final report will be provided to Te Ātiawa in a few months’ time and will contain a summary and more in-depth analysis of current monitoring information and the results of the additional sampling to be carried out.

Table of Contents

1. Contents

2. Introduction

The Waitohi River and Waikawa Stream have relatively small catchments, typical of the Marlborough Sounds. The Waitohi catchment with an area of 1,818 ha is larger than the neighbouring Waikawa catchment, which covers an area of 1,028 ha. Water quality of the Waitohi and Waikawa streams are influenced by the two largest residential areas in the Queen Charlotte Sound/Totaranui, Picton and Waikawa. Both catchments have a large proportion of native vegetation covering about 90% of the area (*Figure 1*). Urban development is the main anthropogenic influence on water quality. In the lower parts of the catchments the native vegetation has been removed to make space for the Picton and Waikawa urban areas. There are small areas of production forestry and extensively grazed pasture in both catchments, but despite their small extent, the influence of these on water quality cannot be assumed to be minor. Nevertheless, the urban areas likely have the greatest influence on water quality. Urbanisation leads to the removal of vegetation and an increase of sealed surfaces, such as roofs, pathways and roads. As a result, rainfall cannot soak into the ground, but instead predominantly results in surface run-off, carrying with it contaminants that have accumulated on these surfaces. This run-off is collected in the stormwater system, which ultimately discharges into streams and coastal waters. The main contaminants of concern in stormwater are fine sediment and heavy metals. Additionally, damaged infrastructure and incorrectly connected sewerage pipes can cause contamination with sewage, which is usually noticeable as very high E. coli concentrations and elevated nutrient levels.

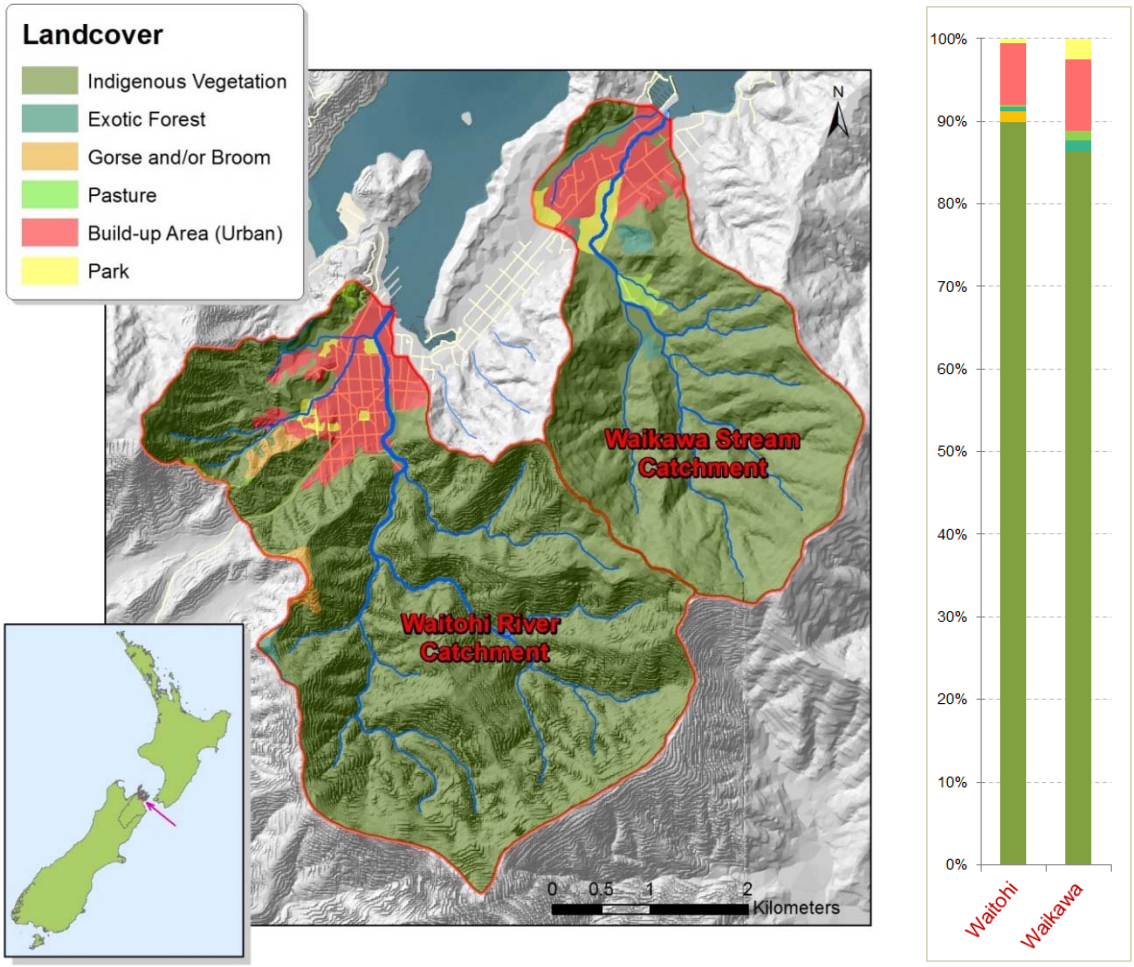


Figure 1: Land cover in the Waitohi and Waikawa catchments based on the New Zealand Land Cover Database 2012.

3. Methodology

Although, in each of the two catchments only about 10% of the area is occupied by urban areas, this land use is known to have significant effects on the water quality. Therefore the majority of monitoring sites was located within the urban areas. However, upstream sites representative of influences from areas covered in native vegetation were also sampled. A total of 15 sites were sampled, ten in the Waitohi and five in the Waikawa catchment (*Figure 2*). Between October 2017 and March 2018 the sites were sampled once or twice per month; a total of eight times. Sampling was carried out four times during base flow as this represents the water quality most of the time. However, surface runoff as a result of rainfall can significantly affect water quality, particularly in urban areas. Therefore, three sampling runs were carried out during relatively heavy rainfall, with one additional sampling run during light rain.

Water samples were stored chilled and in the dark immediately after collection and sent overnight to an independent and accredited laboratory (Hill Laboratories Christchurch) for analysis. Table 1 lists the parameters the samples were analysed for.

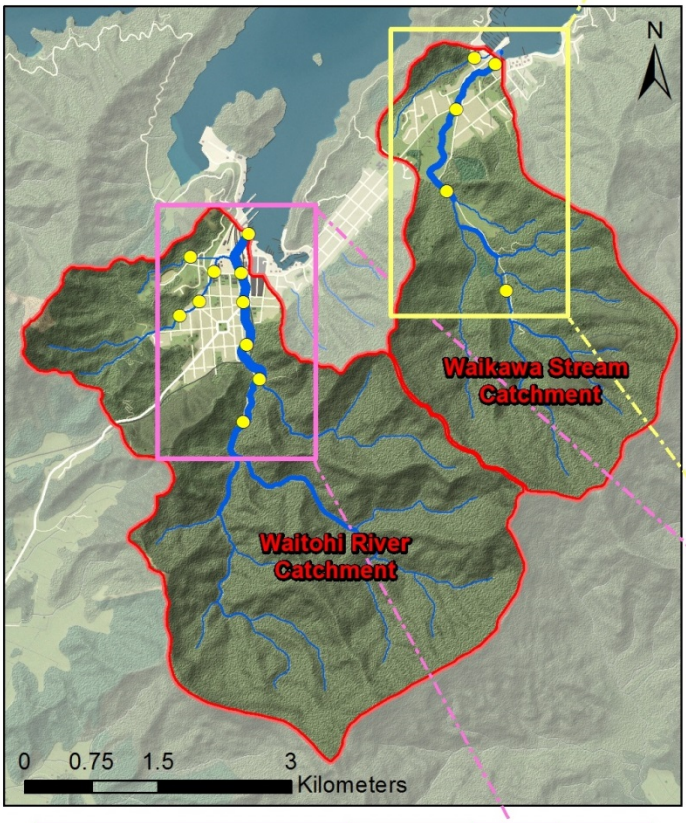
Parameter	Base Flow	Light Rain	(Heavy) Rain
Nitrite and Nitrate Nitrogen	✓	✓	✓
Total Ammonical Nitrogen	✓	✓	✓
Total Nitrogen	✓	✓	✓
Dissolved Reactive Phosphorus	✓	✓	✓
Total Phosphorus		✓	✓
E. coli	✓	✓	✓
pH	✓	✓	✓
Turbidity	✓	✓	✓
Total Suspended Solids		✓	✓
Dissolved and Total Arsenic		✓	✓
Dissolved and Total Cadmium		✓	✓
Dissolved and Total Copper		✓	✓
Dissolved and Total Zinc		✓	✓

Table 1: Parameter monitored in samples taken during the investigation of water quality in the Waitohi and Waikawa catchment.

Due to tidal seawater inflow, some of the lower sites were not sampled as part of the run when tide levels were high.

In order to gain a better understanding of the ecological health of the streams, a fish survey using an electric fishing machine was carried out on 2 November 2017. The survey was qualitative only, which provides sufficient indication about the health of the stream ecosystem. In each catchment two sites were surveyed; a site representative of the upper, undisturbed catchment and a second site near the bottom of the catchment. The two lower sites were located far enough upstream to exclude the influence of tidal saltwater inflows.

Site Name	Short Name	Easting	Northing
Waikawa Stream at Mouth	Wk1	1686984	5430855
Waikawa Stream at Waikawa Road	Wk2	1686536	5430343
Waikawa Stream at Two Pines	Wk3	1686436	5429419
Waikawa Stream at Timmermans	Wk4	1687100	54283004
Endeavour Stream at Boat Yard	Ev1	1686747	5430926



Site Name	Short Name	Easting	Northing
Waitohi River at Picton Harbour	Wt1	1684210	5428944
Waitohi River at Dublin St	Wt2	1684116	5428502
Waitohi River at SH1	Wt3	1684140	5428174
Waitohi River at Camping Ground	Wt4	1684163	5427677
Waitohi River at Garden Tce Ford	Wt5	1684324	5427303
Waitohi River at Treatment Plant	Wt6	1684141	5426821
Kent Street Drain at Dublin St	Kt1	1683810	5428514
Kent Street Drain at Durham St	Kt2	1683419	5428016
Kent Street Drain at Cornwall St	Kt3	1683640	5428181
Gravesend Drain at Cemetry Carpark	Gs1	1683544	5428681

Figure 2: Location of the sites in the Waitohi River and Waikawa catchments that were monitored as part of this project.

4. Results

The following sections present the results of the sampling carried out as part of this project. To improve readability the text will mainly refer to the sites using the short names shown on the maps accompanying the graphs.

4.1. Nitrogen

Nitrogen in waterways is generally divided into the dissolved forms of nitrogen and nitrogen that is bound to particles, mainly in the form of organic material. The most important dissolved form of nitrogen is Dissolved Inorganic Nitrogen (DIN), as it can be easily taken up by plants.

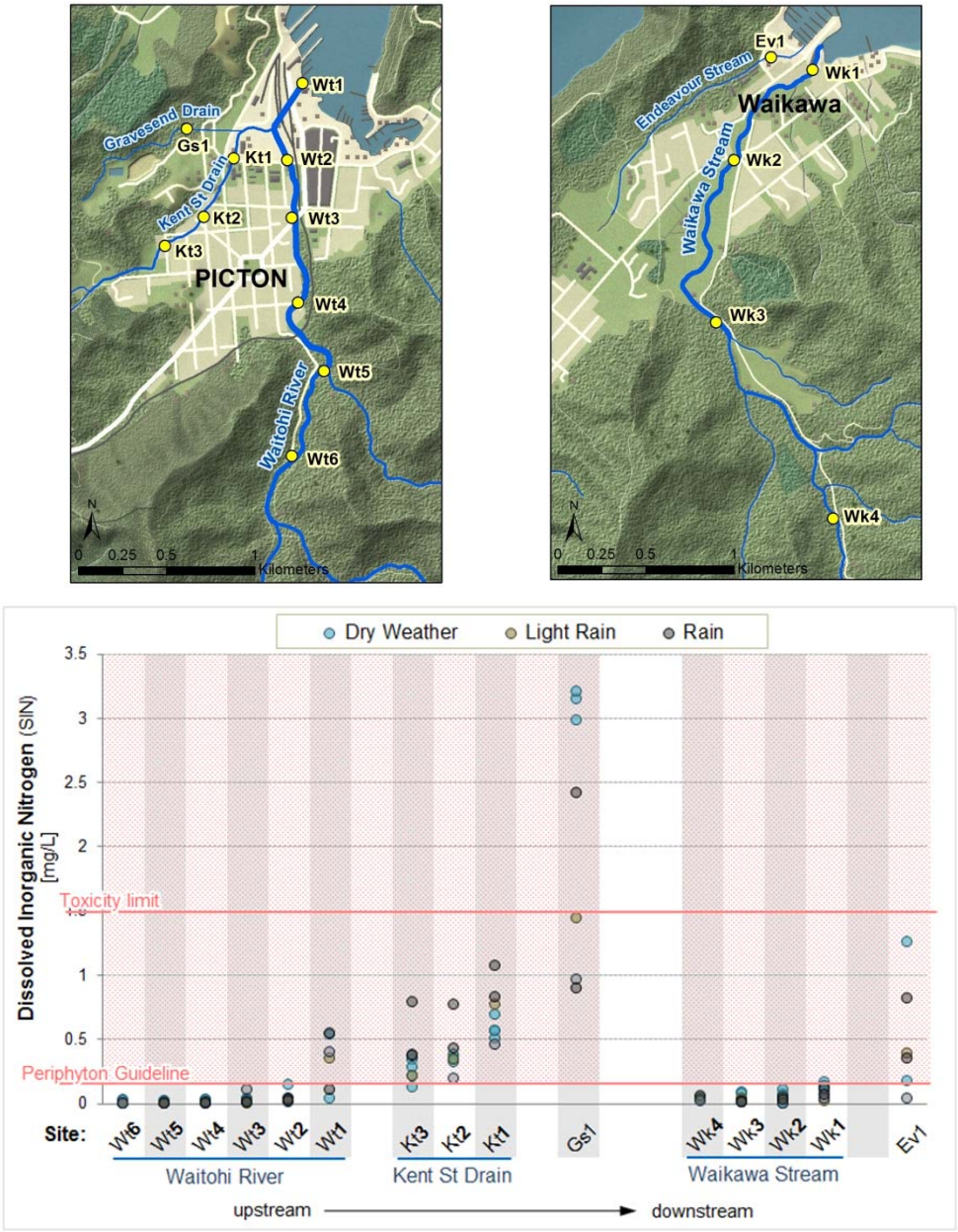


Figure 3: Dissolved Inorganic Nitrogen concentrations in Waitohi and Waikawa catchments. Also shown are the 'Periphyton Guideline', which is indicative of the potential for excessive alga growth, and the 'Toxicity limit' for Nitrate Nitrogen based on the A-Band limit in the National Policy Statement for Freshwater Management. The colours of the dots represent different weather condition during sampling.

High concentrations of DIN can cause excessive algae growth on the stream bed. A thick cover of algae deteriorates the habitat for aquatic animals and limits the availability of food. Excessive algae growth also causes large dissolved oxygen fluctuations with low oxygen levels at night being the main stressor for aquatic life.

Figure 3 shows the DIN concentrations measured in the Waitohi River and Waikawa Stream and their tributaries. Values above the Periphyton Guideline during dry weather conditions (blue dots) indicate an increased likelihood for excess algae growth. In the main streams DIN concentrations are nearly exclusively below the guideline, although levels increase in a downstream direction, coming very close to the guideline value. In Kent St Drain, a downstream increase is also noticeable, but the changes are of greater magnitude. This is likely the result of less dilution as a much greater proportion of Kent St Drain flows through urban areas. All tributaries have significantly higher DIN levels. The highest DIN concentrations were measured in Gravesend Drain, which consistently had levels one or two orders of magnitude above those observed in Waitohi River and Waikawa Stream. DIN levels in Endeavour Stream showed a greater variability compared to the other sites. This means that nitrogen inputs into Endeavour Stream during base flow are more sporadic.

In most catchments elevated nitrogen concentrations during base flow are a result of diffuse sources, in particular nitrogen leaching from agricultural areas. However, in the Waitohi and Waikawa catchments, agriculture is unlikely to be a significant factor, especially as most of the pasture is located along the main streams, which have comparatively low DIN concentrations. High nitrogen concentrations as a result of urban development have been observed in other parts of the country [6]. They are likely a result of the much greater application of fertilisers in parks and private gardens combined with greater irrigation, which causes increased leaching through the soil. However, sewage contamination could possibly contribute to high nutrient levels at some of the sites.

The very high DIN concentrations in Gravesend Drain, however, are likely to originate from a different source. Although, the stream flows past a cemetery, the gradient of the land causes most of the leachate from this area to reach surface water downstream of the sampling site. However, some influence from the cemetery cannot be ruled out. Nevertheless, it is more likely that activities further upstream are the source of nitrogen. Approximately 400 meters upstream of the sampling site (Gs1) is the location of the Picton sewage treatment plant and a closed landfill. Gravesend Drain flows next to the treatment ponds and closed landfill at a distance of approximately 20 meters (*Figure 4*). Any leachate escaping from these areas is therefore likely to surface in Gravesend Drain. Although the treatment plant and landfill seem obvious sources, sampling of sites upstream would provide confirmation of possible sources.

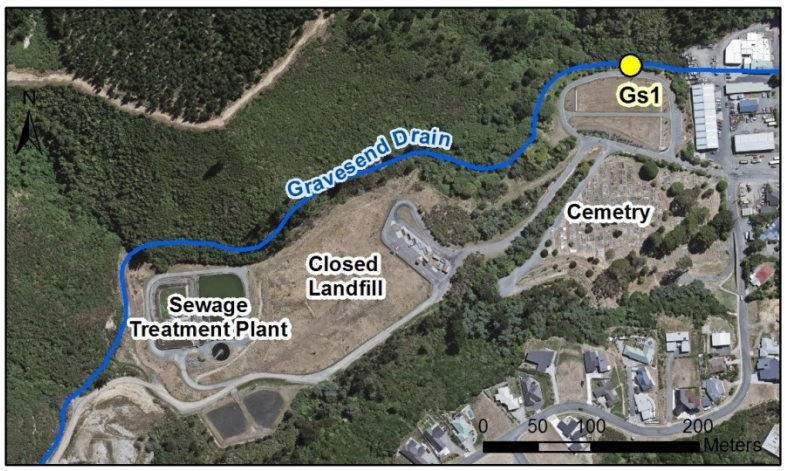


Figure 4: Arial photograph of the lower sub-catchment of Gravesend Drain.

During rainfall, additional sources of DIN can be introduced into waterways. This is the case for Kent St Drain, which shows higher DIN concentrations during rainfall. This is also effecting concentrations observed in the lowest Waitohi River site (Wt1) located downstream of the confluence with Kent St Drain (*Figure 3*, grey dots). The lower Waitohi site is also impacted by the high nitrogen concentration from Gravesend Drain, despite the fact that rainfall run-off has a diluting effect in Gravesend Drain. The same rainfall dilution of DIN concentrations during rainfall was also observed in Waikawa Stream.

DIN is comprised of Nitrate Nitrogen, Nitrite Nitrogen and Ammonical Nitrogen. In most waterways Nitrate Nitrogen is the major form of DIN as it is the most stable at natural oxygen levels. Dissolved nitrogen originating from organic contamination is comprised mainly of Nitrite Nitrogen and Ammonical Nitrogen; however bacteria naturally found in waterways quickly use the oxygen in the water column to convert these reduced forms of nitrogen to Nitrate. If oxygen levels in the water are very low however, Ammonical Nitrogen and Nitrite are not converted, instead Nitrate is reduced to these forms of Nitrogen. High levels of Nitrite and Ammonical Nitrogen are therefore an indication of significant contamination with organic material and/or a lack of dissolved oxygen in the water column.

In almost all streams monitored in the Waitohi and Waikawa catchments, Nitrate is the main form of DIN (*Figure 5*). The only exception is Gravesend Stream, which has high Nitrite and Ammonical Nitrogen concentrations. High Ammonical Nitrogen concentrations are toxic to aquatic life and concentrations in Gravesend Drain are above the 80% species protection trigger in the National Policy Statement for Freshwater Management (NPS-FM).

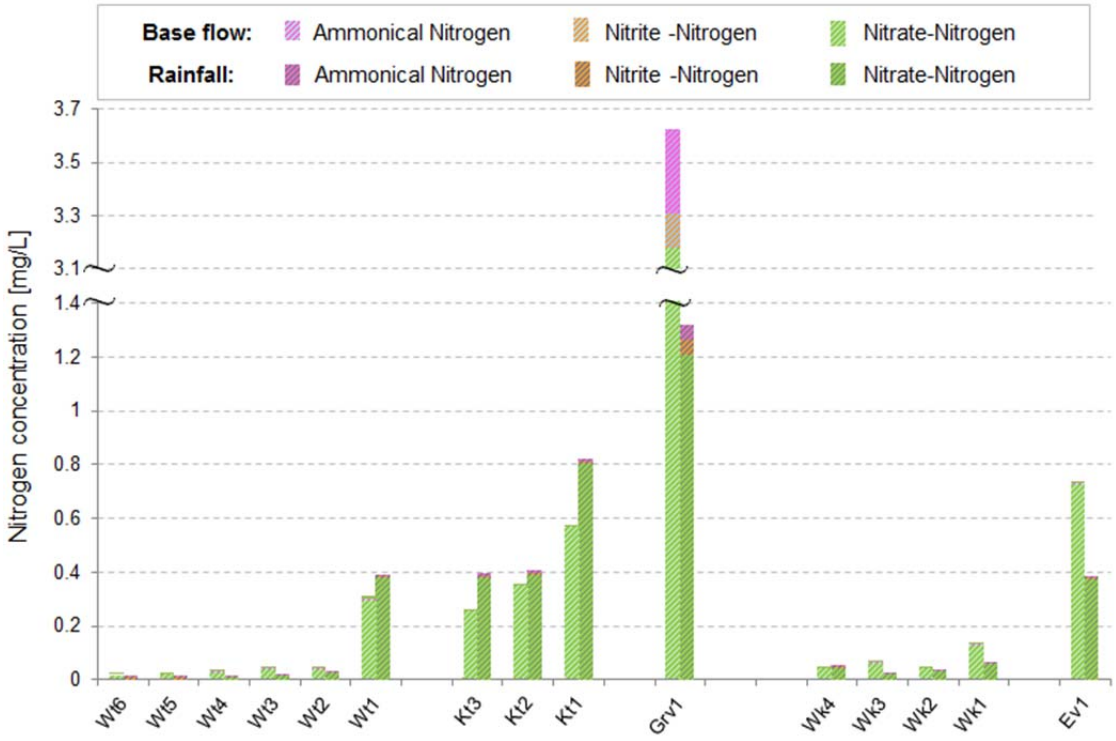


Figure 5: Forms of DIN in the streams of the Waitohi and Waikawa catchments based on median concentrations. Concentrations during base flow and rainfall are shown separately.

Very high Nitrate Nitrogen concentrations are also toxic to aquatic animals. The NPS-FM sets the limit for acute exposure that is unlikely to cause effects at a concentration of 1.5 mg/L. This limit is consistently exceeded in Gravesend Drain (*Figure 3* and *Figure 5*). The high Ammonical Nitrogen and Nitrate Nitrogen concentrations indicate that sensitive species are unlikely to survive in this waterway.

All other sites monitored had Nitrate and Ammonical Nitrogen concentration below the NPS-FM limits in all samples taken.

Samples collected during rainfall were also analysed for Total Nitrogen, which allows calculation of the amount of nitrogen that is bound in and to particulate material suspended in the water. Run-off during rainfall washes organic material off surfaces into streams, resulting in a greater amount of particulate nitrogen.

In the main stems of the Waitohi River and Waikawa Stream, almost all of the nitrogen was in the particulate form (*Figure 6*). In the tributaries, particulate nitrogen was often the dominant form, but compared to the main streams a larger proportion of Total Nitrogen was in the dissolved form. Gravesend Drain was again the exception, with generally a much smaller proportion of particulate nitrogen.

These results indicate that, except for Gravesend Drain, surface run-off is likely the most important source of nitrogen during rainfall.

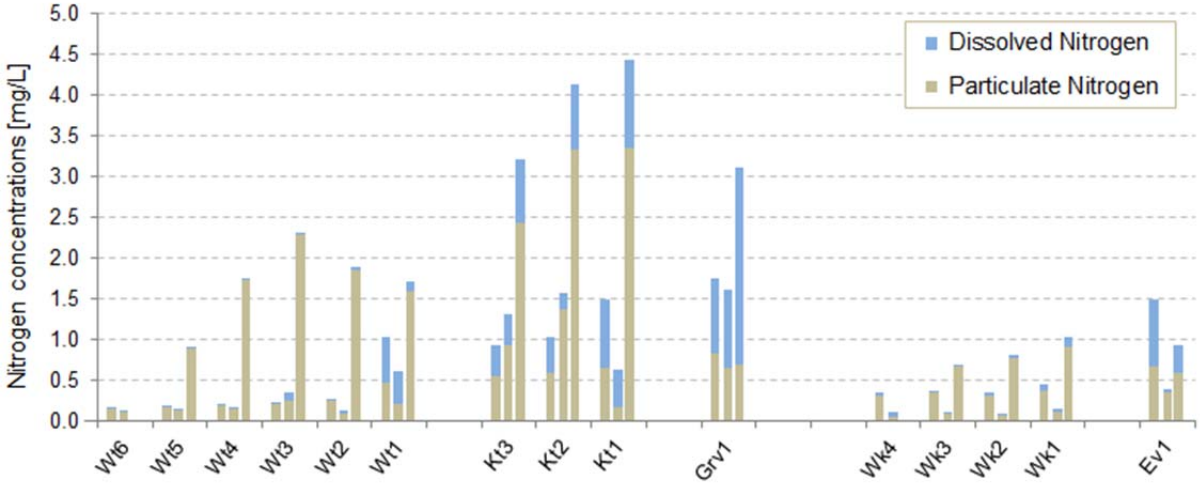


Figure 6: Dissolved and Particulate Nitrogen concentrations in samples taken during rainfall.

Particulate Nitrogen introduced into these streams during rainfall is unlikely to have an effect on the streams themselves. The relatively steep gradient of the land results in comparatively fast flows, which reduces the ability for particles to settle on the stream bed. Field observations indicate that fine sediment only appears to cover significant areas of the stream bed in the intertidal zone. Therefore, the impact of particulate nitrogen is mainly on the coastal environment, as the water flow is slowed and material settles onto the seabed. This results in increased nutrient availability to algae and smothering of the seabed.

4.2. Phosphorus

Like Nitrogen, phosphorus is a major nutrient for plant growth. High phosphorus concentrations in waterways can therefore contribute to excessive algae growth. Dissolved Reactive Phosphorus (DRP) represents the form of phosphorus most readily available to aquatic plants, such as algae.

Apart from one sample taken from the lower Kent St Drain (Kt1) with an unusually high value, DRP concentrations during dry weather conditions were consistently below the guideline level for algae (periphyton) growth (*Figure 7*). However, concentrations at the upper sites of both catchments (Wt6 and Wk4) are elevated with values close to the guideline level. All samples from these sites had very similar DRP concentrations which points to a natural source of phosphorus, such as geological

features in the catchment. Dry weather concentrations in Kent St Drain were of similar magnitude and variability as the values observed in the upper catchments. The lower Waitohi River showed the greatest variability during base flow, likely due to anthropogenic sources.

In the Waikawa catchment DRP levels decrease in a downstream direction, with Endeavour Stream having dry weather DRP concentrations similar to those observed in the nearby lower Waikawa Stream. The measured concentration during dry weather conditions had a limited value range, again suggesting predominantly natural sources for phosphorus in this catchment.

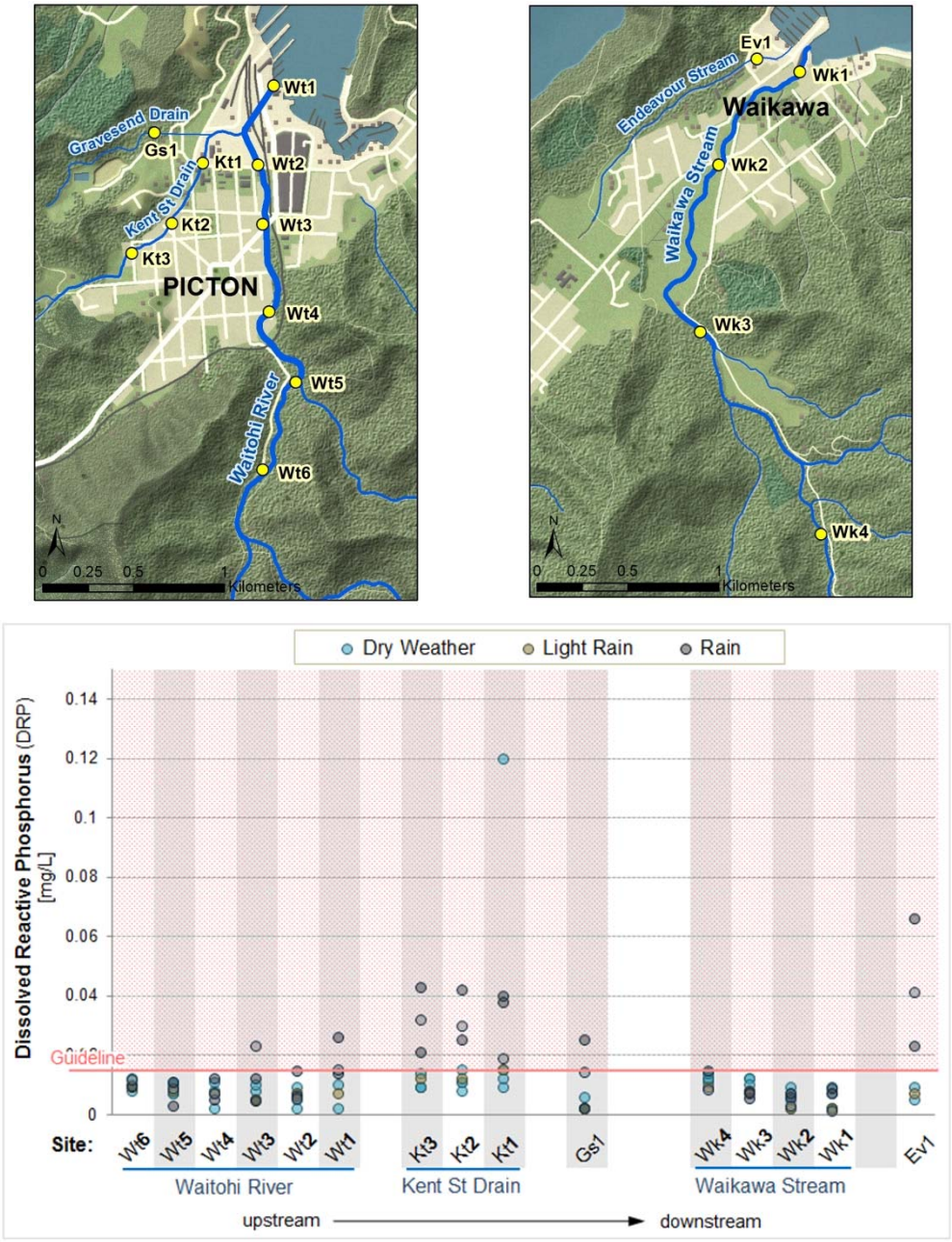


Figure 7: Dissolved Reactive Phosphorus (DRP) concentrations in Waitohi and Waikawa catchments. Also shown is the 'Periphyton Guideline', which is indicative of the potential for excessive alga growth.

Rainfall appears to have very little effect on DRP concentrations in the Waikawa Stream and the upper Waitohi River. In the tributaries, however, rainfall resulted in a noticeable increase in DRP levels, particularly for Endeavour Stream and Kent St Drain. The additional phosphorus is likely

introduced bound to sediment that is washed into these waterways by surface run-off and then released into the water column. However, since these elevated DRP levels only occur for a relatively short period, the additional phosphorus is unlikely to result in a noticeable increase in algae growth in the streams. In fact, high phosphorus concentrations only occur in conjunction with fast flows that result in actual removal of algae cover through bed movement and abrasion.

As with nitrogen, rainfall samples were also analysed for the Total Phosphorus concentration, in order to determine the proportion of particulate phosphorus. The results show that the vast majority of the phosphorus was bound to particulate material. The total amount of phosphorus in the streams was significantly greater than the DRP concentrations alone would have suggested. Total phosphorus concentrations in the Waitohi River catchment were generally higher and more variable compared to the Waikawa catchment.

As was described for particulate nitrogen, the phosphorus bound in particulate matter is unlikely to significantly affect the streams upstream of the tidal zone, with the greatest impact to be expected on the seabed near the stream outflows.

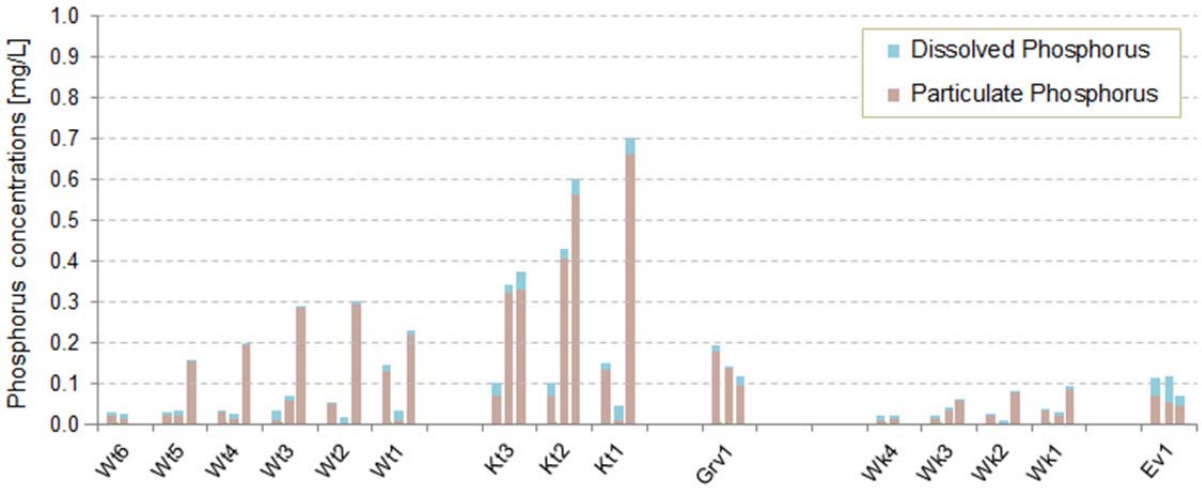


Figure 8: Dissolved and Particulate Phosphorus concentrations in samples taken during rainfall.

4.3. E. coli concentration

E. coli are bacteria that are used as an indicator for faecal contamination. High E. coli concentrations indicate a greater risk for recreational users of becoming sick when coming in contact with the water. Figure 9 shows the E. coli concentrations measured in the two catchments. The guideline value of 550 cfu/100mL is based on unsafe levels for swimmers as published in the Mistry for the Environment and Ministry of Health Guideline document [5].

During base flow (dry weather) E. coli concentrations in the Waitohi River catchment were more variable compared to the Waikawa catchment (*Figure 9*, blue dots). The lower Waikawa Stream (Wk1) was the only site in the Waikawa catchment that exceeded the guideline during dry weather.

In the Waitohi catchment, all sites monitored on Kent St Drain had at least one sample with E. coli concentrations above the guideline level. Kent St Drain had generally the highest E. coli concentrations in the study. E. coli levels in the Waitohi River itself reached their highest level at site Wt4 during base flow. This site is located near a campground that is the home to more than 30 Mallard ducks, which are the most likely source of faecal contamination (*Figure 10*). The sites located

furthest upstream and downstream on Waitohi River had the lowest dry weather E. coli concentrations in this catchment.

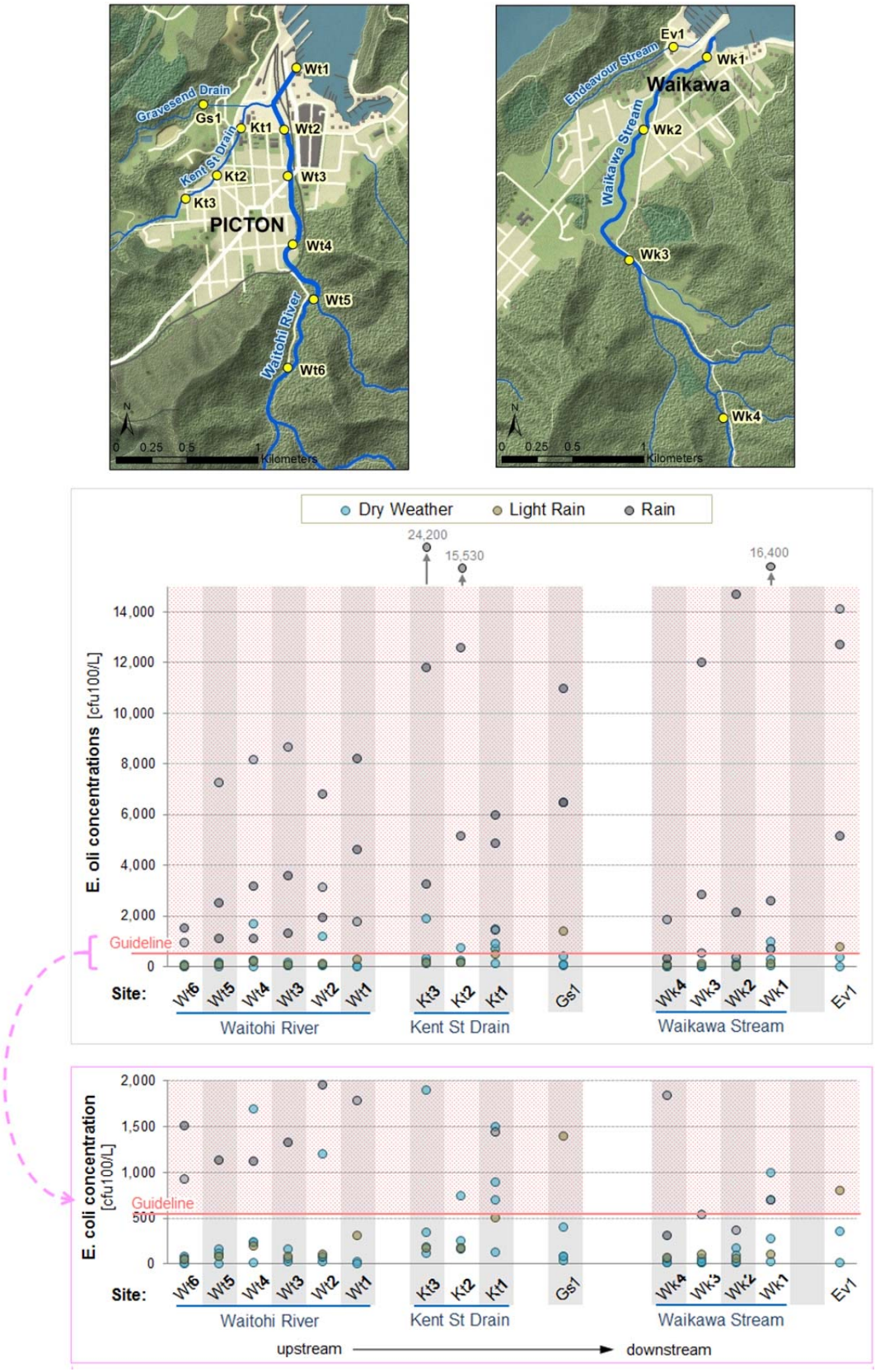


Figure 9: E. coli concentrations in Waitohi and Waikawa catchments.

During rainfall, E. coli concentrations varied considerably at most of the sites, but were lowest at the two most upstream sites (Wt6 and Wk4). Still, bacteria levels in some of the samples from the upstream sites were well above the guideline level. This is surprising, as the main sources of faecal contamination at these sites are likely native and feral animals. At some of the other sites E. coli concentrations reached levels a magnitude higher than those observed at these upstream locations. In the Waitohi River E. coli concentrations peaked at site Wt3, further downstream than during dry weather conditions. In the other waterways no apparent site-specific pattern for the E. coli concentrations could be observed during rainfall events.

Figure 10: Large number of Mallard Ducks at the Waitohi River at site Wt4.

4.4. Turbidity and Sediment

Turbidity is an indirect measure for water clarity. The higher the turbidity, the more reduced is the visibility under water. Water is generally turbid as a result of fine sediment that is suspended in the water column. When this fine sediment is deposited onto the stream bed it fills up important living spaces between pebbles and rock, resulting in the degradation of aquatic habitat. Additionally, when the eggs of aquatic insects and fish become covered in fine sediment, oxygen cannot reach these eggs and they die. Therefore, large amount of fine sediment cover on stream beds will result in the disappearance of more sensitive aquatic species.

Very high sediment loads can also have abrasive effects on the gills of fish, but values have to be exceptionally high for this to occur. The effect is most pronounced if high turbidity persists over long time periods and is not restricted to flood flows alone.

Sediment in the water affects the amenity value of water ways at significantly lower turbidity levels. The turbidity guideline of 5.6 NTU used in this document is taken from the ANZECC (2000) guidelines based on recreational and amenity values.

During base flow (dry weather) the water at nearly all of the sites was relatively clear and turbidity was generally below the guideline level (*Figure 11*). The exception was the lower site of the Kent St Drain (Kt1). This site also had the highest amount of fine sediment deposited onto the stream bed, which is

likely a result of the increased turbidity. During rainfall all sites along Kent St Drain generally had higher turbidity than other sites monitored as part of this study. It appears that a sediment source located between sites Kt2 and Kt1 is causing an increase in turbidity during base flow, while during rainfall, run-off from areas upstream of Kt3 is carrying large amounts of fine sediment into Kent St Drain.

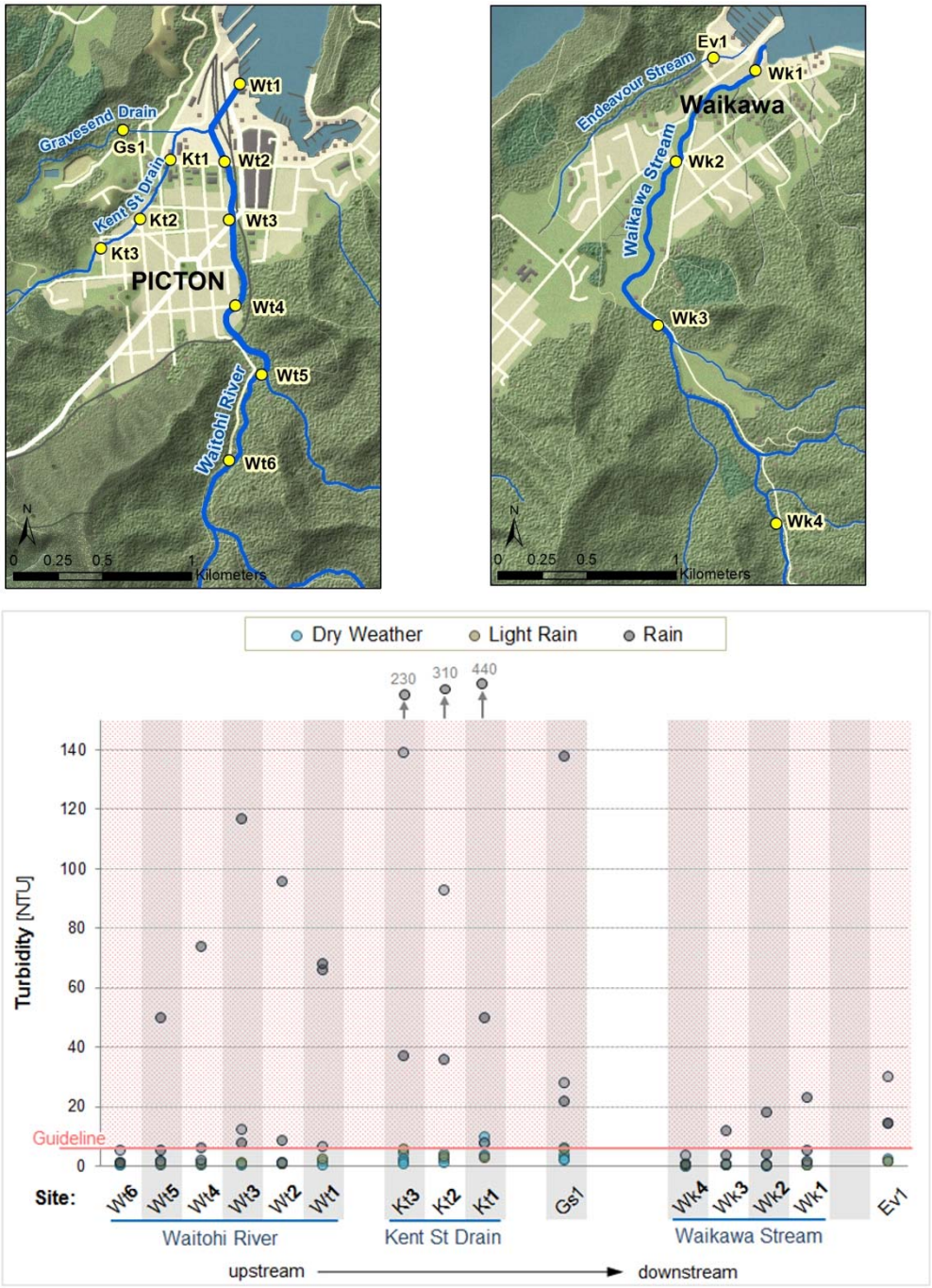


Figure 11: Turbidity in samples taken from the Waitohi and Waikawa catchments. The guideline is based on the Amenity trigger in the ANZECC (2000) document.

Of the tributaries, Endeavour Stream had the lowest turbidity during rainfall, but values were generally higher than in the main streams.

The most upstream sites of both catchments (Wt6 and Sk4) remained relatively clear during all rainfall events. The turbidity in the Waikawa Stream reached values above the guideline during only one of the rainfall events. During this event a consistent increase of turbidity in a downstream direction could be observed. This indicates that there are no single sources of sediment in the catchment, but rather a cumulative effect of run-off from the whole catchment. In the Waitohi River turbidity also increased downstream during the same event, but resulted in significantly greater measurement values. Generally during rainfall, the highest turbidity in the Waitohi River was observed at site Wt3. Site Wt1, located furthest downstream is influenced by the sediment carried into the Waitohi River via Kent St Drain.

To gain a better understanding of sediment source characteristics, the actual concentration of sediment in rainfall samples was measured as Total Suspended Solid concentration. Plotting turbidity values versus the Total Suspended Solid concentration in the same sample indicates that the main sources of suspended sediment in the main stems of Waitohi River and Waikawa Stream are very similar (*Figure 12*), probably resulting from erosion in the natural catchment. The sediments causing higher turbidity in the tributaries appear to be comparable to each other, but different from the sediment in Waitohi River and Waikawa Stream. This indicates that different sediment sources are the dominant cause for turbidity in the main streams compared to the tributaries.

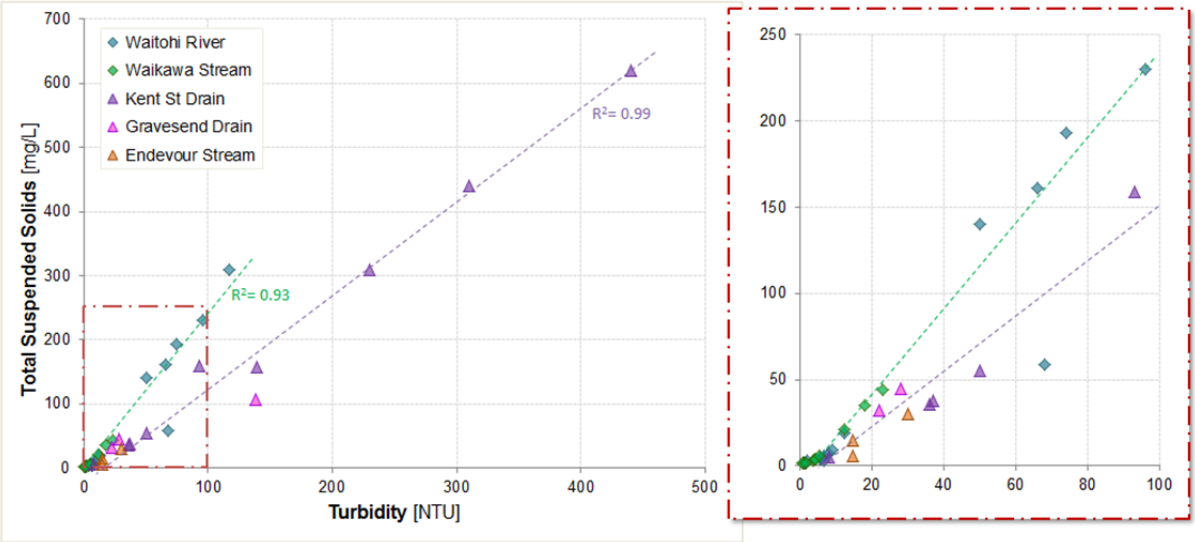


Figure 12: Correlation between Total Suspended Solid concentrations and Turbidity measurements in the Waitohi and Waikawa catchment.

4.5. PH

The pH value is a measure for the acidity or alkalinity of water. A pH value of 7 is neutral, while values below 7 indicate acidic water and values greater than 7 represent alkaline conditions. Deviation from natural pH values can impact on the growth, reproduction and survival of aquatic animals. Especially, rapid changes in pH can cause fish kills downstream, effecting even relatively resistant species, such as eels. For example, the disposal of cement-mixture or lime into stormwater or directly into waterways can cause rapid changes in pH.

Many contamination sources, such as faecal material cause a drop in pH values, while photosynthetic activity of algae increases the pH.

During dry weather conditions, pH values were exclusively in the alkaline range for all sites monitored. The limited variability at some of the sites indicates that this is a natural phenomenon, likely linked to the local geology. Because pH values are so close to the upper guideline value of 7.8, relatively small increases will lead to exceedance of this guideline. However, despite significant algae cover at some of the lower sites, the pH values at these sites were only slightly greater than at upstream sites.

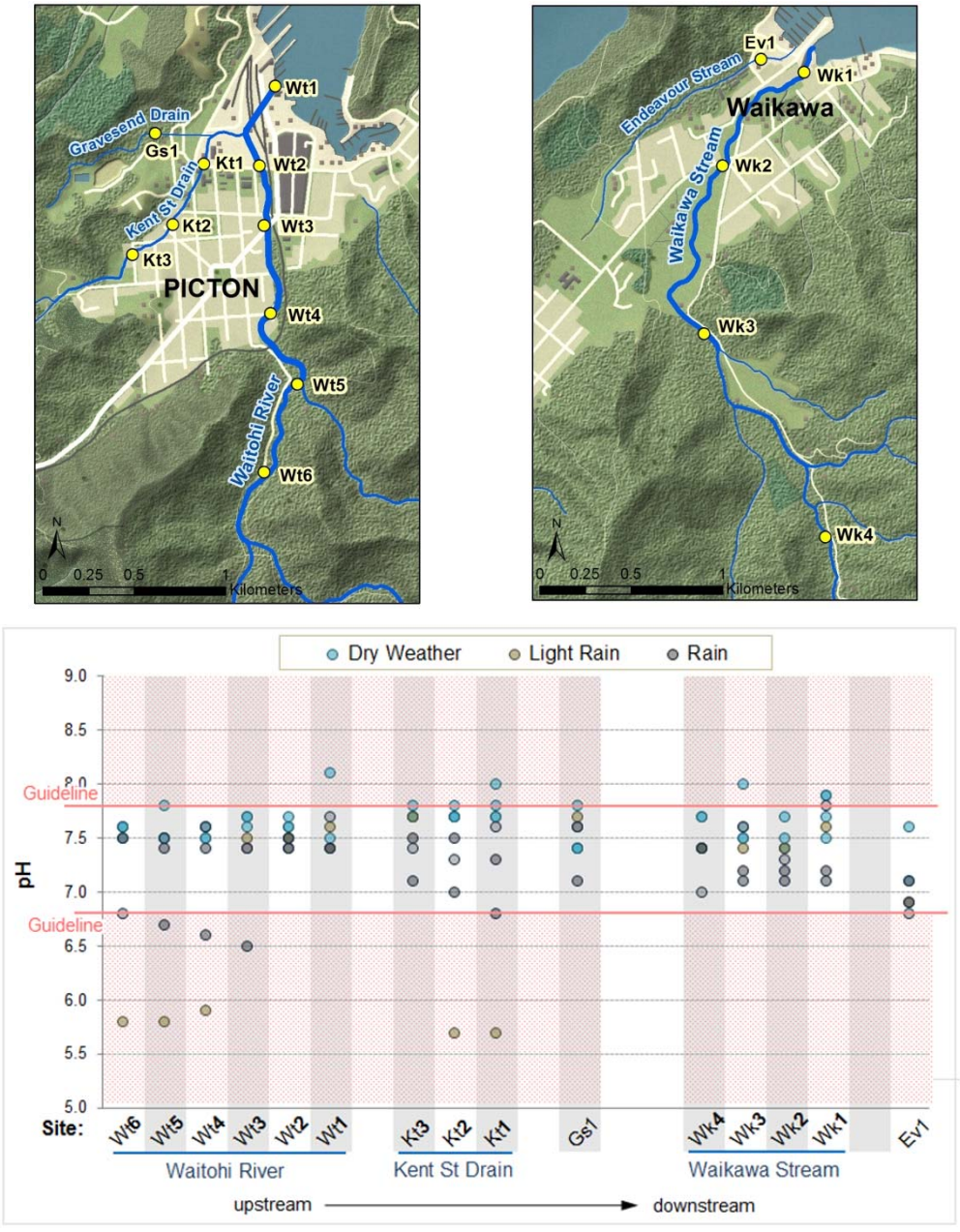


Figure 13: PH values in the Waitohi and Waikawa catchments.

Rainfall generally resulted in lower pH values. Surprisingly the lowest pH values were observed during light rainfall, causing the pH to reduce to values below 6 in the upper Waitohi River and the lower Kent St Drain. Despite very different catchment characteristics the low values in these two waterways are very similar. The cause for this is unclear.

With the exception of one rainfall run, pH values remained above the lower guideline of 6.8 during heavier rainfall. Interestingly, pH values were decreasing in a downstream direction in both the Waitohi River and Kent St Drain. In the Waitohi River pH values reached a minimum at site Wt3. The

reverse pattern was observed for E. coli concentrations, which peaked at Wt3. It is therefore possible that faecal material washed into the stream from the surrounding land caused the decrease in pH values.

In Kent St Drain this pattern is reversed as the highest E. coli concentrations were observed in the most upstream sites, which also had the highest pH values. Therefore, faecal contamination is not the reason for the decreasing pH values in this waterway.

4.6. Heavy metals

High concentrations of heavy metals are toxic to aquatic life. Apart from effecting the survival of aquatic plants and animals, heavy metals can make them unsafe for human consumption.

There are a number of heavy metals that can be found in aquatic environments, but in urban areas, copper and zinc are the metals most often detected [3, 4]. The ANZECC (2000) guideline provides several triggers for different levels of protection. For most waterways the 95% species protection trigger is most appropriate, while the 80% species protection trigger is used for ecosystems that are highly disturbed by human activity.

The main sources of heavy metals in the urban environment are roofing iron, vehicle wear (ie; copper from brake pads) and industrial areas. The metals find their way into stream via surface run-off from sealed surfaces during rainfall.

Samples taken from the Waitohi and Waikawa catchments were also analysed for Arsenic and Chromium as industrial activity can be the source for these metals, but both of these metals only occasionally exceeded the most stringent trigger for 99% Species protection.

Zinc and Copper, however, did reach levels well above all of the ANZECC (2000) trigger levels. Especially Copper concentrations exceeded the 95% Species protection trigger. However, these exceedances were limited to two waterways, Kent St Drain and Endeavour Stream. There are a number of small industrial yards located along the banks of the lower Kent St Drain, which are likely contributing to the high heavy metal concentrations in this waterway. Zinc concentrations are highest at the lower site of Kent St Drain (Kt1), located downstream of these industrial yards. Interestingly, Copper concentrations are already elevated further upstream, at sites Kt2 and Kt3, which are predominantly influence by residential areas. However, there is a construction yard located in the upper catchment which could be the source of some of the copper in Kent St Drain.

Gravesend Drain had Copper concentrations similar to Kent St Drain, but had lower Zinc concentrations.

The majority of copper and zinc in the Waitohi River site Wt1 originates from Kent St Drain and Gravesend Drain, but additional inputs from the port area are also likely.

Endeavour Stream had the highest metal concentrations of all waterways monitored as part of this study with occasional values well above the most lenient ANZECC (2000) trigger levels for 80% species protection. Particularly copper concentrations were high. It is unlikely that copper from vehicle wear alone is causing these high levels. Although most of the stormwater entering this waterway originates from residential areas, surface run-off from the sports fields at Endeavour Park and from Port Marlborough Boatyards also enters the stream.

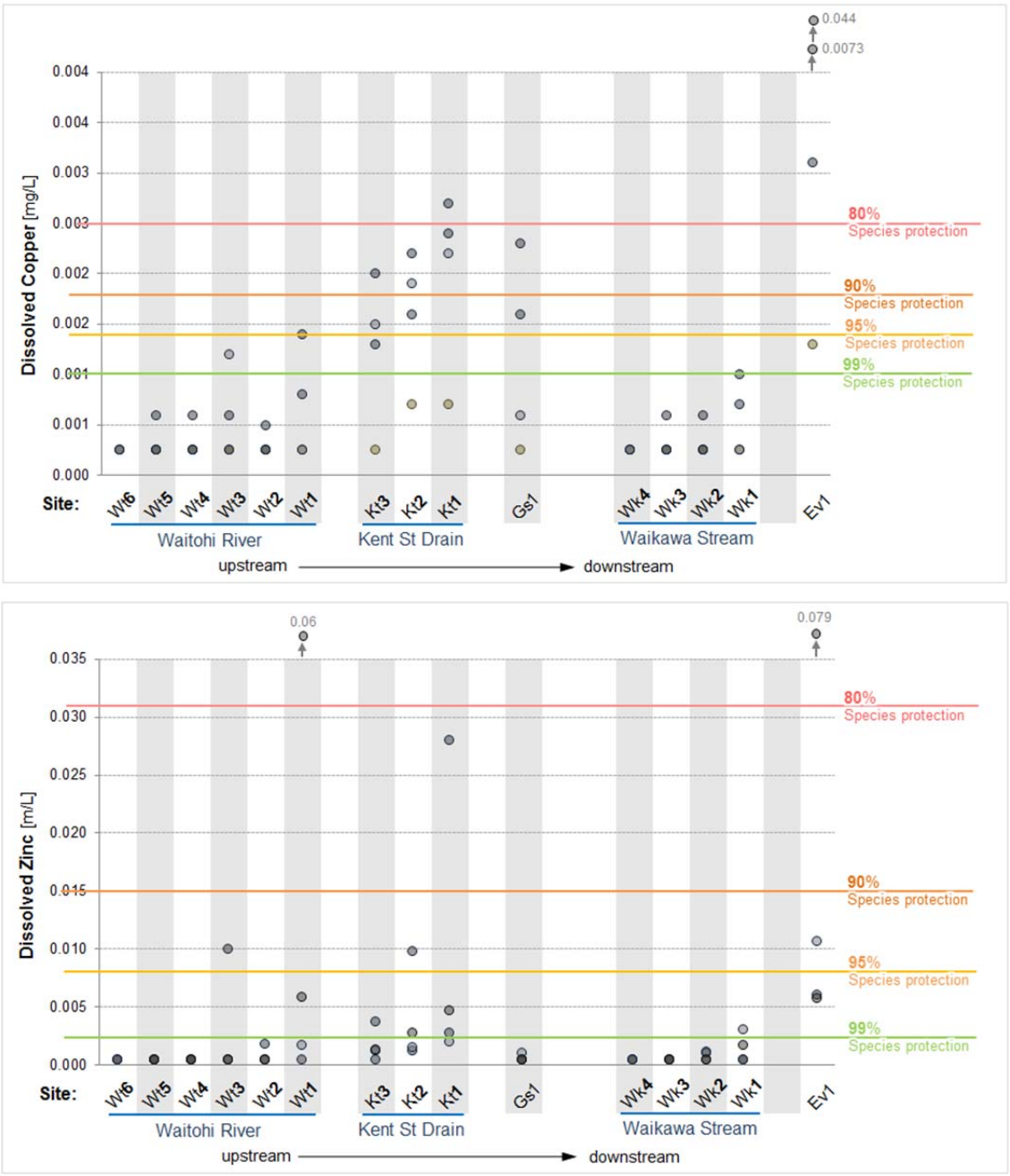


Figure 14: Dissolved Copper and Dissolved Zinc concentrations in the Waitohi and Waikawa catchments. Also shown are the ANZECC (2000) trigger levels.

4.7. Fish Survey

The fish survey of the two upstream sites monitored (Wt5 and Wk3) found a number of Redfin Bullies, Bluegill Bullies and Longfin Eels, but also a large Koaro in the Waitohi River. The lower Waikawa Stream at site Wk2 also had relatively abundant fish life, with Bluegill Bullies, Redfin Bullies, Longfin Eels and Inanga. The lower Waitohi River, however, had no fish life at all. After fishing a reach of approximately 100 meter length at site Wt2, no fish were caught.

5. Summary and Discussion

The aim of this project was to determine the current water quality in the Waitohi River and Waikawa Stream, which flow into the Queen Charlotte Sound/Totaranui. Approximately 90% of both catchments are covered in native vegetation and human influences on water quality are almost exclusively confined to the lower areas near the coast. Sampling sites were concentrated in these lower parts of the catchments, but reference sites with minimal human impact were also sampled. Apart from several sites along the main stream channels, tributaries were also sampled. However, only tributaries with significant human influences were included in the program. In total, 15 sites (10 in the Waitohi and 5 in the Waikawa catchment) were sampled during dry weather conditions and rainfall. Dry weather conditions represent the water quality of the streams most of the time, but surface run-off during rainfall carries soil and contaminants into the water, significantly changing the water quality.

The samples were analysed for a number of parameters, including the major nutrient concentrations (nitrogen and phosphorus), turbidity and E. coli concentrations. Samples taken during rainfall were also analysed for sediment concentration (Total Suspended Solids) and heavy metals.

It is important to note that water quality is highly variable during rainfall events, depending on a number of factors, such as the distribution of rainfall across the catchment, the time since the previous rainfall event and the time since the rainfall started. The highest concentration for a number of contaminants is usually observed during the so-called first-flush. This is the time, the first significant amount of run-off is reaching the water way. This initial run-off carries much of the contaminants, particularly from hard surfaces. However, water usually becomes more turbid well after the first-flush event. This turbidity is an indicator for sediment that is washed into stream as a result of erosion. This sediment represents another set of pollutants. Rainfall is generally not evenly distributed across a catchment. Therefore some sites or catchments can be more affected during the same event. Additionally, rain intensity varies and with the intensity the effect on water quality. It is important to keep in mind that due to this variability, patterns observed during a single event are not necessarily representative and need to be interpreted with caution. Therefore, only general patterns observed during several sampling events will be discussed

Dissolved nutrient concentrations in the main stream channel of Waikawa Stream were consistently below the guideline level for excessive algae growth. In Waitohi River dissolved nutrient concentrations occasionally exceeded the guidelines at the lowest site, which is located downstream of two tributaries influenced by urban development, Kent St Drain and Gravesend Drain. Dissolved Reactive Phosphorus concentrations appear to be naturally slightly elevated as a result of the catchment geology.

The nutrient concentrations in the tributaries sampled was generally higher than in the main stream channels of Waitohi River and Waikawa Stream. The tributary sub-catchments have a significantly smaller proportion of native vegetation cover. Therefore, dilution of contaminant inputs from urban areas with water from native bush is considerably smaller. This means contamination sources have a greater effect on the water quality in the tributaries.

A relatively small variability in Dissolved Inorganic Nitrogen concentrations in the tributaries during dry weather suggests that the nutrient discharge into these streams is constant rather than sporadic. This suggests leaching from fertiliser application and organic material storage in private gardens and parks as the main source of dissolved nitrogen during dry weather. Dissolve Inorganic Nitrogen levels were highest in Gravesend Drain, with toxic concentrations of Nitrate and Ammonical Nitrogen. This small waterway does not receive stormwater from residential development, but flows in close proximity to the Picton Sewage Treatment Plant and closed landfill. Nitrate and Ammonical Nitrogen are not the

only contaminants effecting water quality of this stream and the Picton Sewage treatment plant or closed landfill appear to be possible sources.

Phosphorus binds more strongly to soil than nitrogen and is therefore less likely to leach. This explains the relatively low Dissolved Reactive Phosphorus concentrations observed during dry weather at all of the sites monitored. During rainfall, Dissolved Reactive Phosphorus concentrations were often noticeably higher, particularly in the tributaries. The reason is phosphorus rich soil being washed into waterways during rainfall. Soils in urban areas, particularly parks and gardens, tend to be higher in nutrients. Additionally, the lack of riparian vegetation along streams and greater occurrence of bare soil leads to increased soil erosion. This also manifests in higher turbidity, particularly in the tributaries, compared to the reference sites located in the upper parts of the catchments. However, the results also show that different sources of fine sediment are causing increases in turbidity in the individual waterways. Correlation between turbidity and Total Suspended Solid concentrations show that the fine sediment in the main stream channels of Waitohi River and Waikawa Stream is similar, but is different from sediment found in the tributaries.

Although a single sampling run resulted in the highest turbidity values being observed in the Waitohi River, this is potentially a result of greater rainfall intensity in this catchment at the time, while rainfall might have been less in the Waikawa catchment. Putting this extreme event aside, turbidity in Waitohi River is only slightly higher compared to that observed in Waikawa Stream.

During rainfall, the samples were also analysed for total nitrogen and total phosphorus concentrations. Not surprisingly, the results revealed that the vast majority of phosphorus was bound in particulate material. In the main stream channels most of the nitrogen was also in particulate form, while the tributaries in both catchments had generally a greater proportion of dissolved nitrogen.

Total Phosphorus concentrations during rainfall were noticeably higher in the Waitohi catchment compared to the Waikawa catchment. A similar pattern was observable for Total Nitrogen concentrations, but the difference between the catchments was less distinct. Particulate nitrogen and phosphorus primarily impact the lower stream sites and the seabed near the stream outflows and the results show that the nutrient input into Picton Harbour is greater than for the Waikawa estuary.

E. coli are an indicator for faecal contamination. Concentrations were highest during rainfall. Results from the upstream samples suggest that native and feral animal can be the source of relatively high bacteria concentrations, but the sites influenced by residential development had significantly higher E. coli concentrations. The highest levels were observed in Kent St Drain, particularly the site located furthest upstream, at Cornwall Street Bridge. E. coli concentrations in this waterway were exceeding the guideline during dry weather conditions also. This indicates that stormwater/sewerage cross contamination is the likely reason as no noteworthy numbers of ducks or other wildfowl were observed in the area. Ducks did however have some impact on the water quality in the Waitohi River. E. coli concentrations during dry weather peaked at a site that is the home to more than 20 Mallard Ducks. Surprisingly, during rainfall E. coli concentrations peaked at the site further downstream (Wt3). It is possible that another source is causing this rainfall peak.

In the Waikawa Stream, E. coli concentrations steadily increased in a downstream direction during rainfall, but during dry weather, exceeded the guideline at the site located furthest downstream only. Gravesend Drain and Endeavour Stream had E. coli concentrations above the guideline during rainfall only, but had higher values than the other sites during light rain.

To help narrow down the sources of faecal contamination, genetic markers can be used to identify which type of animal the bacteria originate from. Results from this analysis would assist in uncovering of the sources of faecal contamination.

PH values appear to be naturally quite high in both catchments. Therefore, relatively small increases can result in pH values above the optimal range for aquatic animals. However, despite filamentous algae cover at a number of the sites during base flow, pH values were only occasionally elevated at the lower sites. Surprisingly, a small amount of rainfall resulted in very low pH values in the upper Waitohi River and Kent St Drain. It is unclear what was causing this phenomenon.

Of the heavy metals measured during rainfall sampling, copper exceeded the ANZECC (2000) triggers the most. The tributaries in particular had dissolved copper concentrations above the 95% Species protection trigger during at least two of the three rainfall sampling runs.

Although high heavy metal concentrations only occur during a very short time period in the water (during flood flows) they have a legacy effect on the aquatic environment. A large proportion of these metals will be deposited together with sediment on the stream bed and in the coastal areas. Heavy metals in the sediment affect the aquatic fauna that makes their home on the stream or sea bed. Additionally, when this sediment becomes disturbed, some of the sediment and heavy metals will become re-suspended back into the water column.

The fish survey revealed that the upper catchments had a healthy abundance of fish and so did the lower Waikawa Stream. The lower Waitohi River at site Wt2, downstream of the State Highway One Bridge, however, was absolutely devoid of fish life. The results of the water quality sampling show that water quality is slightly degraded, but this does not explain the total lack of fish life. The most likely explanation is the illegal disposal of a substance, poisonous to fish either into a stormwater drain or the river itself. It only takes one such careless act to wipe out the entire fish population downstream. Unfortunately, it is impossible to determine what was discharged and when, unless it was witnessed and reported. However, no such reports have been received by Council.

5.1. Recommendations

The following recommendations for the improvement of water quality in the Waitohi and Waikawa catchments are based on the results of the investigation thus far. Note, that it is possible that the further sampling planned in the near future will result in changes and/or further recommendations.

- Carry out genetic marker analysis of faecal bacteria from samples taken during rainfall. Based on the results investigate sources and try to eliminate or minimise them where possible
- Promote good yard practices at industrial sites along Kent St Drain to reduce heavy metals in rainfall run-off. If possible investigate if there are hot spots (areas that are the major sources of heavy metal during rainfall)
- Investigate stormwater/sewerage cross-connections effecting Kent St Drain, particularly the upper site (this will be done within the Marlborough District Council and has already been initiated)
- Educate residents that simple acts such as cleaning equipment after use or disposal of surplus liquids that are toxic to aquatic life into stormwater drains can have dramatic effects on aquatic ecosystems. Examples are the disposal of certain paints, concrete mixtures and the use of some pesticides and herbicides on driveways, roofs and pathways
- Investigate the sources of the very high copper and zinc concentration in Endeavour Stream and if possible eliminate or minimise these sources
- Investigate the influence of the Picton Sewage treatment plant and closed landfill on water quality in Gravesend Drain

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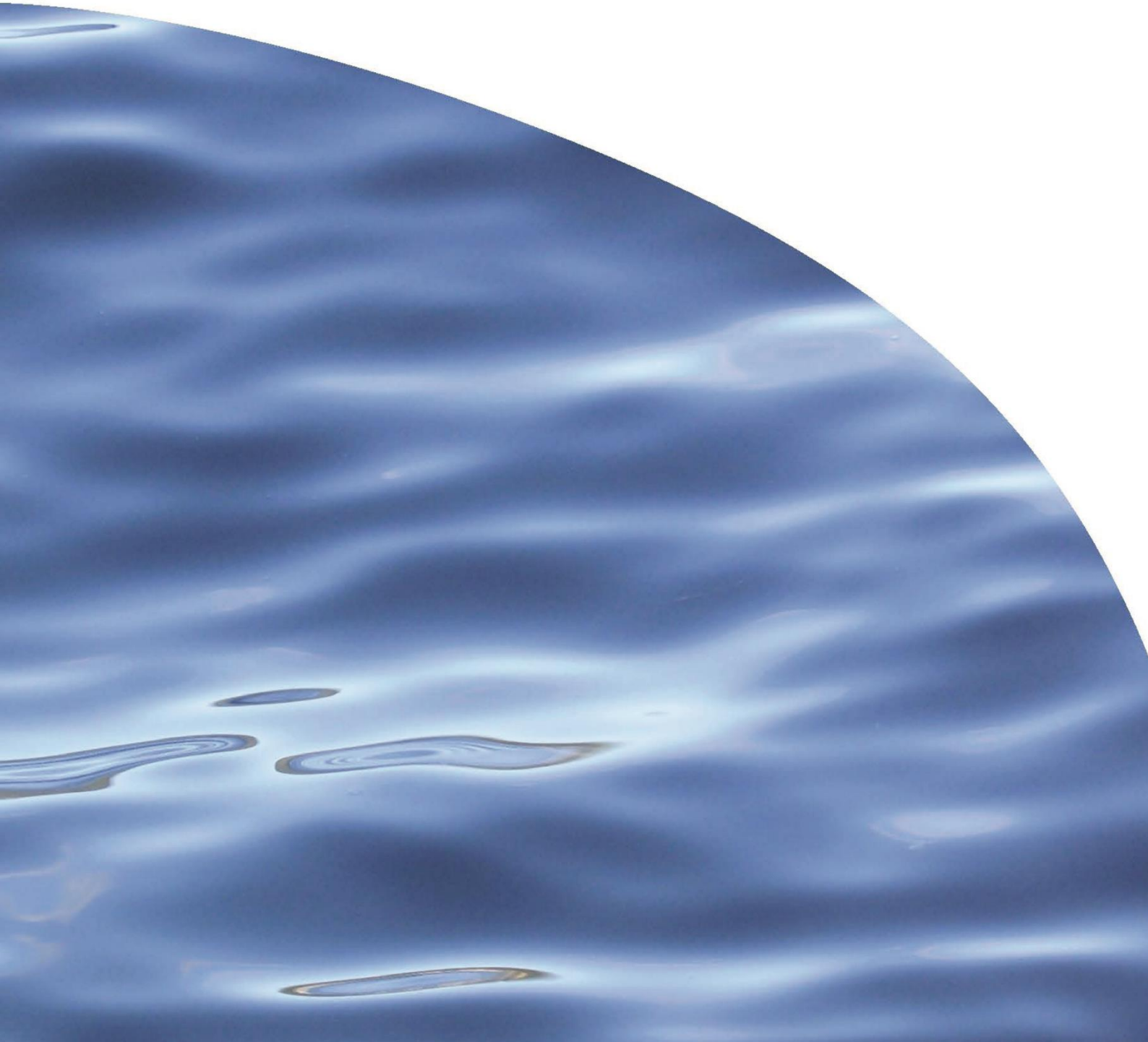
REPORT NO. 3199

WATER MANAGEMENT GROUPS: PRELIMINARY GUIDANCE



WATER MANAGEMENT GROUPS: PRELIMINARY GUIDANCE

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Prepared for the Ministry for the Environment

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1. INTRODUCTION

1.1. The purpose of this report

Diffuse effects on water bodies are difficult for regional councils to manage and equally difficult for individual land users to address. Water management groups (WMGs), if properly structured and supported, have significant potential to help both councils and land users manage diffuse effects. This report offers preliminary guidance to WMGs, regional councils and other interested parties on how WMGs can be structured and what regional council plans should contain to improve the likelihood that groups will achieve the freshwater outcomes desired by their communities.

1.2. The problem of diffuse pollution

In New Zealand, freshwater ecosystems have deteriorated in recent decades, driven by urban and rural land use intensification (Parliamentary Commissioner for the Environment 2013, 2015a, 2015b). A major difficulty in freshwater management worldwide is that many pollutant inputs and other effects on water bodies are diffuse—a myriad of small sporadic inputs that cannot all be monitored and managed reliably by government authorities (Gilbert 2015; OECD 2017). Nitrogen leaching is the most well-known example of diffuse pollution in New Zealand; phosphorus, sediment and *E. coli* are others.

These stressors also interact, causing multiple-stressor impacts (Matthaei et al. 2010; Wagenhoff et al. 2012; Lange et al. 2014), and there are time lags between changes in land use practices and the resulting effects in water bodies. This leads to a 'tragedy of the commons' in which individuals cannot see the results of their actions and therefore consider that their actions will make little difference to the overall outcome.

New Zealand's National Policy Statement for Freshwater Management, issued in 2011 and amended in 2014 and 2017, requires regional councils to set objectives for water quality and ecosystem health for every water body in the country and to implement plans to achieve these objectives. Formulating policies to address diffuse pollution has been one of the more challenging issues facing regional councils.

One approach to managing these diffuse effects is to allocate limits for individual pollutants to individual properties. This is usually based on models that may not accurately reflect physical processes and cumulative effects, leaving environmental outcomes in doubt and land users questioning the models (Duncan 2014). Another approach is to require land users to adopt specific 'good management practices'. This provides some certainty of actions and costs but delivers uncertain environmental outcomes and, without other controls, may allow further intensification. Hence, both approaches have limitations and may not deliver what the community expects.

Collective management offers a way to focus more on achievement of desired outcomes, especially where multiple stressors are involved. By assigning environmental responsibilities to a water management group (WMG) rather than an individual land owner, land users have more flexibility to identify place-specific mitigations. Members are accountable to each other as well as to the wider community, creating peer pressure to improve performance[1]. This report provides preliminary guidance on how to implement such an approach.

It is important to note that this report is *not* about collaborative freshwater *planning*, that is, diverse interests working together to agree on standards and rules for freshwater management. Rather, it is about plan *implementation* through collective management and responsibility, i.e. land users working together to achieve freshwater outcomes already agreed in a plan. These are two very different processes with quite different challenges. Much has been said and written about collaborative planning, but very little about collective responsibility as a strategy for plan implementation even though the idea has been around for some time (Sinner & Nelson 1994).

1.3. Advantages of collective management

Responses to address diffuse effects that affect freshwater ecosystems can be coordinated more effectively at the sub-catchment scale, where landholders can see the results of collective efforts. Regional councils are better able to monitor collective performance than outcomes for individual properties, so landholders (through WMGs) will be more accountable for improving water quality outcomes.

Compliance costs for landholders will also be reduced, as WMGs identify and implement new cost-effective mitigations. WMG members won't need individual consents and will not be required to adopt specific practices; instead they will be empowered to trial new mitigation practices and land uses targeted at specific problems, expected outcomes and values. Group members can collaborate on projects such as riparian planting and reconstructed wetlands, which may not have been viable at the individual property scale.

1.4. Water management groups in New Zealand

There are several examples of groups in New Zealand working collectively to manage freshwater outcomes. Some have existed for several years, while others are just forming or have recently extended their purpose to include environmental objectives.

[1] A video describing this approach is available at https://vimeo.com/270210016

In 2015, Beef and Lamb New Zealand, the Gisborne District Council, Ministry for the Environment and local farmers formed a collaboration to address *E. coli* contamination at Rere Falls and Rockslide, a popular swimming spot on the Wharekopae River near Gisborne. In Hawke's Bay, the Twyford Irrigators Group has pooled its water permits to make better use of members' water allocations, enabling them to reduce total abstractions. Canterbury's Amuri irrigation scheme is taking on responsibility for water quality monitoring, reporting and some compliance roles for its members, and some other irrigation schemes have bulk nutrient allowances that they can allocate flexibly. A group of dairy farmers worked with the New Zealand Landcare Trust (NZLT) and the Marlborough District Council to address water quality concerns in the Rai Valley. In the Tasman District, again with assistance from the NZLT, groups of farmers in the Sherry River and Aorere River catchments are working together to improve freshwater outcomes. Farmer groups are also emerging in Southland and probably in other regions to address water quality issues.

Some provisions for WMGs are being written into RMA plans. For example, for Waikato farmers operating under a Certified Industry Scheme, the Waikato Regional Council's Proposed Plan Change 1 would provide permitted activity status for dairying and other farming activities (except commercial vegetable production) that generate diffuse discharges. Otherwise, starting in 2020 for high priority catchments and high-discharge properties, these activities would require resource consents (Waikato Regional Council 2016). The plan change sets out criteria for a scheme to be approved by the council as a Certified Industry Scheme.

Environment Canterbury's regional plan for South Canterbury coastal streams enables land users to work collectively rather than be required to submit individual farm plans. In Hawke's Bay, farmer representatives have suggested that farmer collectives could manage sediment and other aspects of ecological health of water bodies. Their proposal is being considered by a collaborative stakeholder group making recommendations for new provisions in a regional plan.

In an urban context, the Marlborough District Council worked with stakeholders in the Murphys Creek catchment in Blenheim to agree on stormwater standards for new development (Newton 2017)[2]. The Murphys Creek residents' group could provide the basis for establishing an urban WMG to reduce diffuse pollution from existing residential and commercial properties. There are undoubtedly other urban water groups in New Zealand that could be mobilised to take on a more formal role with councils.

[2] A video about the Murphys Creek collaborative process is available at https://vimeo.com/214937013.

2. PRELIMINARY GUIDANCE FOR COUNCILS AND GROUPS

This report provides preliminary guidance for water management groups that have a formal relationship with a regional council, i.e. have responsibilities to help deliver land and water management objectives identified in a regional plan under the Resource Management Act 1991 (RMA). This guidance is based on insights from Ostrom (1990; 2010) and other literature, and also draws from numerous discussions the authors have had with interested parties over the past several years. However, more research is needed in New Zealand to gain better understanding of the features of effective water management groups.

2.1. Group formation

2.1.1. Size of groups

There is no single right answer to the appropriate size of a water management group. Depending on the size of individual properties and relationships between neighbours, a group might be anywhere from a few properties to twenty or more properties that all contribute to the health of a local water body at a defined point.

A collective response to freshwater management involves identification of selected points in a catchment where outcomes can be monitored and where land users can see the effects of their land management practices. Depending on topography, the size of properties and the intensity of land use, we suggest defining a water management group for the catchment upstream of each confluence of a fourth-order stream[3] with another fourth- or higher-order stream. We refer to these points where one WMG area flows into the next as 'WMG confluence points' as shown in Figure 1.

Alternatively, it might be more practical to combine several fourth-order catchments into one WMG and have sub-groups for each fourth-order catchment.

A sensitive feature such as a significant lake or wetland could be managed by a separate group, defined by the catchment for that feature, or might be managed as part of a group with a larger area, with the significant feature as an additional monitoring point.

[3] Stream order is a measure of the relative size of streams. The smallest tributaries are referred to as first-order streams, and a second-order stream is formed when two first-order streams join. A fourth-order stream is formed by the confluence of two third-order streams, or of a third-order stream and a fourth-order stream. Depending on the number of watercourses in the landscape, it might work better to use fifth-order confluences as the basis for group boundaries.

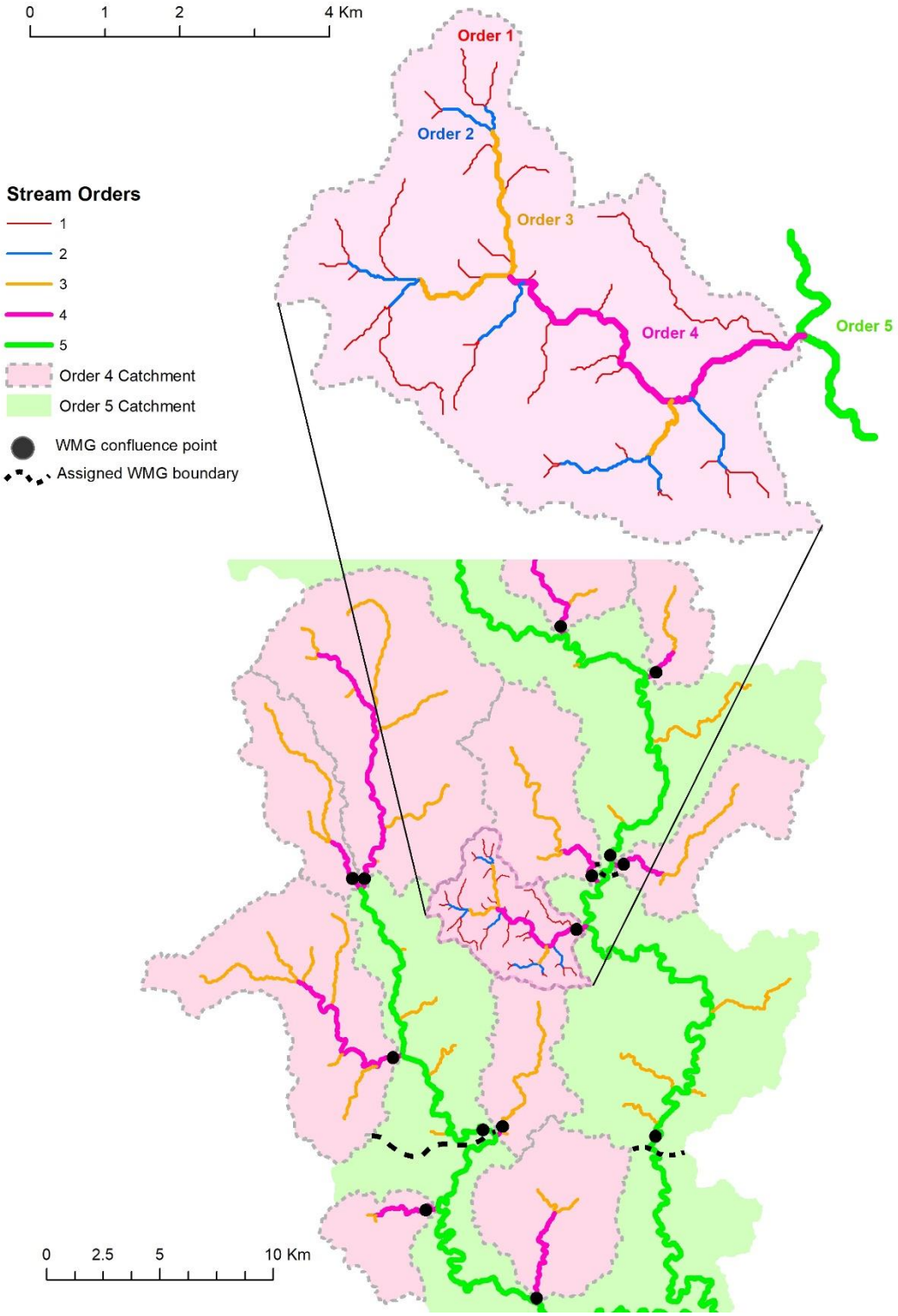

Figure 1. The top image shows a fourth-order catchment, being the area upstream of the confluence of a fourth-order stream and a higher-order stream. The lower image shows this fourth-order catchment amongst others in the wider catchment and the confluence points (black dots) at which WMGs would monitor their performance. The dashed black line is a suggested assignment of a WMG boundary, dividing remaining parts (light green) of the fifth-order catchment that do not have fourth-order streams.

To be most effective, all areas of a river catchment should be included in a water management group or covered by an individual farm plan that is consistent with the catchment group plan. Some properties will belong to two groups if they straddle ridge lines such that the land drains to different streams. Neighbouring groups can decide how to manage these situations.

In addition to these groups at sub-catchment scale, we recommend that there be a group for the entire catchment, comprised of representatives of the smaller groups. The whole-of-catchment group would be a forum where WMGs can discuss alignment and consistency of WMG plans, shared responsibility for downstream objectives, and actions that might require coordination between multiple groups. The whole-of-catchment group could also be an appropriate forum for iwi and other interested parties to engage with WMGs, discussed further in Section 2.4 of this report.

2.1.2. Group structure

Groups may start by working together informally but in order to accept responsibility for delivering freshwater objectives, they should have some formal elements, including the following:

- list of members
- specific objectives for water quality and ecosystem health (see next section)
- defined boundaries and monitoring points shown on a map
- terms of reference or articles of agreement, including decision-making procedures, signed by group members
- contact person or coordinator—a group member or an external person such as a farm advisor or consultant.

Membership can include people who are not landowners or land users inside the WMG area. For example, a WMG could include a representative from the local marae, possibly as an observer rather than as a full member, because it is the full members who will be accountable for taking action to achieve agreed objectives.

It would be advantageous for groups to have legal status, such as an incorporated society or partnership. It may even be required for groups to have a resource consent or other legal obligations under a regional plan. Legal status would also enable groups to apply for grants and enter into agreements with other entities, e.g. other WMGs. Note that legal status brings with it reporting obligations, e.g. incorporated societies are required to maintain accounting records and file annual reports.

Further work is required to assess the merits of different legal structures and determine which would best suit WMGs. It would be useful if a national body were to develop templates for terms of reference and other documents that individual groups could adapt to their circumstances.

2.2. Regional plan provisions for WMGs

2.2.1. Freshwater outcomes

Regional plans under the RMA provide critical context and direction for WMGs, specifying issues and objectives that groups are expected to achieve. If the regional plan is not clear about what outcomes are sought for a catchment, and for specific points within a catchment, WMGs will not know what they are expected to achieve.

Ideally, a regional plan would specify one or more outcomes, e.g. water quality or habitat standards, for every WMG confluence point. Monitoring would be done just upstream of the confluence. To be practical and manageable for WMGs, councils could initially specify, say, between two and four outcomes for any given WMG, based on the most important or sensitive values for that point (or downstream).

Specific water quality and ecosystem health objectives for a WMG confluence point could include some of the following, for example:

- periphyton cover (more than 1 mm thick) not to exceed 30% of streambed[4]
- nitrate (NO_3) concentration not to exceed 0.2 mg/litre for upland sites or 0.45mg/litre for lowland sites
- macroinvertebrate index (MCI) score to be 100 or greater
- whitebait spawning habitat protected along 200 m of bank in specified reach
- water clarity during baseflows to exceed 1 m black disk reading
- *E. coli* count during baseflows not to exceed 260/ml.

For some streams, it might be appropriate to establish standards for temperature, dissolved oxygen and/or pH. Standards for these might involve multi-day averages and hence might require instream data loggers to collect sufficient data, which are more feasible for WMGs than for individual land users.

It is important to note that the standards listed above are just examples, not recommendations. The actual standards chosen for a given WMG confluence point will depend on the values and circumstances of that catchment. Parameters chosen should be linked as closely as possible to the outcomes sought, while still being practical to monitor. For example, native fish will be an important value for some streams, but it is difficult for land users to monitor the outcome, e.g. fish abundance, without specialised equipment and training. Instead, a WMG might focus on water temperature, MCI or other indices (e.g. the Cox-Rutherford Index[5]) and parameters that are likely to be limiting native fish in that stream, with fish monitoring done periodically by council staff or the Department of Conservation (DOC).

[4] In a defined river segment or section at a specified monitoring interval linked to a flow statistic.
[5] The Cox-Rutherford Index is the average of the daily mean and maximum temperatures over the five hottest days of a continuous temperature record.

Regional plans are unlikely to have detailed outcome standards for every WMG confluence point. Councils will need to work with WMGs (preferably through a catchment-wide group that includes a representative from each WMG; see Section 2.1.1 above) to identify appropriate objectives for each WMG confluence point and sensitive feature, and confirm that together these will enable achievement of the objectives specified in the regional plan for the entire catchment.

For example, suppose that an estuary at the bottom of the catchment is compromised by excessive nutrients and sediment. The council could estimate the total load that is sustainable, i.e. consistent with the desired state of the estuary, and then apportion that load to different WMGs. Or the council could specify water quality or other outcomes at each WMG confluence point that would ensure that the outcomes in the estuary are achieved. If information for these estimates is lacking, it could specify a percentage reduction in loads or interim water quality standards for each WMG and then monitor and adjust these at periodic intervals, e.g. five yearly, based on an adaptive management plan. Other approaches may also be possible. Ultimately, the WMGs and the regional council need to demonstrate to the wider community that they are taking steps that will achieve the outcomes specified in the regional plan.

2.2.2. Responsibilities of WMGs

In addition to specifying the outcomes expected of WMGs, a regional plan that relies on WMGs as a mechanism to achieve objectives needs to have policies and methods to make this work. For example, a regional plan could say that every property exceeding a certain size and with specified land uses must have an approved farm environment plan or be part of a WMG with an approved group environment plan.

The regional plan should specify criteria or conditions for a group to be recognised and what its group environment plan must contain (see next section). Waikato's Proposed Plan Change 1 has criteria for Certified Industry Schemes and, in Hawke's Bay, the collaborative planning group for the Tūtaekurī, Ahuriri, Ngaruroro and Karamu (TANK) catchments is considering proposed requirements for what it calls 'catchment collectives'.

A regional plan should specify that a WMG's environment plan must be approved by the regional council in order for this plan to relieve group members of any requirements that non-WMG members are subject to, e.g. requirements to submit an individual farm environment plan for approval. Councils should consider making this a transparent process so that tangata whenua and interested groups such as Fish & Game New Zealand can comment on plans submitted by WMGs. This need not be through a formal resource consent process, although that is one option.

2.3. Content of WMG environment plans

There are several key elements for effective WMG environment plans.

2.3.1. Goals

A WMG environment plan needs to clearly state the goals of the group. These would include the freshwater values in the WMG area and downstream values that are affected by land use of the group. It is also helpful to have an objective for each value, e.g. at point X, flow and water quality will be suitable for swimming during base flow. The plan then also needs to state the specific targets the group is aiming to achieve, based on the objectives in the regional plan; see Section 2.2.1 of this report.

2.3.2. Land use

The plan should specify the land uses and land use practices being used in the WMG area, and where they are being used. The plan should also state what flexibility members have to change land use practices without triggering a formal review of the plan by the regional council.

2.3.3. Mitigation actions

The plan needs to specify what actions will be taken by the group to maintain and/or improve the health of waterbodies within the group's area. These should be specific enough to ensure that they have the desired effect without being overly prescriptive and thereby discouraging possible innovation. A WMG that has a good relationship with tangata whenua and other parties such as DOC or Fish & Game can check proposed changes with these parties and find out whether they have any objections or can offer constructive suggestions.

2.3.4. Monitoring and reporting strategy

Monitoring and reporting are essential for WMGs to be effective. A WMG's environment plan therefore needs to include a monitoring programme, specifying what will be monitored, with what methods and at what frequency. The plan should also state how this information will be reported to the council, tangata whenua and other interested parties.

Monitoring and reporting should include progress on mitigation actions as well as freshwater outcomes. It is recommended that WMGs obtain external review of their monitoring programmes and annual reports, and that the evaluations are documented.

2.3.5. Review

A group environment plan should have a defined duration and provide for review and replacement of the plan with an updated version. The plan should specify the review dates and could require an early review if targets are not being met.
The review should include, among other things, whether the actions are achieving the plan's environmental standards and whether those standards are sufficient to protect the values identified in the regional plan. The monitoring strategy should also be reviewed and updated.

2.3.6. Consequences for non-achievement

Consequences for non-achievement of actions and targets should also be stated in the group's plan. These could include, for example, early review of the group's environment plan, which could result in the council requiring stronger action to improve outcomes, and enforcement action if there is willful failure to comply with the group's environment plan.

2.4. Involvement of tangata whenua and other parties

Tangata whenua and other interested parties such as the Department of Conservation, Fish & Game New Zealand, and the Royal Forest and Bird Protection Society of New Zealand can play important roles in helping make WMGs successful. These roles can include:

- identifying values at risk (e.g. specific species, uses such as swimming or kayaking, or cultural values such as mahinga kai) in specific locations and suggesting appropriate outcomes and standards for WMG confluence points
- suggesting interventions that would improve outcomes (ranging from riparian planting and protection or restoration of wetlands to possible changes in land use)
- providing labour or funding to assist with interventions such as tree planting, fencing or restoring a wetland
- helping with monitoring at WMG confluence points and sensitive features
- reviewing group and catchment plans and providing constructive feedback to ensure that, taken collectively, there is a good chance that the objectives stated in the regional plan will be achieved
- ensuring that there is a robust monitoring programme to evaluate the effectiveness of interventions and adjust group environment plans accordingly. This could include providing peer review of the monitoring strategy and annual reports.

If tangata whenua and other interested parties are involved in selecting measures to achieve the desired objectives, and in monitoring the effectiveness of these

measures, this will help to create a sense of shared ownership in the task and a sense of community between land users, iwi and others.

These parties should be members of the catchment-wide groups that coordinate the action plans of smaller WMGs. The smaller WMG are encouraged to invite participation from members of the local marae and others who may be particularly interested in the health of freshwater ecosystems within their area of responsibility.

2.5. Urban groups

Water management groups could also be effective in urban areas, though some modifications to group structure and function would be required. For example, in urban areas, stormwater is still largely seen as a council's responsibility, rather than something property owners should be helping to manage. There is also lower awareness in urban areas about the implications of land use on local waterbodies. For these reasons, urban WMGs should be informally organised and have non-binding goals—at least until members have a greater understanding and acceptance of the implications of their land use practices.

The most appropriate authority to oversee urban WMGs is likely to be district and city councils, rather than regional councils. While runoff from rural properties discharges directly to waterbodies and therefore is under the authority of regional councils, runoff from urban properties predominantly makes its way into the stormwater network, with only a small amount running off directly to local waterways. As district councils manage the stormwater network and are legally required to meet stormwater discharge consent conditions, it makes sense that district and city councils work with urban WMGs to achieve stormwater management outcomes.

Whereas rural group boundaries will reflect the local stream network, urban groups will be based on the stormwater network. Urban WMGs would likely have more members than rural groups, given the high density of urban properties. Groups of 30-50 properties could be established based on their stormwater runoff to shared stormwater discharge points. Monitoring would take place just downstream of the discharge point to provide feedback to a neighbourhood WMG about progress towards its goals.

3. TOPICS FOR FURTHER RESEARCH

New Zealand has only limited experience with water management groups and the context within which these groups operate varies substantially. Research to analyse and learn from the experience of these groups would help land users, councils and

other parties to formulate group features and regional council plans to enable groups to perform most effectively.

3.1. Practical matters

Almost every aspect of the preliminary guidance provided in the previous section would benefit from research on how it is working in practice. Scale—how much area and how many properties a group should comprise, and how to nest small groups within larger groups—is a key area for research. Suggested topics include the following:

Group formation and structure

- What are the advantages and disadvantages of small vs large groups?
- How should group boundaries be defined relative to stream catchments?
- What are the options for nested groups and what are the pros and cons of different approaches? How can a whole-of-catchment group align the plans of all WMGs within the catchment?
- What should terms of reference or articles of agreement for a WMG contain?
- What are the advantages and disadvantages of groups having formal legal status, what options have been trialled and how did they perform?
- What roles do tangata whenua and other interested parties have with WMGs? What seems to work best?

Standards, plans and monitoring

- How have WMG responsibilities been defined in regional plans and how have these worked? What are the advantages and disadvantages of different options?
- What parameters and standards have WMGs and councils used to define the outcomes that WMGs are supposed to achieve and how useful were these? Which standards are both practical to monitor and meaningful for freshwater outcomes?
- What monitoring strategies and methods have been used by WMGs and councils? What are the advantages and disadvantages of different approaches?
- How do WMGs perform in terms of meeting freshwater outcomes relative to land users working on their own including relative to catchments without WMGs?

For urban groups

- How can urban groups be supported and encouraged to form WMGs? What roles should regional councils play relative to district and city councils?
- What is an appropriate group size in an urban context?

- What obligations, if any, should councils impose on urban property owners to control stormwater runoff? Does this vary for residential and commercial properties?

3.2. Broader implications

In addition, there are broader questions and implications for how WMGs function. Important topics include the following:

- How do WMGs manage internal dynamics of agreeing on a group plan, monitoring compliance with the plan and enforcing sanctions on members who are not compliant?
- Most collective management groups reported in the academic literature evolved over decades or centuries. What happens when we try to create such groups in a short period of time? How does trust develop between members?
- Who is advantaged and who is disadvantaged by collective management of freshwater outcomes? Does this approach tend to mitigate or exacerbate power differentials within society?
- What can we learn from Mātauranga and Tikanga Māori about managing use of resources by members within a group or community? Do New Zealand's bicultural governance arrangements and multicultural demographics suggest a unique approach to collective management?
- What effects do WMGs have on relationships between rural and urban residents and how does this vary with the amount of involvement of other parties with the WMG?
- What capacity do regional councils and territorial authorities have to support WMGs? How can they best service the information and monitoring needs with limited resources?
- What other common pool resource problems could be managed by collective management approaches? What can we learn from the experience of local pest management groups? Fisheries quota holders? Can we extend learnings from WMGs to help these groups?

4. CONCLUSIONS

Diffuse effects from intensified urban and rural land uses on water bodies are difficult for regional councils to manage and equally difficult for individual land users to address. Because outcomes at sub-catchment and catchment scales are the result of

multiple stressors originating from multiple properties, RMA policies and rules aimed at individual properties may not achieve the objectives specified in regional plans.

WMGs offer a way through this problem, and many groups have emerged around New Zealand over the past 15 to 20 years to address local issues. To use this approach more widely under the National Policy Statement for Freshwater Management, however, will require a more deliberate and structured approach, so that the combined actions of all the groups in a given catchment will achieve the community's desired outcomes for that catchment.

This report describes the authors' preliminary guidance to WMGs, regional councils and other interested parties on how WMGs can be established and on what regional council plans could contain to improve the likelihood that groups will achieve the desired freshwater outcomes. These recommendations need to be tested in real-life situations, with research to document, analyse and share the findings in order to increase the effectiveness of this promising new approach to freshwater management.

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Essential Freshwater

Healthy Water, Fairly Allocated

New Zealand Government

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Cover photo: Waiau River.

Ministry for the Environment
Manatū Mō Te Taiao

Ministry for Primary Industries
Manatū Ahu Matua

Contents

Message from the Ministers

Healthy freshwater is important for all New Zealanders. It is our birthright.

At the election the Government won a mandate, and we now carry a duty, to improve the quality of our rivers.

We welcome the contribution of anyone who is willing to share that duty to protect our birthright.

For many of us the river closest to us is the one we hold most precious. It is where we swam as kids, or where we want to see our kids swim in summer, safe in the knowledge they can put their head under without getting crook.

If we all work to improve our local river, then all our waterways will improve.

It is our goal to create a proper legacy for future generations by developing a fair and enduring system for sustainably managing this precious resource.

We have turned a corner. Water quality, allocation, and pricing were top issues throughout the 2017 election campaign. All political parties agreed during the 2017 campaign that we have passed environmental limits for nutrient and livestock pollution in some intensely-farmed catchments.[1] Farming leaders representing 80 per cent of the industry have pledged to improve water quality. Auckland Council is planning to spend $7 billion over 10 years to upgrade water infrastructure.

Research shows that more than 80 per cent of New Zealanders want action to improve water quality. The good news is New Zealanders are optimistic for the future, with 75 per cent agreeing that together New Zealanders can make a difference.

This Government made a clear commitment to action on freshwater in the coalition and confidence and supply agreements.

In the months since the election we have:

- wound down public subsidies for large-scale irrigation schemes
- announced investment in the science behind the OVERSEER® farm management tool, which helps measure nutrient use and greenhouse gas emissions
- progressed the Three Waters Review to tackle water issues in urban and rural communities
- invested in more compliance, monitoring and enforcement activity
- sought and received advice from the Land and Water Forum
- developed our thinking on amending the National Policy Statement for Freshwater Management and other regulation, including working with freshwater scientists and others to clarify shortcomings and areas for further development
- developed a new approach to the Crown/Māori relationship for freshwater.

This document sets out the path ahead for the next two years.

Freshwater management is complex and challenging.

There is no easy fix, because it sometimes takes many years for the pollution already in our land and water to dissipate. But we're not going to keep kicking the can down the road and leave the hard issues for future generations.

1 TVNZ Q&A programme environment election debate, 10 September 2017.

We are confident that the inclusive approach, policy framework, and work programme set out here will result in enduring solutions.

We are focussing on the areas where the Crown and Māori have shared interests – improving water quality and ecosystem health and providing fair access to water resources. Our approach is discussed in the companion document ***Shared Interests in Freshwater***.

We are also supporting our land-based sector to transition towards sustainable land use. Our vision goes beyond healthy water – we are working towards an environmentally-sustainable, high-value economy that supports the well-being of all New Zealanders. We want economic growth within environmental limits.

Many in the sector are already working hard to address the environmental impacts from land use, and recognise the importance of enhancing our reputation as a trusted producer of high-quality food and natural products.

Sustainable land use will not happen overnight. There will need to be a transition period, which the Government will support fairly and effectively through our programmes in the areas of agriculture, climate change, afforestation, freshwater and biodiversity.

For more on this transition see the ***Cabinet minute: Aligning land-based sector work programmes***.

Cabinet has directed that the Essential Freshwater work programme outlined in this document be delivered jointly by a dedicated cross-government taskforce. The recently established taskforce is led by the Ministry for the Environment and the Ministry for Primary Industries, with members drawn from the Treasury, Te Puni Kōkiri, Māori Crown Relations Unit, the Department of Internal Affairs, the Department of Conservation, the Ministry of Business, Innovation and Employment, plus expertise provided by local government.

Hon David Parker
Minister for the Environment

Hon Damien O'Connor
Minister of Agriculture

Enjoying the water at Lake Mapourika.

1. Overview

By 2020, new rules will be in place that will stop the degradation of New Zealand's freshwater.

In five years there will be a noticeable improvement in freshwater quality.

All New Zealanders have a role to play in protecting and restoring freshwater – those living in our towns and cities, farmers, foresters, hydro-generators, three waters operators, science providers, regional councils, and territorial authorities.

Research shows around half of New Zealanders are taking steps to protect and improve water quality – actions from avoiding pouring contaminants down the drain to planting alongside streams and minimising fertiliser use.[2]

More is needed – more voluntary action to reduce contamination and stronger rules to ensure everyone plays their part.

The Essential Freshwater work programme will set New Zealanders on the path to turning around water quality trends and long-term improvements in freshwater health.

2 *Environmental Attitudes Baseline research*, conducted for the Ministry for the Environment by Colmar Brunton, April 2018.

Objectives

The Essential Freshwater work programme has three main objectives:

1. **Stopping further degradation and loss** – taking a series of actions now to stop the state of our freshwater resources, waterways and ecosystems getting worse (ie, to stop adding to their degradation and loss),[3] and to start making immediate improvements so that water quality is materially improving within five years.
2. **Reversing past damage** – promoting restoration activity to bring our freshwater resources, waterways and ecosystems to a healthy state within a generation, including through a new National Policy Statement for Freshwater Management and other legal instruments.
3. **Addressing water allocation issues** – working to achieve efficient and fair allocation of freshwater and nutrient discharges, having regard to all interests including Māori, and existing and potential new users.

Actions

The work programme will deliver on these objectives through:

- targeted action and investment in at-risk catchments, from now
- amendments to the Resource Management Act, introduced later this year
- a new National Policy Statement for Freshwater Management, in force by 2020
- a new National Environmental Standard for Freshwater Management, in force by 2020
- wide engagement in developing options for allocating water resources, starting with allocation of discharges to water in 2019
- ongoing future policy framework development.

The path forward

This document details the:

- current state of freshwater and freshwater management
- work programme for the next two years
- approach to involving people with expertise from across New Zealand in developing policy
- principles that will guide this work
- longer-term vision for a coherent policy framework to safeguard freshwater resources for future generations.

*See **Appendix 1 – Cabinet paper: Restoring our freshwater and waterways** for more detailed discussion.*

Water quality in urban and rural communities

The Three Waters Review is looking at how to improve the management of drinking water, stormwater and wastewater (three waters) to address problems identified in the Havelock North Drinking Water Inquiry, and avoid sewage discharges contaminating rivers and beaches.

Work is also underway on good management principles for councils, developers and others in managing urban water and development.

Measurement and monitoring

Ongoing monitoring of progress and measurement of impacts will support the Essential Freshwater work programme. A number of projects are underway to update information and improve data collection and analysis.

Updated reporting on the state of New Zealand's freshwater will be contained in future reports in New Zealand's environmental reporting series.

The first *Our fresh water* report in 2017 provided a baseline.

In 2023 – five years from now – the Government expects this environmental reporting to show evidence of improved water quality. Because every catchment is different, the time required for improvements to show up will be different.

3 These include rivers, lakes, aquifers, wetlands and estuaries, and the biodiversity they support.

2. About our freshwater

Freshwater environments are made up of rivers, lakes, wetlands, estuaries and ground water. They are complex systems which affect, and are affected by, the land, air and marine environments.

No catchment is the same. New Zealand's 4200 catchments vary in size and complexity, from small creeks running straight into the sea to large systems, such as the Waikato catchment, with complex interactions between land use, surface water, and ground water.

Water quality and use is managed by regional councils under the Resource Management Act 1991 (RMA). The RMA sets the framework and central government provides further direction through national policy statements and national environmental standards.

Regional councils must follow these national directions when making plans to manage freshwater. Councils must also work with their communities, including tangata whenua, as they develop plans. These plans and resource consents then tell users what they can and cannot do with water and the land next to it.

Pressures on freshwater

Freshwater environments are under pressure, as a result of more than 150 years of our population growing, and changes in the way we use our land.

The main cause of the decline in freshwater quality is run-off or leaching of nitrogen, phosphorus, sediment and pathogens (such as *E. coli*).

The damage caused to freshwater by intensification of agriculture has been known since 2004, when it was highlighted by Parliamentary Commissioner for the Environment Morgan Williams in the report *Growing for good*.

Measures to stop this trend were considered in 2008 when the then Minister for the Environment set up a Board of Inquiry, chaired by former Principal Environment Judge David Sheppard. The principles proposed by the Sheppard Inquiry were not adequately reflected in the Freshwater NPS issued in 2011 (with revisions in 2014 and 2017) or in any other national instrument. (See detailed timeline on pages 10-11.)

E. coli *concentrations are higher in urban dominated catchments, with major sources of faecal contamination including wastewater network overflows. Photo supplied courtesy of Dave Allen, NIWA.*

Wastewater network overflows can make popular urban swimming spots unsafe, such as Takapuna beach in Auckland.

Sediment accumulation in the New River estuary near Invercargill.

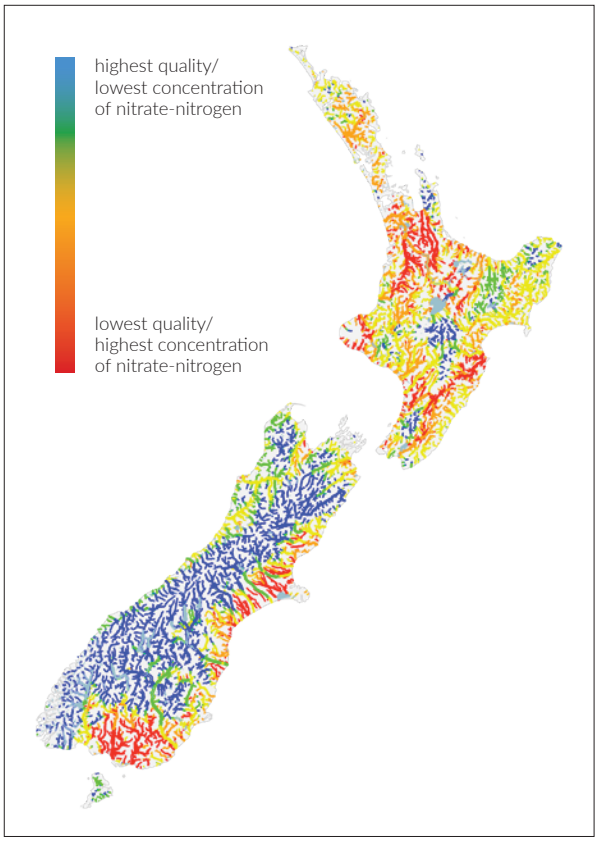
Some farming practices such as intensive winter grazing have a negative impact on land and freshwater. Photo supplied courtesy of Fish & Game.

Concentrating stock in small areas, such as this feedlot, can increase risk to freshwater.

The Sheppard principles required strong action to stop clean rivers being made dirty, and to clean up dirty rivers over a generation. Instead agricultural intensification continued, ruminant stock numbers increased, and significant deforestation occurred.

- The estimated amount of nitrogen leached from agriculture increased by 29 per cent between 1990 and 2012. This has been primarily due to an increase in nitrogen fertiliser use, and an increase in nitrogen from dairy cattle effluent. The most significant increases have been in Waikato, Canterbury, Otago and Southland.
- By 2013, nitrogen was worsening at more monitored river sites than improving (55 per cent and 28 per cent respectively).
- *E. coli* concentration was 22 times higher in urban areas and 9.5 times higher in pastural areas compared with those classified as 'native' areas (2009–2013).
- Aquifer contamination from nitrogen and *E. coli* can create health risks, with some monitored groundwater quality sites not always meeting drinking water standards.
- Fifty Auckland beaches were off-limits for swimming because of sewage overflow or contaminated stormwater at times over summer 2017/18.
- Of the aquatic indigenous species reported on, three-quarters of fish, one-third of invertebrates, and one-third of plants are threatened with, or at risk of, extinction.
- New Zealand has lost 90 per cent of wetlands to agricultural and urban development and they are now some of the rarest ecosystems.
- Estuaries from Northland to Southland are being seriously damaged by sediment smothering the seabed and shellfish.
- Between 2006 and 2015 there was twice as much deforestation (120,115 hectares) as afforestation (64,207 hectares).
- Between 2002 and 2017 the area of irrigated land increased by about 70 per cent nationally.

Nitrate-nitrogen levels in New Zealand rivers, 2009–2013



*For more detail on the state of our freshwater see **Our freshwater environmental reporting**.*

Timeline

LATE 90s TO EARLY 2000s

New Zealand's population grows 17 per cent from 1996 to 2012, driving a 10 per cent increase in urban land area.

Changes in international trading conditions, resulting from the Uruguay round of the General Agreement on Tariffs and Trade, drive increase in dairying, including intensification and conversion of sheep and beef farms to dairy. This leads to rapid expansion in fertiliser application, irrigation and other intensive farming practices.

2002

Dairy cattle numbers increase from 3.8 million in 1994 to over 5.1 million in 2002.

2004

Parliamentary Commissioner for the Environment Morgan Williams identifies decreasing water quality arising from increasingly intensive farming in his report *Growing for good*.

2006

Work begins on a National Policy Statement for Freshwater Management (Freshwater NPS).

2007

OECD Environmental Performance Review of New Zealand recommends introducing baseline regulations on water quality, and economic approaches to water allocation among users.

Freshwater Iwi Leaders Group formed to advance the interests of all iwi in relation to freshwater through direct engagement with the Crown.

2008

National Environmental Standard for Ecological Flows and Levels proposed. This was later put on hold.

Proposed Freshwater NPS referred to a Board of Inquiry, chaired by Judge David Sheppard.

2009

Land and Water Forum (LAWF) established, bringing together industry groups, electricity generators, environmental and recreational NGOs, iwi, scientists, and other organisations with a stake in freshwater and land management to collaborate around freshwater management.

2010

Sheppard Board of Inquiry provides its recommendations on the Freshwater NPS to the then Minister for the Environment.

First LAWF report released. Identifies a set of outcomes and goals for freshwater management and recommends a number of policy changes to achieve those.

2011

Freshwater NPS gazetted requiring that the 'overall quality of fresh water' in all regions of the country be maintained or improved and that the life-supporting capacity of water bodies including their associated ecosystems is safeguarded.

2012

LAWF second and third reports released, which set out a framework for setting limits and managing within limits.

Parliamentary Commissioner for the Environment Dr Jan Wright releases *Water quality in New Zealand: Understanding the science* as a basis for assessing policy interventions.

Waitangi Tribunal begins inquiry into claims led by the New Zealand Māori Council and 10 co-claimants about Māori rights and interests in freshwater and geothermal resources (Wai 2358).

2013

Supreme Court dismisses appeal from the New Zealand Māori Council and others about the proposed sale of shares in state-owned enterprises that use freshwater.

Parliamentary Commissioner for the Environment Dr Jan Wright releases *Water quality in New Zealand: Land use change and nutrient pollution* noting the need to address the link between land use and water quality (an update of this report was published in 2015).

2014

Freshwater NPS updated, including a National Objectives Framework and national bottom lines for water quality. Safeguarding water bodies for human health for recreation added alongside requirements for ecosystem health.

Dairy cattle numbers peak at 6.7 million.

2015

Parliamentary Commissioner for the Environment Dr Jan Wright recommends further improvements to the Freshwater NPS in the report *Managing Water Quality*.

LAWF fourth report on maximising the economic benefits from freshwater while managing within limits and other issues released.

2017

OECD *Environmental Performance Review of New Zealand* recommends accelerating implementation of water management reforms, ensuring water quantity and quality limits are sufficiently ambitious, and expanding the use of economic instruments to encourage more efficient water use and reduce pollution.

Our fresh water 2017 – first dedicated report on the state of freshwater from the Ministry for the Environment and Statistics New Zealand shows freshwater is under pressure, including that in monitored rivers, nitrate-nitrogen was worsening (55 per cent) at more sites than improving (28 per cent).

Growing public concern about water quality is reflected in opinion polls* and becomes one of the top issues in the election campaign.

Freshwater NPS amended including setting targets for improving swimming water quality and better direction about recognising Te Mana o te Wai in freshwater management.

LAWF provides incoming government with an assessment of key freshwater management challenges.

DECEMBER 2017

Ministers ask LAWF for further advice on what can be done between now and 2020 to 'hold the line'; on a nationally-driven system for allocating nutrient loads in a fair way; and how best to address sediment.

JUNE 2018

LAWF reports to Ministers, recommending changes to the current regulatory regime, including the Freshwater NPS and the Resource Management Act. It also recommends prioritising action in at-risk catchments. It was unable to reach agreement on the allocation of nutrient discharge rights in polluted catchments.

OCTOBER 2018

Ministers launch Essential Freshwater work programme.

* stuff.co.nz/Massey University Election Survey, Water New Zealand, Colmar Brunton.

Good farming practices make a big difference to water quality. Photo supplied courtesy of DairyNZ.

3. Work programme

The Essential Freshwater work programme has six workstreams. In each stream government officials will engage with the advisory network – Kahui Wai Māori, the Freshwater Leaders Group, the Science and Technical Advisory Group, regional councils, and others – to develop options for government decision.

The six workstreams are:

1. At-risk catchments
2. National Policy Statement for Freshwater Management amendments
3. National Environmental Standard for Freshwater Management
4. Resource Management Act amendments
5. Allocation of freshwater resources
6. Future framework (see ***section 6***).

There is also work underway beyond this programme that will make an important contribution to the goal of healthier waterways and freshwater habitats, and sustainable land use. See ***Related work*** for more information.

*See the **Essential Freshwater work programme diagram** at the end of this section.*

1. At-risk catchments

This work picks up on the Land and Water Forum recommendations to identify 'at-risk' catchments, ensure plans are in place for those catchments, and take action where necessary to stop further degradation and start reversing the damage that has occurred.

This catchment-by-catchment assessment is already underway and will support regional councils to address water quality and ecosystem health in at-risk catchments in a way that recognises Māori and community aspirations for that catchment and is fair to all landowners.

This will include assessing what can be achieved within current rules in each catchment, where new regulation may be needed, and where investment could be targeted (drawing on, for example, the Hill Country Erosion Fund, the Sustainable Food and Fibre Futures Fund, or the One Billion Trees Programme).

*See 'Land and Water Forum advice on improving water quality: preventing degradation and addressing sediment and nitrogen – May 2018', on the **Land and Water Forum website** for more information.*

Measurement and monitoring

Ongoing monitoring of progress and measurement of impacts will support the at-risk catchment project and the Essential Freshwater work programme.

Next step

→ Report to Government, with an overview of at-risk catchments and recommendations on potential interventions, by the end of 2018.

2. National Policy Statement for Freshwater Management amendments

The National Policy Statement for Freshwater Management (Freshwater NPS) is the main source of national direction about how councils should carry out their responsibilities for managing freshwater. It directs regional councils to consider specific matters and meet certain requirements when they are developing regional plans for freshwater.

A new Freshwater NPS will be based on the Sheppard principles. It will improve regional planning by ensuring all aspects of ecosystem health are managed, and give additional direction on how to proceed where there is uncertainty.

We are proposing amendments to address risks that may see water quality decline. For example, changes may adjust timeframes for implementation, provide greater direction on how to set limits on resource use, and provide better protection of wetlands and estuaries.

Amendments to the Freshwater NPS may also be an avenue for other regulatory changes, for example:

- to direct actions in at-risk catchments
- require the use of good management practices
- improve management of urban catchments
- protect sources of human drinking water.

Work has begun on potential amendments. This has included discussions with freshwater scientists about the strengths and shortcomings of the Freshwater NPS, consideration of recommendations from the Land and Water Forum, and input from other interested parties.

The Science and Technical Advisory Group will play an important role in testing and advising on scientific aspects of the Freshwater NPS, such as new attributes, national bottom lines, and alternative approaches.

The areas being considered for amendments to the Freshwater NPS more widely are:

- how to better provide for ecosystem health
- potential new attributes – sediment, copper and zinc, and dissolved oxygen
- clarifying the direction around how to set effective limits
- better protection for wetlands and sensitive downstream environments (eg, estuaries)
- potential policy around at-risk catchments
- resolving exceptions to national bottom lines
- other changes proposed by the Land and Water Forum and other groups.

See the report 'Land and Water Forum advice on improving water quality: preventing degradation and addressing sediment and nitrogen – May 2018' on the Land and Water Forum website for more information.

See Freshwater: Resolving NPS-FM science differences briefing note on the Ministry for the Environment website.

Next steps

→ Options will be discussed with the advisory network (Kahui Wai Māori, Freshwater Leaders Group, and the Science and Technical Advisory Group) over the next six months.

→ Public consultation will be held in 2019.

→ The amended Freshwater NPS will be in force in 2020.

3. A new National Environmental Standard for Freshwater Management

Introducing a National Environmental Standard for Freshwater Management (Freshwater NES) will provide clear and specific direction on resource use, in particular where rapid action is required, for example, in at-risk catchments.

A Freshwater NES is a potential mechanism for prohibiting activities or including rules that restrict activities such as the draining of wetlands or piping of urban streams.

Certain activities such as intensive winter grazing, hill country cropping, and feedlots are expected to be regulated under a Freshwater NES.

The areas to be considered are:

- preventing further loss of wetlands and urban streams
- potential mechanisms for managing intensification, including targeting at-risk catchments
- potential direction around the use of farm environment plans, good management practices such as stock exclusion and riparian management
- rules to control activities such as intensive winter grazing, hill country cropping, and feedlots
- potential direction on nutrient allocation
- direction for the review of existing consents
- a default regime for ecological flow and levels where none are set, and how minimum flows apply to existing consents.

Next steps

→ Options will be discussed with the advisory network over the next six months. Other national direction will also be considered as a way to achieve the policies.

→ Public consultation will be held in 2019.

→ The Freshwater NES will be in force in 2020.

4. Resource Management Act amendments

The Resource Management Act 1991 (RMA) is the main piece of legislation that sets out how we manage our environment.

The Government intends to make some amendments in the short term to reduce complexity, improve certainty, and improve public participation that will have an impact beyond water management.

For water management, the proposed amendments will better enable regional councils to review consents, to more quickly implement water quality and quantity limits as required in the Freshwater NPS. The amendments will also strengthen enforcement tools for improving environmental compliance.

Longer term, the Government will consider further reform of the resource management system.

Next step

→ Amendment Bill due to be introduced to Parliament late 2018 or early 2019.

5. Allocation of freshwater resources

There are two main aspects to allocation – discharge of contaminants and the authority to take and use water. Because the priority is water quality, the initial focus will be on allocation of contaminant discharges.

Discharges of contaminants

Contaminant discharges include the run-off of nitrogen and phosphorus (known as nutrients) and sediment and microbial pathogens. Major sources of nutrient run-off in rural areas are livestock effluent and fertiliser.

To protect and restore water quality in many catchments, contaminant discharges must be restricted. Every catchment has a different mix of land use and soil types, and so will have a different limit on the amount of contaminants that can be discharged without damaging the health of the waterway.

Setting a freshwater objective to establish the acceptable amount of contaminants, followed by a discharge limit across a catchment, requires decisions about how each property can operate within the collective limit, or what the 'discharge allocation' is.

The challenge is to find a way to fairly and efficiently allocate discharges among resource users (properties and point-source dischargers such as wastewater treatment plants) taking into account current land use and potential future development.

The initial focus is on nitrogen, because there is already some ability to measure, model or monitor nitrogen discharges at a property level. Principles or processes for allocating nitrogen could be applied to the allocation of discharges of phosphorus or sediment, when better models, measurements and satellite monitoring allow. Alternatively, restrictions on certain activities or inputs may be needed to meet environmental limits.

The Land and Water Forum discussed how to allocate discharge rights amongst competing land users in catchments at or beyond the limit of environmental sustainability. However, they could not resolve the tension between existing users and owners of underdeveloped land, including Māori.

The Government intends to work collaboratively with Kahui Wai Māori and the Freshwater Leaders Group, and other interested parties, to explore options for a fair and efficient allocation system.

Water takes

The authority to take and use water is also an important area where Māori rights and interests must be recognised, together with fairness to existing users (including households), economic development, and efficiency.

As discussed in the companion paper *Shared Interests in Freshwater*, the Government's approach includes recognising and acting on the shared interests of the Crown and Māori.

In areas where water regularly becomes scarce and where economic development is being limited by this scarcity, there is a need to consider measures that could support economic growth, land development, and community and environmental resilience. These measures may include, for example, environmentally-responsible water storage and distribution, managed aquifer recharge, and technology that supports greater efficiency.

Next steps

→ Issues and options for allocation of discharges will be discussed and consulted on through 2019 and 2020.

→ Options on water take allocation will be developed in 2019/2020.

For more discussion see:

- ***Shared Interests in Freshwater***
- ***A Vision to Restore the Environment speech** by Environment Minister Hon David Parker, June 2018, on the Beehive website.*
- *'Land and Water Forum advice on improving water quality: preventing degradation and addressing sediment and nitrogen May 2018' on the **Land and Water Forum website**.*

Related work

Other government programmes underway that will make an important contribution to the goals of healthier waterways and freshwater habitats and sustainable land use include:

» Establishing a Compliance Oversight Unit to improve the consistency, effectiveness and transparency of council enforcement of Resource Management Act rules and decisions – particularly in relation to freshwater. It is anticipated to be fully operational by January 2019.

» The Three Waters Review, critical to improving water quality affected by urban and rural communities – being led by the Department of Internal Affairs.

» Drinking water and the Government's response to the Inquiry into Havelock North Drinking Water – being led jointly by the Department of Internal Affairs and the Ministry of Health.

» The Department of Conservation's current programme for protection and restoration of freshwater ecosystems and species.

» The Sustainable Food and Fibre Futures Fund will provide $40 million a year for farmers and growers to apply for investment in a greater range of projects.

» Tools and support to lift the environmental and economic performance of New Zealand's primary industries (see ***Cabinet paper: Aligning land-based sector work programmes*** for more details).

» The One Billion Trees Programme which provides opportunities to also deliver significant water quality improvements.

» Climate change policy – especially as it relates to agriculture and forestry.

» Regional economic development – being led jointly by the Ministry for Primary Industries and Ministry of Business, Innovation and Employment.

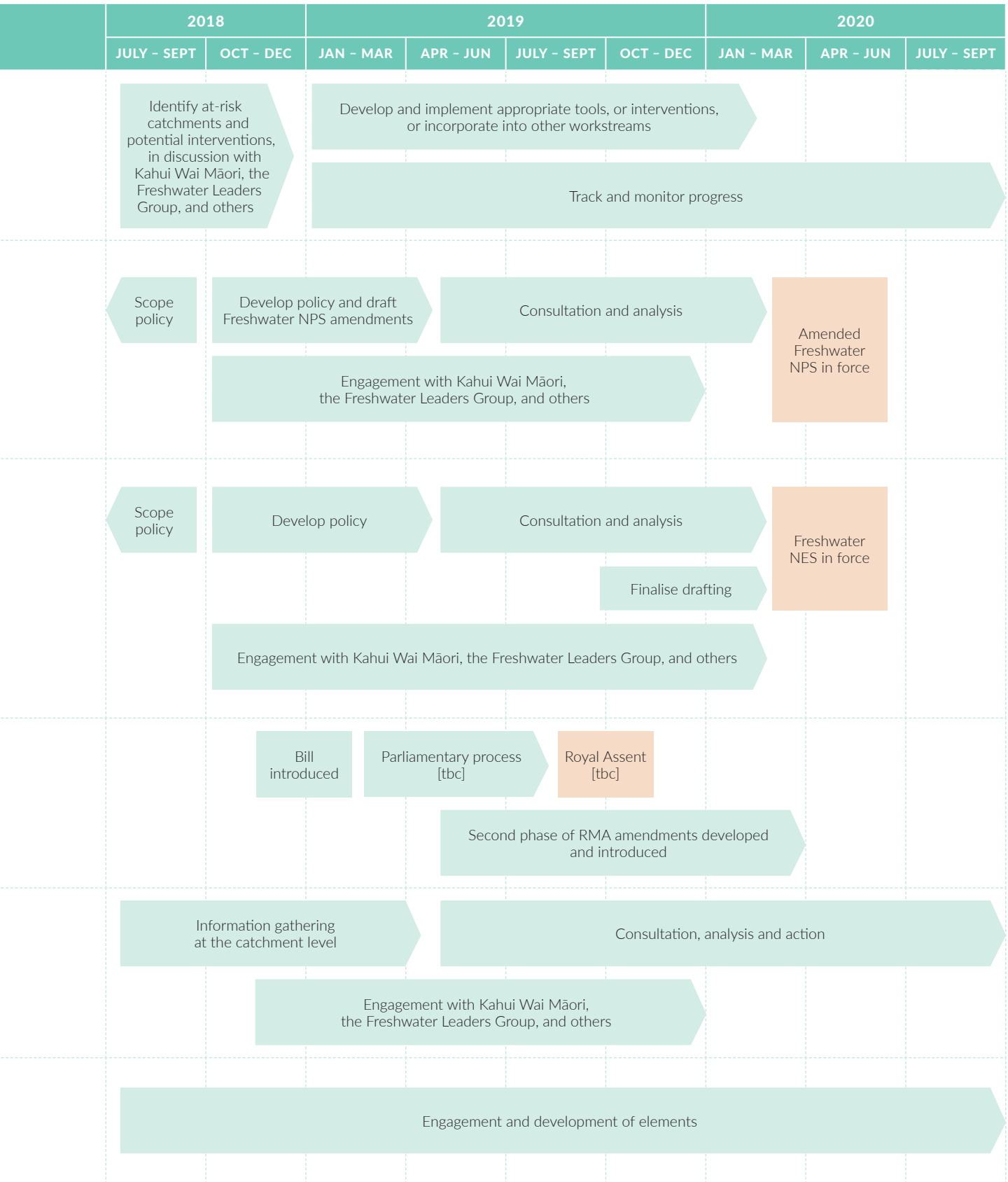
» Investment in science and technology.

» The Government's response to the report of the Tax Working Group on the role of the tax system in delivering positive environmental and ecological outcomes.

» The Whenua Māori Programme, seeking to sustainably develop Māori freehold land.

Essential Freshwater work programme

WORKSTREAM	
AT-RISK CATCHMENTS	**Identify at-risk catchments, to:** » consider the need for regulatory intervention » target erosion risk for input into the One Billion Trees programme and other funds » identify existing restoration projects that could be scaled for increased impact » support voluntary action by councils, Māori, NGOs, other community groups, and industry.
NATIONAL POLICY STATEMENT FOR FRESHWATER MANAGEMENT (FRESHWATER NPS)	**Changes to the Freshwater NPS may include:** » how to better provide for ecosystem health » new attributes – sediment, copper and zinc, dissolved oxygen » clarifying the direction around how to set effective limits » better protection for wetlands and sensitive downstream environments (eg, estuaries) » policy around at-risk catchments » resolving exceptions to national bottom lines » other changes proposed by the Land and Water Forum and other groups.
NATIONAL ENVIRONMENTAL STANDARD FOR FRESHWATER MANAGEMENT (FRESHWATER NES)	**A new Freshwater NES may include:** » preventing further loss of wetlands and urban streams » mechanisms for managing intensification, including targeting at-risk catchments » direction around the use of farm environment plans and good management practices such as stock exclusion and riparian management » rules to control activities such as intensive winter grazing, hill country cropping, and feedlots » direction on nutrient allocation » direction for the review of existing consents » a default regime for ecological flow and levels where none are set, and how minimum flows apply to existing consents.
RESOURCE MANAGEMENT ACT (RMA) AMENDMENTS	» 2018 RMA Bill – a narrow range of amendments. » Second phase; a more comprehensive review of the resource management system.
ALLOCATION OF FRESHWATER RESOURCES	» Gathering information to understand catchment-level water quality issues and land (especially Māori land) development constraints. » Developing options on discharge allocation and engaging with stakeholders. » Developing options on water take allocation and engaging with stakeholders.
FUTURE FRAMEWORK	» Extend good practice across farms, forests, and urban water management. » Target investment in solutions and in advice and tools to support decision-making. » Improved and nationally-consistent measurement and monitoring. » Support councils to undertake their roles.


2018
2019
2020
JULY – SEPT
OCT – DEC
JAN – MAR
APR – JUN
JULY – SEPT
OCT – DEC
JAN – MAR
APR – JUN
JULY – SEPT
Identify at-risk catchments and potential interventions, in discussion with Kahui Wai Māori, the Freshwater Leaders Group, and others
Develop and implement appropriate tools, or interventions, or incorporate into other workstreams
Track and monitor progress
Scope policy
Develop policy and draft Freshwater NPS amendments
Consultation and analysis
Amended Freshwater NPS in force
Engagement with Kahui Wai Māori, the Freshwater Leaders Group, and others
Scope policy
Develop policy
Consultation and analysis
Freshwater NES in force
Finalise drafting
Engagement with Kahui Wai Māori, the Freshwater Leaders Group, and others
Bill introduced
Parliamentary process [tbc]
Royal Assent [tbc]
Second phase of RMA amendments developed and introduced
Information gathering at the catchment level
Consultation, analysis and action
Engagement with Kahui Wai Māori, the Freshwater Leaders Group, and others
Engagement and development of elements

4. Working together

New Zealand's lakes and rivers need to be protected and restored, which can only happen if all water users and the Government work together.[4]

New Zealanders are up for the challenge – more than 80 per cent are committed to improving water quality for the benefit of future generations and around half say they take action to protect and improve water quality.[5]

Many of the changes needed to improve water quality, from upgrading stormwater systems in towns and cities, to reducing run-off across a catchment, cannot be done by individual New Zealanders, and this is where central and local government have a role.

The Government is committed to working inclusively to find solutions that are enduring and practical. To tackle the challenging issues ahead, the Government plans to bring experts from all sides together.

To date the Land and Water Forum and the Iwi Leaders Group have made significant contributions to improved understanding of the challenges in freshwater management and the issues that need to be addressed.

It is now time to make rapid progress towards substantial decisions.

To that end, the Government is setting up a network of advisors to test proposals and provide input on options, as set out below.

Essential Freshwater Taskforce from across government

A multi-agency taskforce of officials has been set up to advance the Essential Freshwater work programme as quickly as possible.

This taskforce includes representatives from the Ministry for the Environment, the Ministry for Primary Industries, the Treasury, Te Puni Kōkiri, Māori Crown Relations Unit, the Department of Internal Affairs, the Department of Conservation, the Ministry of Business, Innovation and Employment, and expertise from local government. Three Waters Review officials are included to ensure a joined-up approach between the work of the Taskforce and the Review.

Kahui Wai Māori

In early August, the Government announced its intent to establish a group to broaden the conversation with Māori on freshwater. This group is known as Kahui Wai Māori – the Māori Freshwater Forum.

This is not the only way the Crown will engage with Māori on freshwater. The Government will continue to consult more widely, including with the Iwi Leaders Group, before key decision points.

Kahui Wai Māori's role is to collaboratively develop and analyse policy options for consideration by Ministers. It will also provide input to the Three Waters Review.

*See **Kahui Wai Māori membership** on the Ministry for the Environment website.*

*See the companion document **Shared Interests in Freshwater** for more discussion on this group.*

Freshwater Leaders Group

Alongside the conversation with Māori, the Government is setting up a Freshwater Leaders Group to contribute to the discussion.

The Freshwater Leaders Group will include leaders from the primary sector and agribusiness, environmental non-government organisations, and other parts of the community. It is intended to have a member in common with Kahui Wai Māori and the Science and Technical Advisory Group. This group will also have a close connection to the Primary Sector Council, established in April 2018 to provide strategic advice to government on issues, opportunities and challenges facing the primary industries.

This group will provide a sounding board for policy, input ideas, challenge analysis, and lead discussion in various sectors.

*See **Freshwater Leaders Group Terms of Reference and membership** on the Ministry for the Environment website.*

4 ***Speech from the Throne***, 8 November 2017.

5 Colmar Brunton ***Environmental Attitudes Baseline research*** for the Ministry for the Environment, 2018.

Science and Technical Advisory Group

It is important to have a robust scientific evidence base for freshwater policy options.

External expertise is needed to explore and test approaches and to advise on science and policy work.

The Science and Technical Advisory Group will oversee the science evidence for freshwater policy development, including water quality attributes.

The establishment of this group draws on useful discussions between freshwater scientists earlier this year about policy development and the science behind the National Policy Statement for Freshwater Management (Freshwater NPS).

This group will provide scientific and technical advice on the Essential Freshwater work programme, and other Ministry for the Environment work. The group will have a role in ensuring the interpretation of the science for policy development is accurate and will help improve protocols to better manage incorporating science into the policy process.

See Science and Technical Advisory Group Terms of Reference and membership on the Ministry for the Environment website.

Regional councils

Regional councils are vital partners in improving freshwater quality, because of their links to local communities and their statutory role.

The Government will continue to work with regional councils, and other councils, to ensure options are practical and easy to implement. Ministers engage with elected representatives while officials work primarily with council staff.

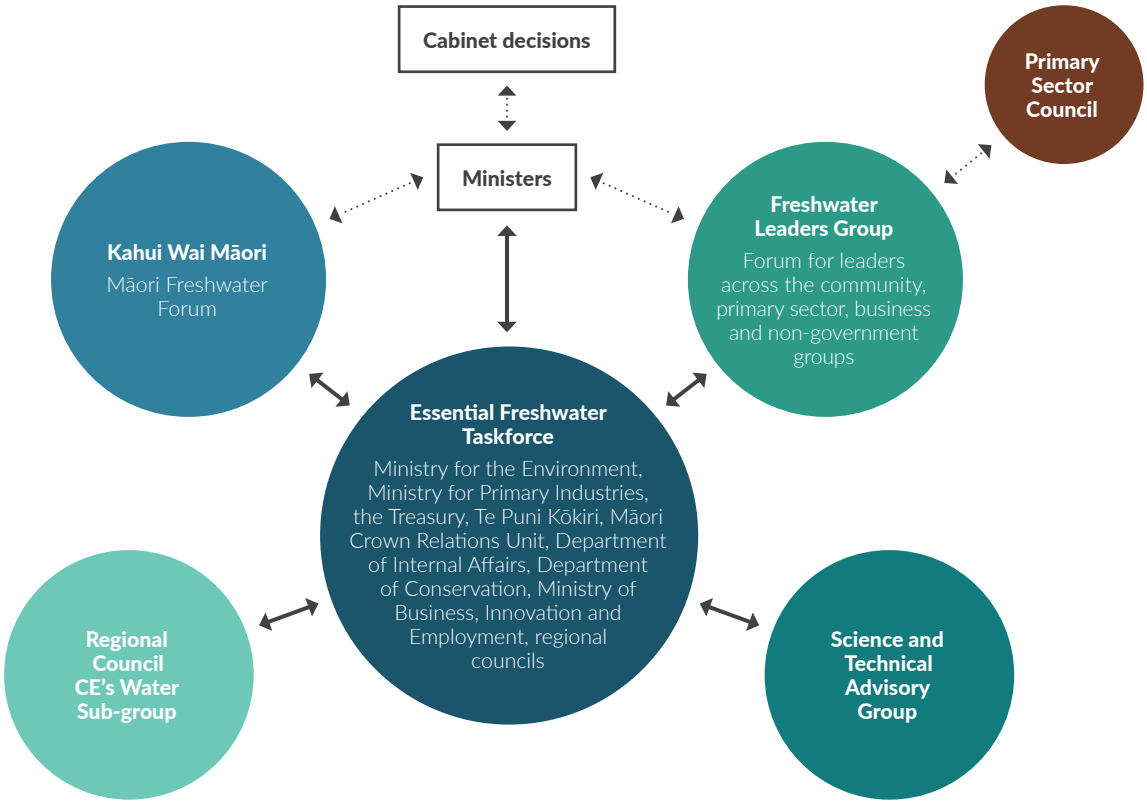
Regional council chief executives have a sub-group with a particular focus on water, and this group will also be involved in testing policy options before central government decision-making.

Wider opportunities for involvement

Beyond the advisory network, the Government intends to provide opportunities for public comment on specific proposals next year (2019).

The Government will also continue working proactively with Māori, regional councils, industry groups, NGOs, communities, and individuals on projects in at-risk catchments.

Working together to protect and restore New Zealand's freshwater



Riparian planting in Canterbury.

5. Principles

The Government has agreed to the following principles, to apply across the Essential Freshwater work programme.

- Ensure central government plays an effective leadership role on freshwater issues, while retaining appropriate decision-making at local government level.
- Establish policies and solutions that are enduring; which means they need to be science-based, reflect mātauranga Māori, be predictable, understood by the public, and underpinned by effective regulation and enforcement.
- Work with landowners, water users, Māori, communities, and local government to this end.
- Provide for flexibility and adaptability so that as knowledge and technology evolve and the climate changes, policy settings and rules can adapt.
- Promote an integrated approach to freshwater management, within catchments, across issues, and with the marine and coastal environment.
- Promote sound environmental outcomes, and in doing so seek to optimise social, cultural, economic development, and national identity outcomes.
- Address the rights and interests of Māori in freshwater and the development aspirations of owners of Māori freehold land, consistent with the Crown's Treaty obligations.
- Provide for intergenerational equity.
- Ensure the benefits of commercial water use are not captured solely by existing users, but that potential new users can access water so that water is applied to higher value uses with lower environmental impacts.

6. Freshwater policy future framework

To achieve the Government's goal of healthier waterways and freshwater ecosystems, New Zealand needs a coherent policy framework that will lead and drive widespread change in behaviour.

Some of the elements are already at least partially in place, but are not adequately safeguarding this essential resource. Progress overall has been patchy and too slow. It will take time to put a new framework in place, but it is important the Government has a clear vision to work towards.

*See **Appendix 1 – Cabinet paper: Restoring our freshwater and waterways** for more discussion of the challenges and system change required.*

The policy framework the Government is working towards is expected to have the following major elements:

- set freshwater objectives and limits catchment-by-catchment and develop integrated catchment management plans, with regional councils continuing to give effect to national policy statements and national environmental standards
- ensure good practice is applied everywhere – farms, forests, urban development, urban discharges (point sources of pollutants), and water infrastructure
- drive more fundamental change where on-going good practice will not be enough
- better target support from government to help landowners and others change
- invest in developing and disseminating solutions
- continuously improve the accuracy of monitoring, modelling and measurement of discharges
- support councils to undertake their roles, and systematically monitor their and the system's performance.

These elements are explored in detail in this section and will be further discussed with the advisory network and the public before final decisions are made.

Catchment-by-catchment

Regional councils would continue to set the outcomes (freshwater objectives) for their freshwater bodies, and 'limits' on resource use needed to achieve those outcomes as required under the Freshwater NPS. The Freshwater NPS would be strengthened, to ensure all aspects of ecosystem health are appropriately managed.

A reformed planning process would allow councils to plan, set and adjust limits/outcomes and implement decisions far more quickly, and with less litigation and better incentives for collaboration than the current system. This would require changes to the Resource Management Act 1991.

Integrated catchment management plans would provide the overarching guidance to help make practical decisions on:

- good practice priorities at farm/forest level
- investment in infrastructure
- where land-use change may be needed
- any targeting of central and local government assistance.

Good practice

All those who discharge pollutants to freshwater would be required to meet good practice. This includes farmers, growers, foresters, businesses, and urban authorities.

In the primary sector, Good Farming Practice Principles for water quality have been agreed and an action plan developed to accelerate their uptake. Some regional councils already require farmers and growers to adhere to Good Farming Practice Principles.

Fishing on the bank of Urenui River.

More consideration is required of how to ensure good practice is applied on every property, including identifying and prioritising actions, monitoring, and consequences if actions are not taken.

See more on good farming practice and farm plans on the Ministry for the Environment website.

All urban developers would also be required to meet good practice in water-sensitive design and in sediment management. Water-sensitive design principles are in development.

Good practice would also be required of:

- operators of wastewater systems and other infrastructure (eg, roading) discharging to or significantly affecting freshwater or freshwater ecosystems (including through the stormwater system)
- major commercial and industrial water users.

Structural change

In some places the ongoing application of good practice will not be enough to achieve the required improvements in water quality, nor will it enable fair allocation to all users including Māori. In those places more fundamental change will be needed, for example, stopping some commercial activities, land-use change, and introduction of 'game-changing' technology or management systems.

The options for driving this change may be a mix of regulatory restrictions and economic drivers such as pollution charges or trading regimes.

To successfully manage the necessary changes, it will be essential to involve those who may be affected in developing the options. This will happen initially through discussions with the advisory network in advance of wider discussion.

Better target support to make change

New Zealanders can and already are taking many actions to reduce their impact on freshwater and waterways; such as planting trees, cleaning up streams, and keeping pollutants out of drains.

Central and local government are already investing in some activities. For example, the Horizons Regional Council's sustainable land-use initiative has seen water quality for sediment and *E. coli* improve over the past 7-10 years.[6]

In the primary sector, there would be a systematic approach to helping farmers, growers and foresters achieve environmental goals, understanding what this would mean for their business, and how to make change successfully.

6 *Assessment of recent reductions in* E. coli *and sediment in rivers of the Manawatū-Whanganui Region*, LWP Ltd, February 2018.

This will be aligned with broader assistance as the land-based sector transitions to more sustainable land use.

*See **Cabinet paper: Aligning land-based sector work programmes** for more information.*

There could also be national training and certification for water sensitive urban design and three waters infrastructure providers to support sustainable urban growth. National certification programmes like those in the USA or Australia could serve as a model.

Investment in solutions

The more practical solutions/technologies available to reduce effects on water, the easier, cheaper and less disruptive it will be to make the changes that are needed.

The Government would better target existing science and research effort and consider increasing investment in finding, quantifying and informing people of solutions/technologies that can improve water quality. As new policies create commercial incentives to develop solutions/technologies, the need for government investment would diminish.

Improve measurement of discharges

In the primary sector, the Government would need to be confident that there was adequate investment in improving the scope and accuracy of estimated discharges and/or risk of discharges at the farm/forest level.

Both modelling options and direct measurement options would be explored. This could include improving greenhouse gas estimates at the farm level.

OVERSEER® is an established decision support tool to help farmers manage nutrient use. The Government has invested an additional $5 million over four years to improve the rigour of OVERSEER® to enable quicker adoption of environmentally friendly farm practices and to include a wider range of land types and farming systems.

Support councils

Councils would continue to play a key role in any future freshwater management system, and it is important they have the capability, competency, and funding to undertake their functions effectively. This includes guidance and support to undertake effective compliance, monitoring, and enforcement activity.

Government would more effectively monitor the performance of councils and the quality of their systems and decision-making.

Currently data collection on the performance of the freshwater management system and freshwater outcomes is *ad hoc* and patchy. A more systematic approach would be established so all agencies responsible for freshwater outcomes have the information they need to make informed decisions and adapt policy as necessary.

Transition

Moving to the framework outlined above cannot happen all at once, and a transition period is needed. This must be integrated and aligned with other changes intended to improve the sustainability of land and water.

The principles that would be applied in the transition to the future freshwater policy framework would be:

- prioritise and target effort to halt further decline, including of at-risk catchments
- provide time for an orderly transition for landowners, but minimise the time it takes to set policy
- clearly signal a pathway for how tightening requirements will apply over time
- front-load investment in finding, commercialising and disseminating solutions
- support resource users with practical and skilled advice and decision-making tools
- work in partnerships, especially with Māori and sector groups
- proactively seek commercial benefits from improving performance/system changes.

Whitewater kayaking at the Nga Awa Purua rapids, Waikato River.

7. Further reading

Companion document

» *Shared Interests in Freshwater– A New Approach to the Crown/Māori Relationship for Freshwater* (MfE website)

Background documents

» *Cabinet paper: Aligning land-based sector work programmes* (MPI website)

» *Kahui Wai Māori membership* (MfE website)

» *Freshwater Leaders Group Terms of Reference and membership* (MfE website)

» *Science and Technical Advisory Group Terms of Reference and membership* (MfE website)

» *Land and Water Forum* report *Land and Water Forum advice on improving water quality: preventing degradation and addressing sediment and nitrogen – May 2018* (LAWF website)

» *Freshwater: Resolving NPS-FM science differences briefing note* (MfE website)

» *A Vision to Restore the Environment speech* by Environment Minister Hon David Parker (Beehive website)

Appendix 1 – Cabinet paper:

Restoring our freshwater and waterways

IN CONFIDENCE

CAB-18-MIN-0296

Cabinet

Minute of Decision

This document contains information for the New Zealand Cabinet. It must be treated in confidence and handled in accordance with any security classification, or other endorsement. The information can only be released, including under the Official Information Act 1982, by persons with the appropriate authority.

Restoring New Zealand's Freshwater and Waterways

Portfolios **Environment / Agriculture**

On 25 June 2018, Cabinet:

Vision

1 **agreed** to affirm that:

1.1 freshwater is a precious and limited resource and a taonga of huge significance, and at the heart of what it is to be a New Zealander;

1.2 access to safe drinking water is a basic right, and drinking water sources must be safeguarded;

1.3 the life-supporting capacity of water is critical for the habitat of indigenous freshwater species and trout and salmon;

1.4 New Zealanders rightly consider they have a birthright to swim safely in New Zealand's rivers and lakes and at beaches, and that waterways should be fishable and safe for food gathering;

1.5 Mauri must be restored to waterways subjected to pollution and practices that have compromised the relationship that Māori have traditionally had with these taonga;

1.6 if each of New Zealand's local rivers is clean enough to swim in safely and life-supporting for freshwater species, then all New Zealand rivers will be;

Establishing a work programme

2 **agreed** that the government's work programme will be called *Essential Freshwater – Healthy Water, Fairly Allocated* (the Essential Freshwater work programme), and comprise three key parts:

2.1 *stopping further degradation and loss* – taking a series of actions now to stop the state of New Zealand's freshwater resources, waterways and ecosystems getting worse (i.e. to stop adding to their degradation and loss), and to start making immediate improvements so that water quality is materially improving within five years;

2.2 *reversing past damage* – promoting restoration activity to bring New Zealand's freshwater resources, waterways and ecosystems to a healthy state within a generation, including through a new Freshwater National Policy Statement and other legal instruments;

2.3 *addressing water allocation issues* – working to achieve efficient and fair allocation of freshwater resources, having regard to all interests including Māori, and existing and potential new users;

3 **noted** that everyone having access to safe drinking water is a further freshwater goal that will be worked on across the environment and local government portfolios;

4 **noted** that in support of the Essential Freshwater work programme, there will be processes to:

4.1 engage New Zealanders;

4.2 fix water and land use fundamentals;

4.3 track and demonstrate progress;

Adopting principles to guide work on freshwater

5 **agreed** that in advancing the government's Essential Freshwater work programme, the following principles will apply:

5.1 ensure that central government plays an effective leadership role on freshwater issues, while retaining appropriate decision-making at local government level;

5.2 establish policies and solutions that are enduring, which means they need to be science-based, reflect mātauranga Māori, predictable, understood by the public, and underpinned by effective regulation and enforcement;

5.3 work with landowners, water users, Māori, communities and local government to this end;

5.4 provide for flexibility and adaptability so that as knowledge and technology evolve, and the climate changes, policy settings and rules can also adapt;

5.5 promote an integrated approach to freshwater management, within catchments, across issues, and with the marine and coastal environment;

5.6 promote sound environmental outcomes, and in doing so seek to optimise social, cultural, economic development and national identity outcomes;

5.7 address the rights and interests of Māori in freshwater and the development aspirations of owners of Māori freehold land, consistent with the Crown's Treaty obligations;[1]

5.8 provide for intergenerational equity;

5.9 ensure that the benefits of commercial water use are not captured solely by existing users, but that potential new users also have access to water and its benefits;

[1] The phrase "rights and interests" is used as it is the term used by the parties and the courts in the Mighty River Power litigation: New Zealand Maori Council v Attorney-General [2013] 3 NZLR 31, though the nature of those rights and interests were not determined by the case.

IN CONFIDENCE

CAB-18-MIN-0296

Establishing a multi-agency taskforce

6 **invited** the Minister for the Environment and Minister of Agriculture to establish an officials' taskforce to implement the Essential Freshwater work programme, hosted by the Ministry for the Environment, and including representatives from the Ministry for the Environment, the Ministry for Primary Industries, Treasury, Te Puni Kōkiri, the Department of Internal Affairs, the Department of Conservation, the Ministry of Business, Innovation and Employment and the Ministry of Justice (Crown/Maori Relations), and expertise from local government;

7 **directed** chief executives to ensure that officials seconded to the Taskforce are of high calibre;

8 **noted** that the taskforce will be responsible for delivering specific areas of freshwater policy work that would otherwise be the responsibility of departments;

9 **noted** that the Essential Freshwater work programme will link to other key work the government is undertaking, including (as described in an earlier paper on *Aligning Land-Based Sector Work Programmes*, under CBC-18-MIN-0062):

9.1 forest establishment (one billion trees) – which provides opportunities to also deliver significant water quality improvements;

9.2 climate change policy – especially as it relates to agriculture and forestry;

9.3 Three Waters work, critical to improving water quality in urban areas – being led by the Department of Internal Affairs;

9.4 drinking water, and the government's response to the *Government Inquiry into Havelock North Drinking Water* – being led jointly by the Department of Internal Affairs and the Ministry of Health;

9.5 the Department of Conservation's current programme for protection and restoration of freshwater ecosystems and species;

9.6 regional economic development – being led jointly by the Ministry for Primary Industries and Ministry of Business, Innovation and Employment;

9.7 investment in science and technology;

9.8 the government's response to the report of the Tax Working Group on the role of the tax system in delivering positive environmental and ecological outcomes;

9.9 the Whenua Māori Programme, seeking to sustainably develop Māori freehold land;

Report back and publicity

10 **invited** the Minister for the Environment and Minister of Agriculture to report back to the Cabinet Environment, Energy and Climate Committee in September 2018 with an update on progress of the Essential Freshwater work programme;

11 **noted** that the Minister for the Environment and Minister of Agriculture intend to establish a Freshwater Leaders Group comprising senior leaders selected from across the land-based business sector, Māori, environmental interests, local government and academia;

I N C O N F I D E N C E

CAB-18-MIN-0296

12 **noted** that:

12.1 on 28 May 2018, the Cabinet Business Committee considered a related paper on *Aligning Land-Based Sector Work Programmes* [CBC-18-MIN-0062], which noted that the Minister for the Environment and Minister of Agriculture intended to establish a Ministerial group on sustainable land-based sectors;

12.2 this Ministerial group will provide oversight and leadership across the freshwater work outlined in the paper under CAB-18-SUB-0296;

13 **noted** that the paper under CAB-18-SUB-0296 will be proactively released, subject to any appropriate redactions.

Michael Webster
Secretary of the Cabinet

Hard-copy distribution:
Prime Minister
Deputy Prime Minister
Minister for the Environment
Minister of Agriculture

In Confidence

Office of the Minister for the Environment

Office of the Minister of Agriculture

Chair

Cabinet Environment, Energy and Climate Committee

Restoring our freshwater and waterways

Proposal

1. We seek Cabinet's agreement to an approach for restoring New Zealand's freshwater and waterways. We intend to pursue a work programme to stop further degradation, reverse past damage, and work toward addressing water and nutrient discharge allocation issues in New Zealand's freshwater management system.[1] We will provide an overall progress update to Cabinet in September 2018, and will brief and/or seek Cabinet decisions on specific issues as appropriate.

Executive Summary

2. This paper:

- summarises the state of our waterways, the main reasons for their decline, and the roles of key organisations (paragraphs 16 to 39);
- sets out relevant parts of our coalition and confidence and supply agreements (paragraphs 40 and 41);
- describes progress on freshwater since the change of Government (paragraphs 42 to 59);
- describes the challenges to addressing water issues (paragraphs 60 to 74);
- proposes principles for, and key parts of, a work programme on freshwater (paragraphs 75 to 77), and how the work programme can be structured (paragraphs 78 to 109); and
- proposes a multi-agency taskforce, using existing resources from across government, to work on the issues and specific deliverables (paragraphs 110 to 117).

3. We propose to call the programme *Essential Freshwater – healthy water, fairly allocated*. Stopping further degradation and loss of our freshwater resources is our first priority.

4. While the need to improve freshwater is primarily driven by environmental concerns, the economic consequences of poor water and land use are significant for New Zealand. The related paper '*Aligning land-based sector work programmes'* discusses

1 'Water and 'freshwater' are used interchangeably in this paper, and include surface water, groundwater and aquifer water. 'Waterways' generally refers to streams, rivers and lakes. The term 'water body' as used in the Resource Management Act 1991 (RMA) also includes wetlands and aquifers.

land use. Māori rights and interests[2] are also important, and these will need to be considered and addressed as part of the work programme.

5. The proposed taskforce would be led and hosted by the Ministry for the Environment (MfE). Chief executives would make high-calibre staff with key skills available for the taskforce, potentially from agencies such as the Ministry for Primary Industries (MPI), Treasury, Te Puni Kōkiri (TPK), MfE, Department of Internal Affairs (DIA), Ministry of Justice – Crown/Māori Relations, Department of Conservation (DOC) and Ministry of Business, Innovation and Employment (MBIE). Expertise from local government would also be seconded into the taskforce.

6. It is not proposed that work on three waters (drinking water, stormwater and wastewater) be included in the work of the taskforce, except where land use has effects on drinking water. The three waters work is being led separately by the Minister for Local Government and DIA.

7. Our freshwater work is one of a number of major initiatives the Government is undertaking that will drive sustainability in the land-based sectors. In the '*Aligning land-based sector work programmes'* paper, we outline proposals for Ministerial oversight and leadership across these initiatives, including the freshwater work programme outlined in this paper.

8. Many individuals and groups are making good progress towards stopping further degradation and loss of our freshwater resources and reversing past damage. We have the opportunity to get alongside and encourage them. However, we also need stronger regulatory instruments and other measures for those who need to change their practices and approaches, for example moving away from unsustainable farming systems, or investing in improved infrastructure and urban design.

Background

9. Freshwater is a precious and limited resource and a taonga of huge significance. Water is at the heart of what it is to be a New Zealander. Access to safe drinking water is a basic right, and drinking water sources must be safeguarded. The life-supporting capacity of water is critical for the habitat of indigenous freshwater species and trout and salmon.[3] Water underpins our agricultural and electricity sectors and is crucial for tourism.

10. New Zealanders rightly consider they have a birthright to swim safely in our rivers and lakes and at our beaches. These are favourite places of recreation. In summer, when flows are lower and most swimming happens, you should be able to put your head under the water without getting sick, not be at risk from toxic algae, and not get out covered in slime. Waterways should be fishable and safe for food gathering.

11. Iwi and hapū want to restore the mauri to waterways subjected to pollution and stop practices that have compromised the relationship they have traditionally had with these taonga.

12. If each of our local rivers are clean enough to swim in safely and life-supporting for freshwater species, then all of our rivers will be.

2 The phrase "rights and interests" is used as it is the term used by the parties and the courts in the Mighty River Power litigation: New Zealand Maori Council v Attorney-General [2013] 3 NZLR 31, though the nature of those rights and interests were not determined by the case.
3 Section 7 of the RMA requires particular regard to be given to 'the protection of the habitat of trout and salmon'.

13. In upland conservation areas with indigenous vegetation cover, freshwater quality is comparatively good. In many places elsewhere, freshwater biodiversity and resources are under great pressure with water quality continuing to decline, particularly in intensively farmed areas. The quality of water in urban areas is generally worse than non-urban areas. Although urban waterways account for a very small percentage of all New Zealand's streams and rivers, the impact can flow through to unswimmable rivers and urban beaches and have a substantial effect on the wider coastal environment.

14. At the last election people expressed their dissatisfaction with the state of our rivers and lakes and the policies that have led to water quality declining. There is a groundswell of public support for the Government to take the lead in doing better, building upon the strong environmental ethic of New Zealanders.

15. There is also opportunity to pursue higher value land uses with lower environmental impact, particularly using new technologies such as data-driven and automated management, robotics, and precision farming.

Freshwater in decline

16. Freshwater environments have been affected by a range of factors, including physical and hydrological modification, land use intensification, deforestation, and the introduction of non-native species.

17. The main cause of the decline in freshwater quality is runoff or leaching of nitrogen, phosphorus, sediment and pathogens (*E.coli*).[4] Nitrogen and phosphorus are essential nutrients on land, but too much of them in water triggers excessive growth of periphyton (slime) in rivers and toxic algae in lakes. While trees can protect erodible land, the harvesting of plantation forests can increase sedimentation risk, especially if done poorly or if the trees were in the wrong place to begin with.

18. Nitrogen (in nitrate form) is the nutrient of greatest concern in the freshwater environment. Over the past 10-25 years, nitrogen levels have increased in monitored rivers and lakes nationwide, with the most significant increases being in the Waikato, Canterbury, Southland and Otago. However, while elevated phosphorus levels remain a problem in many rivers, over twice as many monitored sites showed decreases in phosphorus levels as showed increases. Factors in this improvement were retirement of erosion-prone land from sheep and beef operations, fewer direct effluent discharges and a reduction in phosphorus fertiliser use.

19. Sediment reduces water clarity and smothers the beds of waterways to the detriment of freshwater species. Increased sediment has particularly impacted on the ecosystem health of estuaries such as those in Southland. Pathogens are introduced into waterways through animal excreta, polluted stormwater and leaky sewage pipes. Due to these pathogens, and the inadequacies in drinking water management identified in the Havelock North drinking water report, we have some of the highest rates of waterborne infections and illnesses in the OECD.

20. The pressures on freshwater are illustrated by the following:

- Between 1990 and 2012, the estimated amount of nitrogen leached from agriculture increased by 29 percent.

4 *E.coli* indicates the likely presence of pathogens such as campylobacter and cryptosporidium, but can itself sometimes be a pathogen.

- The increase in nitrogen load on land has been primarily due to an increase in nitrogen fertiliser use, and an increase in nitrogen from dairy cattle effluent (offset in part by a decline in sheep numbers).
- Between 1994 and 2013, nitrogen was worsening at more monitored river sites than improving (55 percent and 28 percent respectively).
- Between 1994 and 2016, the number of dairy cows nationally increased by 70 per cent (although numbers now appear to have peaked), and between 2002 and 2012 the area of dairy farm land doubled in Canterbury, Otago, and Southland.
- Between 2006 and 2015 there was twice as much deforestation (120,115 hectares) as afforestation (64,207 hectares).
- Between 2002 and 2017 the area of irrigated land increased by about 70 per cent nationally, with new technologies such as K-Line and centre pivots, but with poor control of resulting increases in farming intensity and ensuing environmental impacts.
- In the 2012-2016 period, 55 percent of nationally monitored lowland river sites were unsuitable for swimming due to *E.coli* levels.[5]
- In the 2012-2016 period, 18 percent of nationally monitored lakes were unsuitable for swimming due to *E.coli* levels. Additionally, lakes can be made unswimmable by high levels of toxic algae. (This led to Lake Taupō being closed to swimming at times this summer).
- Of the aquatic indigenous species reported on, three-quarters of fish, one third of invertebrates, and one third of plants are threatened with, or at risk of, extinction.
- Freshwater aquifers are being contaminated particularly with nitrogen. The highest concentrations are found in shallow wells in Canterbury, Waikato and Southland. Furthermore, nitrogen in groundwater is slow to reach aquifers, with nitrogen taking 50 years or more to travel through some catchments. If high nitrogen levels are present in drinking water, this can be a risk to the health of young infants e.g. ‘blue baby syndrome’ (methaemoglobinaemia).
- In a growing number of catchments, the volume of water allocated for people to use has reached or exceeded sustainable limits.[6]
- The first in first served water allocation model now risks locking underdeveloped land into its current use, which will disproportionately adversely affect Māori, whose lands, for historical reasons, are often underdeveloped.

21. Agricultural intensification is not only a dairy issue. In some areas intensive beef production is problematic, with poorly designed and managed intensive feedlots allowing sediment, nutrient and faecal pollution to enter streams, rivers and aquifers. On hill slopes, poorly managed intensive winter grazing causes similar but more widespread problems. This includes land practices like ‘spray and pray’, where slopes are sprayed off of vegetation, replanted in stock crops, and then heavily grazed in winter. Forest harvesting can also add significant sediment loads to waterways and single rotation horticulture crops can generate very high rates of nitrogen leaching.

5 The monitoring was for 136 river sites below 400 metres in elevation.

6 For example, of the 36 groundwater allocation zones in Canterbury where quantity limits have been set, 16 are at full allocation or over-allocated. There is also over-extraction from some waterways, especially smaller tributaries and streams.

22. The difficulties facing freshwater fish and invertebrates are not just from poor water quality, but also from habitat loss and barriers to fish migration from altered river flows and physical barriers (e.g. from irrigation takes, dams, culverts and flood control gates). Excessive nutrients promote algae and slime growth that can impede flows and smother stream beds that freshwater species depend on for food and habitat. These pressures together with sedimentation lead to biodiversity loss, and can particularly accumulate in the lower reaches of waterways, causing large and complex impacts.

23. Some 90 percent of wetlands have been lost since 1840, together with the ecosystem services they provide. Wetlands play a significant role in managing water quality. They capture sediment and phosphorus and cycle nitrogen, make landscapes more resilient to drought, and support a diverse range of ecosystems and species. Wetlands are highly significant to Māori. It is important to protect remaining wetlands, around 40 percent of which are on private and Māori land.

24. Sediment and weed growth are smothering estuaries and destroying shellfish beds. Effects extend out to sea, with coastal kelp beds and fisheries being adversely impacted by turbidity and pollution. Poorly flushed estuaries are particularly vulnerable to nutrients and sediment from freshwater flowing into them. Some estuaries contain legacy levels of sediment that will be difficult to mitigate with even minimal further land use intensification.[7]

Particular urban issues

25. Rivers in urban areas are closest to where most New Zealanders live. While there has been increasing control of industrial discharges and improved treatment of sewage, significant issues remain. Streams continue to be piped. Runoff from impervious surfaces such as streets, paved and roofed areas goes directly into remaining, often highly modified, waterways as stormwater. The resulting high and low flow extremes combined with modified stream banks, and lack of healthy riparian margins severely compromise in-stream biodiversity.

26. Stormwater also introduces sediment and many pollutants into waterways. These include heavy metals (such as copper and zinc) from brake pads, tyres, metal roofing, and industrial yards, and sediment from building sites and roadworks.

27. Poorly performing urban wastewater systems and networks also contribute to significant degradation of freshwater and coastal ecosystems.

28. Wet weather can see sewage overflowing into stormwater mains with sewage ending up in rivers and streams, or at beaches and in coastal waters where people recreate. This is an issue that has recently been highlighted in areas of Auckland. Stormwater management needs to improve, including completion of the separation of stormwater and sewerage systems.

29. There is evidence that upgrading urban sewage treatment plants and other large point sources to rivers can greatly improve water quality across an entire catchment or region. For example improvements to urban point source discharges across the Horizons region over the past decade have led to significant improvements in E.coli and suspended sediment concentrations. Because many of the discharges were located inland on large main-stem rivers, the improvements significantly contributed to an increase in the swimmable length of these rivers.

7 It is anticipated that a separate paper will be presented to Cabinet in due course on wetland and estuary protection. The proposed NPS on Indigenous Biodiversity could be an important tool for protecting wetlands.

30. In response to public pressure, Auckland Council proposes to bring forward a 30 year water quality programme to 10 years. The Council intends to invest an extra $856m over the next 10 years to reduce sewage flows onto city beaches by between 80 and 90 percent.

Hydro generation

31. Since mid-last century the natural flow characteristics of many of our major catchments have been significantly modified by the addition of hydro generation installations and related canal or diversion structures. The general effect has been to reduce variability in flow rates to an average significantly below natural peak flows.

32. Around 60 per cent of New Zealand's electricity derives from hydro generation, which relies on ready access to freshwater. The continued operation of this generation is critical to security of electricity supply, and to our 100 percent renewable electricity target and the reduction of carbon emissions.[8]

33. Hydro generation is enmeshed in our major catchments through a series of consents for water use granted under the RMA. This significant use will be an important ongoing consideration in freshwater policy.

Role of the RMA and councils

34. Under the Resource Management Act 1991 (RMA), water quality and use is managed by regional councils, as is the control of associated land use and activities within waterways including structures and reclamation.[9] Under the RMA, regional councils are responsible for safeguarding the life-supporting capacity of water.[10] With many waterways becoming degraded over the last 25 years, councils have been failing to fulfil this statutory duty.

35. The RMA sets the framework and central government provides further direction through national policy statements (NPSs) and national environmental standards. These collectively direct regional councils and territorial local authorities (district and city councils) what to include in their plans. In turn, these plans and resource consents tell users what they can and cannot do with water, and land adjacent to it. Water Conservation Orders are another form of protection that can be applied to waterways of national significance.

36. In 2006 the then Minister for the Environment initiated an NPS on Freshwater Management (Freshwater NPS). The resulting 2010 draft NPS, from a tribunal chaired by former Principal Environment Judge Sheppard, required strong action to stop clean rivers being made dirty, especially by agricultural intensification, and to clean up dirty rivers over a generation. That draft NPS was dropped by the National Government.

37. The Sheppard principles were not adequately reflected in the Freshwater NPS issued by the next government in 2011 (with revisions in 2014 and 2017) or in any other national instrument. Instead agricultural intensification continued, ruminant

8 See the NPS for Renewable Electricity Generation 2011, which gives direction on the benefits of renewable electricity generation, including hydro.
9 See sections 13 and 30(c) of the RMA.
10 See section 5 of the RMA, Purpose. Note that the term 'regional councils' includes unitary councils.

stock numbers increased, and significant deforestation occurred (partly due to degradation of the Emissions Trading Scheme).

Role of Department of Conservation and Minister of Conservation

38. DOC has a statutory function 'to preserve as far as is practicable all indigenous freshwater fisheries, and protect recreational freshwater fisheries and freshwater fish habitats'.[11] The Department also administers nearly one third of New Zealand's land area, which contributes significantly to the condition of freshwater ecosystems within and beyond public conservation lands.

39. The Minister of Conservation has responsibility for the New Zealand Coastal Policy Statement (NZCPS), which sets policies around coastal lagoons and estuaries. The Minister of Conservation is also responsible for the approval of regional coastal plans, which direct how regional councils will deal with the impact of freshwater flows on estuaries, beaches and the wider coastal environmental.

Government's commitments on freshwater

40. The Labour/New Zealand First coalition agreement commits the Government to:

- honour existing Crown Irrigation investment commitments;
- no resource rentals for water in this term of Parliament;
- introduce a royalty on exports of bottled water; and
- higher water quality standards for urban and rural areas, using measurements which take into account seasonal differences.

41. The Labour/Green confidence and supply agreement commits the Government to:

- provide assistance to the agricultural sector to reduce biological emissions, improve water quality, and shift to more diverse and sustainable land use including more forestry;
- safeguard our indigenous biodiversity by reducing the extinction risk for 3,000 threatened plant and wildlife species, significantly increasing conservation funding, increasing predator control and protecting their habitats;
- budget provision being made for significantly increasing the Department of Conservation's (DOC) funding;
- improve water quality and prioritise achieving healthy rivers, lakes and aquifers with stronger regulatory instruments, funding for freshwater enhancement and winding down Government support for irrigation; and
- the RMA being better enforced.

Progress on freshwater since change of government

42. The new Government has accelerated and expanded work on freshwater. Officials started work immediately on implementing the coalition agreement and the confidence and supply agreement. Officials are preparing advice on a range of options to improve water quality, achieve healthy rivers, lakes and aquifers, and protect wetlands and estuaries. Progress includes the following:

Towards a new Freshwater NPS

11 See section 6(ab) of the Conservation Act 1987.

43. We want to develop a new, more comprehensive and more effective Freshwater NPS as soon as possible, and officials are working on it and other supporting regulations. These will reflect the Sheppard principles referred to above (paragraph 36), and include controls on sedimentation (rural and urban), nutrient allocation, and land use intensification. Officials have made good progress on developing thresholds for sediment in freshwater ecosystems, including preliminary national bottom lines for water clarity, turbidity, and deposited fine sediment. Work is also underway on other water quality and ecological attributes for possible inclusion in the new Freshwater NPS.

Advice from the Land and Water Forum

44. We invited the Land and Water Forum (LAWF) to provide further advice (expected in June 2018) on whether there is a consensus view on how best to:

- allocate nutrient and sediment loads by catchment, in order to achieve fairness between existing capital investment and undeveloped land, while meeting science-based bottom lines; and
- implement this without repetition of the same underlying policy debate in each regional council area.

45. We also asked LAWF to give more detailed consideration of interim limits and measures, and provide us advice on what could be done between now and 2020 to prevent further damage – or using LAWF's words, what can be done to 'hold the line'. LAWF's advice will be taken into account in formulating government action.

46. As part of the development of the new Freshwater NPS, we are also open to receiving information directly from stakeholders not part of LAWF processes who wish to make contributions on these issues.

47. Many of LAWF's previous recommendations are not yet actioned, and officials are providing advice on whether or not to implement them.

Controlling agricultural intensification and excluding stock from waterways

48. We have asked officials to develop options to address the key issue of controlling agricultural intensification as soon as possible. This might be via a new national environmental standard.

49. Officials are also developing advice on compulsory exclusion of stock from waterways after draft regulations were put on hold by the previous government due to pressure from primary sector groups. Additionally we are seeking advice on regulating high risk land management practices such as intensive feedlots, 'spray and pray', and intensive winter grazing on hill slopes.

50. Advice is being sought on better protecting indigenous freshwater fish species, and better controlling sources of heavy metal pollutants.

Protecting wetland and estuaries

51. We are seeking advice on how better to manage wetlands and estuaries and integrate them into the regulatory system. There is substantial ongoing research to identify appropriate bottom line attributes for estuaries, and officials are also analysing mechanisms that could be used to enhance their protection.

Winding down public funding for large-scale irrigation schemes

52. In April 2018 the Government announced the winding down of public funding for large-scale irrigation schemes, while honouring existing commitments. This was on the basis

that such schemes should be economically viable on their own without requiring significant public financing. Also, they can lead to intensive farming practices that contribute to adverse environmental outcomes, including lower water quality.

Water bottling

53. Officials have provided initial advice on how to give effect to the Labour/New Zealand First coalition agreement to introduce a royalty on exports of bottled water. Work to date has involved information gathering and exploration of options. Further work is exploring the costs and implications of options.

Investing in key support tools

54. We are investing more in the crucial nutrient management software OVERSEER®. An additional $5m of funding has been provided in the 2018 Budget, to help ensure that nutrient management software performs well across a wider range of farms and regions, and provides farmers with more practical options to reduce their environmental impact.

Urban issues affecting freshwater

55. Officials are working to identify high priority pollutants and pressures on freshwater and coastal ecosystems related to urban land use. Issues in common with rural areas include E.coli and sediment. Additionally, urban streams suffer particularly from heavy metal pollution and the degradation of ecosystems through stream modification, like artificial channelling, and removal of riparian vegetation.

56. Officials are working with key stakeholders, including some councils, to establish a set of good management principles. These principles will guide councils, developers and others in managing urban water and development. This project is focusing largely on increasing the uptake of measures to improve ecosystem health, flood risk mitigation and general amenity through 'water sensitive urban design'.

57. There is also a range of connected government work programmes that relate to urban water outcomes. This includes the ongoing three waters Infrastructure Review (which is investigating how to achieve higher standards in the provision of drinking water and wastewater services and stormwater management) led by DIA, and work to increase housing capacity under the Urban Growth Agenda. We have asked MfE to explore how to align the efforts of these cross-agency projects so that they can contribute to good urban water outcomes.

Expectations of councils and stakeholders

58. Our overall message to stakeholders is that more needs to be done to address water quality, and more quickly. This includes better compliance, monitoring and enforcement, in respect of which draft guidelines setting out expectations for councils have been released for comment. A new unit is being established within MfE to oversee compliance with the RMA, with $3.1 million of funding announced for it in the 2018 budget.

59. We have also asked primary sector organisations and leaders to show greater leadership and commitment to improve freshwater quality. There has been a positive response. For example, DairyNZ has identified projects to demonstrate that the sector can work with other interested parties to lead and influence farmer behaviour and achieve more sustainable land use. These projects will provide insights about lifting dairy farming environmental performance across the country. Our officials are working with DairyNZ to develop these projects.

Comment

The challenges ahead

60. Degradation of freshwater, waterways and freshwater biodiversity is continuing. National direction on water quality and ecosystem health is partial only. Enforcement of existing rules is sometimes weak, as is reporting, monitoring, governance and accountability. There are no national standards for flow management. Water infrastructure in some urban areas is inadequate. Current management frameworks struggle to deal with the connections between freshwater and coastal environments. The rights and interests of Māori are not resolved.

61. Water allocation issues have not been adequately addressed. These include: the lack of effective claw-back mechanisms for fairly reducing takes in over-allocated catchments in a timely way; ensuring that water is applied to higher value uses; the needs of non-commercial users; and availability of water for the public good (for example, drinking water supplies).

62. As noted above, a Freshwater NPS was issued in 2011, with revisions in 2014 and 2017. Among other things, the Freshwater NPS sets a number of national bottom lines for attributes of water quality and requires councils to set limits to maintain or improve water quality. However, the Freshwater NPS is not comprehensive. For example, it does not adequately address sedimentation, other key water quality attributes such as dissolved oxygen and heavy metals, or allocation of water or nutrient discharges.

63. Despite these limitations, a number of regional councils have made progress on water issues, and most are some way toward implementing the current Freshwater NPS. There has also been progress through iwi, landowners, business groups and non-profits working collaboratively with local and central government to take voluntary actions.

64. Through a combination of market conditions and shifts in policy, the recent rapid expansion of dairying appears to have ceased, at least for now. Dairy herd numbers increased rapidly from 5.1 million in 2003 to 6.7 million in 2014, but have since fallen back to 6.5 million.[12] In the absence of a robust NPS, this trend was driven largely by economics and divorced from environmental outcomes.

65. Progress on freshwater overall has been patchy and too slow. The poor outcomes we are now experiencing are a result of many systemic failures and gaps across the current freshwater management system. Appendix 1 summarises these and describes the shifts needed to achieve an ideal future state. Some shifts may require legislative change or reform, others require public debate and discussion, and capacity and capability building in organisations.

66. Protecting and restoring our freshwater needs co-operation between water users, Māori, local government and central government. LAWF, for example, used a collaborative process to facilitate dialogue and consensus across stakeholders,[13] and this work contributed to the Freshwater NPS. However, some key – and contentious – issues have not reached consensus.

12 6.5 million dairy cows produce waste equivalent to about 90 million humans.

13 The LAWF is a sector initiative that started in 2009 and sought consensus solutions for water issues. The LAWF includes a range of stakeholders consisting of industry groups, electricity generators, environmental and recreational NGOs, iwi, scientists, and other organisations with a stake in freshwater and land management.

67. Collaborative processes take a 'bottom up' approach to problem solving, and have their pluses and minuses. The pluses are the achieving of acceptable compromise solutions among diverse interests for some (but not necessarily all) issues. The minuses are that collaborative processes can take a long time and be expensive, and can experience difficulty grappling with thorny issues. On water, these thorny issues include allocation, pricing, fairness between existing uses (with their sunk capital investment) and potential new uses on underdeveloped land. Government has a duty to govern by way of taking a more 'top down' approach in making decisions when consensus is plainly not achievable.

68. Achieving water quality improvements will require some adjustment in economic activity, particularly in land-based businesses. For example, improved farming methods will be needed to minimise losses of nutrients and pathogens to groundwater – employing more sophisticated and precise management and technology, and moving away from unsustainable farming systems. Lower impact land uses will be needed in some areas. Making these changes will sometimes come at a cost and require investment.

69. Continuing work is also needed with Māori to address their rights and interests in water.

70. Improving urban waterways will mean significant investment in improved infrastructure and urban design – not only the sewerage and stormwater pipes, but in such things as reducing impervious surfaces, reducing contaminants like heavy metals, sediment and litter, and restoring habitats.

71. Regulatory controls on freshwater inputs (including through the Freshwater NPS) need to be integrated with the Minister of Conservation's regulatory role over the coastal marine area through the NZCPS and approving regional coastal plans.

72. Many of the issues are challenging – technically, legally, economically, socially and culturally. For example, there are some gaps in science and information, with good information available for water quality of monitored sites, but gaps in data about other aspects of waterway health. Pollution sources are often diffuse and difficult to measure,[14] and cumulative in nature. Legacy issues exist, and commercial interests are at play. It takes time to engage and consult with stakeholders, who can hold strong and divergent views.

73. In short, there is some way to go to turn our ambition and the public's broad support for action on freshwater into a fully coherent policy framework, widespread change in behaviour, and healthier waterways and freshwater habitat. Meanwhile, as discussed below, there is a broad range of actions that can be taken within the RMA and water management systems as they currently stand.

74. We are determined to make significant progress in this term of government. Cleaner, healthier water will be good for the environment and freshwater life, and for all human users of water. We can leave a proper legacy for future generations.

14 'Point source' refers to a discharge coming from a single identifiable source, e.g. a pipe – whereas a 'diffuse source' is not specifically identifiable, e.g. runoff or leaching through the soil. Diffuse sources account for more than 95% of the nutrients that end up in freshwater.

Work programme: *Essential Freshwater – healthy water, fairly allocated*

75. We propose an *Essential Freshwater* work programme with three key parts:

- ***Stopping further degradation and loss*** – taking a series of actions now to stop the state of our freshwater resources, waterways and ecosystems getting worse (i.e. to stop adding to their degradation and loss),[15] and to start making immediate improvements so that water quality is materially improving within five years
- ***Reversing past damage*** – promoting restoration activity to bring our freshwater resources, waterways and ecosystems to a healthy state within a generation, including through a new Freshwater NPS and other legal instruments
- ***Addressing water allocation issues*** – working to achieve efficient and fair allocation of freshwater and nutrient discharges, having regard to all interests including Māori, and existing and potential new users.

76. We have an additional freshwater goal for everyone to have access to safe drinking water. This work will require work across the environment and local government portfolios.

77. We propose that, in advancing the *Essential Freshwater* work programme, the following principles apply:

- Ensure that central government plays an effective leadership role on freshwater issues, while retaining appropriate decision-making at local government level.
- Establish policies and solutions that are enduring; which means they need to be science-based, reflect mātauranga Māori, predictable, understood by the public, and underpinned by effective regulation and enforcement.
- Work with landowners, water users, Māori, communities and local government to this end.
- Provide for flexibility and adaptability so that as knowledge and technology evolve and the climate changes, policy settings and rules can adapt.
- Promote an integrated approach to freshwater management, within catchments, across issues, and with the marine and coastal environment.
- Promote sound environmental outcomes, and in doing so seek to optimise social, cultural, economic development and national identity outcomes.
- Address the rights and interests of Māori in freshwater and the development aspirations of owners of Māori freehold land, consistent with the Crown's Treaty obligations.
- Provide for intergenerational equity.
- Ensure that the benefits of commercial water use are not captured solely by existing users, but that potential new users can access water so that water is applied to higher value uses with lower environmental impacts.

15 These include rivers, lakes, aquifers, wetlands and estuaries, and the biodiversity they support.

Three key parts of *Essential Freshwater*

Stopping further degradation and loss

78. While freshwater degradation is likely to continue in some areas – where, for example, it can take many decades for increased nitrogen from land to show up in waterways – we want to act quickly to stop adding greater levels of pollutants and contaminants to stressed waterways.

79. We expect to make significant progress working within the existing legislative framework (although we would explore some legislative change in the short term if this was likely to generate substantial gains).

80. We have listed above under *Progress on freshwater since change of government* a range of issues that are already being worked on by officials and LAWF.

81. Other actions and policies that may help stop further degradation include:

- getting young people employed to work on improving the health of waterways;
- riparian management and planting on intensively managed land to filter and absorb silt and nutrients; and
- ensuring that urban development and infrastructure aligns with our freshwater goals, including completion of separation of sewerage and stormwater systems.

82. Many in the primary sectors recognise the need for change and are already driving that change, taking action on the ground that is halting further degradation. However, there are still others that need to change their practices.

83. We also propose to pilot and test new ways of working, highlighting and encouraging further sector leadership, and building evidence for future policy and/or investment such as demonstrating the Good Farming Practice: Action Plan for Water Quality; and exploring how best-practice sustainable land use can be recognised and encouraged.

84. The Primary Sector Council will have a chance to contribute ideas to achieving outcomes for freshwater and can be part of driving the work programme.

85. We will support council RMA implementation by identifying exemplary councils across varying aspects of good practice in water regulation and management, using those exemplars as a guide, and considering what further national direction on implementation may be appropriate. We will also develop good management principles to support water-sensitive urban design.

Reversing past damage

86. Reversing past damage will require a long-term programme to tackle the ongoing effects of past changes to waterways, including:

- physical characteristics of waterways (e.g. the effects of past channelisation and wetland severance);
- vegetation in catchments and riparian areas;
- pollutants that do not flush out naturally;
- weeds and pests; and
- reduced or lost ecosystems and species/populations.

87. DOC and councils are already active in some places, and many communities have embarked on freshwater ecosystem restoration initiatives such as for wetlands. There is also an active science effort to develop new techniques for assessing and improving waterway health.

Addressing water allocation issues

88. Progressing fair and effective allocation of the right to take water and discharge nutrients is becoming more pressing because:

- the increased scarcity of water resources reduces supply (in part, due to introducing limits on takes and discharges) at the same time as demand has increased;
- introducing limits means that decisions on how to allocate the rights to use resources are unavoidable – not making a decision is actually a decision for the status quo; and
- part of the approach requires addressing Māori rights and interests in freshwater including the development aspirations of owners of Māori freehold land.

89. The work will look for opportunities to increase the efficiency and fairness from the use of New Zealand's freshwater resources especially, through:

- incentivising reductions in wastage of water and minimising nutrient discharges;
- enabling higher value uses to access water and to discharge nutrients;
- the development and use of more adaptable and flexible tools to manage diffuse agricultural discharges;
- reducing the capitalisation of the right to use water or nutrient discharges into the value of the business/land; and
- enabling new users to access the rights to take water and discharge nutrients, including Māori landowners who own a disproportionately high percentage of under-developed land.

90. The work will also look at ways that the allocation system can support our work programme on stopping further degradation and reversing past damage.

91. The Crown has acknowledged Māori rights and interests in freshwater and has given assurances to the Supreme Court that the Crown will address these.

Support processes

92. In support of this work, we will need to:

- *Engage New Zealanders* – keep New Zealanders informed and involved, taking the public along with us as we stop further degradation and loss, reverse past damage, and address water allocation issues.
- *Fix water and land use fundamental*s – address systemic failures and gaps in the system for managing freshwater and land use; and establish solutions for water quality, use, allocation and storage that are effective, durable, and future-proofed for a changing climate; and work with the land use sectors to move toward higher value land uses with lower environmental impacts.
- *Track and demonstrate progress* – establish a framework of outcomes and indicators that tracks progress towards achieving our freshwater goals.

93. *Essential Freshwater* also needs to link to other major initiatives the Government is undertaking, including:

- Forest establishment – which provides opportunities to also deliver significant water quality improvements but can also increase sedimentation risks during and after harvest if not properly managed.
- Climate change policy – especially as it relates to agriculture and forestry and the risks posed by droughts and floods.
- The Three Waters work, critical to improving water quality in urban areas – being led by DIA.
- Drinking water, and the Government's response to the *Government Inquiry into Havelock North Drinking Water* – being led by DIA.
- DOC's current programme for protection and restoration of freshwater ecosystems and species.
- Regional economic development – being led jointly by MPI and MBIE.
- Investment in science and technology.

94. The work of the Tax Working Group (TWG) may also be relevant in terms of longer-term policy settings. The TWG is developing advice on the role of the tax system in delivering positive environmental and ecological outcomes. The TWG will provide its initial report in September 2018, and its final report in February 2019.

95. We propose reporting back to Cabinet in September 2018 with an update on progress on the *Essential Freshwater* programme.

Engage New Zealanders

96. The New Zealand public sees water-related issues as the most important environmental issue facing this country[16] with recent public opinion polls showing around three-quarters of New Zealanders are concerned about poor quality water and pollution of lakes and rivers.[17]

97. It is important that we keep New Zealanders informed and involved in the broad range of freshwater issues and take them with us as we stop further degradation of water, reverse past damage, and address allocation. Public dialogue to date has seen a particular emphasis on the impact of dairy intensification and exports of bottled water.

98. Community restoration programmes, both urban and rural, are an important way of engaging people in freshwater management, and helping them understand the complexities of catchment systems.

99. Farming groups, environmental non-government organisations, freshwater experts, Māori, the Primary Sector Council, stakeholders, and other influencers have a valuable part to play in public debate on water issues, and via direct input to the Government and officials.

16 Hughey, K.F.D, Kerr, G.N. and Cullen, R. 2016. Public Perceptions of New Zealand's Environment: 2016. EOS Ecology, Christchurch.

17 The Water New Zealand Consumer Survey 2017 shows 73% are concerned about poor quality in their waterways; Colmar Brunton research for Fish and Game New Zealand shows 75% are 'extremely' or 'very' concerned about pollution of lakes and rivers.

100. We propose to develop a public engagement programme, so that New Zealanders have the information they need to understand the challenges, complexities and opportunities in restoring our water quality. This will assist them to have input and take action on water quality issues.

101. The high level of public interest in freshwater quality also provides a way into a continuing national dialogue about the choices facing New Zealanders in shifting to a more environmentally sustainable society and economy given the fundamental role that freshwater management has in achieving this.

Fix water and land use fundamentals

102. As noted above and in Appendix 1, there are systemic failures and gaps across the current freshwater management system, many of which will require some time to work through. Fundamental governance, decision-making and planning issues may extend beyond freshwater management to the resource management and planning framework as a whole, and thus require broader legislative change.

103. Our proposed actions within the current system will directly inform the extent to which deeper reform may be required. This aligns with the proposed timeframe for the Urban Growth Agenda that is looking to make shifts in how the planning system operates within urban areas. In both these work programmes there will be parallel work streams which will focus on delivering within the current system, while considering what changes may be needed to the system as a whole.

104. A key issue is the pace, consistency and practice that councils are applying when implementing the Freshwater NPS. We are concerned that implementation is highly variable across councils and timeframes are too long in many cases.[18] We would like to see a regulatory framework that:

- accelerates timeframes for getting plans and new regulatory controls in place, especially those relating to water quality;
- reflects the public good aspects of freshwater management;
- avoids each proposed plan being challenged through the courts over essentially the same matters, wasting time and money;
- addresses the rights and interests of Māori including the development aspirations of owners of Māori freehold land; and
- allows much faster adjustments of rules in future in response to new science and technology.

Track and demonstrate progress

105. We will need to establish a framework of indicators, mapped against high-level objectives for freshwater, that track and demonstrate progress toward achieving our freshwater goals. As it can take a number of years for policies and interventions to translate into better water quality, it is important we are able to monitor whether these are affecting behaviours in the way we expect. This will also help us demonstrate progress to the public and stakeholders. Indictors might include such things as the percentage of waterways fenced, amount of erodible hill country afforested, or improvement in urban three waters infrastructure.

18 The average timeframe for a plan change is eight years, although it may take considerably longer.

106. Progress will also be tracked against the Government's overall goals for the land-based sectors, to which action on freshwater has linkages as discussed below.

Current working arrangements on freshwater

107. Within government, policy work on freshwater issues is currently being carried out by a joint Water Directorate of officials from MfE and MPI. The Directorate is located at MfE's premises, and comprises mainly MfE officials.

108. DOC has a broad range of statutory responsibilities for freshwater systems and operates at a policy and operational level. Further consideration is needed on how best to integrate DOC's policy work with that of MfE and MPI.

109. DIA is leading separate but related work on three waters (drinking water, stormwater and wastewater). The work aims to create a strong and sustainable three waters system with work streams focused across: regulatory and institutional settings; funding and finance; and capacity and capability. Addressing the increasing challenge of affordability for small communities in building and maintaining three water services will be an important consideration.

A freshwater multi-agency taskforce

110. The freshwater issues we need to resolve have strong linkages with the work the Government has initiated on sustainable agriculture, freshwater ecosystem restoration, rebuilding our regions, planting a billion trees over the next 10 years, and climate change. All this work is underpinned by the vision the Government has for our land-based sectors, which is the subject of a related Cabinet paper titled '*Aligning land-based sector work programmes'*. In that paper we outline proposals for a Ministerial Group on sustainable land-based sectors which would provide oversight and leadership across these key areas of work, including the freshwater programme outlined in this paper.

111. To advance our *Essential Freshwater* work programme we propose establishing a multi-agency taskforce, which would be directed to make recommendations as soon as possible on steps to achieve the three key parts of the programme.

112. The taskforce would bring together high-calibre officials with key skills from across agencies and local government to deliver a series of specific proposals for the Ministerial reference group to consider before putting them (as appropriate) to Cabinet. Relevant Ministers would require their chief executives to commit senior staff capacity to the taskforce.

113. Experience has shown that such approaches can expedite progress. To be successful the taskforce should:

- have access to expertise from agencies across the public sector;
- have clear and specific deliverables and timeframes for delivery and a strong mandate, with deliverables including detailed plans of action on land use, and technology / economic development opportunities;
- be able to engage Māori, and with key stakeholders, including through the Primary Sector Council;
- be made up of senior policy thinkers, selected by their respective departmental chief executives for their skills and experience who bring the expertise and viewpoint of their department and achieve resolution across government;

- have the necessary range of skills and disciplines, including strategic policy, science, legal and economic skills;
- have a flat management and governance structure, reporting to Ministers with as little hierarchy as possible; and
- be independent of any particular agency (except insofar as administrative arrangements are necessary).

114. The taskforce would be led and hosted by MfE. MfE would work with agencies such as MPI, Treasury, TPK, DIA, DOC, and MBIE to establish the taskforce. For example, the involvement of MBIE is relevant because resolving land use challenges will require the use of new technologies, commercial development, and maximising the economic development opportunities presented. The role of the Crown/Māori Relations Unit would need to be determined. The taskforce could also be assisted by a technical advisory group of experts, including freshwater scientists. Expertise from local government would also be seconded to the taskforce.

115. Members of the taskforce would liaise with the agencies from which they are drawn with the intention that allied work on land use practices and technology/economic development opportunities would be progressed at the same time. The timing for release of the results of the taskforce's work and allied initiatives would be coordinated as a signal of the whole-of-government approach being adopted.

116. It is not proposed that the work on three waters led by DIA, be included in the work of the taskforce, except to where land use has effects on drinking water.

117. We intend to establish a Freshwater Leaders Group to provide a sounding board for policy, input ideas, challenge analysis and lead their sectors. This group would be comprised of senior leaders selected from across the land-based business sector, iwi, environmental interests, local government and academia. Participation would be unpaid.

Consultation

118. The following Departments have been consulted and their views are reflected within this paper: Treasury; Ministry of Business, Innovation and Employment; Department of the Prime Minister and Cabinet; Te Puni Kōkiri; Ministry of Justice; Department of Internal Affairs; Land Information New Zealand; Crown Law Office; Ministry of Health; and Department of Conservation.

Financial implications

119. Policy work will be undertaken within baselines. There are no specific financial implications within this paper. If, once further policy work is undertaken, any proposals within this paper do have financial implications, these will be considered by Cabinet at that point.

Human rights

120. There are no human rights implications in this paper.

Legislative implications

121. Some of the proposals described above will require legislative or regulatory change to implement. This is likely to include amendments to existing regulations as well as new regulations under the RMA. We will provide further advice on each of the potential regulatory mechanisms in our report back in September 2018.

Regulatory impact analysis

122. There are no regulatory implications of this paper and a regulatory Impact analysis has not been prepared.

Gender implications

123. There are no gender implications in this paper.

Disability perspective

124. There are no disability implications in this paper.

Publicity

125. We propose that this paper be proactively released, subject to any necessary redactions. Our offices will jointly develop a communication plan prior to release.

Recommendations

We recommend that Cabinet:

Vision

1. **Affirm** that**:**

   1.1. Freshwater is a precious and limited resource and a taonga of huge significance, and at the heart of what it is to be a New Zealander;

   1.2. Access to safe drinking water is a basic right, and drinking water sources must be safeguarded;

   1.3. The life-supporting capacity of water is critical for the habitat of indigenous freshwater species and trout and salmon;

   1.4. New Zealanders rightly consider they have a birthright to swim safely in our rivers and lakes and at our beaches, and that waterways should be fishable and safe for food gathering;

   1.5. Mauri must be restored to waterways subjected to pollution and practices that have compromised the relationship that Māori have traditionally had with these taonga;

   1.6. If each of our local rivers is clean enough to swim in safely and life-supporting for freshwater species, then all of our rivers will be;

Establishing a work programme

2. **Agree** that the Government's work programme will be called *Essential Freshwater – healthy water, fairly allocated*, and comprise three key parts:

2.1. ***Stopping further degradation and loss*** – taking a series of actions now to stop the state of our freshwater resources, waterways and ecosystems getting worse (i.e. to stop adding to their degradation and loss), and to start making immediate improvements so that water quality is materially improving within five years

2.2. ***Reversing past damage*** – promoting restoration activity to bring our freshwater resources, waterways and ecosystems to a healthy state within a generation, including through a new Freshwater NPS and other legal instruments

2.3. ***Addressing water allocation issues*** – working to achieve efficient and fair allocation of freshwater resources , having regard to all interests including Māori , and existing and potential new users;

3. **Note** that everyone having access to safe drinking water is a further freshwater goal that will be worked on across the environment and local government portfolios;

4. **Note** that in support of the *Essential Freshwater* work programme, there will be processes to:

4.1. Engage New Zealanders,

4.2. Fix water and land use fundamentals, and

4.3. Track and demonstrate progress;

Adopting principles to guide work on freshwater

5. **Agree** that in advancing the Government's *Essential Freshwater* work programme, the following principles will apply:

5.1. Ensure that central government plays an effective leadership role on freshwater issues, while retaining appropriate decision-making at local government level;

5.2. Establish policies and solutions that are enduring, which means they need to be science-based, reflect mātauranga Māori, predictable, understood by the public, and underpinned by effective regulation and enforcement;

5.3. Work with landowners, water users, Māori, communities and local government to this end;

5.4. Provide for flexibility and adaptability so that as knowledge and technology evolve, and the climate changes, policy settings and rules can also adapt;

5.5. Promote an integrated approach to freshwater management, within catchments, across issues, and with the marine and coastal environment;

5.6. Promote sound environmental outcomes, and in doing so seek to optimise social, cultural, economic development and national identity outcomes;

5.7. Address the rights and interests of Māori in freshwater[19] and the development aspirations of owners of Māori freehold land, consistent with the Crown's Treaty obligations;

5.8. Provide for intergenerational equity; and

5.9. Ensure that the benefits of commercial water use are not captured solely by existing users, but that potential new users also have access to water and its benefits;

19The phrase "rights and interests" is used as it is the term used by the parties and the courts in the Mighty River Power litigation: New Zealand Maori Council v Attorney-General [2013] 3 NZLR 31, though the nature of those rights and interests were not determined by the case.

Establishing a multi-agency taskforce

6. **Invite** the Minister for the Environment and Minister of Agriculture to establish an officials' taskforce to implement the work programme, hosted by the Ministry for the Environment, and including representatives from the Ministry for the Environment, the Ministry of Primary Industries, Treasury, Te Puni Kōkiri, the Department of Internal Affairs, the Department of Conservation, the Ministry of Business, Innovation and Employment, and expertise from local government;
7. **Direct** chief executives to ensure that officials seconded to the Taskforce are of high calibre;
8. **Note** that the taskforce will be responsible for delivering specific areas of freshwater policy work that would otherwise be the responsibility of departments;
9. **Note** that *Essential Freshwater* will link to other key work the Government is undertaking including (as described in the related paper titled "*Aligning Land-based Sector Work Programmes*"):
    9.1. Forest establishment (one billion trees) – which provides opportunities to also deliver significant water quality improvements;
    9.2. Climate change policy – especially as it relates to agriculture and forestry;
    9.3. Three Waters work, critical to improving water quality in urban areas – being led by the Department of Internal Affairs (DIA);
    9.4. Drinking water, and the Government's response to the *Government Inquiry into Havelock North Drinking Water* – being led jointly by DIA and the Ministry of Health;
    9.5. The Department of Conservation's current programme for protection and restoration of freshwater ecosystems and species;
    9.6. Regional economic development – being led jointly by the Ministry for Primary Industries and Ministry of Business, Innovation and Employment;
    9.7. Investment in science and technology;
    9.8. The Government's response to the report of the Tax Working Group on the role of the tax system in delivering positive environmental and ecological outcomes; and
    9.9. Whenua Māori Programme, seeking to sustainably develop Māori freehold land;

Report back and publicity

10. **Invite** the Minister for the Environment and Minister of Agriculture to report back to Cabinet in September 2018 with an update on progress of *Essential Freshwater*;
11. **Note** our intention to establish a Freshwater Leaders Group comprising senior leaders selected from across the land-based business sector, Māori, environmental interests, local government and academia;

12. **Note** that the related paper '*Aligning land-based sector work programmes*' proposes to establish a Ministerial Group on sustainable land-based sectors which would provide oversight and leadership across the freshwater work outlined in this paper;

13. **Agree,** subject to any necessary redactions, that this paper be proactively released.

Authorised for lodgement.

Hon David Parker
Minister for the Environment

Hon Damien O'Connor
Minister of Agriculture

Appendix 1: Key Shifts Needed in New Zealand's Freshwater Management System, to an Ideal Future State

Current state …	In an ideal future state …
Governance and decision-making	
Central government has priorities that may be in tension with policies relating to freshwater, including between various national policy statements and standards under the RMA.	Central government's policies and priorities align so they work collectively to value the environment and freshwater more and optimise overall economic, social, environmental and cultural values.
The relationship between central government's broad policy and priorities and local government policy and priorities can be unclear and sometimes in conflict.	Central and local government policy and priorities are aligned and decision-making (including local plan development) is transparent and consistent and proportionate to the national significance of decisions being made.
There is a wide variation in the capability and performance of councils.	All councils meet good practice and have access to capable people.
There is a lack of transparency and public trust in consenting decisions.	There is transparency and public trust in the consenting system.
Māori rights and interests	
How to recognise Māori rights and interests is not yet fully resolved.	Māori rights and interests are recognised and provided for.
Planning framework (for freshwater and land use)	
The current planning process can in practice be sluggish, litigious, unresponsive to new information, and move only when situations become critical.	The planning process is proactive and facilitates/encourages timely responses to emerging evidence and trends. Parties have strong incentives to engage, reach and maintain consensus.
Existing users' expectations	
Existing users often assert that their current time-limited use / discharge rights are their property, and have expectations they will continue indefinitely.	It is clearly understood there is no right to pollute; and there is broad understanding that rights to use water / discharge do not endure perpetually, and changes to them should be expected – within appropriate frameworks.
Managing all aspects of water quality, quantity and ecosystem health	
Not all aspects of water quality, quantity and ecosystem health are considered in resource management decisions.	All key aspects of water quality, quantity and ecosystem health are considered, and where appropriate, are specified in regulatory instruments (such as an NPS).
Allocation and economic efficiency	
Many externalities are not factored into water and land use decisions, distorting investment and management decisions.	Relevant externalities are recognised and factored into investment and management decisions of water users and dischargers.
Science and information	
There are gaps in science and information and in tools to model outcomes	Key gaps in science and information are identified and addressed, and accurate tools are available to model outcomes.
Compliance, monitoring and enforcement	
Compliance, monitoring and enforcement and can be patchy and councils can under-invest in CME and be reluctant to take enforcement action	All councils have a culture of strong compliance action, including taking enforcement proceedings where appropriate.

Appendix 2 – Cabinet minute:

Aligning land-based sector work programmes

IN CONFIDENCE

CBC-18-MIN-0062

Cabinet Business Committee

Minute of Decision

This document contains information for the New Zealand Cabinet. It must be treated in confidence and handled in accordance with any security classification, or other endorsement. The information can only be released, including under the Official Information Act 1982, by persons with the appropriate authority.

Aligning Land-Based Sector Work Programmes

Portfolios **Environment / Agriculture**

On 28 May 2018, the Cabinet Business Committee:

1 **agreed** that the government's goal for the land-based sectors is that New Zealand becomes the world leader in the provision of high value, environmentally sustainable primary products and services, so that New Zealand land-based enterprises:

1.1 are profitable, resilient, confident and innovative;

1.2 benefit commercially from New Zealand's increasingly strong credentials as environmentally responsible and sustainable;

1.3 play a critical and respected role as part of the government's overall effort to create high-value primary sector exports;

1.4 move quickly to stop further degradation to New Zealand's environment and productive capacity;

1.5 are increasingly helping to reverse the damage previously done to New Zealand's environment and steadily reducing their contribution to climate change;

1.6 are socially responsible and remain able to support strong, resilient and prosperous rural communities;

2 **agreed** that in pursuing the goal outlined in paragraph 1 above, the government acknowledges and affirms:

2.1 the critical role and contribution of the land-based sectors to New Zealand's current and future prosperity, and the importance of these sectors to addressing global challenges, such as food supply, biodiversity loss, and climate change;

2.2 the increasing variability of climate, driven by climate change, which affects the land-based sectors;

2.3 the imperative to ensure land-based businesses are sustainable, resilient, adaptive, and market-led;

2.4 the significant cumulative change facing landowners, and the stress this will place on individuals, their families and rural communities;

2.5 the importance of on-going flexibility in land use, recognising that this must be aligned with landowners facing the true costs, and in particular the costs to the environment, of their decisions;

2.6 the critical role regulation can play, particularly where external costs are not, or cannot be, applied to businesses through prices;

2.7 that considerable work has been done in some local communities, and by the sector, councils, iwi, and central government to address environmental impacts, but that many of the most difficult problems have not yet been resolved, and that there is now a need for government leadership;

2.8 that Māori land has, for several reasons, been under-developed compared to other land, and that the government needs to:

2.8.1 recognise the potential of further developing Māori land and incorporating Te Ao Māori into land-based businesses;

2.8.2 provide for equitable development opportunities for Māori land, in line with the owners' aspirations;

2.9 that a just transition is needed to achieve sustainable land use, which the government will support fairly and effectively;

2.10 that New Zealand's technological expertise can be utilised and developed so as to maximise the economic opportunities born of new technologies and higher value land uses;

2.11 that while alteration of the environment through human and economic activity is unavoidable, aggregate or cumulative effects need to be sustainable across generations;

2.12 that no one has an intrinsic right to pollute;

3 **noted** that the Minister for the Environment and Minister of Agriculture intend to use the following groups to govern, oversee and align the government's initiatives on sustainable land-based sectors:

3.1 a Ministerial group, to provide overall governance and make connections across the government's relevant initiatives;

3.2 a supporting group of Chief Executives, to ensure the Public Service can deliver the government's ambitious work programme and aligns its activities with the goals for sustainable land use;

4 **invited** the Minister for the Environment, Minister for Agriculture, Minister of Forestry, Minister for Māori Development, Minister for Climate Change and Minister of Conservation to work with other relevant Ministers to establish the Ministerial group described in paragraph 3.1 above;

5 **directed** the Chief Executives of relevant government departments to work to align their relevant activities and priorities to support the goal outlined in paragraph 1 above, informed over time by the development of the pan-industry vision and strategy for the land-based sectors;

IN CONFIDENCE

CBC-18-MIN-0062

6 **noted** that the paper under CBC-18-SUB-0062 will be proactively released, subject to any appropriate redactions.

Janine Harvey
Committee Secretary

Present:
Rt Hon Jacinda Ardern (Chair)
Rt Hon Winston Peters
Hon Kelvin Davis
Hon Grant Robertson
Hon Phil Twyford
Hon Chris Hipkins
Hon Andrew Little
Hon Carmel Sepuloni
Hon Dr David Clark
Hon Nanaia Mahuta
Hon Stuart Nash
Hon Iain Lees-Galloway
Hon Tracey Martin
Hon James Shaw

Officials present from:
Office of the Prime Minister
Department of the Prime Minister and Cabinet

Hard-copy distribution:
Minister for the Environment
Minister for Māori Development
Minister of Agriculture
Minister of Forestry
Minister of Conservation

11.2. Government's New "Essential Water" Policy Framework

Prepared for:	Policy Committee
Report No.	PPRM1839
Activity:	Regulatory: Policy Development
Prepared by:	Sarah Gardner, Chief Executive
Date:	10 October 2018

1. Précis

To outline the Government's new "Essential Water" policy framework announced on 8 October 2018.

2. Background

The government has announced a new freshwater policy framework for New Zealand that is expected to show improvements in water quality in five years (2023).

The various policy initiatives are expected to be in place by 2020 and will be developed by the Essential Freshwater Taskforce which is a collaboration with the Ministry for the Environment, Ministry for Primary Industries, the Treasury, Te Puni Kokiri, Maori Crown Relations Unit, Department of Internal Affairs, Department of Conservation, Ministry of Business, Innovation and Employment and Regional Councils. They will be informed and supported by four new groups of partners and stakeholders, Kahui Wai Maori (Maori Freshwater Forum), Freshwater Leaders Group (includes community, primary sector, business and non-government group leaders), Science and Technical Advisory Group and a Regional Council CE's Water Sub-group.

A leading partnership conversation and approach within this new policy framework between the Crown and Maori is central to the policy framework. Cabinet have agreed that:

- The Crown and Maori have a shared interest in improving the quality of New Zealand's freshwater, including the ecosystem health of our waterways;
- The Crown and Maori have a shared interest in ensuring sustainable, efficient and equitable access to and management of freshwater resources;
- No one owns freshwater and we are all guardians of it;
- Maori have rights and interests in freshwater;
- Existing users also have interests in freshwater to be considered.

Importantly the Crown has committed to work with Maori and regional government to consider how freshwater resources can be accessed fairly for the development of under-developed land based on the following principles;

- The need to gather key catchment-level information on water-related Maori land development opportunities and the current situation in those catchments;
- Any change to existing allocation method is achieved in a way and at a pace that takes into account the interests of existing users and the public interest in optimal use of the resource;
- The need to ensure solutions for water meet sustainable limits for swimmability, ecological health and human health.

3. Policy Framework Summary

3.1 Objectives

The objectives of the new policy framework are:

- Stopping further degradation and loss (including making immediate improvements);
- Reversing past damage (using a new NPS for Freshwater Management and other legal instruments);
- Addressing water allocation issues (efficient and fair allocation of freshwater and nutrient discharges).

3.2 Actions

There are five key actions that form the framework for the Government's policy approach to Freshwater moving forward. They are:

- **At risk catchments** – this assessment is already underway and has been informed by catchments selected by regional councils as those at a tipping point. The work involves assessing what can be achieved with current rules in each catchment, where new regulation might be needed and where investment might be targeted e.g. Hill Country Erosion Fund or Billion Trees Programme.

- **National Policy Statement for Freshwater Management (NPS FM) amendments** – based on the original NPS FM Sheppard principles. It is to improve regional planning by ensuring all aspects of ecosystem health are managed and will give direction on proceeding where there is uncertainty. Changes may impact timeframes for implementation, direct how to set limits on resource use and further protect wetlands and estuaries. Other possible inclusions may be instruments to direct at risk catchment action, require good management practice, improve urban catchment management and protect sources of human drinking water. It is likely to include mechanisms to consider sediment, copper and zinc and dissolved oxygen in freshwater and to resolve exceptions to national bottom lines. Public consultation on the NPS FM will occur during 2019.

- **New National Environmental Standard (NES) for Freshwater** – this will provide direction on resource use. It may prohibit activities or restrict impacts on wetlands or urban streams. It is expected to regulate hill country cropping, winter grazing and feedlots. Potential mechanisms for managing intensification, a default regime for ecological flows and determination on how minimum flows will apply to existing consents are under consideration. The NES will be consulted on publicly in 2019.

- **Resource Management Act amendments** – these amendments are to be made quickly and a Bill is due to be introduced into the house either late in 2018 or early 2019. It will better enable regional councils to review consents, to more quickly implement the limits required by the NPS FM and will strengthen enforcement tools.

- **Allocation of freshwater resources** – considers takes and discharges. Work will be undertaken with the Kahui Wai Maori and Freshwater Leaders Groups and others to explore options for a fair and efficient allocation system. Issues and options for discharge allocation and for water take allocation will be developed and consulted on between now and 2020.

In addition to the five key areas above, related work will continue and includes the Three Waters Review, the establishment of a Compliance Oversight Unit to improve Council enforcement of the Resource Management Act, the Sustainable Food and Fibre Futures Fund and One Billion Trees programme amongst other policy work.

It is anticipated that the future framework for freshwater management in New Zealand will result in extended good practice across farms, forests and urban water management, target investment in solutions and tools to assist, improve the measuring and monitoring of impacts and support councils in their roles.

The framework recognises that in some places the above key actions and areas of focus will be insufficient to achieve the policy objectives. This may mean more direct action is taken such as stopping some commercial activities, land-use change, and introducing technology and management systems. Some of this might be achieved through regulatory restrictions and some economic levers such as pollution charges and trading regimes.

The Government has signalled a transition will be needed to implement and integrate this new framework. It expects a transition to:

- Prioritise effort in at risk catchments;
- Provide time for landowners to transition but to minimise the time it takes to set policy;
- Signal how tightening requirements will apply over time;
- Front load investment in solutions;
- Support resource users with practical and skilled advice and tools;
- Use working together in partnerships;
- Seek commercial benefits from improvements and changes.

4. Impacts for Otago

Little time between the announcement and the circulation of this paper means we have not undertaken a full assessment of impacts on our region. We suggest we do this for the next committee round.

5. Recommendation

a) That Council note this report; and

b) That Council ask the Director Policy, Planning and Resource Management to provide an analysis of the impacts of this new policy framework for Otago and this Council to its Policy Committee in November 2018.

Endorsed by: Sarah Gardner
Chief Executive

Attachments

1. Essential Freshwater - New Government Policy Framework **[11.2.1]**
2. Shared Interests - New Government Policy Framework **[11.2.2]**

PATHWAY DRAFT PROGRESSIVE IMPLEMENTATION PLAN

Otago Regional Council

NATIONAL POLICY STATEMENT FOR FRESHWATER MANAGEMENT

The National Policy Statement for Freshwater Management 2014 (amended 2017) identifies that the quality, health, availability and economic value of fresh water, both surface and groundwater, in New Zealand is under threat and gives direction to regional councils to manage water in an integrated and sustainable way.

Regional councils are required to implement the policy 'as promptly as is reasonable in the circumstances', so that it is fully implemented no later than 31 December 2025 or by extension, December 2030. A staged approach can be adopted with public notification.

This timeline shows our intended staged approach.

BY APRIL 2019

ESTABLISH FRESHWATER MANAGEMENT UNITS (FMUS)
Objective CA1 and Policy CA1 outline the process for setting Freshwater Management Units. This would be confirmed by Council resolution.

COMMENCE FEBRUARY 2019

DEVELOP FRAMEWORK FOR WATER MANAGEMENT IN OTAGO

- S79 review of Water Plan, including three waters, starting Feb 2019
- Land use gaps identified by July 2019
- Stocktake and gap analysis of water plan against the NPSFM, NES Drinking Water, completed by April 2019
- Analysis and alignment with Rural Water Quality Strategy, where practical

BY AUGUST 2019

TECHNICAL AND SPECIALIST WORK PROGRAMME TO UNDERSTAND BASELINE KNOWLEDGE
Stocktake of baseline information for each Freshwater Management Unit (FMU)

COMMENCE AUGUST 2019

TECHNICAL AND SPECIALIST WORK PROGRAMME IDENTIFIED AND COMMENCED TO SUPPORT LIMIT SETTING
Building on the values to understand the technical work programme required to set objectives and limits

COMMENCE OCTOBER 2019

VALUES CONVERSATION
Policy CA2 outlines the value setting process involving conversations with community and stakeholders to identify values, and set objectives and limits

PLAN REVIEW NOTIFIED DECEMBER 2025

BOARD OF INQUIRY

Proposed National Policy Statement for Freshwater Management

Report and Recommendations of the Board of Inquiry into the Proposed National Policy Statement for Freshwater Management

Prepared in January 2010
by the Board of Inquiry into the Proposed National Policy Statement
for Freshwater Management

In the Matter of the Resource Management Act 1991

And

In the matter of the Inquiry into the Proposed National Policy Statement for Freshwater Management

THE BOARD OF INQUIRY

Judge David Sheppard (Chair)
Associate Professor Jon Harding (Member)
Mr Kevin Prime (Member)
Mrs Jenni Vernon (Member)

REPORT AND RECOMMENDATIONS OF THE BOARD OF INQUIRY

Contents

INTRODUCTION

Preparation of the proposed national policy statement and appointment of Board of Inquiry

[1] In November 2006, the Minister for the Environment ("the Minister") determined that it is desirable to issue a national policy statement on freshwater management. Having sought and considered comments from the relevant iwi authorities and the persons and organisations that he considered appropriate,[1] the Minister prepared a national policy statement on management of fresh water. The Minister chose to use the process set out in sections 47 to 52 of the Resource Management Act 1991 ("RMA", or "the Act"), and appointed a board of inquiry to inquire into, and report on, the proposed national policy statement ("the proposed NPS").

[2] The role of the Board of Inquiry ("the Board") has been to:

- inquire into the proposed NPS;
- consider all submissions made and all evidence given on the proposed NPS; and
- report to the Minister on the contents and subject matter of the proposed NPS, including making recommendations about amendments to the content of the proposed NPS so that it will more fully serve its purpose and the purpose of the RMA.[2]

[3] A copy of the proposed NPS prepared by the Minister is at Appendix A. The Minister provided the Board with terms of reference, a copy of which is at Appendix B.

Public notification and making of submissions

[4] On 21 August 2008, the Board decided to publicly notify the proposed NPS. The Board also decided to invite the making of written submissions on the proposed NPS during a period closing on 23 January 2009; and to allow the making of further submissions supporting or opposing submissions, after a summary of the primary submissions was published. The proposed NPS was publicly notified on 20 September 2008.

[5] The Board received 149 submissions on the proposed NPS; and having published a summary of the primary submissions, invited the lodging of further submissions supporting or opposing primary submissions during a period closing on 14 April 2009. The Board received 30 further submissions.

Hearing and consideration of submissions

[6] On 21 days during the period from 30 June 2009 to 18 September 2009, the Board conducted public hearings of submissions and further submissions, at which 80 submitters took part.

[7] Having completed the inquiry hearing, the Board, in accordance with section 51 of the RMA, considered:

a) the relevant contents of Part 2 of the RMA;

b) the proposed NPS;

c) the submissions and further submissions received;

d) the evidence presented at the inquiry hearing; and

e) other relevant matters raised by submitters.

[8] Section 51(1)(ca) of the RMA also requires the Board to consider any additional material provided by the Minister under section 47A(1)(b) of the RMA. No such material was provided to the Board.

Report of the Board of Inquiry

[9] The terms of reference provided to the Board outline matters to be explicitly addressed in its report to the Minister, as follows:

> The Board shall provide, in its report:
> - recommendations on the wording of the proposed NPS, including the objectives and policies;
> - recommendations on how councils should give effect to the proposed NPS pursuant to section 55;
> - reasons for the content of its report and recommendations.
>
> The report and recommendations may also address:
> - the internal consistency of the proposed NPS as a whole, and ways to address any potential inconsistencies;
> - the level of certainty or clarity provided by the proposed NPS, and if this is inadequate, ways to improve it;
> - the removal or further refinement of issues, objectives and policies where this is appropriate for achieving the policy approach of the proposed NPS;
> - the identification of any unintended or unforeseen, but likely outcomes of the proposed NPS, and ways to address these;
> - whether or not some of the changes needed to regional policy statements, district or regional plans would be best achieved via direct insertion into the regional policy statements or plans pursuant to section 55(2A)(b) of the RMA, and if so what those provisions should state.

[10] Having considered the matters outlined in paragraph [7] above, the Board has prepared this report, which contains its recommendations, and which is made to the Minister in terms of section 51(2) of the RMA within the terms of reference set by the Minister.

Endnotes

1 Invitations to comment were sent to 300 iwi organisations and other stakeholders in freshwater management.

2 Terms of reference for board of inquiry on the proposed National Policy Statement for Freshwater Management.

GENERAL TOPICS

Content of national policy statement

[11] The purpose of national policy statements under the RMA is to state objectives and policies for matters of national significance that are relevant to achieving the purpose of the Act.[3] A national policy statement can direct[4] a local authority to amend a document in a class identified in section 55(1) of the RMA[5] to include specific objectives and policies set out in a national policy statement, or so that objectives and policies specified in a document give effect to objectives and policies specified in a national policy statement. A local authority has to make those amendments without using the notification and hearing process in Schedule 1 of the Act.[6]

[12] A national policy statement may also include transitional provisions for any matter, including its effect on existing matters or proceedings.[7]

[13] Four main matters of national significance for which the proposed NPS states objectives and policies can be inferred from the preamble as being:

- challenges, of varying degrees and causes across regions, in ensuring there is sufficient water in lakes, rivers and aquifers; and
- ensuring that society gains the greatest benefit from the allocation of available water; and
- limiting and remediating degradation of water quality; and
- improved integrated management of freshwater resources.

[14] The preamble also records the Crown's recognition of a particular need for clear central government policy that directs local government to implement measures necessary to achieve stated goals. Those goals are embraced by the matters of national significance outlined in paragraph [13].

[15] A fifth matter of national significance that became evident during the Board's hearing of the inquiry was the protection of wetlands from further degradation and loss as a result of human activities.

[16] The objectives and policies of the NPS are to be relevant to achieving the purpose of the Act. That purpose is to promote the sustainable management of natural and physical resources. In that context, sustainable management is given the meaning identified by section 5(2) of the RMA:

> In this Act, sustainable management means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while –
>
> (a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
>
> (b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

[17] In this context *natural and physical resources* include fresh water;[8] *effect* is to be given a broad meaning that includes positive and adverse effects, cumulative effects, and potential effects of low probability which have a high potential impact;[9] and *environment* is given a broad meaning that includes ecosystems and their constituent parts, including people and communities; amenity values; and social, economic, aesthetic, and cultural conditions which affect them.[10]

[18] Application of section 5 involves a broad judgement as to whether a proposal promotes sustainable management of natural and physical resources, recognising that the Act has a single purpose and allowing for comparison of conflicting considerations, their scale and degree, and their relative significance or proportion.[11]

[19] Therefore, the Board's consideration of the submissions on the proposed NPS is not a broad review of the management of fresh water. It is to be guided and constrained by the RMA, and to lead to decisions specifically for the promoting of sustainable management of natural and physical resources, including fresh water.

[20] Those who made and presented submissions on the proposed NPS differed on the application of the purpose of the Act to the instrument.

[21] Many wanted positive direction or guidance, placing particular focus on the elements described in paragraphs (a), (b) and (c) of section (5)(2). They contended that the NPS should not avoid making hard decisions between competing values and goals, but should articulate national priorities. They argued that favouring economic well-being, at the cost of declining quality and quantity of fresh water in the environment, would not be balanced; and urged that a national policy statement should focus on the elements in paragraphs (a) to (c) because of their particular relevance to the subject matter of freshwater management.

[22] Other submitters disagreed, arguing that this would displace or downgrade the enabling of people and communities to provide for their economic well-being.

[23] The scope of sustainable management described in section 5(2) identifies several goals and values reflecting aspirations and interests of different sections of the public. In applying the concept of any particular subject matter, some of the identified elements may be inconsistent or even in conflict with others. In general, a decision-maker has to come to a judgement that reflects all the identified aspirations and values that are relevant.

[24] The Board considers that, to be effective in giving positive direction to local authorities so as to achieve goals identified as being of national importance, a national policy statement may need to place emphasis on particular elements of sustainable management. That would not be to subdue, let alone evade, other elements of the given meaning of sustainable management, such as those enabling economic activity. Rather, in the circumstances of a national policy statement it would give effect to the word *while*, by which the managing of resources for the enabling elements of

sustainable management is constrained by the sustaining, safeguarding, and effects-based elements in paragraphs (a), (b) and (c).[12]

Freshwater resources

[25] Throughout the proposed NPS reference is made to the management of *freshwater resources*, the meaning of which includes fresh water in rivers, lakes, wetlands and groundwater, but excludes water in ephemeral streams and artificial watercourses. The exclusion of ephemeral streams and artificial watercourses was a subject of many submissions, and a number of submitters also requested that the meaning of the term reflect the RMA definition of fresh water. Reference to *freshwater resources* was seen by some submitters as weighting the proposed NPS towards the enabling elements of sustainable management.

[26] The Board accepts that the NPS should use terms that are clear in meaning, and (when practicable) consistent with meanings given to them by the RMA.

[27] The use of *resources* throughout the proposed NPS implies that fresh water is something to be used for economic gain, which the Board does not consider appropriate in the context of the matters of national significance that have been identified. However, the Board recommends that the policy on setting environmental flows and levels not apply to ponds and naturally ephemeral water bodies.

[28] The Board uses the term *fresh water* as defined in the RMA, and uses *freshwater ecosystems* and *freshwater processes* where appropriate in the objectives and policies in the NPS.

Need for positive direction

[29] A number of submitters requested the NPS be outcome-oriented rather than process-oriented. Submitters identified problems with a process-based approach, including:

- lack of clarity and understanding of, and clear guidance on, the issues that need to be addressed;
- limited flexibility for councils to deal with regional issues and to determine the most appropriate methods for addressing them;
- a lack of recognition of the progress that has already been made in freshwater management around the country;
- a 'one-size-fits-all' approach that would impede strategic and innovative freshwater management approaches, and would not allow approaches other than regulation that may be more suitable and effective;
- a lack of clarity of intent or meaning, leading to lengthy interpretive debate.

[30] Other submitters noted that difficulties have been identified with existing planning processes, but that the proposed NPS continues to rely on these processes to achieve its aims.

[31] A common theme of many of the submissions was that the NPS should provide national direction by identifying national issues and national goals.

[32] As a national policy statement is a subordinate instrument under the RMA, its objectives and policies have to be relevant to achieving the purpose of the RMA, that is, the sustainable management of natural and physical resources.

[33] Requests by submitters for national guidance recognised that, for a variety of reasons, issues relating to freshwater management are not being fully addressed by local government. Requests for positive direction were driven by a desire for guidance on how those issues are to be addressed, combined with a request that national priorities be set for the most important issues.

[34] The Board agrees with submitters that the NPS should make a difference to freshwater management. The focus should be on improving outcomes for fresh water. The management process to achieve this should be included, but should not be the focus of the NPS.

[35] The Board acknowledges some councils are making notable advances in managing fresh water, but it considers that nationally there is a need to phase out over-allocation and contamination of fresh water. The RMA processes for the management of water are already being followed, but the NPS needs to state objectives as goals for these processes to achieve.

[36] Improvements in fresh water by phasing out over-allocation and contamination require that fresh water is used for enabling economic well-being only while, and to the extent that, the life-supporting capacity of water and its associated ecosystems is fully safeguarded, and the potential to meet reasonably foreseeable needs of future generations is fully sustained. In this way the requests for setting national priorities for the most important issues would be met.

Key national values of fresh water

[37] A number of submitters requested the NPS identify key national values with respect to management of fresh water, and provide clear national direction about the values to be given additional weighting in freshwater management.

[38] The Board agrees that identifying national values of fresh water in the NPS would be useful. The Board recommends that the NPS identify issues of national significance that are to be addressed, and sets national objectives and policies for achieving sustainable management.

[39] The Board has identified specific values from the RMA itself, the proposed NPS, and submissions and evidence presented to the Board.

[40] The national values of fresh water can usefully be classified in two groups:

1. values for which people and communities make use of water for their own well-being and amenity, for example:
    a) domestic drinking and washing water;
    b) animal drinking water;
    c) community water supply;
    d) fire fighting;
    e) hydro-electricity generation;
    f) commercial and industrial processes;
    g) irrigation;
    h) recreational activities (including waka ama);
    i) food production and harvesting, e.g. fish farms and mahinga kai;
    j) transport and access (including tauranga waka);
    k) cleaning, dilution and disposal of waste.
2. values that relate to recognising and respecting fresh water's intrinsic values for safeguarding the life-supporting capacity of water and associated ecosystems; and sustaining its potential to meet the reasonably foreseeable needs of future generations. These are instances of intrinsic values of fresh water:
    a) the interdependency of the elements of the freshwater cycle;
    b) the natural form, character, functioning and natural processes of water bodies and margins, including natural flows, velocities, levels, variability and connections;
    c) the natural conditions of fresh water, free from biological or chemical alterations resulting from human activity, so that it is fit for all aspects of its intrinsic values;
    d) healthy ecosystem processes functioning naturally;
    e) healthy ecosystems supporting the diversity of indigenous species in sustainable populations;
    f) cultural and traditional relationships of Māori with fresh water, including mauri, waahi tapu, wai taonga, recognised customary activities and spiritual values;
    g) historic heritage associations with fresh water;
    h) providing a sense of place for people and communities.

[41] Intrinsic values of fresh water are substantial in themselves. Maintenance, restoration and enhancement of them is not subordinate to economic values of fresh water for potential use for people and communities' well-being.

[42] The national issues that the Board has identified are:

1. over-allocation of fresh water;
2. contamination of fresh water;
3. loss of wetlands;
4. incompletely integrated management.

[43] The Board recommends these goals to address those issues so that the national values of fresh water are safeguarded:

1. to phase out over-allocation of fresh water;
2. to phase out contamination;
3. to protect wetlands;
4. to improve the integration of management of fresh water.

Withdrawal of national policy statement

[44] A number of submitters made requests to the effect that the proposed NPS should be withdrawn entirely, and a new national policy statement on freshwater management prepared. Reasons given for this request included that the proposed NPS is unworkable, unnecessarily complex, and would be time-consuming and costly to implement. Submitters asserted the proposed NPS would not contribute in any meaningful way to managing increased demand for water, and would provide little direction beyond restating section 5 of the RMA.

[45] Other submitters contended a national policy statement on freshwater management is needed, some said urgently.

[46] Those submitters seeking withdrawal of the proposed NPS generally supported the intent of a national policy statement and requested that it be substantially redrafted. Few submitters suggested a national policy statement on freshwater management is unnecessary.

[47] The Board did not hear from submitters that the proposed NPS is so fundamentally flawed that it should be withdrawn and not replaced.

[48] The RMA confers on the Minister responsibility for deciding whether it is desirable for there to be a national policy statement; whether to make any recommended changes; and whether to recommend to the Governor-General in Council approval of the national policy statement. None of those decisions is within the scope of the duties of a board of inquiry.

[49] The Board accepts the content of the proposed NPS is capable of improvement. Its core task is considering the content of the proposed NPS, and making recommendations on changes to it.

[50] The interests of various sections of the community on the content of the proposed NPS, and on the recommended changes, may conflict. By this report, the Board recommends a number of changes to the proposed NPS to give effect to submissions on it. The Board judges that, amended as recommended, the NPS would more fully state objectives and policies for

matters of national significance for achieving sustainable management; and by doing so, give effective direction on the resolution of potential conflicts.

[51] Therefore, the Board does not accept requests by submitters that the proposed NPS be withdrawn.

Relationship between NPS and RMA

[52] Some submitters strongly supported objectives and policies in the proposed NPS that closely match provisions of the RMA, on the basis that the provisions are consistent with the definition of sustainable management and in keeping with the enabling focus of the RMA.

[53] Other submitters considered that, unless an objective or policy added further to the provisions of the RMA, it did not need to be stated.

[54] A document prepared under the RMA, such as the NPS, is subordinate to its parent statute. The Board acknowledges that the NPS needs to be consistent with the RMA provisions, but considers that for the NPS to make a difference it needs to do more than just mirror the words in the RMA.

Local authority functions, boundaries, flexibility and resources

[55] Many submitters raised questions about local authority functions, boundaries, and resources and about the need for flexibility in ways of managing fresh water in different regions.

Functions

[56] Many submitters protested the proposed NPS does not clearly distinguish the functions of regional councils (identified by section 30 of the RMA) from those of territorial authorities (identified by section 31). Some sought amendments to clarify which objectives and policies are directed to which class of local authority, to avoid unnecessary duplication and cost.

[57] By section 30 of the RMA, the relevant functions of regional councils include control of the taking, use, damming and diversion of water, and control of the quantity, level, and flow of water in any water body; the control of discharges of contaminants into or onto land or water, and discharges of water into water; the control of the use of land for the purpose of maintenance and enhancement of the quality of water in water bodies, maintenance of the quantity of water in water bodies, and maintenance and enhancement of ecosystems in water bodies; and achieving integrated management of the natural and physical resources of the region. Additional functions include maintaining indigenous biodiversity, and strategic integration of infrastructure with land use.

[58] Regional councils also have other functions specified in the Act, including considering and deciding resource consent applications.

[59] By section 31, the functions of territorial authorities include integrated management of the effects of the use, development and protection of land and associated natural and physical resources; and also control of actual or potential effects of activities in relation to the surface of water in rivers and lakes. Territorial authorities also have other functions specified in the Act.

[60] It has been established that there might be an overlap between the functions of regional councils and those of territorial authorities. What is limited is not so much what can be controlled, but the purpose for which it can be controlled.[13]

[61] The Board accepts that the NPS should identify, where practicable, a class of local authority that is expected to apply a policy. That is desirable to avoid duplication, and so that the policy is applied by local authorities of the class that is more likely to have the knowledge, skills and capability of taking the action indicated.

[62] By section 35(2) of the RMA, every local authority has a duty to monitor the state of the whole or any part of the environment of its region or district to the extent that is appropriate to enable the local authority to effectively carry out its functions under that Act.

[63] Consistent with that, the Board accepts that responsibility for monitoring and reporting on particular objectives should also be entrusted to the class of local authorities having the relevant functions. The functions of regional councils identified in section 30(1) generally embrace the purpose of monitoring freshwater management.

[64] One submitter asked who would be responsible for collation of monitoring data. The Board expects that the body that collects data would have to collate it so that a report could be prepared.

[65] A number of urban local authorities sought clarification of roles and responsibilities in respect of urban stormwater and water supply infrastructure. There is no dispute that the monitoring of compliance with the RMA and instruments under it by operators of such infrastructure is generally the responsibility of regional councils.

[66] Submitters also commented on the order in which local authority planning documents should be amended to be consistent with the NPS, with some favouring amendments to regional policy statements first and some requesting a process to reach consistency and agreement about changes to regional and district plans.

[67] Although the former would generally be a logical sequence, the variety of circumstances existing around the country may preclude making following that sequence mandatory. With respect to the latter request, while consistency and agreement with respect to regional and district plans may generally be sensible, a territorial authority operating infrastructure cannot expect to be able effectively to veto regional plan provisions regulating activities of that type. The RMA provides procedures for resolving differences on such matters.

[68] A few submitters raised points about local authorities deciding resource consent applications. One was that protection against degradation of resources should be adequately addressed when applications are received. Another was that the proposed NPS would not provide a mandate for refusing resource consent applications on grounds of cumulative effects. A third was that, in small communities, those sitting on hearing panels are often compromised by association with those causing degradation.

[69] The Board considers those to be points of general practice that are not specific to freshwater management. The NPS should confine itself to matters of national significance in relation to the management of fresh water, and not stray into points of general practice.

[70] Two submitters urged that the NPS encourage stricter enforcement action against those whose activities result in degradation of water quality.

[71] By section 84(1) of the RMA a local authority has a legal duty to enforce observance of its planning instruments. It has a discretion as to how it does so, and should be left free to decide the means and courses of action to be adopted in particular situations.[14] The Board considers it inappropriate for the NPS to direct local authorities about the methods and strictness of their enforcement action.

[72] One submitter protested that the proposed NPS does not address institutional reform, and contended that an alternative model to the current fragmented situation would result in more effective, efficient and sustainable outcomes. Models in parts of Australia where water management is more centralised (although local political structures and representation remain) were cited, and commended to the Board.

[73] A national policy statement is an instrument under the RMA. Reform of the institutional regime for managing water would involve amendments to that Act, and perhaps also to the Local Government Act. That is beyond the scope of a subordinate instrument such as a national policy statement, and is not an appropriate topic for this Board of Inquiry to consider.

[74] Additional points of practice raised by submitters were that regional councils should work together to develop a combined marine and freshwater plan to save costs and provide consistency; encouragement of better communication between divisions of council administration; increased use of qualified experts, and keeping up-to-date with overseas research; ensuring that monitoring responsibilities are not impeded by reporting duties; and lack of capacity of local authorities to deal with many complex technical problems such as cumulative effects, uncertainty, and application of the precautionary approach.

[75] The Board considers that those are general issues, not specific to freshwater management, that would be better followed up in other contexts than the NPS.

Boundaries

[76] A few submitters criticised patterns of local authority boundaries as hindering the effective performance of duties under the RMA. They desired that the Board recommend a new pattern, particularly for boundaries of regions.

[77] The Board is satisfied that alterations of local authority boundaries are governed under the Local Government Act 2002, and are beyond the competence and remit of a board of inquiry under the RMA.

Flexibility

[78] Several submitters contended that the proposed NPS would not allow local authorities the appropriate flexibility in applying its policies. These particular respects were cited:

- regional variation in the intensity of issues;
- existing instruments to similar effect;
- potential for undermining a local authority's strategic initiatives;
- application of general policies where there are site-specific solutions; and
- the burden on smaller authorities with limited staff in meeting time limits.

[79] Submitters asked that the NPS allow local authorities to choose policies that, taking into account existing instruments, allow regional adaptation and innovation, and best suit their present and future needs, having regard to their capabilities and resources.

[80] The Board accepts that, in principle, the Act contemplates that local authorities have some flexibility in applying national policies according to regional circumstances. The extent of that flexibility is limited by the imperative that a national policy statement is to be given full effect. Flexibility in application is not intended to be so broad as to excuse any failure to give effect, or any prolonged delay in doing so.

[81] Existing regional instruments, let alone strategic initiatives, are expected to be altered if necessary, so that it is apparent that they conform to, and give effect to, a national policy statement. To the extent that a local authority's capability and resources preclude them doing so immediately, it should at least make a public commitment to a firm programme of staged compliance, identifying the timing and content of each stage, and publicly reporting progress to show faithful adherence to the programme.

Implementation costs and local authority resources

[82] Numerous submitters contended that implementation of the proposed NPS would result in significant additional work for local authorities having limited financial and staff resources, and impact on current budgets and priorities, at considerable cost to ratepayers that would be unaffordable

and unsustainable. One submitter stated that lack of funding would have a negative impact on the ability to address freshwater management issues, another that implementation of the proposed NPS should not be at the expense of local authorities or ratepayers. Submitters remarked that smaller authorities lack the resources, capability and professional staff required to deal with technical issues such as cumulative effects, uncertainty, application of the precautionary approach, and determination of flows and levels.

[83] Many local authority submitters urged that the costs of implementing the proposed NPS should be addressed and provided for in it. They contended that central government funding (or subsidising) of the costs incurred by local authorities would ensure that its goals would be able to be achieved. Some argued that the costs of achieving national benefits (monitoring, reporting, improving degraded water resources to attain water quality standards and protecting outstanding ones) should be borne nationally, rather than central government continuously 'cost-shifting' to local government. Another submitter contended that where financial benefit accrues, a levy should be placed on water abstraction to fund freshwater management; another also contended that costs should be borne directly by the user; another urged allocation of costs depending on where the benefits would fall.

[84] Some of the submissions on costs of implementation of the proposed NPS relate to the costs of monitoring and reporting required by it. The Board has already acknowledged that responsibility for monitoring and reporting should be entrusted to the class of local authorities having the relevant functions. To that extent, the duties of monitoring and reporting are imposed on the appropriate local authorities by section 35 of the RMA; and the effect of the NPS would largely be to emphasise the effective execution of those duties. The Board is therefore not persuaded by the submissions to the effect that the proposed NPS would impose a costly burden on local authorities, because the duty has, in substance, been imposed by Parliament since 1991.

[85] Consideration of other submissions calls for distinguishing between functions of local authorities under the RMA and executive functions they may have under other legislation, for example, as owners and operators of water supply networks. The primary effect of the NPS would directly fall on the functions of local authorities under the RMA. It is possible that a local authority exercising functions under the RMA may require a local authority owner or operator of a water supply or wastewater disposal network to take action to avoid, remedy or mitigate adverse effects of its operation on fresh water. The cost of doing so cannot sensibly be described as central government 'cost-shifting' to local government; and the Board is not persuaded that it should be borne by taxpayers rather than by those who benefit from the network operation.

[86] To the extent that implementing the NPS more generally would fall on local authorities in respect of their functions under the RMA, the submitters may have a case for arguing for recovery, or at least subsidising of their costs. However, the Board is not persuaded that this is a question for the content of the NPS itself; nor one for the Board to decide. If the NPS is approved, local authorities would be free to take up the matter of implementation costs with the Minister.

Māori issues

[87] For many Māori submitters, issues of rights and interests in fresh water, and questions of ownership of the resources, were of key importance. A number of iwi submitters deliberately set aside the question of rights and interests, noting that it is an issue to be addressed between iwi and the Crown separately from the proposed NPS. Other submitters noted that the NPS should not compromise the ability for the Crown and Māori to settle future claims for fresh water.

[88] The Board agrees with those submitters who stated that the ownership of water cannot be addressed in the NPS. It is up to the Crown and iwi to decide how this issue will be addressed.

[89] A number of submitters called for specific recognition of the role of iwi as Treaty partners, rather than 'stakeholders' in freshwater management. They argued that by not acknowledging the Treaty, the proposed NPS does not provide a meaningful role for Māori within water management at the local level, due to the dilution of their status as Treaty partners and kaitiaki that resulted from grouping them as part of the 'stakeholder' community. Many of these submitters requested strengthening of the proposed NPS provisions by providing a specific Treaty objective and associated policies.

[90] By section 6(e) of the RMA, the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga is to be recognised and provided for. Section 6(g) has a similar requirement with respect to the protection of recognised customary activities. Section 7 of the RMA requires particular regard to be had to kaitiakitanga and the ethic of stewardship. Section 8 of the RMA requires all persons exercising functions and powers under it to take into account the principles of the Treaty of Waitangi.

[91] The NPS is subject to the RMA, including those sections relating to Māori and the Treaty of Waitangi. The Board sees little value in repeating in the NPS what is already stated within the RMA. This is consistent with the Board's general principle (outlined at paragraph [54]) of not repeating RMA provisions in the NPS.

[92] The Board is satisfied that Māori and their interests are already specially acknowledged in the objectives and policies of the proposed NPS.

[93] Consideration of how the Treaty is incorporated into the proposed NPS led to requests from submitters relating to management of fresh water, with many of the iwi submitters citing co-management regimes as an appropriate way forward (with particular reference to the establishment of co-management relationships for the Waikato River and Rotorua Lakes). There were also requests for full partnership in freshwater management. Some iwi submitters argued that the proposed NPS falls short of stating that central government considers a primary Treaty partnership between Māori and local government as the most effective and efficient means of achieving the purpose of the RMA in relation to fresh water.

[94] Many iwi submitters considered that recognition of the Treaty relationship and provision for new management approaches would allow

them to more fully carry out their kaitiaki responsibilities, and that the proposed NPS does not empower kaitiakitanga. The role of kaitiaki was seen as paramount in freshwater management.

[95] Co-management is a technique that has developed out of a relationship between central government and iwi organisations in relation to the management of particular bodies of fresh water. The Board does not consider that a blanket prescription of this approach over the whole country would be appropriate. Bearing in mind local circumstances, the type of relationship that develops between Māori and local government for management of fresh water is a matter for the parties to establish between themselves, rather than for the NPS to dictate.

Existing uses and activities

[96] There were differences among submitters on the application of the proposed NPS to existing land uses and activities, including those authorised by resource consents.

[97] Some submitters asked for certainty that existing takes and uses of fresh water would not be restricted, so the NPS would only apply to activities authorised by consents granted after the NPS comes into effect.

[98] Some cited particular instances relating to hydro-electricity generation, to irrigation, and to harvesting of existing forests. Submitters raising concerns in those respects stressed that hydro generation is a valid and nationally significant use of fresh water; and urged that there should be no additional restrictions on continuation of existing activities except for robust reason, and if the benefits outweighed the costs to other aspects of the environment.

[99] Other submitters urged that recognition of existing investment would help existing consent holders to have confidence to invest; and that those consent holders had a legitimate expectation that, provided any effects were appropriately managed, their existing uses would not be undermined. The principle of non-derogation of grants of consent was cited too. Another submitter was concerned that the proposed NPS would allow local authorities to control harvesting of existing forests on the basis that discharges of contaminants require continued existence of forestry as a means of providing environmental benefits to downstream waterways and users.

[100] Other submitters contended that the proposed NPS misses an opportunity to require that existing consents be reviewed to ensure they align with current best practice. That was supported on grounds that existing consent conditions have been too lenient or have allowed abstraction for too long a term, resulting in existing land-use practices (including agricultural intensification) causing unsustainable major decline in water quantity and quality. They urged that the NPS should mandate local authorities to tackle pre-existing problems.

[101] Another related issue concerns the distinction between considering an application for replacement of an existing resource consent held by the applicant, and an application for a new consent. It was submitted that the

proposed NPS makes no distinction between them in recognising an applicant's existing investment in infrastructure.

[102] The Board considers a national policy statement has to be read as subordinate to the RMA under which it is made; and as conforming to the regime under that Act.

[103] The RMA contains express provisions about the conditions in which, and extents to which, existing uses of land[15] and surfaces of water bodies[16] are protected; about the circumstances in which existing lawful activities may continue;[17] about consent authorities having regard to the value of investments of holders of existing consents;[18] and about the exercise of resource consents while existing holders are applying for new consents.[19]

[104] A national policy statement cannot alter those provisions; nor can it extend them. To the extent the Act does not give some submitters the certainty they ask for, it is beyond the Board's remit to consider that. Conversely, to the extent the Act does not give local authorities power to review existing uses, activities or consents during their terms, as other submitters asked for, that is also beyond the Board's remit to consider.

[105] In particular, the Board understands that to the extent to which the non-derogation principle applies to grants of resource consent, it gives no basis for any expectation that consent authorities would grant replacement consents without having regard to any national policy statements current at the time.[20] A consent authority having regard to a national policy statement may lead to the imposition of new restrictions, or even to refusal of consent for continuation of an existing activity for which previous consent has expired. Despite their value, the Act gives no special immunity from national policies for particular activities such as hydro generation, agricultural irrigation or intensification, or forestry.

Cumulative effects

[106] A number of submitters specifically raised the issue of cumulative effects and their management within the proposed NPS. Submitters requested assistance by inclusion in the NPS of a policy on the management of cumulative effects. Inclusion of a policy was seen as: supporting and reinforcing councils' efforts to address cumulative effects; providing clearer direction to avoid the impact on water quality and quantity of cumulative effects; and, allowing councils to proactively manage cumulative effects. Submitters also urged inclusion of a policy as a way of providing the detailed guidance needed to allow councils to ascertain the point in time and space at which the accumulation of insignificant effects becomes significant.

[107] The Board acknowledges the importance of having regard to the issue of cumulative effects in the exercise of all functions, powers and duties under the RMA. However, authoritative court precedent about identification of cumulative effects exists,[21] and it is not within the scope of the NPS to expand or explain what has been stated in case law, nor to instruct councils on their duties under the RMA.

[108] The Board also notes that the meaning of *effect* outlined in section 3 of the RMA includes *any cumulative effect which arises over time or in combination with other effects*, so cumulative effects are addressed comprehensively in the proposed NPS by reference in objectives and policies to *effect*.

[109] The recommended policy on integrated management specifically invokes cumulative effects. However, the NPS cannot address requests for detailed guidance, as consideration of cumulative effects needs to be undertaken on a case-by-case basis.

Precautionary approach

[110] A variety of submitters commented on the difficulty of decision-making in an environment of scientific uncertainty or lack of information, and the possibilities of adaptive management. A number of different policy approaches were suggested to address this within the proposed NPS.

[111] Issues of scientific uncertainty, lack of information and implementation of adaptive management approaches are not unique to the management of fresh water. A number of matters being requested by submitters for inclusion in the NPS are already contained in the RMA. For example, the concept of a precautionary approach is already integrated in the meaning of *effect* which includes *any potential effect of low probability which has a high potential impact*.

[112] The Board considers it is not the role of the NPS to prescribe how decisions can be made by consent authorities, and that codifying the precautionary approach in a policy could be limiting and restrictive to its application to the management of natural and physical resources.

[113] Decisions about resource use have to be made on the information that is presented. In some cases, relatively little information is available, but there are considerable difficulties in writing a policy to address this. In these circumstances, the RMA already requires that decision-makers adopt a precautionary approach.

[114] The Board also notes that while there is some common ground in the precautionary provisions that submitters have sought, there was no true agreement on what should be put into the proposed NPS.

Use of RMA terminology and expressions

[115] Many submitters asked that the terminology used in the proposed NPS be consistent with that in the RMA. Submitters were concerned that the introduction of new terms, or terms that were inconsistent with the RMA, would lead to litigation to resolve questions of interpretation during regional policy statement and regional/district plan processes. There was also comment about terms contained in the proposed NPS that require some form of judgement to implement, with some submitters urging that terms in the proposed NPS either be defined or deleted.

[116] Submitters also raised questions about consistency between the proposed NPS and various RMA expressions. A commonly cited example was the use in Objective 8 of a new phrase *identify and reflect*.

[117] The RMA gives meanings to many terms, and these are mostly clear and well understood. Terms such as *inappropriate*, *significant* and *life-supporting capacity* are used in the RMA without their meanings being defined in the interpretation section.

[118] The Board considers the NPS would be improved by using RMA terms wherever possible. The terms used in the NPS should, as far as practicable, be free from any requirement for judgement to be exercised in implementation, although some judgement will still be needed for implementation of the NPS at the regional level.

Scope of the Board's duties/considerations

[119] Submissions were received on a wide variety of topics that are not directly related to the provisions of the proposed NPS.

[120] Submitters sought that the Board recommend to the Minister a number of courses of action relating to central government responsibilities with respect to freshwater management. Some submitters favoured a 'whole of government' approach. These requests do not fall within the scope of the duties of a board of inquiry on a national policy statement. Likewise, it is not within the scope of the Board's task to recommend that central government adopt a 'whole of government' approach to freshwater management.

[121] Many submitters raised issues about integration and linkages between the proposed NPS and other national documents such as:

- the Proposed National Policy Statement for Renewable Energy Generation;
- the revision of the New Zealand Coastal Policy Statement;
- the Vision and Strategy for the Waikato River;
- the proposed National Environmental Standard on Ecological Flows and Water Levels; and
- the National Environmental Standard for Sources of Human Drinking Water.

[122] The Board accepts that, ideally, it would be desirable if the content of the NPS was consistent with that of other instruments under the Act on related subjects. However, by the end of the hearing of submissions on the proposed NPS, and by the time this report was prepared, the report of the Board of Inquiry on the review of the New Zealand Coastal Policy Statement had not been published; the report of the Board of Inquiry into the proposed National Policy Statement on Renewable Electricity Generation had not been published; the legislation to adopt the Vision and Strategy for the Waikato River had not been passed; and the processes on the proposed National Environmental Standard on Ecological Flows and Water Levels had not been completed. Therefore, the Board has kept its focus on the content of the

proposed NPS, leaving to others the task of moderating any inconsistencies among those instruments.

[123] Submitters also requested that the proposed NPS provide guidance on good practice in strategic planning, setting of environmental bottom lines and allocation limits. The Board does not consider that these matters are appropriate for national policy statements, whose purpose is to state objectives and policies in relation to matters of national significance. If the Ministry for the Environment sees a need for good practice advice to be disseminated, that is part of its function.

[124] Submitters suggested that the proposed NPS should provide national policies on governance, including implementation or clarification of the intent of collaborative governance processes and assistance in achieving them, and inclusion of provisions relating to co-management. Some submitters expressed concern about the impact of the proposed NPS on existing governance arrangements. The Board notes that these matters extend beyond freshwater management, and considers that a national policy statement would not be an appropriate instrument for addressing governance arrangements.

[125] In conjunction with submissions relating to demand management and efficient use of water, some submitters requested that the proposed NPS encourage or require widespread adoption of water measuring devices. Water measuring devices are one of a number of methods of managing demand for fresh water, and the Board considers that prescribing their use is too specific for inclusion in a national policy statement.

[126] Some submitters suggested that commercial users of water should be required to pay levies on abstraction of fresh water, with the resultant funds being used for freshwater management initiatives or to fund stakeholder involvement. This is beyond the scope of the Board's functions.

[127] The work of the Land and Water Forum was also the subject of comment by submitters, who suggested a need for consistency between the two processes, or that the proposed NPS should be delayed until the work of the Forum is complete. The main role of the Board is to consider and report on the submissions on the proposed NPS in terms of the RMA. The Board understands that, by comparison, the role of the Forum is much broader and at a higher order of generality. The Board, having heard the submitters, is obliged to complete its report without unnecessary delay. Because the Forum's work has broader scope, it does not justify the Board delaying its report. This report should be available to the Forum well before it is due to report.

[128] Many submitters commented on matters contained in the section 32 report on the proposed NPS, criticising its analysis of costs and benefits. By section 32(1)(a) of the RMA, prior to public notification of any national policy statement, the Minister has the responsibility for evaluating the appropriateness of objectives, and the efficiency, effectiveness and appropriateness of policies in achieving the objectives. By section 32(2)(b) the Minister has to carry out a further evaluation prior to issuing a national policy statement. The preparation, contents and sufficiency of any section 32 analysis are not matters for a board of inquiry to consider.

[129] The Board received many requests from submitters (from all sectors of interests in freshwater management) about the costs of implementation of the proposed NPS, and the provision of funding from central government. As the Board explained in paragraph [86], it considers that the extent to which costs of implementing the NPS should be met by local authorities, and the extent of any subsidy from central government, are outside the ambit of the Board's functions.

Endnotes

[3] Section 45(1) RMA.

[4] Section 55(2) RMA.

[5] Documents in that class are planning instruments such as regional policy statements and regional and district plans.

[6] Section 55(2A)(a)

[7] Section 55(4) RMA.

[8] See meanings given in RMA, s2(1) for *water* and *natural and physical resources*.

[9] RMA, s3.

[10] RMA, s2(1).

[11] *New Zealand Rail v Marlborough District Council* [1993] 2 NZLR 641; [1994] NZRMA 70 (HC).

[12] Resources may be used, but only in a sustainable way: *Auckland City Council v John Woolley Trust* [2008] NZRMA 160 (HC), per Randerson J, para [47].

[13] *Canterbury Regional Council v Banks Peninsula District Council* [1995] 3 NZLR 189, 194; [1995] NZRMA 452, 458 (CA).

[14] *Manukau Shopping Centre Merchants Association v Manukau City Council* HC Auckland CP2721/99 01/12/88, Wylie J; *Gunson v Waikato Regional Council* Env C A198/05, para [88].

[15] RMA, s10.

[16] RMA, s10A.

[17] RMA, s20A.

[18] RMA, s104(2A).

[19] RMA, ss124–124B.

[20] See RMA, s104(1)(b)(iii).

[21] *Dye v Auckland Regional Council* [2002] 1 NZLR 337; (2001) 7 ELRNZ 209; [2001] NZRMA 513 (CA).

NPS PROVISIONS

Preamble

[130] Many submitters were critical of the Preamble to the proposed NPS, highlighting inconsistencies between the Preamble and the objectives and policies of the proposed NPS, and between the Preamble and the provisions of the Act. A number of submitters requested amendments to the Preamble, including changing its focus and rewriting it to provide what was considered by submitters to be the necessary guidance and direction for freshwater management.

[131] During the inquiry, the Board requested an explanation of the status of the Preamble from the Ministry for the Environment. The Board was advised the Preamble had been drafted on the understanding that, because it is not formally part of a national policy statement as dictated by statute, its legal status would be minimal. The Preamble functions as an additional piece of guidance to help clarify the Government's intention as reflected in the proposed NPS and is intended to provide some context to the objectives and policies of the proposed NPS, to assist interpretation.

[132] The Board accepts that, in principle, there is value in stating, in a preamble, the circumstances in which the NPS is considered desirable. The Board also accepts submissions to the effect that some of the content of the Preamble to the proposed NPS is inappropriate.

[133] The Board recommends replacement of the proposed Preamble with a statement of the national values of fresh water, the national issues about freshwater management, and national goals in respect of those issues. They are drawn from the Act, the proposed NPS, the submissions, and the evidence presented by submitters. Taken together, those issues and goals are the circumstances in which the NPS is desirable.

Purpose

[134] Some submitters argued that the purpose of the proposed NPS does not add significantly to the document, nor clearly state the reasons why the proposed NPS has been prepared.

[135] As noted earlier, the Board considers that the NPS should be outcome focussed. However, a purpose statement should only be included if it helps the reader to understand the intention of having the NPS.

[136] The national values, the national issues, and the national goals, together provide a clear statement of the intention of the NPS. Therefore, the Board considers that a separate statement of the purpose of the NPS is unnecessary.

Objectives and policies

[137] The RMA treats the words *objective* and *policy* as having different meanings. From section 62(1)(c) of the RMA the Board understands that an objective is something sought to be achieved. The Court of Appeal has held[22] that a policy is a course of action, and may be a mandatory direction having a restraining effect. The Board infers from that case that a policy is intended to be a course of action for the achievement of an objective.

[138] So, to the extent relevant in deciding submissions on the proposed NPS, the Board will assort the content as objectives or policies accordingly.

[139] Some submitters asked for the stating of an *overarching* objective of the proposed NPS. The RMA does not provide for a category of *overarching* objectives. However, it can be helpful to identify as such a broad objective having general application. The Board prefers to call it a general objective.

[140] Objective 1 in the proposed NPS, by restating enabling elements of the meaning given to sustainable management, focuses on the utilising of fresh water for human benefit. As many submitters urged, that would not respond to the main matters of national significance identified. They may be briefly restated as over-allocation, contamination of water, loss of wetlands, and incompletely integrated management.

[141] The general objective of the NPS can be drawn from the matters of national significance, and national issues and goals identified by the Board, and restated as follows:

> To manage fresh water in a way and at a rate that –
>
> 1) maintains, and to the extent practicable, restores and enhances the intrinsic values of fresh water:
>   a) in the interdependence of the elements of the freshwater cycle; and
>   b) in the natural form, character, functioning and natural processes of water bodies; and
>   c) in natural and healthy conditions free from alterations resulting from human activity; and
>   d) in healthy ecosystem processes functioning naturally; and
>   e) for safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
>   f) for providing healthy ecosystems supporting the diversity of indigenous species in sustainable populations; and
>   g) for sustaining cultural and traditional relationships of Māori with fresh water; and
>   h) for sustaining the potential for fresh water to meet the reasonably foreseeable needs of future generations; and
> 2) (while not detracting from attaining clause 1), enables people and communities to provide for their social, economic and cultural well-being, and for their health and safety.

Freshwater intrinsic values

[142] The proposed NPS contains an objective to recognise and protect life-supporting capacity and ecological values (Objective 4).

[143] Although the link between the policies of the proposed NPS and Objective 4 is not entirely clear, it appears that Objective 4 is to be achieved by:

- identifying notable values (including potential values) of outstanding and degraded freshwater resources; and
- setting freshwater quality standards and environmental flows and levels for all freshwater resources of a region, with a particular focus on protecting outstanding freshwater resources and enhancing or restoring degraded freshwater resources.

[144] Submitters proposed a variety of amendments to Objective 4. Most of them sought to narrow the terms *life-supporting capacity* and *ecological values* by insertion of qualifiers such as 'net' life-supporting capacity and 'significant' ecological values. One submitter proposed a much more detailed objective, specifying the methods by which the life-supporting capacity of fresh water would be safeguarded. Another submitter requested that groundwater which is unconnected to surface water be omitted from the objective.

[145] Many submitters commented that the link between the objective and policies is not clear, and that it is not easy to discern how life-supporting capacity and ecological values are to be *recognised and protected*.

[146] These submitters generally suggested that values of some type (be they 'notable', 'natural' or 'significant') should be identified for all freshwater resources, although submitters differed on who should be responsible for that identification.

[147] Many submitters commented on the requirement for freshwater quality standards and environmental flows and levels to be established for freshwater resources. These submissions are addressed later in this report, in the Board's considerations of water quantity and water quality.

[148] The Board approaches those submissions for alteration of the proposed NPS by considering what would more fully achieve sustainable management of fresh water. As mentioned earlier in the report, the Board considers that fresh water should be managed so that the enabling elements do not prevail over, but are constrained by, the sustaining, safeguarding and effects-based elements of sustainable management. In that way the intrinsic values of fresh water should not be sacrificed to its values for well-being and amenity of people and communities.

[149] Objective 4 of the proposed NPS would be restricted in achieving that goal. By being limited to significant values, it would allow for minor and de minimis effects on the environment to be ignored. Cumulative effects of doing so have contributed to the national issues that called for the NPS. There are other intrinsic values that have also to be safeguarded and sustained.

[150] Likewise, the Board considers that introducing the concept of 'net' life-supporting capacity would narrow the objective too much, and would imply that compensation and trade-offs can be used as the first choice when addressing adverse effects of inappropriate activities on fresh water.

[151] In the Board's opinion, making an exception for the specific situation where groundwater is not connected to surface water would not be warranted. The case advanced for this exemption was that a deep aquifer may have no life-supporting capacity or ecological values. In those circumstances, the objective would not on its terms apply to that water.

[152] The detailed objective (noted in paragraph [144]) that was suggested to the Board would outline relatively narrow values for fresh water (only relating to biodiversity) and then set standards and outline details of implementation. The Board considers that the setting of standards and provision of details on implementation are laudable aims, but an objective of that nature would raise questions about how practicable it would be to implement. When an objective is seen as too difficult to implement, this can lead to inaction.

[153] However, the suggestion about values of fresh water has led the Board to consider what the focus of Objective 4 should be. Earlier in this report, the Board noted that values of fresh water are wider than just ecological values. As suggested by some submitters, the Board recommends that Objective 4 should be widened to include ecosystem processes and indigenous species and their associated ecosystems.

[154] Policies for achieving the objective should apply to all the values of fresh water, not just those classified as notable. Identifying national values of fresh water in the NPS can help regional councils in preparing policy statements and plans, especially in the range of intrinsic values. That should lead to an improvement in managing fresh water, and in controlling activities that can affect full realisation of its values.

[155] Policies for achieving the objectives in respect of water quantity and quality are discussed below. They do not require carrying forward the concepts in the proposed NPS of *outstanding* and *degraded* fresh water.

Water quantity

Environmental flows and levels

[156] Policies 1(a) and 1(c) of the proposed NPS would require environmental flows and levels to be set for all freshwater resources of a region. The purposes of setting environmental flows and levels are to protect the notable values of outstanding freshwater resources and to enhance or restore the notable values of any degraded freshwater resources.

[157] Some submitters asked that the requirement to set environmental flows and levels should be removed altogether, or that they should only be set for outstanding water bodies or those at risk of degradation. One submitter urged the Board to require setting of environmental flows and levels in order to ensure security of supply to domestic and municipal water supplies.

[158] A number of submitters also commented that the definition of environmental flows and levels should be consistent with the definition contained in the proposed National Environmental Standard on Ecological Flows and Levels.

[159] Submitters questioned who should be responsible for setting environmental flows and levels, with suggestions including: central government through the NPS; regional councils; or that a case-by-case approach should be adopted, where flows and levels are set if a community has decided that the values of, or demands on, the water resource make setting standards appropriate and where freshwater resources are affected by discharges or abstractive use.

[160] The Board considers the NPS should contain a policy of setting environmental flows and levels, and that regional councils should be responsible for doing this. The Board accepts that many regional councils have already made significant progress in setting flows and levels for some water bodies in their regions. The setting of these flows and levels needs to be done over time for all water bodies, not just those that are outstanding or at risk of contamination. However, there is no need to do so in respect of ponds and naturally ephemeral water bodies.

[161] So the Board recommends that regional councils should adopt programmes for setting flows and levels for all water bodies in the region. If need be, it could be done over a period by adopting a progressive programme. This programme should be publicly stated and should be publicly reported annually, so that the community can see the progress being made.

[162] When setting environmental flows and levels, the range of values to be considered needs to be wider than notable values. Security of supply for domestic and municipal supplies is only one of many values (including intrinsic values) that should be considered.

[163] The proposed National Environmental Standard on Ecological Flows and Levels is not in its final form, so the Board cannot rely on any of its contents for consistency between the documents.

[164] The Board was asked to prescribe default flows and levels in the NPS. The Board understands that there is a divergence of expert opinion about how to set flows and levels, so choosing any one method for setting interim defaults would be controversial. The Board also understands that the appropriateness of different ways of setting flows and levels is being considered as part of the process of developing the National Environmental Standard on Ecological Flows and Levels, so this is not required in the NPS. The Board does not wish to parallel the NES process, nor recommend a policy that may be inconsistent with it.

[165] Because some councils may need to take a protracted period to set flows and levels for all water bodies in their regions, a transitional provision is needed in the meantime. The Board recommends that the NPS direct immediate inclusion in regional plans (without using the Schedule 1 process) of a policy requiring resource consent for certain changes in activities involving taking, using, damming or diverting of fresh water, or draining of

any wetland or in the natural variability of flows or level. The policy would state assessment criteria to be applied to consent applications.

Allocation of water

[166] A number of submissions related to allocation of water. Many submitters contended that the application of the 'first-in, first-served' approach to allocating fresh water is an approach that would not promote healthy fresh water in the long term. That may be, but even though some may doubt whether the 'first-in, first-served' approach serves the promotion of the sustainable management purpose of the Act, that approach has authoritatively been declared to be the law.[23]

[167] Where a resource has been fully allocated, applying the principle of non-derogation of grants can also limit further grants that may be justifiable for promoting sustainable management, but that principle has also been authoritatively declared to be the law.[24]

[168] The Board's duties are to make recommendations about the content of the NPS stating objectives and policies, and methods for including them in planning instruments. Its duties do not extend to making recommendations about changes to the law; and a national policy statement itself could not be effective to alter the law. Therefore, the Board does not accept submissions that, directly or indirectly, seek alteration of the 'first-in, first-served' approach to allocation of fresh water, nor of the application to water allocation of the principle of non-derogation of grants.

[169] A wide variety of submitters also commented on the prioritisation of water supply to various uses. Although the proposed NPS envisages management of demand for fresh water in such a way that priority is provided to reasonably foreseeable domestic water supply, many submitters sought the prioritisation of 'domestic and municipal' supply, with various methods suggested by which this could be done.

[170] The RMA confers on regional councils the function of establishing rules in regional plans to allocate the taking or use of water,[25] including allocating the resource to types of activities.[26] So the NPS might contain an objective or policies on how, in general, that function is exercised by regional councils. However, the relevant conditions in regions and catchments may vary, and the Act entrusts to regional councils the function of specific allocations of water to types of activity. That is to be done by provisions in regional plans, and by decisions on consent applications giving effect to those provisions.

[171] Therefore, the NPS may include a policy of allocating fresh water to intrinsic values, and of allocations to other types of activity being prescribed as absolute limits that are not to be exceeded, so the allocation to intrinsic values is not vulnerable to being diminished by over-allocation to types of activities for taking and use.

[172] The Board considers that the NPS should contain a policy of regional councils setting priorities for allocations of fresh water to intrinsic values and to types of activity for achieving sustainable management and the objectives of the NPS, according to the particular conditions in their regions and

catchments. The Board considers it inappropriate for the NPS to direct specific priorities or amounts for allocation to types of activity, beyond the policy of giving primacy to the needs of intrinsic values over the needs of types of activity. The policy should also include the regional councils' duties to have regard to the potential for climate change.

[173] The Board sees no national justification for giving priority to domestic and municipal supply, bearing in mind the regional differences in water availability, and the complexity of existing consents for the allocation of water to domestic and municipal supplies in cities and towns.

Addressing over-allocation

[174] In some regions, water has been over-allocated, leaving insufficient water for sustaining intrinsic values and the health of water bodies, and for various classes of needs. Some allocations are for greater amounts than are needed, and some exceed what is actually used.

[175] Many submitters contended that this outcome has arisen from an imbalance between the enabling elements of sustainable management as described in section 5(2) of the RMA and the counterpoint goals in paragraphs (a) to (c) of that subsection. Submitters asked that the NPS give firm direction to those carrying out functions under the RMA so that over-allocation of water is reversed, and efficient use of water required.

[176] The Board supports the concepts for managing over-allocation suggested by a number of submitters, and considers that if this type of approach assists in better management of fresh water, it should be included in the NPS.

[177] Policies in the proposed NPS would require regional councils to restrict existing taking, using, damming and diverting of fresh water in order to sustain notable values and tangata whenua interests and values in times of low flow.

[178] A number of submitters requested that conditions in which restrictions can be applied be expanded. Some requested that restrictions be able to be applied throughout the full flow regime, indicating that it is not only in times of low flow that values need to be sustained. Others proposed restrictions as a method for addressing the issue of over-allocation. They suggested that the policy be extended to provide for restrictions in over-allocated catchments at all times and in all catchments in times of low flow. Some submitters have sought exceptions to restrictions.

[179] In general, restrictions on taking, using, damming and diverting of fresh water may be needed to ensure the life-supporting capacity of water bodies is sustained. The sustaining of that capacity may be imperilled at times of low flow or level. It may also be imperilled in other conditions too, such as in over-allocated catchments. In alignment with recommended general Objective A1, restrictions on taking, using, damming and diverting of fresh water may be needed in periods of low flow or level, or in other circumstances to protect the intrinsic values of fresh water described in the second list in paragraph [40].

[180] The Board does not accept that there are types of activity that should be exempt from restrictions on taking, using, damming or diverting of fresh water. For instance, it does not support an exception for community water supplies. They provide water for more than domestic drinking and washing needs. Rather, the Board considers that all consent holders should bear their share of restrictions on a pro rata basis.

[181] The Board agrees with the submitters' suggestions that the restrictions policy be extended to provide for restrictions to be imposed in over-allocated catchments at all times and in all catchments in times of low flow or level. The Board acknowledges there are limitations on what can be done to change the exercise of existing consents until they expire or are reviewed in terms of section 128 of the RMA.

Managing demand and avoiding wastage

[182] Many submitters commented on the policies in the proposed NPS that require councils to manage demand for fresh water and ensure water that is taken is used efficiently.

[183] The Board considers that regional plans should manage demand according to efficient use of water and local and regional circumstances. It is not appropriate for the NPS to go to the detail of specifying types of demand management.

[184] The Board further considers that a number of the suggestions made by submitters about efficient use of water are either not within the scope of a national policy statement (such as directing that water that is 'fit for purpose' is used, and directing territorial authorities to address potential impacts on water quantity and quality) or have been reflected in different ways in other recommendations of the Board (such as those relating to integrated management).

[185] The Board has concluded that the proposed Objective 7 is really a policy and can be omitted. The general intent of it is met by other objectives and policies the Board has recommended for inclusion in the NPS.

Transfer of water permits

[186] Policy 1(i)(iii) of the proposed NPS would require that regional policy statements guide and direct regional and district plans to manage demands for fresh water in a manner which promotes efficient water use, including (where appropriate) through the transferability of resource consents.

[187] Some submitters have stated that increased guidance for implementing a transferable water permit regime would be helpful. Others have noted that there still needs to be a full discretionary assessment of the effects of any transfer, and that councils should ensure that existing allocation regimes are sustainable before allowing any transfers.

[188] The Board considers that the NPS does not need to state policies for markets for water. However, there would be merit in a policy stating criteria for assessing applications for transfer of water permits, including the extent

to which the transfer would result in maintaining quantities of fresh water; in enhancing the quality of fresh water; and in enhancing the technical efficiency of the use of water.

Water quality

Enhancement of water quality

[189] Objective 3 of the proposed NPS refers to the concept of *progressive enhancement of the overall quality* of fresh water, including by ensuring that appropriate freshwater resources can reach or exceed a *swimmable* standard.

[190] Some submitters raised questions about the meanings of the terms *progressive enhancement* and *overall quality* in the proposed NPS, and whether this would mean that the water quality of some water bodies could be allowed to degrade while that of others are improved, in order that *overall quality* is enhanced.

[191] Many submitters questioned the inclusion of the goal that appropriate water bodies reach or exceed a swimmable standard. Some submitters requested that the reference to *swimmable* either be removed or better defined. Other submitters urged the Board to set the bar higher than 'swimmability', commonly requesting that fresh water be improved to drinkable standard. Some submitters also requested that a standard to aspire to should apply to all fresh water, not just those water bodies seen as *appropriate*.

[192] Submitters also noted that the link between objectives and policies relating to water quality is not clear, and sought that the NPS include a policy framework that would require that:

- outstanding freshwater resources be protected;
- degraded freshwater resources be enhanced or restored (with the exception of those deemed to be 'naturally degraded');
- catchments considered to be 'at risk' of degradation be managed, or prioritised for pre-emptive action; and
- the quality of all other freshwater resources be maintained.

[193] The Board considers that the NPS should state a national goal of phasing out contamination of fresh water. So progressive enhancement of water quality is necessary. However, with a national goal of phasing out contamination, the Board does not consider it necessary to include a standard such as 'swimmability' in objectives or policies of the NPS.

[194] The Board acknowledges concerns expressed by submitters about reference to *overall* water quality in the proposed NPS. The Board considers it would be appropriate to include the following objective in the NPS to recognise the need to differentiate between different types of water bodies:

> To protect the quality of outstanding fresh water, to enhance the quality of all fresh water contaminated as a result of human activities, and to maintain the quality of all other fresh water.

This objective would also provide the exception sought by many submitters for 'naturally degraded' water bodies.

[195] The suggestion to focus on 'at risk' catchments is considered to be an example of good practice when establishing a programme for enhancing and maintaining the quality of fresh water. That level of detail is not needed in the NPS.

[196] In the same way that the Board indicated that environmental flows and levels could be set progressively, the Board recommends that regional councils could adopt a programme of progressive implementation of defined, time-limited stages that protects or enhances the water quality of all water bodies in a region, with annual public reporting of progress.

Further degradation of water quality

[197] Many submitters commented on the need to improve water quality and to recognise that water is a finite resource. These submissions have informed the Board's development of recommended Objective A1. Equally, many submitters protested that the reference in Objective 5 of the proposed NPS to avoiding *further degradation* of freshwater resources would implement a zero-tolerance threshold for contamination that is not appropriate or consistent with the concept of reasonable mixing contained in the RMA.

[198] Some submitters saw the capacity of water bodies to assimilate discharges as a 'value' that should be provided for. A number of submitters in metropolitan areas urged the Board to look differently at urban streams, with their perceived values for conveyance of stormwater and sewage overflows. Some urged that a 'polluter pays' approach should be adopted when existing or potential discharges are being considered, in order to ensure that effects are avoided, remedied or mitigated. Other submitters asked that the NPS make allowance for temporary or short-term effects on water quality as an exception to the requirement to avoid further degradation, based on the perceived minor extent of these effects.

[199] The Board considers that a change in attitude to, and management of, contamination of fresh water is needed. Fresh water should only be used for cleaning, diluting and disposing of waste if there is a positive assurance that the life-supporting capacity of the water and associated ecosystems, and the potential of the water to meet reasonably foreseeable needs, will not be diminished, and will, where practicable and necessary, be enhanced.

[200] The RMA entrusts to regional councils a function of making rules to allocate the capacity of water to assimilate a discharge of a contaminant. The concept of assimilative capacity assumes that it is possible to calculate the capability of fresh water to receive contaminated discharges without resulting in adverse effects on the quality of the water, or on ecosystems that it supports.

[201] However, in many parts of the country, cumulative effects of contaminants discharged into water bodies have resulted in fresh water having unacceptably degraded conditions. That leaves doubt about the soundness of assumptions about assimilative capacity.

[202] The Board considers that a national policy should not recognise any right to contaminate fresh water, nor to use its supposed assimilative capacity. Nor does it support the concept of 'polluter pays' if it implies that a polluter is free to buy or trade off contaminating fresh water in order to gain consent. Compensation for a truly unavoidable effect may be acceptable, but only where there is a causal link between the compensation and the unavoidable effect.

[203] The Board is not persuaded that differences between streams in urban and rural environments are of such significance that the NPS should differentiate in how they are to be managed. Urban streams still have values, and these need to be sustained. The Board acknowledges the imperative of disposing of stormwater. However, contaminants carried by stormwater can be intercepted and removed before they reach a water body, and progressive enhancements to stormwater systems to do so should be continued.

[204] The Board also considers that no allowance should be offered by the NPS to either councils or resource users by explicitly allowing temporary or short-term degradation, as this would not be consistent with the national goal of phasing out contamination of fresh water.

Diffuse source discharges

[205] Submitters urged the Board to ensure that the NPS contains policy to address diffuse source discharges. Most of these submitters considered the proposed NPS does not deal explicitly with diffuse source discharges when considering water quality.

[206] The objective is that life-supporting capacity, ecosystems processes and indigenous species and their associated ecosystems will be sustained. The Board accepts that this cannot be achieved without accounting fully for all sources of contaminant from natural sources and human activity, including diffuse long-term leaching from deposits on land.

[207] The Board recommends a general objective of restoring and enhancing the intrinsic values of fresh water; and objectives of protecting, enhancing and maintaining fresh water and of safeguarding its life-supporting capacity. It also recommends policies that include controlling use of land so as to avoid cumulative effects, setting water quality standards, avoiding future contamination, and consent conditions requiring adoption of best practicable options to protect against contamination.

[208] Although these objectives and policies are not specifically limited to diffuse source discharges of contaminants, they are intended to apply to contamination of fresh water from diffuse sources, including application of pesticides and fertilisers and grazing by livestock. They are also intended to include contamination from discharges to, and deposits onto or into, land, and leaching to groundwater or surface water.

Freshwater quality standards

[209] Many of the points raised by submitters in relation to environmental flows and levels also applied to the requirement in the proposed NPS that freshwater quality standards be set for all freshwater resources in a region.

[210] Consistent with the discussion at paragraphs [160] and [162], freshwater quality standards should be set for all water bodies in a region, and for the full range of intrinsic values, rather than just notable values. Where early implementation is not practicable, this work could be carried out progressively as part of a staged programme of implementation.

[211] There were also requests by submitters for a transitional regime for managing fresh water until quality standards are established. The Board agrees that this would be appropriate. To that end, the Board recommends a transitional policy be included in the NPS for direct insertion into regional plans. The policy would require that any change or increase in the intensity of a land use or activity involving a discharge of contaminants would require resource consent. It would also set assessment criteria for deciding consent applications.

District plan provisions

[212] Many submitters commented on the provisions of the proposed NPS that require territorial authorities to undertake functions in relation to the management of effects of activities on water quantity and water quality. A number of submitters requested that these provisions be removed, because they do not fall within the scope of territorial authorities' responsibilities under the RMA.

[213] As discussed earlier, the Board accepts the points made by these submitters, and considers that references to functions of territorial authorities in the proposed NPS should be amended to ensure that the NPS is consistent with the RMA.

Wetlands

[214] Some submitters sought that the NPS make provision for wetlands and the indigenous biodiversity of their ecosystems. They asked for a national policy that councils protect wetlands from invasion by, or expansion of, exotic plant and animal species.

[215] The Board understands that the main issues relating to wetlands are draining and other activities affecting water quantity, and maintaining indigenous biological communities. A healthy functioning wetland provides habitat for essential ecosystem processes.

[216] The Board accepts that protection of wetlands is a national issue, and that changes in wetland ecosystem processes allow invasive species to become established. To the extent relevant to the subject-matter of the NPS, that is addressed by the recommended objectives and policies. However, invasive species that are pests are managed under the Biosecurity Act 1993, not under the RMA.

Integrated management

[217] Submitters urged that the NPS provide more fully for the two major aspects of integrated management:

- the interconnected nature of freshwater resources (e.g. surface water and groundwater) spatially, temporally and within catchments; and
- adoption by councils of management methods that respond to the nature of the resource and the diversity of effects that can occur.

[218] Various objectives and policies were suggested by submitters to address these requests on integrated management. Some would relate to connections between natural features, others to interactions between institutions.

[219] The Board considers that it would be inappropriate for the NPS to require councils to adopt particular institutional arrangements. It would be more pertinent and effective for the NPS to state a policy for integration of the management of effects of activities on water quantity and quality. Incomplete integration in management of these effects is leading to cumulative adverse effects.

[220] The Board recommends that this issue is addressed by an objective of managing catchments in an integrated manner, as follows:

> To improve integrated management of fresh water, associated ecosystems and use of land in whole catchments.

[221] The Board also recommends the following policy to give effect to this objective:

> By every regional council managing fresh water and freshwater ecosystems, and controlling activities and use of land, in whole catchments, so as to avoid adverse cumulative effects anywhere in the catchment.

[222] The Board considered whether to recommend an integrated management policy for district councils as well. However, the functions conferred on territorial authorities by section 31 of the RMA do not extend to the management of the quantity or quality of fresh water, as those conferred on regional councils by section 30 do. So the Board infers that achieving integrated management of fresh water is a responsibility of regional councils, but not of territorial authorities.

Tāngata whenua roles and Māori values and interests

Involvement in freshwater management

[223] Many submitters questioned the reference in Objective 8 and Policy 1(d) of the proposed NPS to the involvement of iwi and hapū in the management of, and decision-making regarding, freshwater resources. As

noted in paragraphs [93] and [94], some iwi submitters requested full partnership in management of fresh water, and some requested new management approaches to allow them to more fully give effect to their kaitiaki responsibilities.

[224] Other submitters were opposed to the increased involvement of iwi and hapū in decision-making that the proposed NPS would provide for.

[225] The Board considers that the use of the term *involvement* in Objective 8 deliberately allows for different approaches to iwi and hapū roles in the management of fresh water. This reflects the different ways in which involvement currently occurs around the country. The difference in approach reflects different relationships between Māori and local government. The NPS can state the objective of involvement, but should not dictate details of the kind of relationship. The type of relationship is something for the parties to establish, develop and take responsibility for, together.

Iwi and hapū

[226] A number of submitters were concerned at the requirement of Objective 8 and Policy 1(d) to involve *iwi and hapū* in freshwater management. They pointed out this would change the existing presumption about consultation with tāngata whenua in some parts of the country. Other submitters were concerned this would impose a burden, based on the large number of hapū within some regions.

[227] Submitters generally suggested that reference to iwi and hapū in the proposed NPS be replaced with *tāngata whenua*. Many asked that tāngata whenua values and interests be defined in the NPS.

[228] Section 6(e) of the RMA refers to the relationship of *Māori* with their ancestral lands, waters and sites. By section 2 of the RMA *tāngata whenua* means *...in relation to a particular area...the iwi, or hapū, that holds mana whenua over that area*.

[229] Consistent with the Board's recommendation to use RMA terms (see paragraph [118]), the word *Māori* should be used instead of *iwi and hapū* or *tāngata whenua* in respect of values; and as generally the term *tāngata whenua* relates to the people of a specific area, that term would be more appropriate in respect of involvement in management and decision-making.

[230] The Board considers that a definition of tāngata whenua or Māori values and interests could limit the identification of the values to only those included in the definition. This could restrict the flexibility of the application of the NPS objective around the country.

Identification of values and interests

[231] Many submitters argued the proposed NPS would not provide clear guidance to regional councils on how tāngata whenua values and interests are to be identified. Current practice was seen by these submitters as meaning that the use of existing RMA provisions would not achieve the intention of the proposed NPS.

[232] Several of the iwi submitters explained what they expected to see included in a national policy statement on freshwater management for it to be of benefit to Māori. The existing objectives and policies were seen as not being strong enough to protect Māori interests, partly due to the perceived relegation of iwi and hapū interests and the Treaty partnership.

[233] Māori and other submitters also urged the Board to address issues relating to fresh water in the coastal marine area.

[234] Various suggestions were made as to how tāngata whenua values and interests could be identified.

[235] The Board considers that the NPS should be responsive to different understandings about Māori values in different areas. Although this approach may result in variation of practice, it also respects the diverse relationships between tāngata whenua and local government in different parts of the country.

[236] Far from relegating iwi and hapū interests, the NPS expressly provides for the contribution that iwi management plans, statutory acknowledgements and Waitangi Tribunal reports make to decision-making. (The Board acknowledges that Waitangi Tribunal reports are only available for some areas.)

[237] On the submissions about fresh water in the coastal marine area, the subject-matter of the NPS is management of fresh water. At or near the coast, fresh water mixes with coastal water. The NPS applies to fresh water down to the landward boundary of the coastal marine area established under the RMA. Improvements in the quantity and quality of fresh water flowing into the coastal marine area are likely to have positive effects on coastal waters.

Monitoring and reporting

[238] Objectives and policies of the proposed NPS would require that regional councils and territorial authorities undertake *effective monitoring and reporting* of various matters to do with freshwater management. A number of submitters considered that it is unnecessary for the proposed NPS to impose monitoring obligations additional to those required under the RMA, and that the RMA requirements are sufficient in respect of monitoring.

[239] Concerns were also expressed by submitters about the costs of additional monitoring being imposed by the proposed NPS, and the appropriateness of territorial authorities being required to monitor and report on freshwater management issues.

[240] By section 35(2)(b) of the RMA, local authorities are required to monitor the efficiency and effectiveness of policy statements and plans. By section 35(2A), local authorities are required to report on the outcome of that monitoring. Other relevant monitoring and reporting sections in the RMA include:

- section 360(1)(hk) – relating to the Minister's regulation-making powers in relation to councils supplying information to the Minister

- section 24(f) – relating to the Minister's monitoring responsibilities
- section 27(3) – relating to the supply of information to the Minister.

[241] The Board considers that it is inappropriate to include a policy in the NPS for local authorities to perform duties already imposed by the RMA. If a legal obligation to monitor and report under the RMA is not being complied with, in future it should be. A policy in the NPS about monitoring and reporting would not make an effective difference to performance of duties imposed by the Act.

[242] Where costs of monitoring and reporting fall is an administrative matter, and there is no need for a policy in the NPS about it.

Non-regulatory methods

[243] Some submitters requested that the policy on non-regulatory methods be broadened by including additional detail on non-RMA methods of achieving the objectives of the proposed NPS, and by referring to the methods that central government will employ to give effect to the proposed NPS.

[244] Other submitters expressed concern about the costs of non-regulatory methods, and requested various restrictions on the policy in the proposed NPS.

[245] The Board considers that Policy 7 as currently written is not strictly a policy, and therefore need not be included in the NPS recommended by the Board. However, the Board notes that the absence of a policy on using non-regulatory methods does not diminish the desirability of using them.

Implementation

[246] The Preamble to the proposed NPS states a goal that, by 2035, the quality of fresh water is to meet the aspirations of all New Zealanders. Policies 1, 2 and 3 of the proposed NPS specify that local authorities are to take stipulated actions by prescribed times. A number of submitters questioned those provisions.

[247] Some submitters argued that the goal of 2035 is too far away, others expressed concern about whether the objectives of the proposed NPS would be able to be achieved within that time. Many submitters requested an extension of the time limit for regional and district planning instruments to give effect to the proposed NPS, particularly the 40-day timeframe for amending regional and district plans. Other submitters requested the time limits be shortened, particularly the two-year time limit for regional policy statement changes to be notified.

[248] In general, the matter of time limits has been considered in more detail in relation to the specific objectives and policies assessed earlier in this report.

[249] The Board doubts whether the 2035 date contained in the Preamble to the proposed NPS would have force and effect, as it is not, itself an objective or policy of the proposed NPS. The Board also accepts there are differences in resourcing and in the extent of work that may be required in various regions. Where considerable cost and effort may have to be applied in a region to achieve the objectives of the NPS fully, a progressive implementation programme may be adopted, and progress reported annually.

[250] On considering the submissions about compliance times, the Board recommends a new policy combining two provisions to give regional councils some flexibility in carrying out the policies, while still setting time limits for full implementation of them.

[251] Many regional councils will, with determination, be able to implement most policies within a short period of years. Allowing for the local authority election cycle, the Board recommends that policies be implemented by the end of 2014.

[252] But where a regional council is satisfied that it will not be practicable for it to complete implementation of a policy by the end of 2014 it may, within 18 months, adopt a programme of progressive implementation of defined and time-limited stages, by which the policy would be fully implemented by an extended time limit, no later than the end of 2030. To engage the public in such a protracted programme, its adoption should be publicly notified, and annual progress reports published.

Existing NPS provisions

[253] To this point of the report, the Board has addressed major topics on which submitters asked for amendments to the proposed NPS. The Board has indicated several provisions which it recommends be replaced. In its terms of reference, the Board has to review the remainder of the proposed NPS to address any potential inconsistencies.

[254] The Board considers that a preamble can provide a useful introduction to the NPS. It should outline in broad terms the challenges for freshwater management, and state national values, issues and goals. But the Board doubts whether the Preamble to the proposed NPS does that clearly and effectively. It recommends a replacement preamble.

[255] As discussed in paragraph [135], a purpose statement should only be included if it helps the reader to understand the intention of having the NPS. The purpose statement in the proposed NPS does not do this, and the Board considers that a separate statement of the purpose of the NPS is unnecessary.

[256] As discussed in paragraph [140], Objective 1 of the proposed NPS focuses on utilising fresh water for human benefit, and does not respond to the main matters of national significance identified. The Board therefore recommends that it be omitted.

[257] An issue of incompletely integrated management of fresh water was identified in the proposed NPS in Objective 2 and was the subject of some submissions. The Board accepts that the NPS should state an objective on that topic. It stated its recommended objective in paragraph [220].

[258] As suggested by some submitters the Board recommends that Objective 3 of the proposed NPS be amended to focus on protecting the quality of outstanding fresh water and enhancing the quality of all fresh water contaminated as a result of human activities. As the Board recommends that the national goal with respect to water quality should be to phase out contamination, this would set a more stringent requirement than the reference in Objective 3 to a swimmable standard of water quality. This national goal would also remove the need for Objective 5 of the proposed NPS.

[259] The Board accepts that the *ecological values* the subject of Objective 4 of the proposed NPS should be clarified to apply to *ecosystem processes and indigenous species and associated ecosystems*. The Board also considers that Objective 4 would be clearer if split into two objectives, one relating to water quality and one to water quantity.

[260] Objectives 6 and 7 of the proposed NPS are considered by the Board to be more in the nature of policies than objectives, and it is therefore recommended that they be omitted. The general intent of both objectives would be met by other objectives and policies that the Board recommends be included in the NPS.

[261] The Board recommends that Objective 8 is retained in the NPS, with amendments to give effect to comments from submitters.

[262] As discussed in paragraph [241], the Board does not consider it appropriate to include an objective or policy relating to monitoring and reporting in the NPS, as these are the subject of requirements of the RMA.

[263] Policies 1(a) to (c) of the proposed NPS address the identification of notable values, and the setting of freshwater quality standards and environmental flows and levels for freshwater resources. The Board sees merit in requiring regional councils to set freshwater quality standards and environmental flows and levels for all bodies of fresh water in their regions (with the exception of environmental flows and levels for ponds and naturally ephemeral water bodies). However, the Board recommends that, when setting freshwater quality standards and environmental flows and levels, all intrinsic values of a particular water body be considered, rather than there being a particular focus on *notable values*. The Board therefore recommends that Policy 1(b) of the proposed NPS be omitted.

[264] Policies 1(d) to (f) of the proposed NPS relate to the involvement of iwi and hapū in management and decision-making in respect of freshwater resources; identifying and recognising tāngata whenua values and interests in those respects. Earlier in this report, the Board addressed submissions on those topics, and stated its conclusions that the NPS should allow for variation in Māori values and interests in different areas, and in the part tāngata whenua have in management and decision-making in respect of fresh water. Therefore, the Board recommends a policy (Policy B1) for achieving the objective (Objective B1).

[265] Policy 1(g) of the proposed NPS relates to restricting certain activities in times of low flow in order to sustain notable values and certain tāngata whenua values and interests. The Board recommends a revised version of the policy that recognises the limits on permissible restrictions on

existing consents, and broadens the scope of the purposes for which restrictions might be imposed.

[266] Policies 1(h) and 1(j) of the proposed NPS are directed towards integrated management. The Board recommends a clearer policy on that topic.

[267] As discussed at paragraph [24], the Board considers that a national policy statement may need to place emphasis on particular elements of sustainable management. It has determined that the emphasis of the NPS should be on the sustaining and safeguarding elements of section 5(2) of the Act. In this context, the Board considers that the matters covered in Policy 1(i) of the proposed NPS are more appropriately addressed in a policy that requires regional councils to manage demand for fresh water so that water bodies are not over-allocated.

[268] Policy 2(a) of the proposed NPS applies to regional councils changing regional plans to set freshwater quality standards and environmental flows and levels. By Policies D2 and E1 the recommended NPS would do so.

[269] Policy 2(c) of the proposed NPS outlines various requirements for regional councils to impose consent conditions. While the Board agrees that efficient use of water, sustainable management of demand, integrated management of the effects of activities on water quality and quantity, and protection against contamination of water quality are important matters for the NPS, the Board prefers simpler and more direct policies. As discussed at paragraphs [241] and [262], the Board considers that the NPS should rely on the RMA provisions for monitoring and reporting, rather than restating those duties as policies.

[270] Policy 3 of the proposed NPS would impose requirements on territorial authorities that would be outside their functions under section 31 of the RMA. The policy should therefore be omitted.

[271] The Board considers that Policies 4 and 5 of the proposed NPS (which outline matters to be considered by councils in the preparation of planning documents) do not add significant value to the contents of the proposed NPS. Regional councils are required to recognise a national policy statement by making amendments to their planning documents. The objectives and policies that the Board recommends for inclusion in the NPS cover, to the extent the Board considers appropriate, the matters contained in Policies 4 and 5.

[272] Policy 6 of the proposed NPS relates to consent and designation conditions. The substance of that is included in Policies C1, D7, D8, E2 and E3 of the recommended NPS.

[273] Policy 7 of the proposed NPS about the use of non-regulatory methods is not a policy. Therefore, the Board recommends that it be omitted.

[274] Policies 8 and 9 of the proposed NPS repeat duties that are imposed by the RMA and the Board considers that unnecessary and recommends they be omitted.

[275] Following omission of objectives and policies using them, the Board recommends omission of definitions used in the proposed NPS.

Endnotes

[22] *Auckland Regional Council v North Shore City Council* [1995] 3 NZLR 18, 22f; [1995] NZRMA 424, 430; 1B ELRNZ 426, 433.

[23] *Fleetwing Farms v Marlborough District Council* [1997] 3 NZLR 257, 264 (CA) and *Central Plains Water Trust v Synlait* [2009] NZCA 609 (CA).

[24] *Aoraki Water Trust v Meridian Energy* [2005] 2 NZLR 268; [2005] NZRMA 251; 11 ELRNZ 207 (FC).

[25] RMA, s30(1)(fa).

[26] RMA, s30(4)(e).

CONCLUSION

[276] In accordance with its terms of reference, the Board reports that it:

- has inquired into the proposed NPS;
- has engaged with Māori submitters;
- has considered all submissions and further submissions made, and all the evidence given;
- has addressed the contents and subject-matter of the NPS;
- has refined the issues, objectives and policies to more fully achieve the policy approach;
- has addressed the internal consistency of the NPS as a whole, and removed potential inconsistencies;
- has addressed the wording of the NPS, including that of the objectives and policies, and improved it;
- has considered the certainty and clarity provided by the NPS, and improved it;
- has considered the possibility of unintended or unforeseen but likely outcomes, and avoided them;

and recommends the amendments to the content of the proposed NPS that have been incorporated in the recommended NPS at Appendix C so that it will more fully serve the purpose of the RMA.

[277] The Board has set out in this report its reasons for its conclusions on considering the submissions, further submissions and evidence.

[278] The Board has also considered how local authorities should, in accordance with section 55, give effect to the NPS, and whether or not some changes needed to regional policy statements or regional plans would be best achieved by direct insertion into regional policy statements or plans under section 55(2A)(b). Its consideration of those questions is influenced by the further amendments made to section 55 by the 2009 Amendment Act[27] since the Board was constituted and its terms of reference established.

[279] Regional policy statements have to give effect to national policy statements.[28] Regional councils have to consider the desirability of preparing or changing regional plans for implementation of a national policy statement.[29] Regional plans have to give effect to a national policy statement.[30] Consent authorities considering resource consent applications and territorial authorities considering requirements for designations have to have regard to a national policy statement.[31]

[280] In addition, if a national policy statement directs, a regional council has to amend a regional policy statement, or a plan, to include specific objectives and policies set out in the national policy statement, or so that objectives and policies specified in the document give effect to the objectives and policies specified in the statement.[32] Those amendments are to be made

without using the Schedule 1 process.[33] A national policy statement is able to include transitional provisions.[34]

[281] The Board recommends that the NPS direct regional councils to make or change regional plans (without using the Schedule 1 process) to the extent needed to ensure the plans include transitional provisions on water quantity and quality management in Policies D10 and E4 respectively. The changes would require resource consent (as discretionary activities) for changes of land uses, activities, taking, using, damming and diverting or draining of wetlands and specify criteria by which applications are to be assessed. That would provide interim control during the period in which amendments to regional plans are prepared and made under the Schedule 1 process to give effect to the NPS.

[282] In summary, the Board recommends for the Minister's favourable consideration the revised version of the NPS at Appendix C.

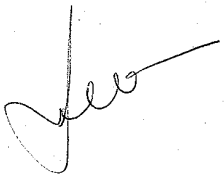
[283] The Board thanks all the many individuals and organisations who made submissions or further submissions, and all who gave evidence at the public hearings.

Dated at Christchurch this 28th day of January 2010.

Judge David Sheppard (Chair)

Mr Kevin Prime (Member)

Associate Professor Jon Harding (Member)



Mrs Jenni Vernon (Member)

Endnotes

27 Resource Management (Simplifying and Streamlining) Amendment Act 2009, s53.

28 RMA, s62(3).

29 RMA, s65(3).

30 RMA, s67(3).

31 RMA, s104(1)(B)(iii) and s171(1).

32 RMA, s55(2).

33 RMA, s55(2A).

34 RMA, s55(4).

APPENDIX A

PROPOSED NATIONAL POLICY STATEMENT FOR FRESHWATER MANAGEMENT

Preamble

All New Zealanders have a common interest in ensuring that the country's freshwater resources are managed wisely, in order to provide for present and future environmental, cultural, social and economic well-being of New Zealand.

Water is central to the social, economic and cultural well-being of many aspects of New Zealand's society. It has deep cultural meaning to all New Zealanders. It is also highly valued for its recreational aspects. It forms a vital input to many forms of economic activity, and most crucially underpins important parts of New Zealand's biodiversity and natural heritage. Many of New Zealand's freshwater bodies are iconic and well known globally for their natural beauty and intrinsic values. Understanding and managing threats to water with respect to the availability, quality, health and economic value are therefore fundamental to our well-being.

New Zealand now faces real challenges, of varying degrees and causes across regions, in ensuring there is sufficient water in our lakes, rivers, and aquifers; protecting freshwater ecosystems, in limiting and remediating degradation of water quality; and in ensuring that society gains the greatest benefit from the allocation of available water. For example, recent monitoring reported that only 60% of New Zealand's freshwater swimming spots tested met the New Zealand guidelines for water-based (contact) recreation almost all of the time. In addition, there is an incomplete understanding of how much water can be sustainably allocated and where it can best be used, and of how alternative land uses affect water quality and options for managing those effects. Those challenges, including those arising from climate change, are nationally significant. Key issues identified through previous consultation and hui regarding fresh water and freshwater management include water quality, allocation, ongoing engagement, and effective implementation of the RMA.

To respond effectively to these challenges and issues requires agreement on and balancing of cultural, ecological, economic and social goals for management of New Zealand's freshwater resources. Identifying sustainable targets for take and use of water, and achieving a smooth transition to them are not straightforward tasks. This National Policy Statement forms part of a suite of efforts to achieve that balance and deliver those targets.

The Treaty of Waitangi (Te Tiriti o Waitangi) is the underlying foundation of the Crown–Māori relationship with regard to Freshwater Resources. This proposed National Policy Statement is one step in the process of addressing tangata whenua values and interests including the involvement of iwi and hapū in the management of fresh water. Additionally, the proposed National Policy Statement is a non-exhaustive step towards progressive strategies at

the national and regional level in order to meet shared objectives in respect of the Freshwater Resources of New Zealand.

Given the central importance of Freshwater Resources to New Zealand and New Zealanders and in order to achieve the purpose of the RMA, the Crown recognises that there is a particular need for clear central government policy that directs local government to implement measures necessary to achieve the following goals:

- address existing and future constraints on the availability of Freshwater Resources
- address the effects of existing and future discharges of contaminants to Freshwater Resources
- provide more certainty in respect of competing demands on New Zealand's Freshwater Resources and facilitate opportunities to increase benefits from the use of Freshwater Resources, within the above constraints on availability and effects of discharges
- meet the recreational aspirations of New Zealanders, including that Freshwater Resources are swimmable
- address matters of national significance relating to the sustainable management of Freshwater Resources
- improve the integrated management of Freshwater Resources by territorial authorities, regional councils, and others whose activities affect Freshwater Resources.

In developing and applying measures, local government should aim wherever possible to provide flexibility in how these goals are achieved, so as to encourage and empower innovation and local solutions. It is expected that this National Policy Statement will have an immediate influence on RMA decision-making. It will also call for progressive improvement in the management of New Zealand's Freshwater Resources. Councils will be expected to make publically available information in this regard, which will be monitored and published as required under section 35 of the RMA. Each national state of the environmental report should demonstrate progress in achieving the goals of the NPS and show continuing improvements in the state of New Zealand's Freshwater Resources, including towards meeting contact recreation guidelines. This is in order that by 2035 the quality of these resources meets the aspirations of all New Zealanders. This date has been chosen as an ambitious yet achievable target, setting a balance between the need to make changes in a timely manner and the cost incurred by making those changes.

Purpose

The purpose of this National Policy Statement is to state inter-related and integrated objectives and policies as to the management of Freshwater Resources as a matter of national significance that is relevant to achieving the purpose of the Act.

Objectives

Objective 1 – Enabling well-being of people and communities

To ensure that Freshwater Resources are managed in a way that enables the people and communities of New Zealand to provide for their social, economic and cultural well-being, and their health and safety.

Objective 2 – Ensuring integrated management of effects on fresh water

To ensure effective integrated management (including by the co-ordination and sequencing of Land-use Development with investment in infrastructure for supply, storage and distribution of fresh water) of the effects of Land-use Development and discharges of contaminants on the quality and available quantity of fresh water.

Objective 3 – Improving the quality of fresh water

To ensure the progressive enhancement of the overall quality of Freshwater Resources, including actions to ensure appropriate Freshwater Resources can reach or exceed a swimmable standard.

Objective 4 – Recognising and protecting life supporting capacity and ecological values

To ensure the life supporting capacity and ecological values of Freshwater Resources are recognised and protected from inappropriate –

a. taking, use, damming or diverting of fresh water; and

b Land-use Development; and

c. discharges of contaminants.

Objective 5 – Addressing freshwater degradation

To control the effects of Land-use Development and discharges of contaminants to avoid further degradation of Freshwater Resources.

Objective 6 – Managing demand for fresh water

To ensure that demands (including social, economic and cultural demands) for fresh water are sustainably managed in a manner that has regard to the following:

a. available supply of fresh water:

b. the need to provide for resilience against the biophysical effects of climate change (such as through infrastructure for supply, storage and distribution of fresh water):

c. the adverse effects that arise from those demands.

Objective 7 – Efficient use of fresh water

To ensure that allocated fresh water is used efficiently particularly in terms of the following:

a. avoiding wastage:

b. avoiding excessive contamination:

c. facilitating opportunities to increase benefits from the use of fresh water.

Objective 8 – Iwi and hapū roles and Tangata Whenua Values and Interests

To ensure that iwi and hapū are involved, and Tangata Whenua Values and Interests are identified and reflected, in the management of Freshwater Resources including the matters specified in Objectives 1–7.

Objective 9 – Ensuring effective monitoring and reporting

To ensure that regional councils and territorial authorities undertake effective monitoring and reporting of the matters specified in Objectives 1–8.

Policies as to regional policy statements

Policy 1

By the second anniversary of the date of commencement of this National Policy Statement, every regional council must notify, in accordance with Schedule 1 of the Act, a proposed regional policy statement or variation to a proposed regional policy statement or change to its operative regional policy statement in order that as soon as practicable thereafter every regional policy statement specifies objectives, policies and methods which –

a. Determine and timetable priorities for when regional plans will set Freshwater Quality Standards and Environmental Flows and Levels for all Freshwater Resources of the region; and

b. Identify Notable Values (including potential values) of –

   i. Any Outstanding Freshwater Resources; and

   ii. Any Degraded Freshwater Resources; and

c. In accordance with Policy 1(a) and (b), guide and direct the setting in regional plans for all Freshwater Resources of the region of –

   i. Freshwater Quality Standards; and

   ii. Environmental Flows and Levels;

   including for the protection of Notable Values of any Outstanding Freshwater Resources and the enhancement or restoration of Notable Values of any Degraded Freshwater Resources; and

d. Guide and direct local authorities as to the involvement of iwi and hapū in the management of, and decision-making regarding, all Freshwater Resources of the region, including but not limited to, requiring local authorities to disclose how they are intending to achieve this involvement; and

e. Identify Tangata Whenua Values and Interests in respect of all Freshwater Resources of the region; and

f. Guide and direct regional and district plans (including considerations for the determination of resource consent applications and notices of requirement) in relation to the recognition of Tangata Whenua Values and Interests in respect of all Freshwater Resources of the region; and

g. Guide and direct regional plans (including considerations for the determination of resource consent applications) to restrict existing takes, uses, damming and diversion of fresh water in order to sustain Notable Values and non-consumptive Tangata Whenua Values and Interests in times of low flow; and

h. Guide and direct regional and district plans (including considerations for the determination of resource consent applications and notices of requirement) to effectively manage Land-use Development and discharges of contaminants to control the adverse effects of the discharge of contaminants into fresh water or onto or into land in circumstances where contaminants may enter fresh water; and

i. Guide and direct regional and district plans (including considerations for the determination of resource consent applications and notices of requirement) to manage demands for fresh water, including demands arising from Land-use Development and discharges of contaminants, in a manner which –

    i. Provides certainty to communities and water users (including as appropriate through prioritisation of allocation for takes of fresh water for reasonably foreseeable Consumptive Use); and

    ii. Provides priority for reasonably foreseeable domestic water supply, over other competing demands, provided that appropriate demand strategies are established for such supply; and

    iii. Promotes efficient Freshwater use (including through the transferability of resource consents, where appropriate); and

    iv. Increases resilience to the effects of climate change; and

    v. Controls adverse effects; and

j. Guide and direct regional and district plans (including considerations for the determination of resource consent applications and notices of requirement) to ensure integrated management of the effects of Land-use Development –

    i. by encouraging co-ordination and sequencing of infrastructure for supply, storage and distribution of fresh water; and

    ii. by controlling adverse effects (including associated discharges of contaminants) on the quality and available quantity of Freshwater Resources.

Policies as to regional and district plans

Policy 2

Every regional council must –

a. By the date or dates specified in the regional policy statement, notify a proposed regional plan, change or variation, to set Freshwater Quality Standards and Environmental Flows and Levels for the Outstanding, Degraded and other Freshwater Resources of the region to give effect to the regional policy statement in relation to the matters in Policies 1(a) to (c); and

b. By no later than 40 working days following the date a regional policy statement or change notified pursuant to Policy 1 is made operative, every regional council must notify a proposed regional plan, change or variation to give effect to the regional policy statement in relation to all other matters in Policy 1; and

c. By no later than 40 working days following the date a regional policy statement or change notified pursuant to Policy 1 is made operative, every regional council must notify a proposed regional plan, change or variation to include rules to achieve the following:

    i. Require that all water permits for the Consumptive Use of fresh water granted after the date of commencement of this National Policy Statement include conditions for the efficient Consumptive Use of fresh water including, as a minimum, providing for the use of industry good practice and technology to achieve efficient use:

    ii. Require that all water permits for the Consumptive Use of fresh water granted after the date of commencement of this National Policy Statement include conditions for, where appropriate, the return of fresh water to Freshwater Resources, in order to achieve the requirements of paragraph (a) of this Policy:

    iii. Require that all discharge permits affecting Freshwater Resources granted after the date of commencement of this National Policy Statement include conditions for –

        a. Protection against degradation of the quality of fresh water of Freshwater Resources (including through the management of activities giving rise to stormwater discharges); and

        b. Sustainable management of demands on fresh water in a manner which has regard to available supply of fresh water and adverse effects, both individual and cumulative; and

        c. Integrated management of the effects of Land-use Development and discharges of contaminants on the quality and available quantity of Freshwater Resources;

    to be achieved, as a minimum, by the use of industry good practice:

    iv. Require effective monitoring and reporting on matters relating to paragraphs (c)(i), (ii) and (iii) of this Policy.

Policy 3

By no later than 40 working days following the date a regional policy statement or change notified pursuant to Policy 1 is made operative, every territorial authority must notify a proposed district plan, change or variation in order that as soon as practicable thereafter every district plan –

a. Gives effect to the regional policy statement; and

b. Includes rules to require that all relevant land-use and subdivision consents granted after the commencement of this National Policy Statement include conditions for –

   i. Protection against degradation of the quality of fresh water of Freshwater Resources (including through the management of activities giving rise to stormwater discharges); and

   ii. Sustainable management of demands on fresh water in a manner which has regard to available supply of fresh water and adverse effects, both individual and cumulative; and

   iii. Integrated management of the effects of Land-use Development and discharges of contaminants on the quality and available quantity of Freshwater Resources; and

   to be achieved, as a minimum, by the use of industry good practice; and

c. Includes rules to require that all relevant land-use and subdivision consents granted after the commencement of this National Policy Statement include conditions to require monitoring and reporting on matters relating to paragraph (b).

Policies as to the preparation of policy statements and plans

Policy 4

When preparing a regional policy statement or variation or change to give effect to Policy 1 and when preparing a regional plan or variation or change to give effect to Policy 2, every regional council must consider the following:

a. The Notable Values of each Freshwater Resource:

b. The sensitivity of each Freshwater Resource and its Notable Values to adverse effects including effects of Land-use Development and the discharge of contaminants:

c. The needs of primary and secondary industry and communities for sustainable fresh water supply:

d. The contribution of existing and potential uses of Freshwater Resources and of existing economic investment to regional and national social, economic and cultural well-being:

e. The importance of avoiding over-allocation of Freshwater for Consumptive Use:

f. Tangata Whenua Values and Interests:

g. Social and economic transition costs:

h. The value of swimmability to the community.

Policy 5

When preparing a district plan or variation or change to give effect to Policy 3, every territorial authority must consider the following:

a. The importance of controlling Land-use Development in a way and at a rate that minimises the adverse effects on the quality and available quantity of Freshwater Resources:

b. The importance of ensuring that the planning and implementation of Land-use Development applies industry good practice in order to –

   i. Minimise the adverse effects on the quality and available quantity of Freshwater Resources; and

   ii. Maximise efficiency in the use of Freshwater Resources:

c. The importance of ensuring that the planning for and implementation of infrastructure for water supply, wastewater treatment and stormwater are undertaken –

   i. In an integrated manner; and

   ii. At a rate that, as a minimum, keeps pace with the rate of Land-use Development:

d. Tangata Whenua Values and Interests:

e. Social and economic transition costs.

Policy as to certain consents and designations

Policy 6

Without limiting Policies 1 to 3, this National Policy Statement will be achieved also through the inclusion, unless inappropriate, of conditions on any relevant resource consents granted and recommendations on designations confirmed in respect of the following:

a. Efficient Consumptive Use of fresh water (including where appropriate, the return of fresh water to Freshwater Resources):

b. Protection against degradation of the quality of Freshwater Resources (including through the management of activities giving rise to stormwater discharges):

c. Sustainable management of demands on fresh water in a manner which has regard to available supply of fresh water and adverse effects, both individual and cumulative:

d. Integrated management of the effects of Land-use Development and discharges of contaminants on the quality and available quantity of Freshwater Resources:

to be achieved, as a minimum, by the use of industry good practice:

e. Monitoring and reporting on matters relating to paragraphs (a) to (d).

Policy as to non-regulatory methods

Policy 7

In addition to giving effect to Policies 1 to 3 and Policy 6 by regulatory means, regional councils and territorial authorities may give effect to this National Policy Statement through non-regulatory methods (including financial contributions, development contributions under the Local Government Act 2002 and other methods).

Policy as to information

Policy 8

All local authorities will make publicly available (including electronically) a record of the process used to identify the Tangata Whenua Values and Interests in Freshwater Resources of the region as required to give effect to Policy 1(e), including the identification of the relevant iwi and hapū.

All local authorities will assist the Minister for the Environment by making publicly available (including electronically) an up-to-date register of the regulatory and non-regulatory methods to give this National Policy Statement full effect.

Review of this National Policy Statement

Policy 9

The Minister for the Environment will seek an independent review of the implementation and effectiveness of this National Policy Statement at achieving all the objectives and policies of the National Policy Statement no later than 10 years after it comes into force and shall then consider the need to review, change or revoke this statement. Collection of data to inform this review will begin at least two years prior to the review.

Definitions

In this National Policy Statement:

"**Act**" means the Resource Management Act 1991.

"**Consumptive Use**" means any use of fresh water that alters the flows and or levels in a Freshwater Resource on either a temporary or permanent basis, including:

- storage and later release downstream of fresh water:
- permitted activities:
- takes under section 14(3)(b) and (e) of the Act:

but excludes any water that is returned to the same Freshwater Resource at or about the same location and which does not affect the spatial or temporal availability, or the physical, chemical or biological quality, of the fresh water.

"**Degraded Freshwater Resources**" means those Freshwater Resources of a region whose Notable Values have been so degraded by inappropriate Land-use Development, discharges of contaminants and/or the taking, use, damming or diverting of fresh water as to require that priority be given to enhancement or restoration in order to achieve the purpose of the Act.

"**Environmental Flows and Water Levels**" means a regional rule to prevent the allocation for Consumptive Use of Freshwater Resources necessary for the purposes of protecting, maintaining, enhancing or restoring Notable Values of the relevant Freshwater Resource.

"**Freshwater Quality Standard**" means a regional rule on freshwater quality which gives effect to this National Policy Statement.

"**Freshwater Resources**" means the fresh water of New Zealand's rivers, lakes, wetlands and groundwater systems [but does not include fresh water of any ephemeral stream or artificial watercourse]".

"**Land-use Development**" includes land-use intensification, land-use change, and subdivision of land.

"**Notable Values**" in relation to any Freshwater Resource includes:

a. Scientific, ecological and biodiversity values:

b. Cultural values:

c. Recreational (including contact recreational; eg, swimming) values.

"**Outstanding Freshwater Resources**" means those Freshwater Resources of a region whose Notable Values and/ or Tangata Whenua Values and Interests are such as to require that priority be given to protection in order to achieve the purpose of the Act.

APPENDIX B

TERMS OF REFERENCE FOR BOARD OF INQUIRY ON THE PROPOSED NATIONAL POLICY STATEMENT FOR FRESHWATER MANAGEMENT

Establishment of a Board of Inquiry

The Minister for the Environment (Minister) has decided to develop a National Policy Statement for Freshwater Management. The proposed National Policy Statement for Freshwater Management (proposed NPS) is attached as Appendix 1.

Pursuant to section 46A(1)(a) of the Resource Management Act 1991 (RMA), the Minister has chosen to use the process set out in sections 47 to 52 of the RMA to advance the proposed NPS. The Minister has appointed the Board of Inquiry (the Board), with the agreement of the Cabinet.

Role of the Board

The Board, in accordance with sections 48 to 51 of the RMA, is to:

a. inquire into the proposed NPS;

b. consider all submissions duly made and all the evidence duly given on the proposed NPS;

c. report to the Minister on the contents and subject-matter of the proposed NPS, with any recommendation the Board has about amendments to the content of the proposed NPS so that it will more fully serve the purpose of the RMA and of this proposed NPS.

The process

a. The Board is to give the public adequate time and opportunity to make written submissions on the content and subject-matter of the proposed NPS.

b. The Board is to consider the most appropriate method to engage with tangata whenua.

c. The Board is to publish the written submissions duly made.

d. The Board may provide opportunity for the making of further submissions in response.

e. The Board is to sit in public when hearing submissions and evidence in support of written submissions and submissions in response.

f. The Board may invite and consider further submissions on amendments to the proposed NPS prior to completing its report and recommendations.

Matters to be explicitly addressed

The Board shall provide, in its report:

- recommendations on the wording of the proposed NPS, including the objectives and policies;
- recommendations on how councils should give effect to the proposed NPS pursuant to section 55;
- reasons for the content of its report and recommendations.

The report and recommendations may also address:

- the internal consistency of the proposed NPS as a whole, and ways to address any potential inconsistencies;
- the level of certainty or clarity provided by the proposed NPS, and if this is inadequate, ways to improve it;
- the removal or further refinement of issues, objectives and policies where this is appropriate for achieving the policy approach of the proposed NPS;
- the identification of any unintended or unforeseen, but likely outcomes of the proposed NPS, and ways to address these;
- whether or not some of the changes needed to regional policy statements, district or regional plans would be best achieved via direct insertion into the regional policy statements or plans pursuant to section 55 (2A) (b) of the RMA, and if so what those provisions should state.

The Board's report to the Minister

The Board's report should be sent to the Minister's Office as a signed hard copy, and copied to the Secretary for the Environment, as an electronic copy.

Term of inquiry

The inquiry will run from the date of appointment set out in the letters of appointment until the receipt by the Minister of the report and recommendations, under section 51(2) of the RMA.

The Board is invited to report progress on the inquiry to the Minister by 31 May 2009.

Administrative support to the Board

a. The Ministry is to provide the Board with the administrative support and assistance it requires in order to carry out its tasks efficiently and effectively.

b. The Ministry will provide the Board with the following documents for background reference:

   - Wai Ora – Report of SWPoA Consultation Hui

- Comments received from iwi authorities and stakeholders during consultation
- Report on the evaluation under Section 32 of the RMA of the proposed NPS.

c. The Ministry is also to provide any other documents that the Board requires to carry out its task.

d. The Ministry is to make a record of the proceedings at public sittings of the Board.

APPENDIX C

NATIONAL POLICY STATEMENT FOR FRESHWATER MANAGEMENT

(As recommended by the Board of Inquiry)

Preamble

Fresh water is highly valued by New Zealanders for many uses and intrinsic values. Yet the availability of supplies of fresh water, and its suitability for those uses and for maintaining those values, are under threat. New Zealanders are faced with considerable challenges in managing allocations of water that leave enough in lakes, rivers and aquifers for the health of associated ecosystems; in eliminating contamination of them; and in protecting wetlands. The challenges are greater due to increasing climate change.

National policies are needed to address those challenges and remove the threats for good. In some respects that may take a generation. But national policies on management of fresh water will only be credible if, by carrying them through, those goals will be reached.

There follow lists of values of fresh water for enabling well-being of people and communities, and of intrinsic values; of national issues about freshwater management; and of national goals. They are the foundations for setting national objectives and policies for freshwater management. Meanings are given of some terms used in them.

National values of fresh water

There are values for which people and communities may make use of fresh water to provide for their own well-being and amenity, for example:

- domestic drinking and washing water
- animal drinking water
- community water supply
- fire fighting
- hydro-electricity generation
- commercial and industrial processes
- irrigation
- recreational activities (including waka ama)
- food production and harvesting, e.g. fish farms and mahinga kai
- transport and access (including tauranga waka)
- cleaning, dilution and disposal of waste.

There are also values that relate to recognising and respecting fresh water's intrinsic values for: safeguarding the life-supporting capacity of water and associated ecosystems; and sustaining its potential to meet the reasonably foreseeable needs of future generations. Examples of these values include:

- the interdependency of the elements of the freshwater cycle
- the natural form, character, functioning and natural processes of water bodies and margins, including natural flows, velocities, levels, variability and connections
- the natural conditions of fresh water, free from biological or chemical alterations resulting from human activity, so that it is fit for all aspects of its intrinsic values
- healthy ecosystem processes functioning naturally
- healthy ecosystems supporting the diversity of indigenous species in sustainable populations
- cultural and traditional relationships of Māori with fresh water, including mauri, waahi tapu, wai taonga, recognised customary activities and spiritual values
- historic heritage associations with fresh water
- providing a sense of place for people and communities.

All the values in both lists are important national values of fresh water.

National issues about freshwater management

Four national issues about freshwater management arise:

- over-allocation of fresh water
- contamination of fresh water
- loss of wetlands
- incompletely integrated management.

National goals

These issues are nationally significant and to address them and ensure that all those national values of fresh water are safeguarded, this National Policy Statement has these national goals:

- to phase out over-allocation
- to phase out contamination
- to protect wetlands
- to improve the integration of management.

A. General objective

Objective A1

To manage fresh water in a way and at a rate that –

1) maintains, and to the extent practicable, restores and enhances the intrinsic values of fresh water:

   a) in the interdependence of the elements of the freshwater cycle; and

   b) in the natural form, character, functioning and natural processes of water bodies; and

   c) in natural and healthy conditions free from alterations resulting from human activity; and

   d) in healthy ecosystem processes functioning naturally; and

   e) for safeguarding the life-supporting capacity of air, water, soil and ecosystems; and

   f) for providing healthy ecosystems supporting the diversity of indigenous species in sustainable populations; and

   g) for sustaining cultural and traditional relationships of Māori with fresh water; and

   h) for sustaining the potential for fresh water to meet the reasonably foreseeable needs of future generations; and

2) (while not detracting from attaining clause 1), enables people and communities to provide for their social, economic and cultural well-being, and for their health and safety.

B. Tāngata whenua roles and Māori values and interests

Objective B1

To ensure that tāngata whenua are involved, and Māori values and interests are recognised and provided for, in the management of fresh water and associated ecosystems.

Policy B1

By every regional council making or changing its regional policy statement to the extent needed to ensure it contains policy:

(a) for identifying Māori values and interests in all fresh water and freshwater ecosystems in the region; and

(b) for involving tāngata whenua in management and decision-making regarding fresh water and freshwater ecosystems in the region.

C. Integrated management

Objective C1

To improve integrated management of fresh water, associated ecosystems and use of land in whole catchments.

Policy C1

By every regional council managing fresh water and freshwater ecosystems, and controlling activities and use of land, in whole catchments, so as to avoid adverse cumulative effects anywhere in the catchment.

D. Water quantity

Objective D1

To safeguard the life-supporting capacity, ecosystem processes and indigenous species and their associated ecosystems of fresh water from the adverse effects of taking, using, damming, or diverting of fresh water or of draining of wetlands.

Objective D2

To phase out over-allocation of fresh water.

Policy D1

By every regional council making or changing regional plans to the extent needed to ensure the plans allocate fresh water among types of activity in a manner and at rates that (having regard to reasonably foreseeable impacts of climate change) enable environmental flows and levels to be fully sustained.

Policy D2

By every regional council making or changing regional plans to the extent needed to ensure the plans set environmental flows and levels for all bodies of fresh water in its region (except ponds and naturally ephemeral water bodies).

Policy D3

By every regional council phasing out existing over-allocation.

Policy D4

By every regional council avoiding any decision and any other action that results in future over-allocation.

Policy D5

By every regional council, wherever permissible, reviewing water permits and consents to ensure the exercise of them safeguards intrinsic national values of fresh water:

(a) in over-allocated catchments; and

(b) in over-allocated water bodies; and

(c) in times of low flow or level.

Policy D6

By every regional council managing demand for fresh water so that the aggregate of all amounts of fresh water in a water body that are authorised to be taken, used, dammed or diverted does not over-allocate the water in the water body.

Policy D7

By every regional council managing use of fresh water so as to avoid wastage.

Policy D8

By regional councils imposing conditions of water permits requiring adoption of the best practicable option to achieve conservation of water.

Policy D9

By every regional council making or changing regional plans to the extent needed to ensure the plans state criteria by which applications for approval of transfers of water permits are to be decided, including:

(a) the extent to which the transfer would result in enhanced quality of fresh water;

(b) the extent to which the transfer would maintain quantities of fresh water in natural water bodies

(c) the extent to which the transfer would enhance the conservation of water.

Policy D10 and direction (under section 55) to regional councils

By every regional council making or changing regional plans (without using the process in Schedule 1) to the extent needed to ensure the plans include the following policy to take effect immediately, and to continue in effect until changes required by Policy D1 (allocation), Policy D2 (environmental flows and levels), and Policies D3 and D5 (over-allocation) of this national policy statement have been given full effect:

"1. This policy applies to:
   (a) any change in the character, intensity or scale of any activity that involves any taking, using, damming or diverting of fresh water or draining of any wetland; and
   (b) any change in the natural variability of flows or level of any fresh water, by which the activity or variability is not the same or similar in character, intensity, scale, or relative frequency and extent as that which immediately preceded the change.
2. Any change to which this policy applies requires resource consent (as a discretionary activity), and any application for consent is to be decided by criteria that include:
   (a) the extent to which the change would adversely affect safeguarding the life-supporting capacity of fresh water and of any associated ecosystem; and
   (b) the extent to which it is feasible and dependable that any adverse effect on the life-supporting capacity of fresh water and of any associated ecosystem resulting from the change would be fully avoided."

E. Water quality

Objective E1

To protect the quality of outstanding fresh water, to enhance the quality of all fresh water contaminated as a result of human activities, and to maintain the quality of all other fresh water.

Objective E2

To safeguard the life-supporting capacity, ecosystem processes and indigenous species and associated ecosystems of fresh water from adverse effects of the use or development of land, and of discharges of contaminants.

Policy E1

By every regional council making or changing regional plans to the extent needed to ensure the plans:

(a) set freshwater quality standards for all bodies of fresh water in their regions; and

(b) by rule, prescribe attainment of those standards (except in respect of contaminants that do not result from human land use or activity).

Policy E2

By every regional council avoiding any decision and any other action that results in future contamination of fresh water.

Policy E3

By regional councils imposing conditions of discharge permits requiring adoption of best practicable options to protect against contamination of fresh water.

Policy E4 and direction (under section 55) to regional councils

By every regional council making or changing regional plans (without using the process in Schedule 1) to the extent needed to ensure the plans include the following policy to take effect immediately, and to continue in effect until changes required by Policy E1 (freshwater quality standards) of this national policy statement have been given full effect:

"1. This policy applies to any change in the character, and to any increase in the intensity or scale, of any land use or activity—

(a) that is not of the same or similar character, intensity or scale as that which immediately preceded it; and

(b) that involves any discharge (by any person or by any animal) of any contaminant or water into fresh water, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering fresh water.

2. Any change or increase in intensity of land use or activity to which this policy applies requires resource consent (as a discretionary activity), and any application for consent is to be decided by criteria that include:

(a) the extent to which the land use or activity would avoid contamination of, and any other adverse effect on, fresh water;

(b) the extent to which it is feasible and dependable that any adverse effect on fresh water, and on any ecosystem associated with fresh water, resulting from the use or activity would be fully avoided."

F. Progressive implementation programme

Policy F1

1. This policy applies to the implementation by a regional council of a policy of this national policy statement.

2. Every regional council is to implement the policy as promptly as is reasonable in the circumstances, and so it is fully completed by no later than 31 December 2030.

3. Where a regional council is satisfied that it is impracticable for it to complete implementation of a policy fully by 31 December 2014, the council may implement it by a programme of defined time-limited stages by which it is to be fully implemented by 31 December 2030.

4. Any programme of time-limited stages is to be formally adopted by the council within 18 months of the date of gazetting of this national policy statement, and publicly notified.

5. Where a regional council has adopted a programme of staged implementation, it is to publicly report, in every year, on the extent to which the programme has been implemented.

Meanings of terms

In this national policy statement:

"Act" means the Resource Management Act 1991.

"Environmental flows and levels" means the water flows and levels required to provide for the intrinsic values of fresh water contained in the second list of values of fresh water in the preamble.

"Fresh water" has the same meaning as in section 2 of the Act.

"Freshwater quality standard" means a regional rule on freshwater quality which provides for the intrinsic values of fresh water contained in the second list of values of fresh water in the preamble.

"Over-allocation" means

- allocating fresh water in a water body among types of activity
- authorising the taking, using, damming or diversion of fresh water in the water body

to an extent that exceeds the amount of water available in the water body after taking into account:

(a) environmental flows and levels in respect of the water body; and

(b) amounts of water likely to be taken from the water body under section 14(3)(b) of the Act; and

(c) amounts of water in the water body already allocated or committed by current water permit.

Terms given meaning in the Act have the meanings so given.

November 2018

Clutha River/Mata-au Catchment Recreation Values Assessment

Lakes Wakatipu, Wānaka, Hāwea, Roxburgh and Dunstan, and the Clutha River/Mata-au, Hāwea River and Kawarau River

Prepared for the Otago Regional Council

www.greenaway.co.nz

Clutha River/Mata-au Catchment

Lakes Wakatipu, Wānaka, Hāwea, Roxburgh and Dunstan, and the Clutha River/Mata-au, Hāwea River and Kawarau River

Recreation Values Assessment

November 2018

Prepared for:

Otago Regional Council

By:

Rob Greenaway & Associates
www.greenaway.co.nz

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Contents

Abbreviations

ACC	NZ Accident Compensation Corporation
CDC	Clutha District Council
CMS	Conservation Management Strategy
CODC	Central Otago District Council
Contact	Contact Energy Ltd
COW	Central Otago Whitewater Club
DoC	Department of Conservation
DTS	Domestic Travel Survey
ECNZ	Electricity Corporation of NZ
F&G NZ	Fish & Game New Zealand
GIS	Geographic information system
IVS	International Visitor Survey
LINZ	Land Information New Zealand
m asl	metres above sea level (a measure of lake level)
m^3/s	cubic metres per second, or cumecs (a measure of river flow)
MBIE	Ministry of Business, Innovation and Employment
MfE	Ministry for the Environment
NAS	National angler surveys carried out for F&G NZ
NIWA	National Institute of Water and Atmospheric Research
NPSFM	National Policy Statement for Freshwater Management 2014
NZOIA	NZ Outdoors Instructors Association
OFGC	Otago Fish & Game Council
ORC	Otago Regional Council
QLDC	Queenstown Lakes District Council
RiVAS	River Values Assessment System
RMA	Resource Management Act 1991
SAR	Search and Rescue
SUP	Stand-up paddle board
WCO	Water Conservation Order
WHO	World Health Organisation

Figures

Tables

1 Introduction

The Otago Regional Council (ORC) is developing a change to the *Regional Plan: Water for Otago* ('the Water Plan') to set minimum flows and/or levels and allocation limits that seeks to set restrictions on the taking of surface and connected groundwater from the Clutha River/Mata-Au, the Hāwea and Kawarau Rivers and Lakes Dunstan, Roxburgh, Hāwea, Wakatipu and Wānaka.

Section 30 of the Resource Management Act 1991 (RMA) requires regional councils to set levels and flows for water bodies. The National Policy Statement for Freshwater Management 2014 (NPSFM, as updated in 2017) requires every freshwater management unit to have 'environmental flows and/or levels' and to phase out over-allocation and ensure efficient water use. The Otago Regional Council began a programme of plan changes in 2004 to set minimum flows and levels for catchments throughout Otago.

This report supports the process of setting minimum flows and allocation limits for the Clutha River/Mata-au and the Hāwea and Kawarau Rivers and Lakes Roxburgh, Dunstan, Hāwea, Wakatipu and Wānaka, by describing their recreation and tourism values, and identifying relevant community preferences for flows and levels.

This report will be used in further consultation to identify a preferred water quantity regime, including limits to water abstraction and/or minimum flows and lake levels. The preferred option will then be notified as a proposed change to the Water Plan, with opportunities for submissions and input via a public hearing process.

This report is based on literature review and interviews with stakeholders. The report author has previously worked on the reconsenting of Contact Energy Ltd's hydro operations and assets in the catchment, and later hydro investigations, the Clutha Parkway project, and numerous development proposals adjacent to Lakes Wakatipu, Wānaka and the Kawarau River, and has completed reviews of many other river and lake recreation resources nationally.

1.1 Response to the project brief

The brief for this project was defined by the ORC, with each item and its location in this report listed below:

A. *All existing water-based recreational uses, values and activities, both commercial and non-commercial. These include, but are not limited to boating, swimming, paddling and angling.*

   Sections 3 and 5 describe all the recreation and tourism activities identified via, respectively, literature and stakeholder interviews. Section 2 – the executive summary – provides a description of recreation and tourism for each water body.

B. *Other commercial and non-commercial recreational uses and activities that rely on the availability or access to the water bodies or the amenities offered by them. (e.g. cycling, horse-riding, walking along river margins, sightseeing, including informal usage).*

   Section 3 summarises all activities identified and includes a review of public access opportunities. The scale of the study area is very large, however, and rather than list every item of recreation furniture and track formation, external references – which are more likely to remain current over time – are provided.

C. *Tourism activities/operations reliant on the presence of or access to these water bodies and any businesses supporting these activities.*

   Section 3.2 summarises commercial tourism operations via reference to Queenstown Lakes District Council (QLDC) licensing for 'marine' operators, Department of Conservation (DoC)

concessions and Maritime NZ licences. Several commercial operators were interviewed and appear in section 5. Individual operators (of which there are many dozens) are not listed, and such a dataset would rapidly date. Current operator lists can be sourced from the three agencies just identified.

D. *The significance of identified recreational uses, values and activities at a local (community, district level) and wider regional economy and national level.*

Section 4 reviews all relevant published assessments of significance for the study area, and research which provides relative data at a regional or national level. A summary assessment is made in that section, and these appear for each water body in section 2.

E. *User benefits derived from identified recreational activities based on or adjacent to the water bodies.*

These are considered in section 6, but are general in nature. There are no data available to attribute a set of quantified benefits to, for example, picnickers on the shores of Lake Dunstan or kayakers on the Hāwea River.

F. *Macro-scale (e.g. changes in recreational demand from global and domestic tourism) and local trends in the demand for or participation in identified recreational activities.*

See section 6.4 for a discussion of trends in recreation and domestic and international tourism.

G. *Importance of river flows/lake levels for maintaining and improving recreational values.*

These are identified in section 2 for each water body.

H. *The economic value of existing recreational activities and uses (quantify where practicable and appropriate).*

Data from regional economic assessments are summarised in section 6.1. However, these are only broadly applicable to recreation in the study area.

2 Executive summary by water body, with hydrology

This section presents:

- Flow or lake level duration curves for each water body. A duration curve shows the percentage of time each lake spends above a specific level (measured in stage height as metres above sea level (m asl)), or the percentage of time a river flows above a specific flow (measured in m^3/s or cumecs). Figure 1, over-page, for example, shows that Lake Wakatipu, for the period 1 January 2008 to 8 June 2018, never exceeded 311.5 m asl (or exceeded it for 0% of the time) and never dropped below 309.5 m asl (for 100% of the time the lake level was above this height), and was above 310 m asl for about 28% of the time. The decade 2008 to 2018 was chosen for most water bodies as this is within reasonable memory and most likely reflects the recreation experience of interviewees. A shorter period is used for Lake Roxburgh to indicate only the period after 2010 when its level was raised.
- Example annual hydrographs for each water body. The year 2015 is shown for each. While no year is typical, 2015 did not appear to have very dry periods as in 2017. There was, however, a wet period in winter, which can often be dry (with water locked as snow).
- For relevant water bodies affected by hydro generation, a seven-day hydrograph for the first week of 2015 (Sunday to Saturday – 4 Jan to 10 Jan). This shows the daily flow or lake level variation over seven days. Again, no week is typical, and early in the year was chosen to coincide with a busy recreation period – although electricity demand would not be representative of the working year –because the week chosen typifies the experience of the recreational users interviewed for this study. Contact Energy's approach to the management within the Clutha hydro scheme is summarised in section 5.5.

The hydrological data are presented to aid in understanding the preferred flows for recreation and to provide stakeholders with appropriate base data (although interviewees indicated, generally, a strong understanding of hydrological conditions). All data are based on hourly or quarter-hourly measurements, and at the scale presented the difference in period is irrelevant. Data records are held by Opus Consultants or NIWA and have been provided by Contact Energy Ltd and the ORC. This assessment does not consider the effects of extreme natural hydrological events on recreation as they are not relevant to the setting of preferred flow ranges.

The section also summarises, by water body:

- The recreation values and assets identified by literature review and interviews,
- An assessment of the significance – at the national and regional level – of each water body based on literature review, and interpretation by the author of this report (some professional opinion is expressed),
- Experiences of the existing hydrological regime and preferred flow rates and lake level ranges, identified through interviews and literature,
- Recreation conflicts and other influences on recreation quality, identified by literature review and interviews.

Description and analysis of natural water bodies in the study area are brief, as their hydrological regimes are protected by the Water Conservation (Kawarau) Order 1997 or the Lake Wānaka Preservation Act 1973. Referencing in this section is minimal and all relevant data are presented in the following report sections. There is some repetition of information in each section as various data are common and each section needs to be able to be read separately.

2.1 Lake Wakatipu

2.1.1 Hydrology

Figure 1 and Figure 2 show the natural hydrological regime of Lake Wakatipu, with the only control influenced by the gated weir at the lake outlet. During the decade described (2008 – 2018) the Lake

Figure 1: Lake Wakatipu level duration curve, 2008 – 2018 – at Willow Place

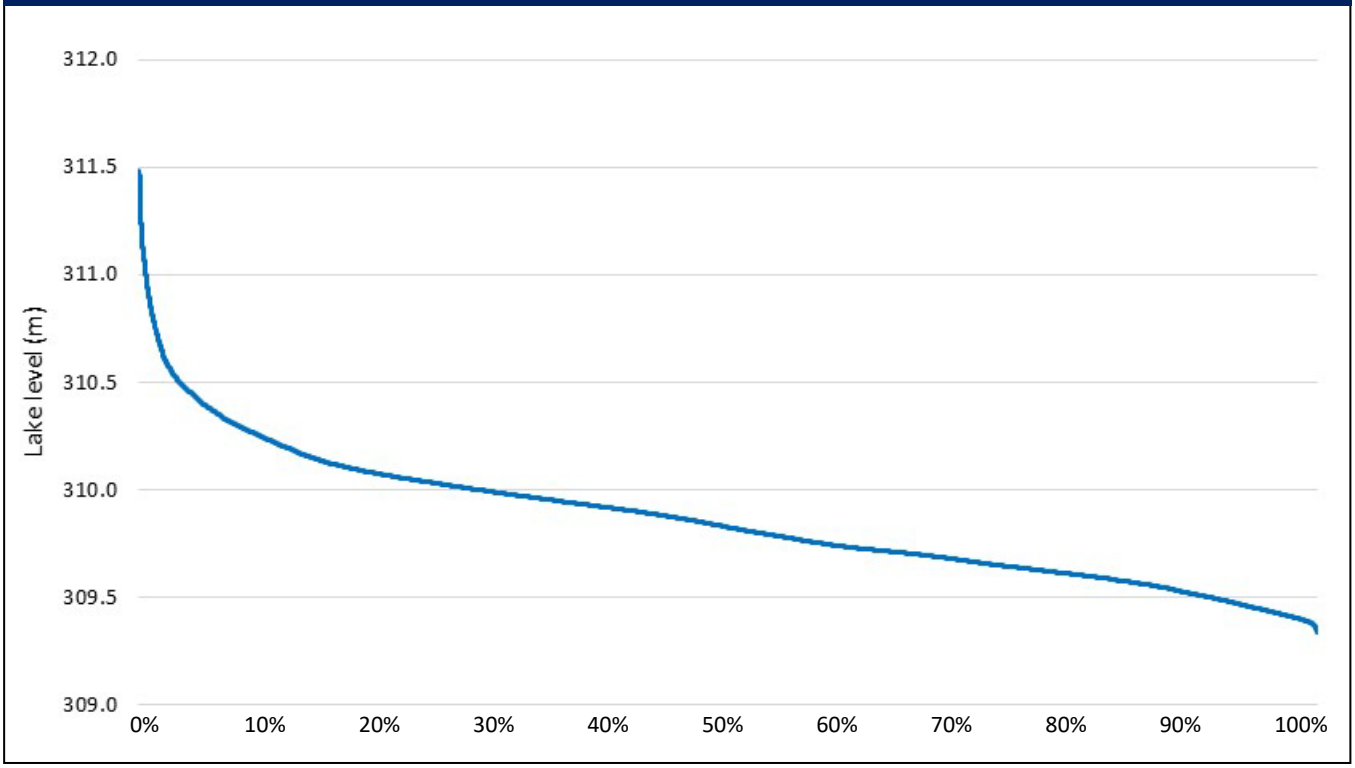
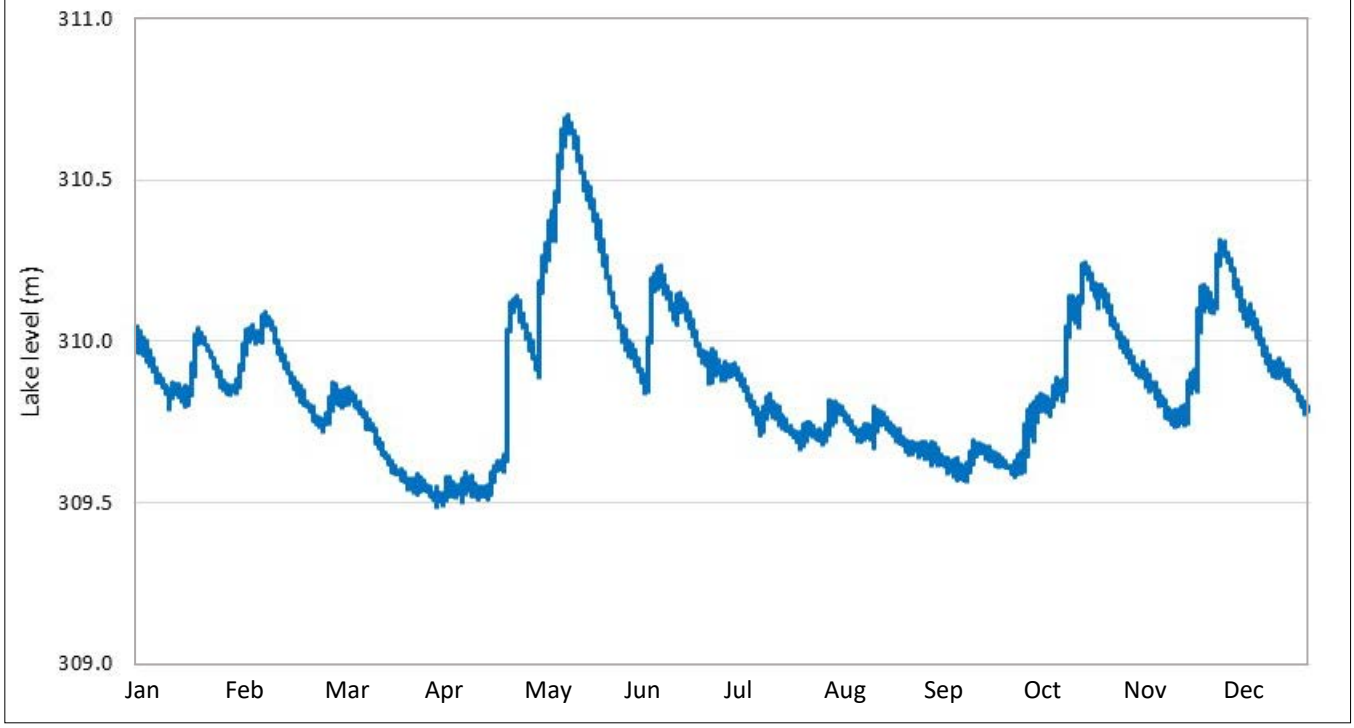


Figure 2: Lake Wakatipu full year hydrograph for 2015 – at Willow Place

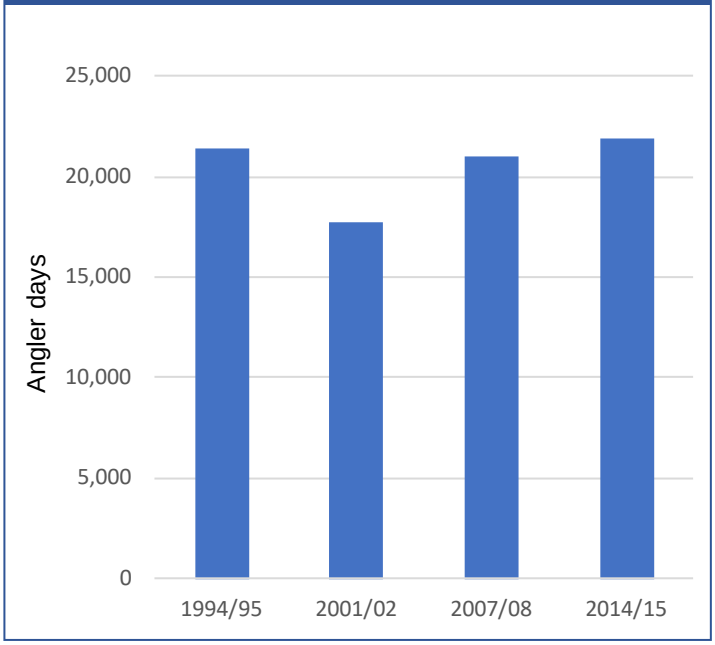


range was 309.4 to 311.5 m asl – a range of 2.1 m – although 90% of the time the Lake operates within a 1 m range. The November 1999 flood had a record level of 312.78 m asl, and the Steamer Wharf deck is reached at 311.6 m asl (ORC data).

2.1.2 Recreation and tourism values

Lake Wakatipu is part of one of New Zealand's most important tourism settings, for active use and scenic values. Most forms of freshwater recreation occur. Its shores are popular for lakeside picnicking, swimming, angling and passive recreation. The lake is used extensively for commercial tourism services, including jet boating, jet ski tours, the TSS Earnslaw, an underwater observatory, guided angling, cruises, sailing, paragliding, Seabreacher rides (Hydro Attack), kayaking and stand up paddle boarding (SUP). Almost all commercial activities are also carried out casually. The Frankton Arm is the most intensely used part of the Lake, for both on-water and lakeshore activities.

Figure 3: Lake Wakatipu angler days 1994 – 2015



Fishing activities are dispersed. Fish & Game NZ's (F&G NZ) national angler survey data for NZ resident licence holders[1] indicate a reasonably stable level of fishing activity since the mid-1990s (Figure 3).

Recreation assets include wharves and jetties, boat launching ramps (9), boat yards and slipways, navigational aids, anchorages and moorings, beach access areas and lakeshore picnic areas, and a marina (under construction at the time of writing).

The Department of Conservation had issued, as of August 2018, 65 concessions for commercial recreation activities on Conservation land adjacent to the Lake, more than half of which were for guided walking – noting that this count could be heavily inflated by individual concessionaires having multiple agreements over many different land areas.

High water clarity is an important recreation asset.

2.1.3 Significance

The hydrological regime of Lake Wakatipu is protected by the Water Conservation (Kawarau) Order 1997, which indicates its status as an outstanding recreation resource at the national level. All data reviewed in this study independently validate this status, considering the variety and scale of activity, and the scenic qualities of the setting.

[1] Overseas anglers were not surveyed in 1994/95 and 2001/02, and different survey methods were used for overseas anglers in 2007/08 and 2014/15. To allow comparison over time, only NZ resident anglers are shown in Figure 3 (and similar charts in this section), which means all counts are conservative (they do not include overseas anglers) (Unwin 2016). For more detail see section 3.5.

2.1.4 Experience of hydrology

As a natural water body, the hydrological regime is accepted as such. While low lake levels can affect the ability to use some moorings, there is generally no impediment to the operation of all recreation structures under normal conditions.[2]

2.1.5 Recreation conflict

The Lake is administered according to the QLDC Navigation Safety Bylaw 2018, which is one of the more comprehensive navigation bylaws nationally, reflecting the intensity of commercial and recreational activity on the relevant water bodies. Submissions on the proposed revision of the 2014 bylaw did not include any references to the need for additional controls to manage recreation conflict on Lake Wakatipu.

[2] Marty Black, QLDC Harbourmaster, pers comm.

2.2 Lake Wānaka

Figure 4 and Figure 5 show the natural hydrological regime of Lake Wānaka. During the decade described (2008 – 2018) the Lake range was 276.3 to 279.5 m – a range of 3.2 m, although 90% of the time the Lake operates within a 2 m range (twice the range of Lake Wakatipu). The November 1999 flood had a 122-year record level of 281.32 m (ORC data).

Figure 4: Lake Wānaka level duration curve, 2008 – 2018, Roys Bay

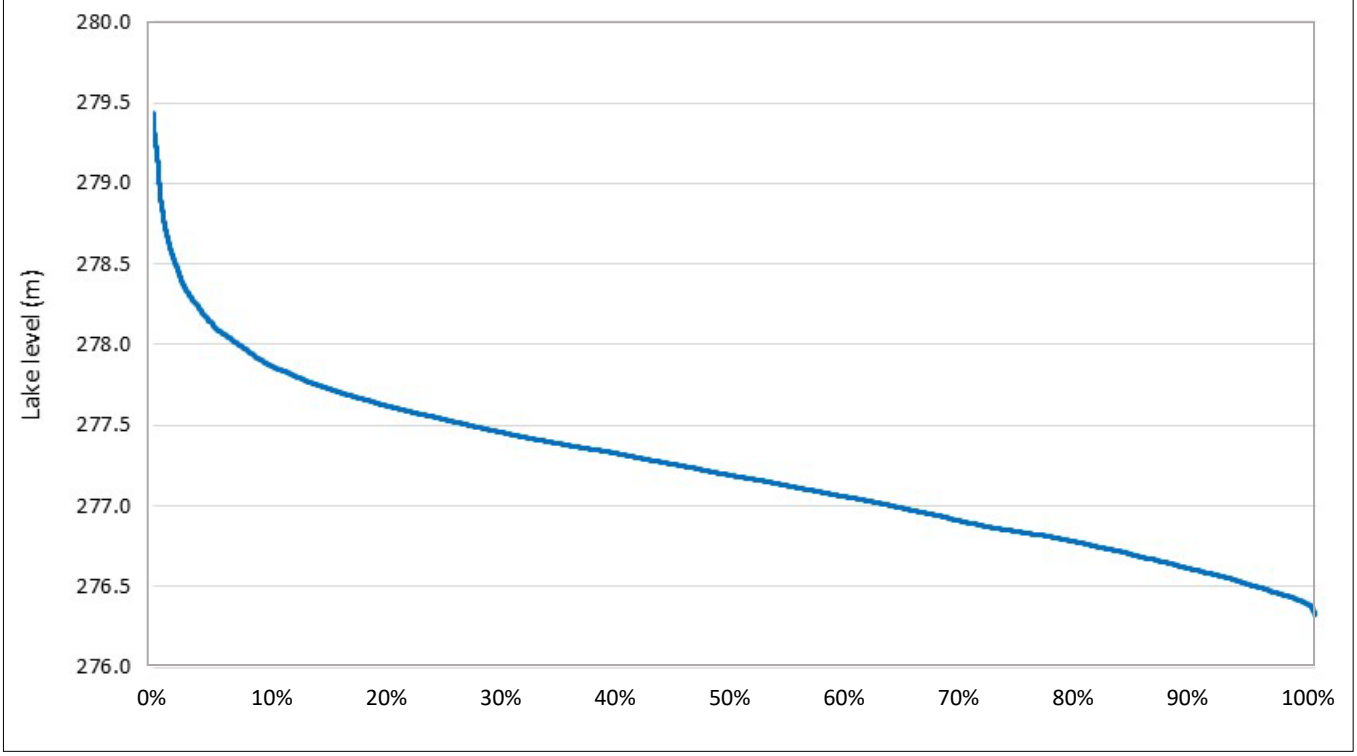
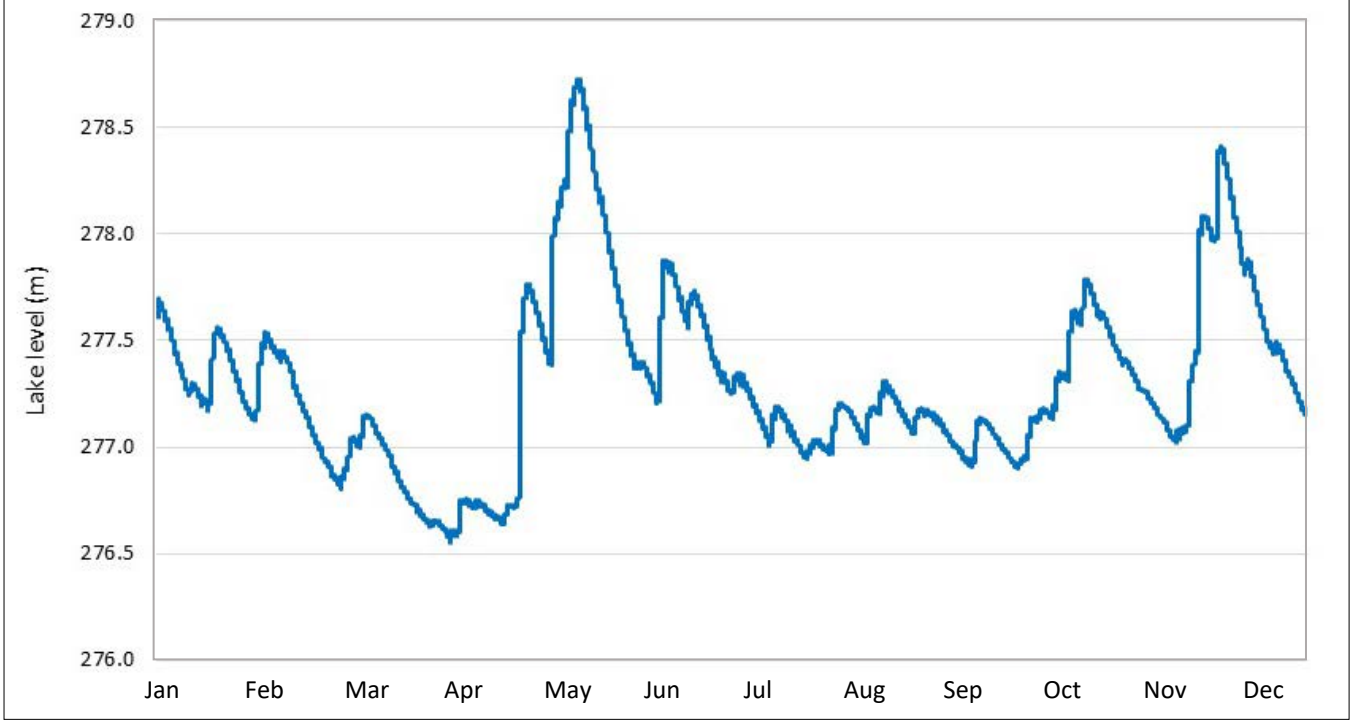


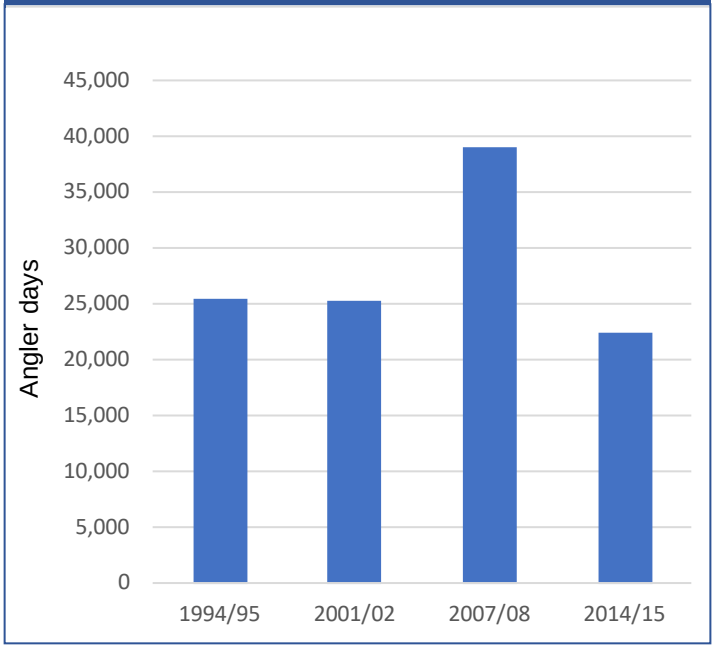
Figure 5: Lake Wānaka full year hydrograph for 2015, Roys Bay



2.2.1 Recreation and tourism values

Lake Wānaka, like Lake Wakatipu but to a lesser degree, is part of one of New Zealand's most important tourism settings, for active use and scenic values. Most forms of freshwater recreation are supported including lakeside picnicking, swimming, angling, camping and passive recreation. Open water swimming is popular, casually and within events. The lake is also used extensively for commercial tourism services, including jet boating, guided angling, cruises, sailing, paragliding, kayaking and SUP. Roys Bay is the most popular recreation setting on the Lake – considering its proximity to town and the location of the local rowing club, marina and open space for holding events – but Glendhu Bay and the onshore and offshore route to the Outlet are also particularly popular. Fishing activities are dispersed but concentrated around river mouths. Circular peregrinations of Ruby Island are common for swimmers and those in small boats. There are active swimming, rowing and boating clubs.

Figure 6: Lake Wānaka angler days 1994 – 2015



Fish & Game NZ's national angler survey data for NZ resident licence holders indicate a reasonably stable level of fishing activity since the mid-1990s, with a peak in the 2007/08 season (Figure 6).

Recreation assets include wharves and jetties, boat launching ramps (9), a slipway, navigational aids, anchorages and moorings, a marina, beach access areas and lakeshore picnic areas.

The Department of Conservation had issued, at August 2018, 39 concessions for commercial recreation activities on Conservation land adjacent to the Lake, half of which were for guided walking – noting that this count could be heavily inflated by individual concessionaires having multiple agreements over many different land areas.

High water clarity is an important recreation asset.

2.2.2 Significance

The hydrological regime of Lake Wānaka is protected by the Lake Wānaka Preservation Act 1973, which implies its status as an outstanding freshwater resource at the national level. All data reviewed in this study independently validate this status, considering – as for Lake Wakatipu – the variety and scale of activity, and the scenic qualities of the setting.

2.2.3 Experience of hydrology

As a natural water body, the hydrological regime is accepted as such. While low lake levels can affect swimming, there is generally no impediment to the operation of all recreation structures under normal conditions.[3]

[3] Marty Black, QLDC Harbourmaster, pers comm.

2.2.4 Recreation conflict

The Lake is administered according to the QLDC Navigation Safety Bylaw 2018, which is one of the more comprehensive navigation bylaws nationally, reflecting the intensity of commercial and recreational activity on the relevant water bodies. Submissions on the proposed revision of the 2014 bylaw did not include any references to the need for additional controls to manage recreation conflict on Lake Wānaka. Lake swimmers report some conflict with motorised craft, particularly those not obeying basic navigation rules (5 knots within 200 m of the shore, unless within a designated access lane). Summer is reported to be increasingly busy with growing numbers of jet skis, which reduces recreation enjoyment for some. Consultation by ORC over November 2017 to February 2018 (see section 3.1) noted concerns over recreation conflict between motorised vessels and other recreational users on the Lake.

2.3 Lake Hāwea

Figure 7 and Figure 8 show the hydrological regime of Lake Hāwea, which is managed by Contact Energy Ltd (Contact) for water storage for hydro generation in the Clutha scheme. Contact's consent requires the Lake to have a normal operating range of between 346 and 338 m asl, although it may be dropped to 336 m for emergency generation or dam safety purposes. Rates of

Figure 7: Lake Hāwea level duration curve, 2008 - 2018

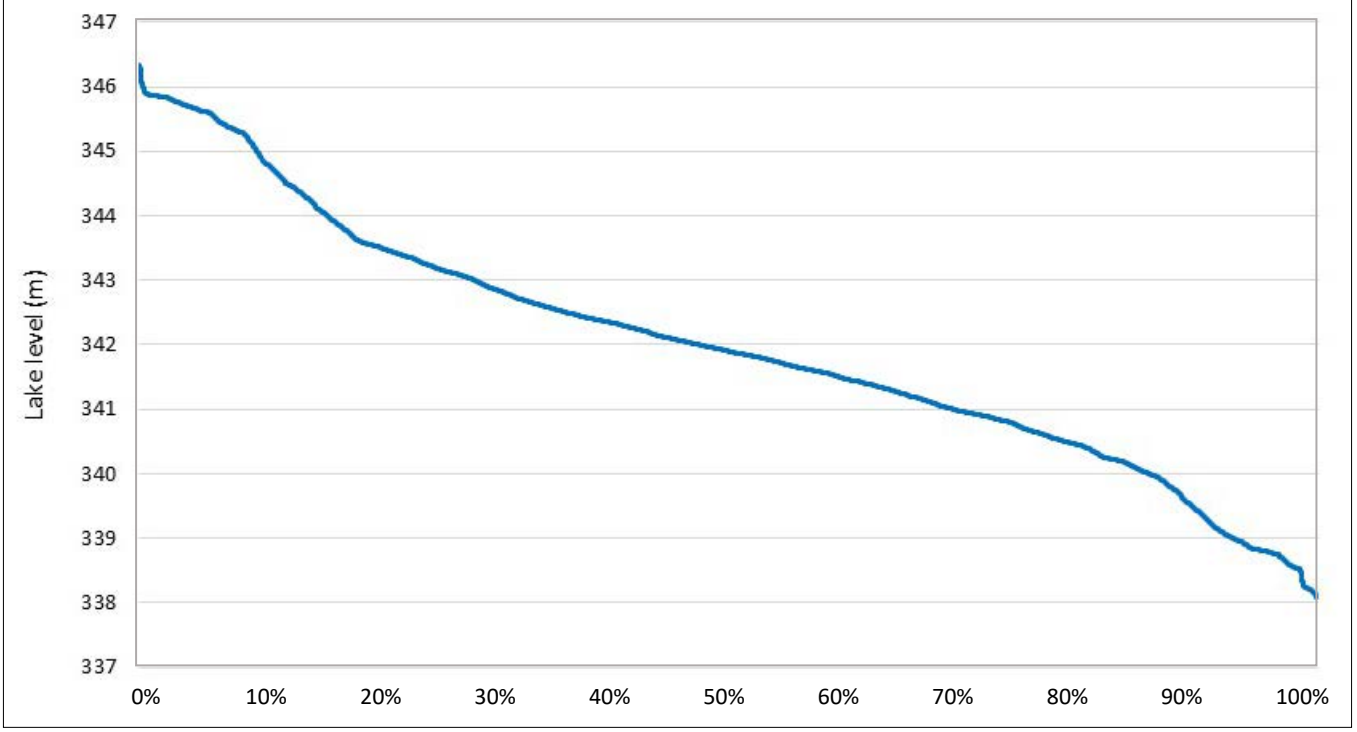
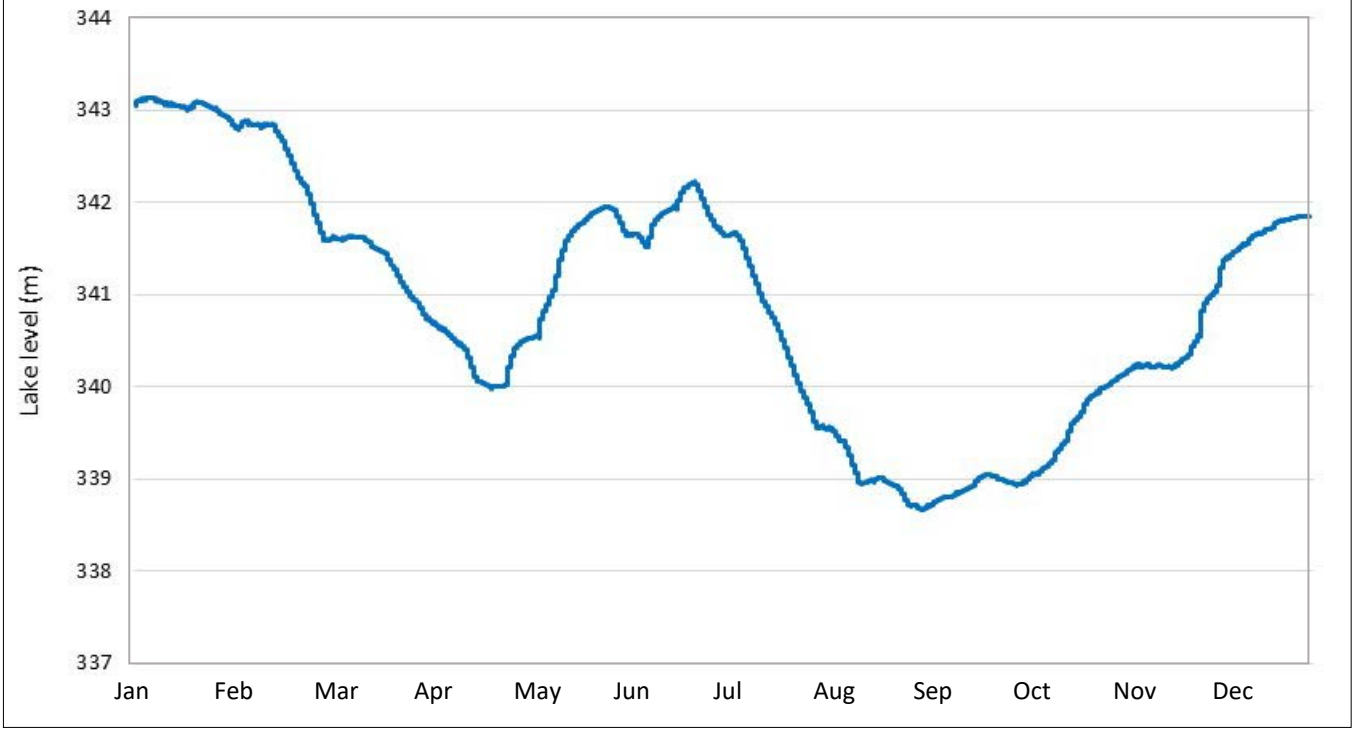


Figure 8: Lake Hāwea full year hydrograph for 2015



draw-down are governed by consent conditions for maximum flows in the Hāwea and Clutha Rivers (200 and 800 m^3/s respectively, unless in flood). During the decade described (2008 – 2018) the Lake range was 346.3 m to 338 m – a range of 8.3 m – with the minor peak over 346 during the heavy rain period of April 2009. The relatively straight level duration curve shows that the Lake spent almost as much time at any level within the range.

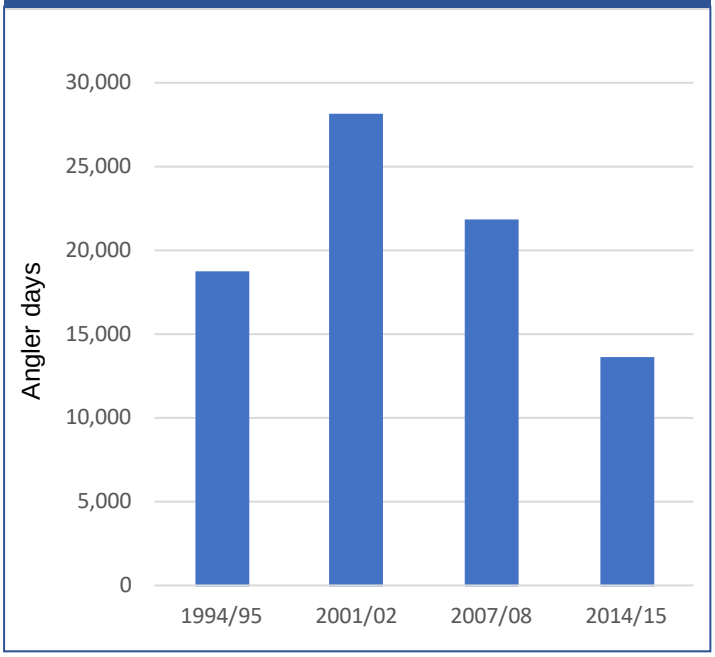
The 2015 hydrograph shows an almost-typical year with the Lake filling during the spring thaw and draining over winter, although a May rain event (also shown in the hydrographs for Lakes Wakatipu and Wānaka) gave the Lake a good top-up. High lake levels are normally experienced during the peak summer recreation season.

2.3.1 Recreation and tourism values

Lake Hāwea has a significantly lower international and domestic tourism profile compared with Lakes Wānaka and Wakatipu, but supports one of the most popular lake fisheries in New Zealand (casual and commercial).

Wind and kite surfing is popular, particularly along the township foreshore, where lakeside picnicking, swimming, water skiing, jet boating, flat water kayaking and passive recreation are also focused, along with at the Lake Hāwea Holiday Park. In 2017, Contact excavated the embayment adjacent to the boat ramp by the Holiday Park to extend the swimming season in this popular, sheltered site.

Figure 9: Lake Hāwea angler days 1994 – 2015



There are few recreation structures on Lake Hāwea. One of three boat ramps is formed with a hard surface – that at the Holiday Park, which operates at all lake levels and has a floating pontoon, and has been recently three-laned, improving its efficiency. The other two ramps at The Neck and Kidds Bush are unformed and require a 4WD, and can be difficult to use at low lake levels. A swimming platform is based near the Holiday Park in summer (this was stranded at low lake levels prior to Contact excavating the embayment).

Fish & Game NZ's national angler survey data for NZ resident licence holders indicate a decline in fishing activity since the 2001/02 season (Figure 9).

The Department of Conservation had issued, at August 2018, no concessions for commercial recreation activities on Conservation land adjacent to the Lake.

The Lake's high water clarity is very important for recreation for, for example, scenic values, swimming quality and sight fishing.

2.3.2 Significance

Lake Hāwea is significant at the national level for angling. There are no data to suggest that the Lake is more than regionally significant for all other recreational uses. The Lake has been assessed as nationally significant for its scenic value for tourism (see 4.16).

2.3.3 Experience of hydrology

Contact has no record of any requests to maintain the Lake at a specific level for recreation, and would not be able to comply regardless – the Lake being very slow to respond to any actions taken, some outflow always required, and meaningful increases dependant on rainfall.

Lake level variation has little effect on amenity for all water sports – such as wind and kite surfing and boating – and swimming. Access to the Hunter River at low levels on Lake Hāwea can make access difficult, but use is low. The Jet Boating NZ Otago Branch holds a couple of events annually on the Hunter River and there are probably fewer than 150 boats accessing it annually.

Anglers report that while the Lake is fishing reasonably well at the moment, it is not as good as has been under previous lake-range management. Interviewees reported that twenty-years-ago the Lake tended to be full right through summer to spring and would begin to lower in early winter. It now seems to be rarely full and drops earlier in the season. The lake edge can be good for brown trout which loiter around weed beds – as is also the case in natural lakes. High levels mean the weed beds are inaccessible from the lake edge and the fishing is over barren cobbles (although some anglers report good fishing over drowned delta areas at high levels). Very low levels mean weed beds are exposed. Median to low levels are preferred. Maintaining connectivity for spawning fish to enter and exit tributaries of the Lake is an important issue for anglers.

Locals report increased weed growth – gorse and lupins – on beach areas due to the Lake being held lower for longer. Other non-recreation issues were raised in interviews, such as dust affecting residents during very low level periods, shore erosion during high levels, dam failure risks. Lake ecology concerns have been raised through previous ORC consultation.

2.3.4 Recreation conflict

The Lake is administered according to the QLDC Navigation Safety Bylaw 2018, which is one of the more comprehensive navigation bylaws nationally, reflecting the intensity of commercial and recreational activity on the relevant water bodies. Submissions on the proposed revision of the 2014 bylaw did not include any references to the need for additional activities to manage recreation conflict on Lake Hāwea.

Jet skis have been a source of complaint, particularly around Scotts Beach where they come inside the moored marker lines for swimmers. Otherwise there is little reported recreation conflict on the Lake.

2.4 Lake Dunstan

Figure 11 and Figure 10 show the hydrological regime of Lake Dunstan, which is managed by Contact for water storage for hydro generation at the Clyde Dam. Contact's consent requires the Lake to have an operating range of between 193.55 and 194.56 m asl – far less than Lake Hāwea. During the decade described (2008 – 2018) the Lake range was slightly above the normal

Figure 11: Lake Dunstan level duration curve, 2008 - 2018 – at Cromwell

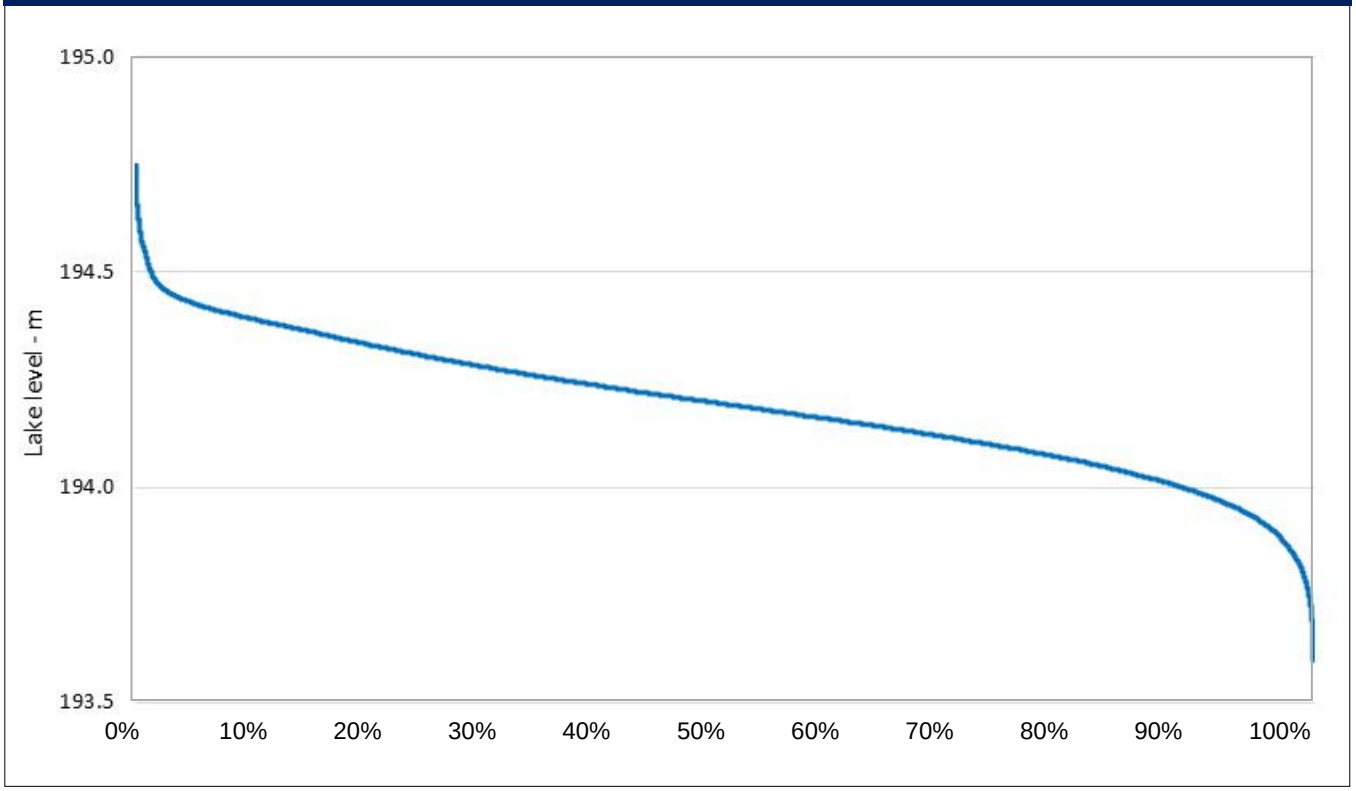
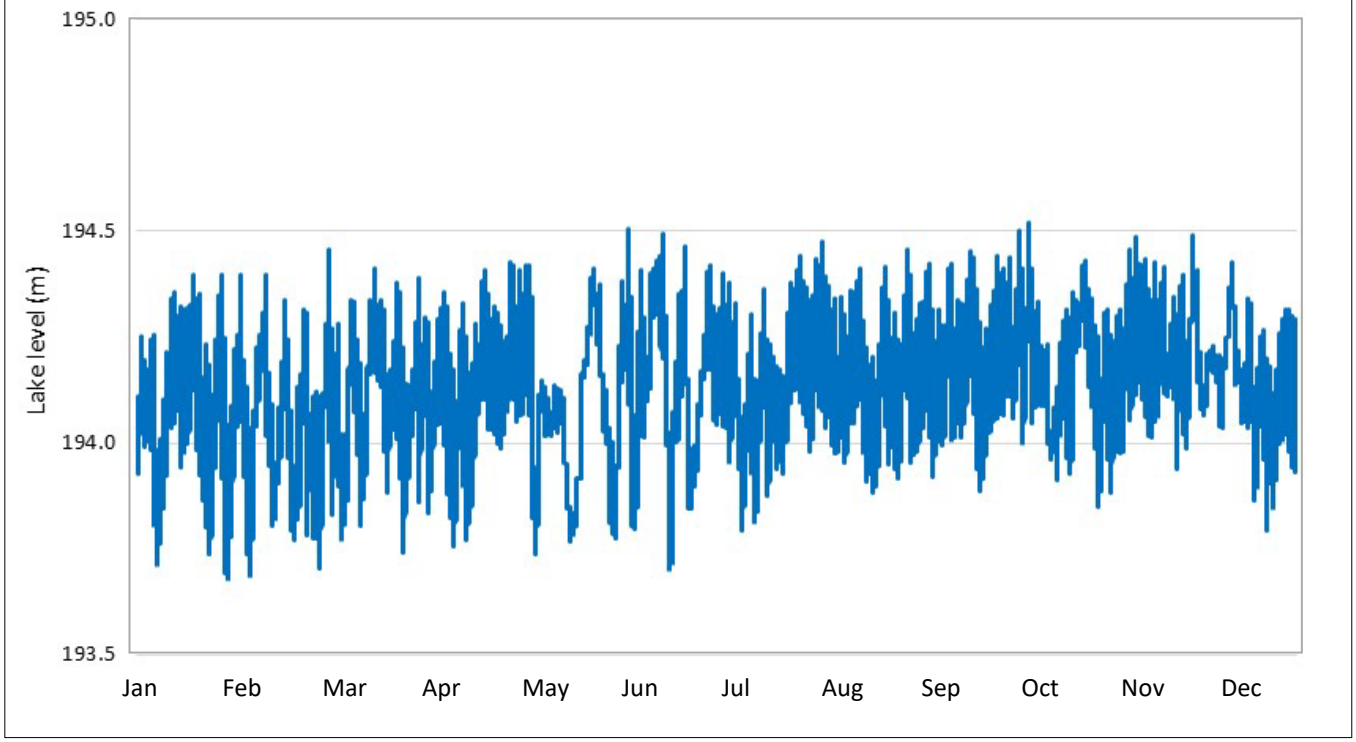


Figure 10: Lake Dunstan full year hydrograph for 2015 – at Cromwell



maximum during the April 2009 high flows and in January 2013. There is no seasonality to the lake range, but Figure 12 shows the normal daily rise of level in the morning and fall over the afternoon, as measured at Cromwell (4 to 10 January 2015). Figure 13 shows level variation measured at Ripponvale in the Kawarau Arm of the Lake for the same period. This is subject to flow variability in the Kawarau River.

Figure 12: Lake Dunstan one week hydrograph January 2015 – at Cromwell

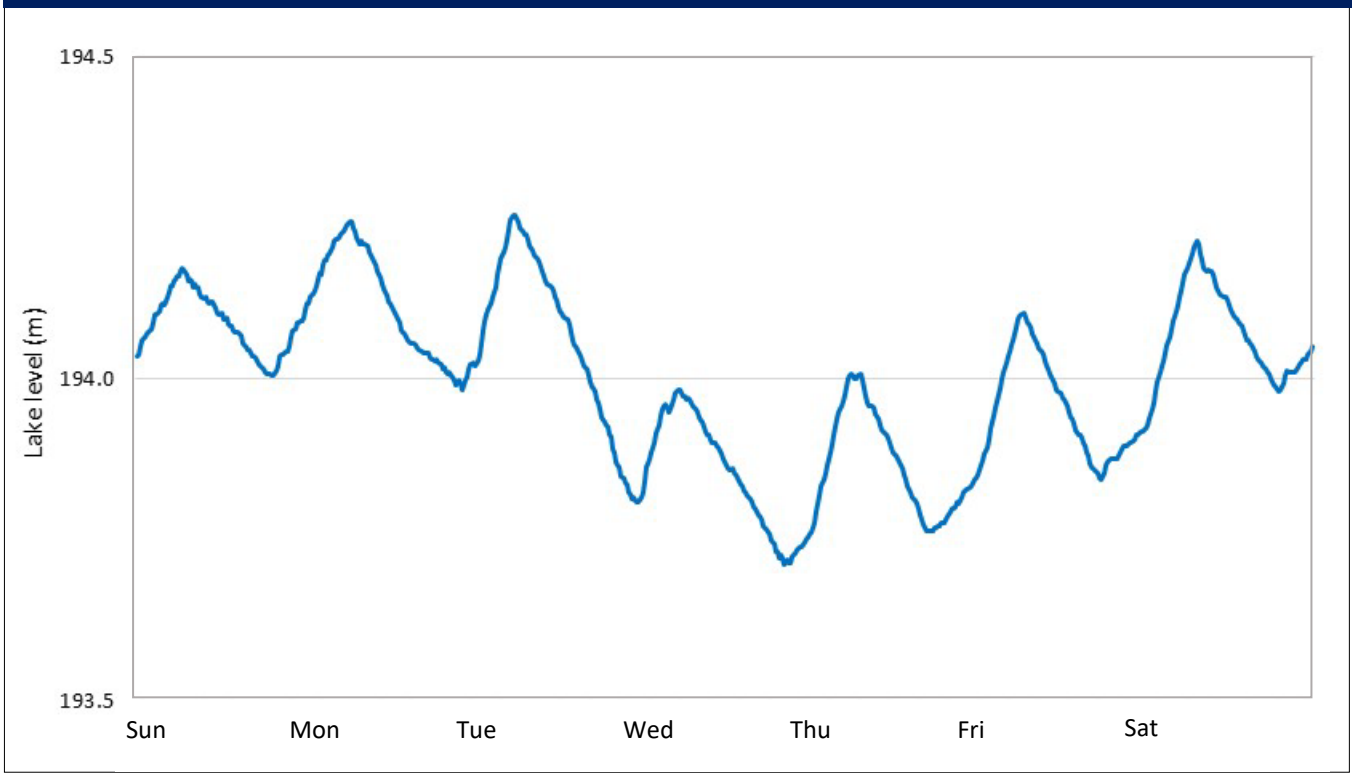
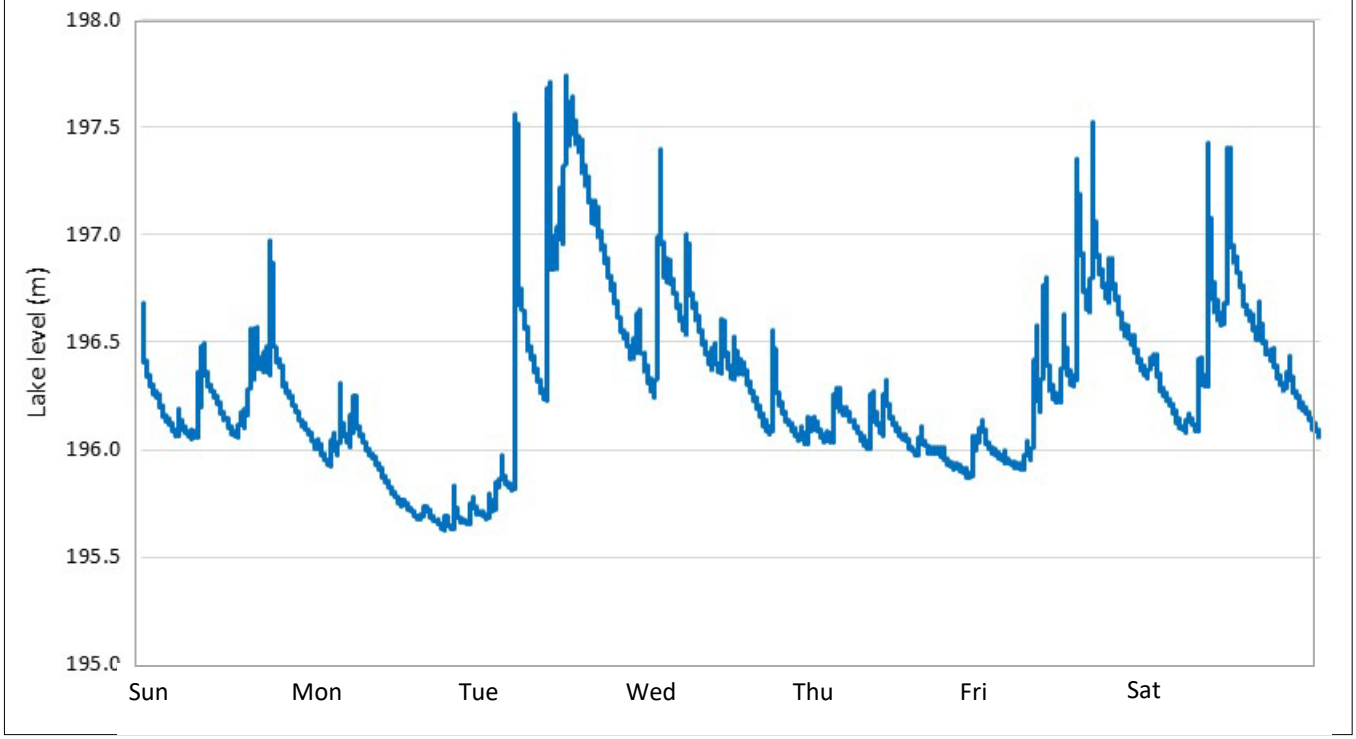


Figure 13: Lake Dunstan one week hydrograph January 2015 – at Ripponvale

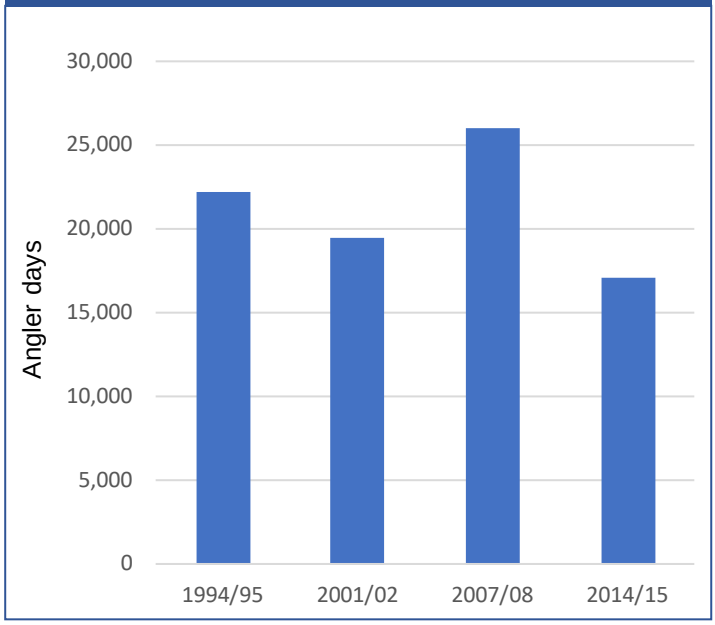


2.4.1 Recreation and tourism values

Lake Dunstan – or at least Cromwell – has a higher international tourism profile than Lake Hāwea, but far less than Wānaka and Queenstown.

Power and jet boating, jet skiing, water skiing and sailing are popular. The Dunstan Arm Rowing Club is based at Burton Creek near the Clyde Dam, and the Cromwell Rowing Club and Cromwell College Rowing use the same facilities at McNulty Inlet. The Lake Dunstan Boat Club, also at McNulty Inlet, is a centre for small yacht racing with regular events from November to April. The old Cromwell Bridge is an occasional dive site. Lowburn, Bannockburn and the Cromwell township areas are heavily used casual recreation settings.

Figure 14: Lake Dunstan angler days 1994 – 2015



The upper Clutha River/Mata-au delta area – although changing rapidly with sediment build-up and extension – is a good fly fishing area and fishes quite steadily (casual and commercial). Anglers have generally accepted lagarosiphon as part of the lake environment and to provide fishing amenity. The Lake is considered a productive 'weed fishery'.

Fish & Game NZ's national angler survey data for NZ resident licence holders indicate a decline in fishing activity since the 2001/02 season (Figure 14).

The Kawarau Arm features many sand bars upstream of Cromwell and boaters need to be wary when navigating in the area. The Kawarau Arm is not fished as much as the Clutha Arm since the Kawarau tends to be cloudy from sediment flowing from the Shotover River – but good fish can still be caught.

Wildfowl hunting is popular at the head of Lake Dunstan and in the delta area of the upper Clutha River/Mata-au.

There are numerous picnic areas around the Lake, installed when it was first formed. Other structures include a residential canal area (Pisa Moorings), access for boat and rowing clubs, boat launching ramps (11), including pontoons at Lowburn, Bannockburn and McNulty Inlet, and ski lanes. Bendigo, Champagne Gully, Jacksons Inlet and the Lowburn Harbour have Central Otago District Council (CODC) designated camping areas.

The Department of Conservation had issued, at August 2018, one concession for commercial recreation activities on Conservation land adjacent to the Lake – a sporting event.

A three-season survey carried out late last century on lakeshore and water-based recreation on Lake Dunstan – discussed in section 3.13.1 – gave the results shown in Table 1, with boating and fishing the top two pursuits for water-based activities (both often associated).

Table 1: Water-based activities on Lake Dunstan (1993 – 1995) - Johnston Whitney	
Activity	**Percent (n=2218)**
Boating	39
Fishing	14
Paddling (shore-based, not quite swimming)	10
Water skiing	9
Swimming	6
Rowing	6
Biscuiting	4
Canoeing	3
Sailing	3
Windsurfing	<1
Jet skiing	<1
Diving	<1
Other	6
Total	**100%**

2.4.2 Significance

Lake Dunstan is significant at the national level for angling. There are no data to suggest that the Lake is more than regionally significant for all other recreational uses. The Lake has been assessed as nationally significant for its scenic value for tourism.

2.4.3 Experience of hydrology

Contact has regular requests to maintain Lake Dunstan as high as possible for powerboating, yachting and multisport events; to provide easy access or sustain the same conditions through a competition.

Lake variability can mean underwater features – such as rocks and sandbars – can become hazards in, generally, the afternoons. Boats beached in the morning can be stranded quite quickly. However, as the lake level changes in a very predictable manner, this is treated as normal and acceptable. The Clyde Coastguard is aiming to develop charts for the Lake.

Some boat ramps have developed holes beyond their formed ends and these can trap trailer wheels at low lake levels. (Holes at many ramps nationally generally form as a result of boaters driving their vessels onto trailers using the boat motor, and scouring the lake bed – although natural scouring can be an issue at some sites.)

In the upper Clutha Arm, low levels and weed can mean it is inaccessible by boat. In the Kawarau Arm, caution is required as sand banks shift and vary in depth depending on lake level and flow in the Kawarau River.

Low lake levels expose more lakeshore weed and this can prove difficult for fishing – although lagarosiphon is generally accepted as providing fish habitat.

2.4.4 Recreation conflict

The Lake is administered according to the CODC Lake Dunstan Navigation Safety Bylaws 2017. The Lake Dunstan Safety Officer – Shayne Hitchcock – reports very little recreation conflict on the Lake in his 23 years of experience, partly due to its expansive scale and many areas of beach. Newcomers, however, often require some education about national and local maritime rules.

2.5 Lake Roxburgh

Figure 15 and Figure 16 show the hydrological regime of Lake Roxburgh, which is managed by Contact for water storage for hydro generation at the Roxburgh Dam. Contact's consent requires the Lake to have a normal operating range of between 130.15 and 132.60 m asl. The normal

Figure 15: Lake Roxburgh level duration curve, 2011 - 2018 - at dam

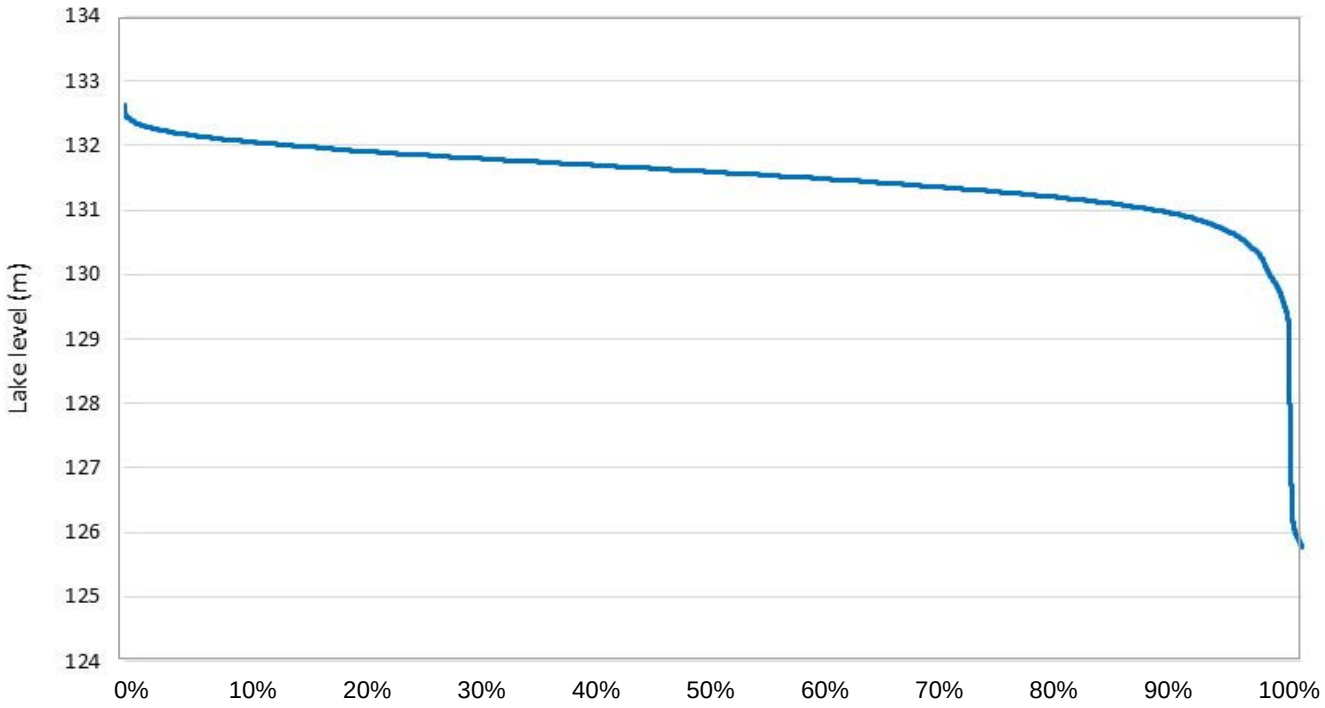
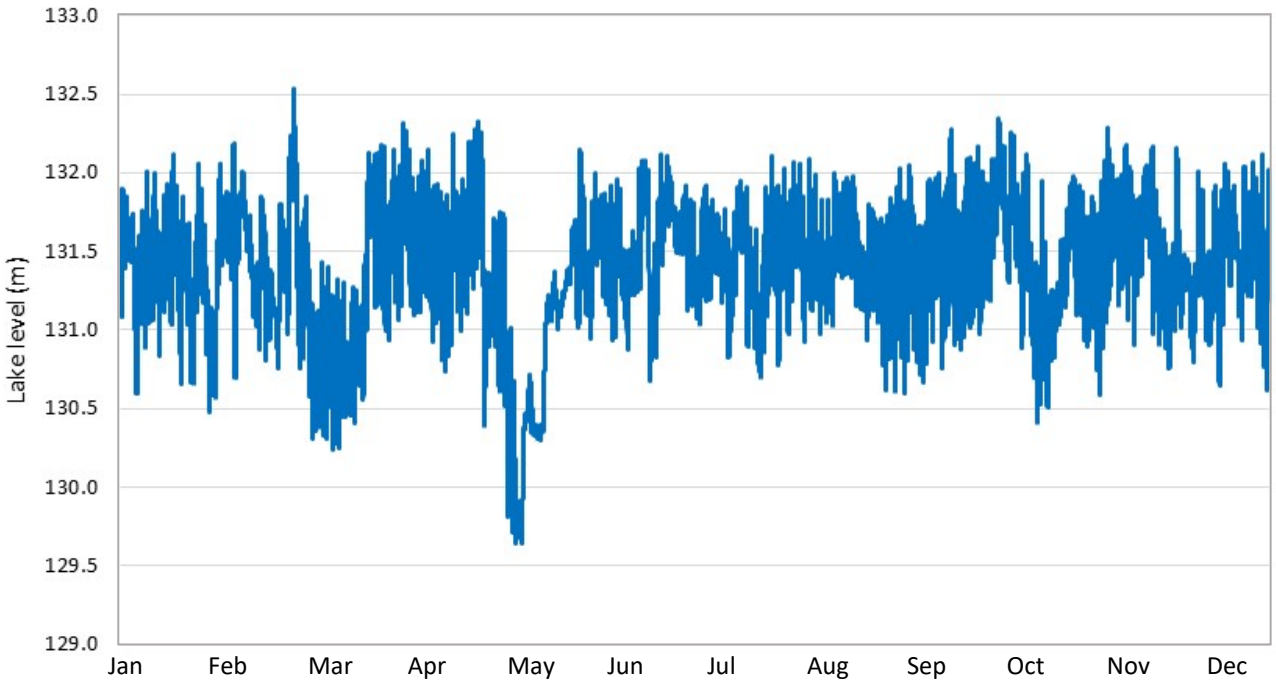


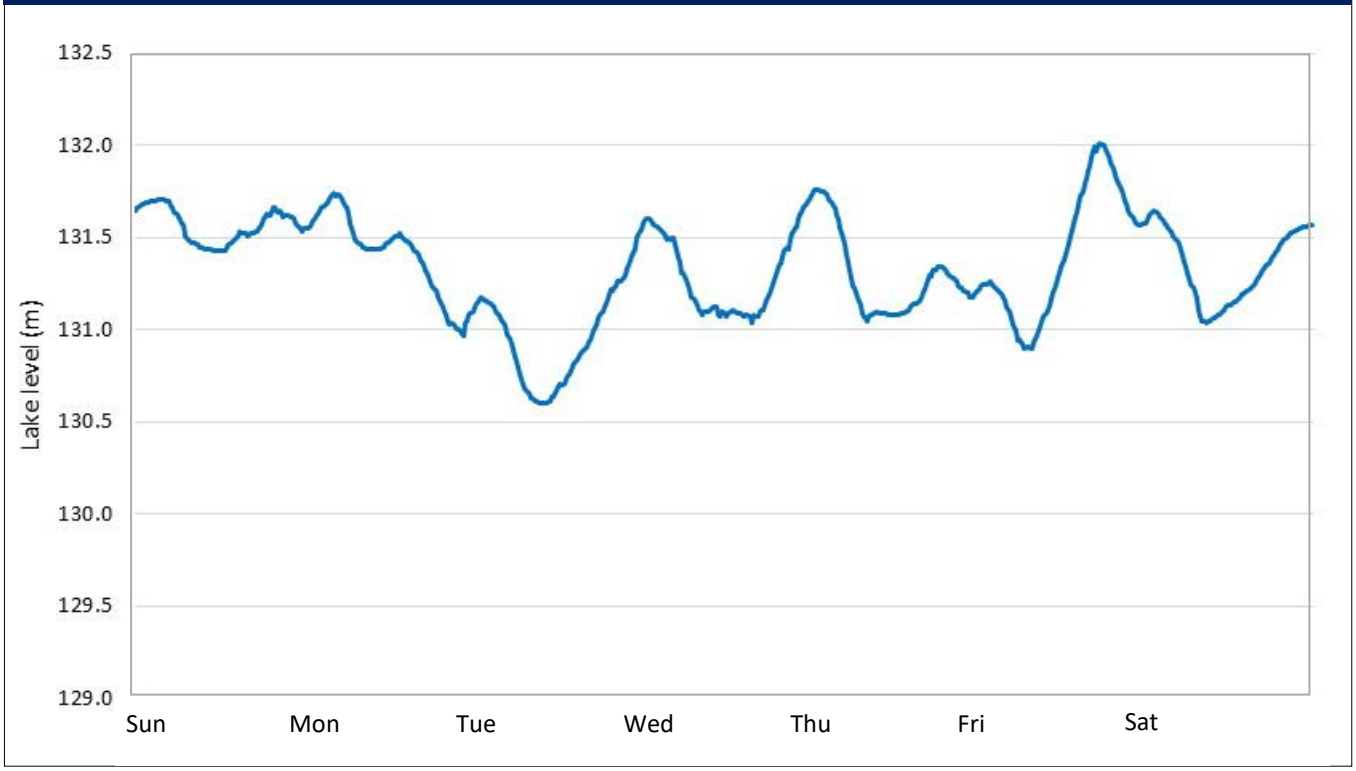
Figure 16: Lake Roxburgh full year hydrograph for 2015 – at dam



maximum operating range was raised from 132.0 m in 2010 and the hydrology data presented here are for only the period from 2011.

During the period described (2011 – 2018) the Lake range included four drops to below 126 m to mobilise sediment in the upper Lake – three events in 2013 (January, July and October) and one in February 2017. The Lake was above 130.15 m for 97% of the time in the period shown. There is no seasonality to the lake range, but Figure 17 shows the normal variability with, generally, a drop in the morning and a rise overnight, as measured at the dam (4 to 10 January 2015).

Figure 17: Lake Roxburgh one week hydrograph January 2015 – at dam



2.5.1 Recreation and tourism values

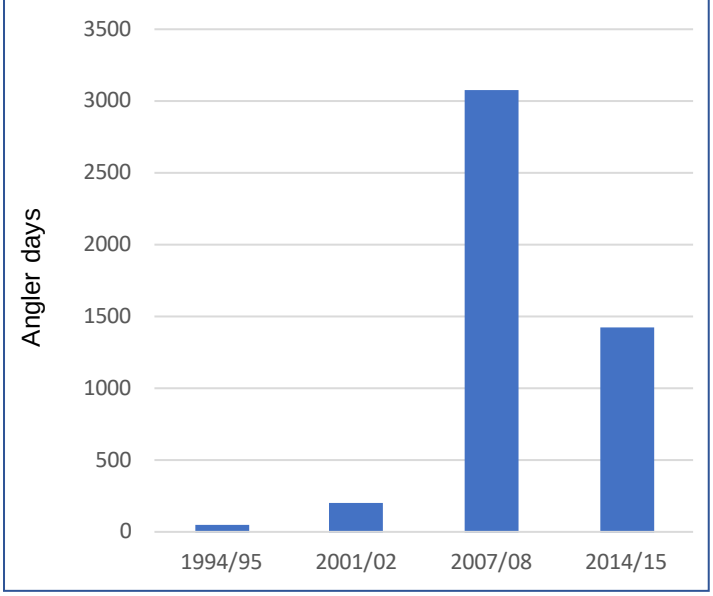
Lake Roxburgh is the least-used water body in the study area. Its most important recreation value, and most recently developed, is the 11 km ferry through the Roxburgh Gorge for cyclists (mostly) and walkers on the Clutha Gold Trail, serviced by two commercial boat operators during the summer season. A Ministry of Business, Innovation & Employment (MBIE) assessment estimated 7,600 trail users in 2015, 6.6% of whom were international visitors (Figuracion 2016).

Ferry operators rely on a floating pontoon midway up the Lake and a fixed jetty nearer the dam for boarding and disembarking passengers. The Clutha River Heritage Cruise travels – in season – downstream from Alexandra to Doctors Point in the Lake.

The Lake is a recently-discovered fishery and use appears to have grown on the back of additional publicity generated by the Trail. Three species of salmonid are resident, as well as perch. Users are still experimenting with the best approach to fishing. Boats must either launch at Roxburgh or journey from Alexandra. Many anglers in the area are accustomed to flatwater boating and can find the rapids below Alexandra quite intimidating, especially with families.

Fish & Game NZ's national angler survey data for NZ resident licence holders indicate a huge increase in fishing activity in the 2007/08 season, followed by drop in 2014/15 – but still well-above 2001/02 levels (Figure 18).

Figure 18: Lake Roxburgh angler days 1994 – 2015



The Department of Conservation had issued, at August 2018, no concessions for commercial recreation activities on Conservation land adjacent to the Lake.

2.5.2 Significance

Lake Roxburgh has never been identified as a significant recreation setting by any literature reviewed for this study. Angling counts are relatively low, but have shown promise. The Lake is likely to be regionally significant for recreation due to its position on the Clutha Gold Trail, but only locally significant for all other recreation and tourism values. This may change as use of the Clutha Gold Trail grows.

2.5.3 Experience of hydrology

To board cyclists and walkers, the ferry services rely on a floating pontoon upriver and a jetty nearer the dam. The jetty is fixed and works with a wide lake level range. The pontoon does not work below a 2 m drop from the normal level, and although sediment flushing events mean it is inoperable, extensive areas of beach are exposed and these provide easy boat access.

There are mixed responses to the lake level rise in 2010, with some additional inundation of beach areas reported, while the jury is still out for anglers (especially considering there is very little experience of angling the Lake prior to 2010).

2.5.4 Recreation conflict

The Lake has very low use and no conflict has been reported.

2.6 Upper Clutha River/Mata-au – above Hāwea confluence

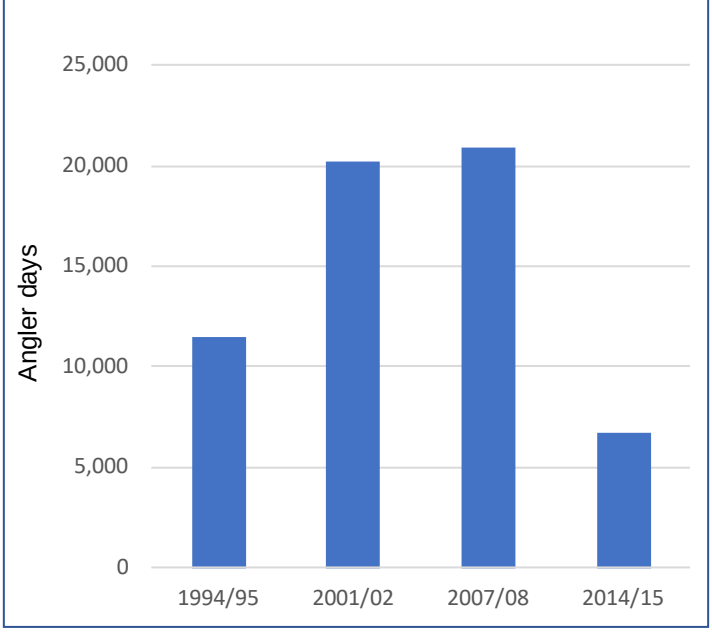
The upper Clutha River/Mata-au is considered in two sections – above and below the Hāwea River confluence – due to the different hydrological regimes in each.

The upper Clutha River/Mata-au – from the Lake Wānaka Outlet to the Hāwea River confluence – has, in the main, a natural flow. This is not metered. A synthetic hydrograph could be generated by deleting measured inflows from the Cardrona and Hāwea Rivers from the measured flow in the Clutha River/Mata-au below the Cardrona River confluence. However, this is not necessary for this study as the flow is unaffected directly by hydro-control or abstractions – largely due to the Lake Wānaka Preservation Act 1973 – and a synthetic data set would not indicate the scale of change when high inputs from the Hāwea River (up to 200 m^3/s from hydro storage) cause flows to back-up in the upper Clutha River.

2.6.1 Recreation and tourism values

The upper Clutha River/Mata-au supports a range of recreation values, particularly shore angling (casual and commercial), easy kayaking, canoeing and rafting experiences, jet boating, swimming, and riverside walks and cycling, with several sheltered beach areas suited to swimming and some commercial use. The Outlet Track and walks along the lower Cardrona River and along Deans Bank are very popular.

Figure 19: Upper Clutha R angler days 1994 – 2015



Deans Bank is a premier fly-fishing site. Opinions vary, but prior to didymo appearing, this section was agreed to be of international class, and some still give it this status. Others report a significant drop in trout numbers due to didymo, although with some recent recovery.

Fish & Game NZ's national angler surveys do not divide the upper Clutha River, and so only data for NZ resident licence holders for the section from Lake Wānaka to Lake Dunstan are available. These indicate peaks in fishing activity in the 2001/02 and 2007/08 seasons, followed by a significant drop in 2014/15 (Figure 19).

The Department of Conservation had issued, at August 2018, 24 concessions for commercial recreation activities on Conservation land adjacent to the upper River, mostly guided walking and mountain biking and sporting events.

Water clarity is a significant feature.

2.6.2 Significance

The upper Clutha River/Mata-au is significant at the national level for angling, despite the drop in angler days in 2014/15. Outstanding values for angling have been experienced in the River above the Hāwea confluence at Deans Bank. The upper River also supports a wide range of recreation activities – including angling, kayaking, rafting and swimming, and viewing it from adjacent reserves and walking and cycling tracks – and has been identified in literature as nationally significant for recreation generally. Its association with Wānaka – as a significant domestic and international

visitor destination – and the combined use of Lake Wānaka and the upper River as shown in Strava data (section 3.7) affords the upper River – at least above the Luggate Bridge – a similar status to Lake Wānaka. In the opinion of the author of this report, the Clutha River/Mata-au above the Hāwea confluence is likely to be an outstanding water body for recreation.

2.6.3 Experience of hydrology

In the River above the Hāwea River confluence, there is occasional backing-up of flow when the Hāwea is running high, but otherwise it has a natural flow pattern and is generally stable.

The Hāwea confluence itself can feature strong eddies when the Hāwea is flowing high (200 m^3/s), although this has little effect on the ability to use the River or pass this section in small boats, such as kayaks, rafts and jet boats – although, as discussed, at high flows there may be a lot of free didymo which is a hazard for jet boat intakes; and some caution may be required by the unwary (although kayakers and rafters can consider the eddies a bonus feature on an otherwise reasonably featureless river experience).

2.6.4 Recreation conflict

The upper Clutha River/Mata-au from the Outlet to the Luggate (Red) Bridge is administered according to the QLDC Navigation Safety Bylaw 2018, which is one of the more comprehensive navigation bylaws nationally, reflecting the intensity of commercial and recreational activity on the relevant water bodies. Submissions on the proposed revision of the 2014 bylaw were dominated by concerns over potential conflict between jet boaters and other river users in this river section. The uplift for jet boating was approved in the 2018 bylaw.

There were some comments in the 2017/18 ORC swimming survey (section 3.6) noting concern about the speed and subsequent hazards posed by jet boats, but little concern was apparent amongst interviewees for this study, considering the relatively low level of use by jet boats, their transitory nature and, in the main, consideration shown by drivers. One kayaker noted that while jet boats can be intimidating for rookies, the River is wide and the boats are easily avoided. Commercial guides on this section note the need to be vigilant with clients interacting with motorised craft over the busy January period. Consultation by ORC over November 2017 to February 2018 (see section 3.1) noted stronger concerns over recreation conflict between motorised vessels and other recreational users in the upper River – especially above Albert Town – where use is highest.

2.7 Hāwea River

The Hāwea River is controlled for hydrogeneration, operated by Contact as a conduit for water stored in Lake Hāwea and used in generation from Lake Dunstan. It has a high consented operating range, from a minimum of 10 m^3/s and a maximum of 200 m^3/s, unless in flood or limited by a maximum of 800 m^3/s in the Clutha River/Mata-au below the Hāwea confluence.

Figure 20: Hāwea River flow duration curve, 2008 – 2018, Camphill Bridge

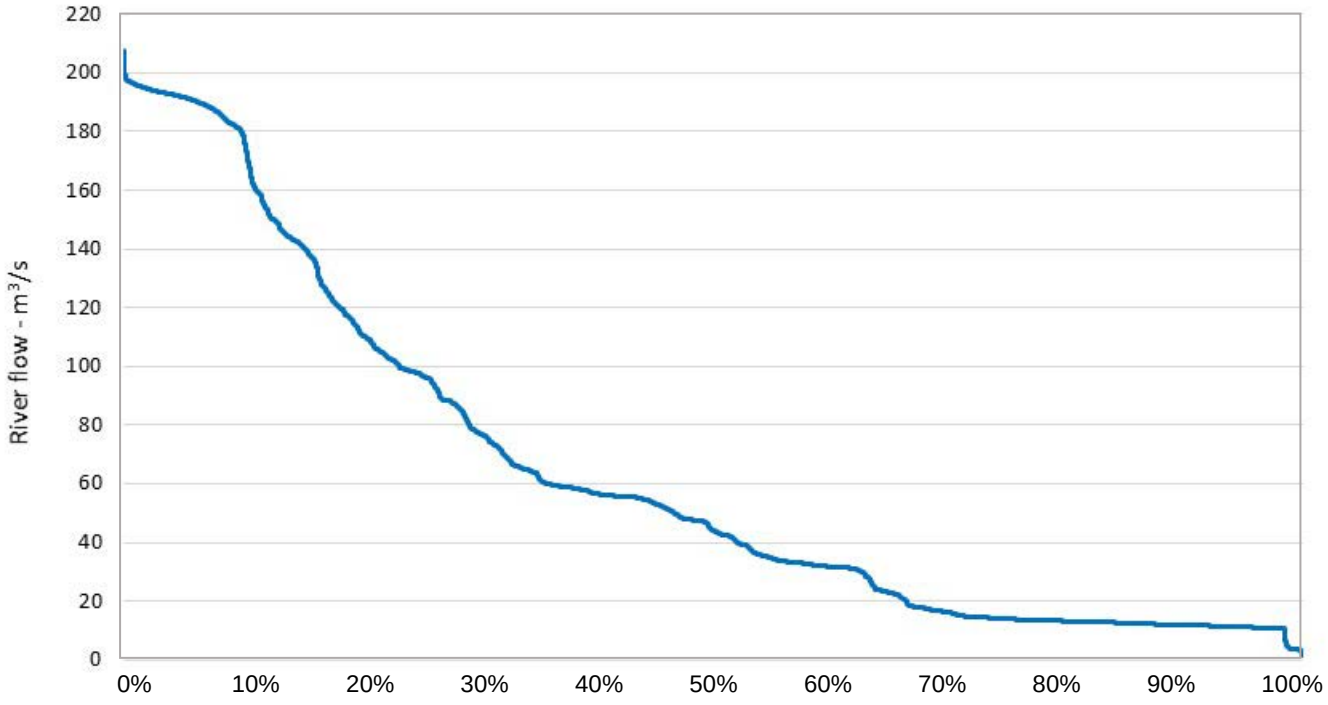
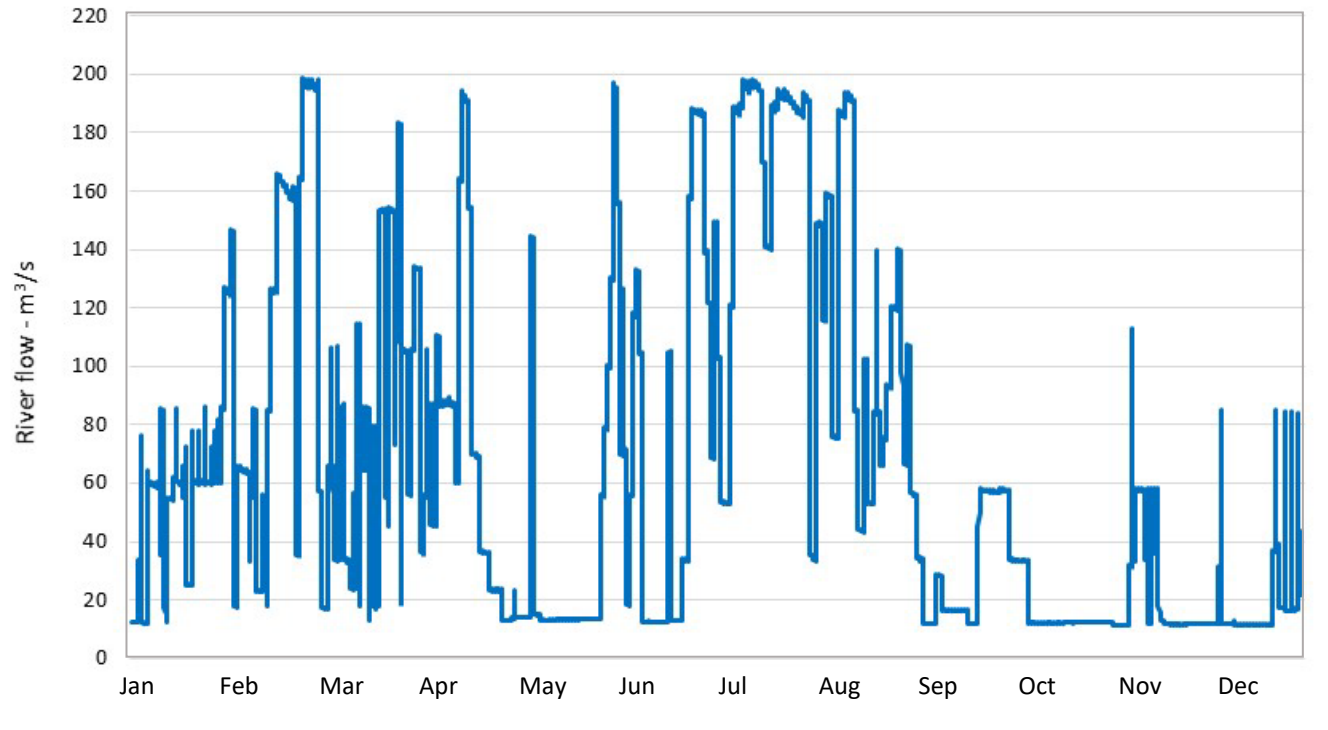


Figure 21: Hāwea River full year hydrograph for 2015, Camphill Bridge



Consent conditions also require a 'best endeavours' stable flow of between 10 and 60 m^3/s "between 1 September in any year and 31 January the following year to provide for rainbow trout spawning and rearing and angling" – subject to satisfying competing demands by other recreational users, flood mitigation and electricity generation. A low flow of 3 m^3/s is also permitted for maintenance, particularly inspection of the structures of the Hāwea Whitewater Park – evident in the tail of the flow duration curve in Figure 20.

Consent conditions also require that the River's level is held at 30 m^3/s, 8am to 8pm, on the first Saturday and Sunday of November, December, January and February. All flows and times are set at the Hāwea Dam. Contact responds to many requests for specific flows for, in the main, kayaking (discussed below).

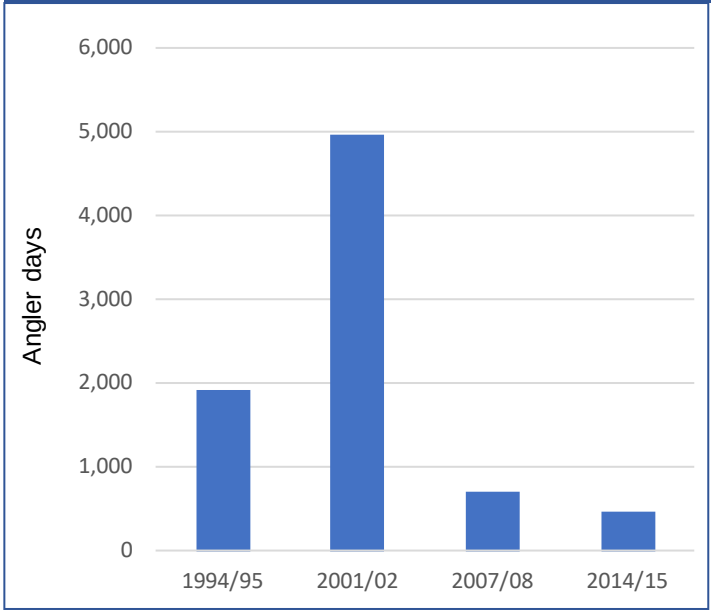
In the period described the River flowed above 150 m^3/s for 13% of the time and was above 60 m^3/s for 36% of the time.

Contact has direct access to the Central Otago Whitewater (COW) online calendar, and details planned flow events there directly. Contact also operates a text system which notifies users of changes in flow. These texts are normally forwarded as tweets by COW and appear on the COW website. Flows on the Hāwea River are also available through the ORC's website.

2.7.1 Recreation and tourism values

Use of the Hāwea River is dominated by white water activities, mostly at the Hāwea Whitewater Park, but also throughout. Angling is also popular (casual and commercial), but use has varied from season to season, with a recorded high of 4,970 ± 1,310 angler days in 2000/01 and a low of 480 ± 170 in 2014/15. The River still retains some good fish – mostly smaller rainbows – which move up from Lake Dunstan. In its lower reaches, the River is reasonably accessible along its banks, and presents some good water for dry fly fishing at low flows. Improved foot and cycle access around the River has been a benefit to anglers. It is also good for junior anglers to learn skills in an accessible area.

Figure 22: Hāwea River angler days 1994 – 2015



Fish & Game NZ's national angler survey data for NZ resident licence holders show a major decline in fishing activity since 2001/02 (Figure 22).

The Hāwea Whitewater Park is located at Camphill Bridge and was constructed in late 2012. It provides two river-waves for kayakers, bodyboarders, surfers, and rafters. It has particularly high education values. A kayak slalom course has also been installed in the natural river below the artificial wave structures.

Riverside trails – which extend over its full length – and the camping and picnic areas (particularly in the lower section) are important for locals and visitors.

Rare requests are made by Jet Boating NZ for access to the River. There is no permanent uplift of the navigation safety 5 knot rule, which limits jet boat access.

The Department of Conservation had issued, at August 2018, no concessions for commercial recreation activities on Conservation land adjacent to the Hāwea River.

2.7.2 Significance

No literature reviewed for this study identified the Hāwea River as significant at the local, regional or national level, although the construction of the Whitewater Park post-dated all relevant research.

There are no use data for the Whitewater Park or for whitewater activities on the Hāwea River *in toto*. However, it is clearly a significant whitewater feature and has sustained activities not normally associated with the region – such as surfing[4], and safe and easy family bodyboarding.

Angler numbers vary from moderate to low, and the River is likely to be only regionally significant for fishing – based on 2001/02 angler counts rather than 2014/15.

The Hāwea River is potentially nationally significant for whitewater activities, due to the construction of the Whitewater Park and the management of its flows for, in the main, whitewater, slalom and educational kayaking, but also the range of whitewater activities possible – from easy family bodyboarding at 10 m^3/s to skilled kayak rodeo and surfing at much higher flows.

2.7.3 Experience of hydrology

The Hāwea River is experienced as a controlled river. Prior to the construction of the Hāwea Dam the River was considered a world-class dry fly fishing resource. Damming and control are reported to have affected trout habitat and anglibility (the ability to access or use the River and to present a fly or spinner and expect to catch a fish). At low flows – from 10 to 16 m^3/s – the lower River is reasonably accessible along its banks, and presents some good water for dry flies. Above these flows the River is very difficult to fish, and, considering its slippery boulders and water speed, a danger to wade. The main issue for angling is reported to be a lack of trout habitat, caused by high ramping rates (the time over which flows can be artificially increased), didymo, regular high flows and a lack of gravels for redds.

In 2016 Contact had 61 requests for recreation flows on the Hāwea River, all of which were granted (in addition to the four 12-hour flows required by the consent conditions). This totalled 204 hours of requested flow releases for recreation, plus 48 hours required by the consent – almost two-thirds occurring from January to March. Requests were made by, Central Otago Whitewater, Mt Aspiring College, Cromwell College, Tai Poutini Polytechnic, Otago University Canoe Club, Otago Polytechnic, NZ Outdoors Instructors Association (NZOIA) (river safety training), Jet Boating NZ, Christchurch Whitewater Canoe Club and local groups for slalom training.

Flow requests for 2016 are summarised below by activity (almost all kayaking) and requested flow (in m^3/s). Lower flows tended to be for beginner kayak training and slalom events. The NZ Outdoors Instructors Association request was for Search and Rescue (SAR) swift-water safety and rescue training.

[4] Surfing previously occurred in the region, but was associated only with flood events on the Kawarau River (see for example Greenaway 1995).

Table 2: Number of flow requests to Contact Energy by flow and activity, Hāwea River 2016																	
Activity / Flow in m^3/s	10	12	15	20	25	30	40	60	65	70	75	80	85	90	100	120	Total
Jet Boat								1									1
Kayak	1	9	4	6	2	4	8	3	1	1	1	13	1	4	1		59
NZOIA																1	1

Operational requirements to generate and maintain other consent requirements (such as lake levels) mean all requests have to be timebound. Ramping rate restrictions also affect the timing of flow delivery. Water storage requirements also mean that requested lower flows can generally be provided for longer periods than high flows (for example, 35 m^3/s for 10 hours is often the same to Contact as 70 m^3/s for 5 hours). Requested flows are not granted where they would cause or contribute to the spilling of water from the Clyde or Roxburgh Dams (when flows in the Clutha catchment would exceed storage and generation capacity).

A range of preferred flows for swimming, kayaking and surfing were identified by interviewees:

- At low flows – 10 to 30 m^3/s – kids with boogie boards are on the wave features and young children can safely swim in the River, although it is safest for little kids at 10 m^3/s, and is a very nice swimming site at 10 – 15 m^3/s when kids can dive off rocks into deep water.
- Flows below 30 m^3/s are not ideal for whitewater activities on the wave features but still suit younger families and kids, and can be used by slalom and beginner kayakers using the current and eddies (the waves are too small) but is useful for the River as a whole for teaching beginners and school groups (schools often request flows around the 12 to 15 m^3/s range for beginners).
- 30 to 50 m^3/s is ideal for slalom kayaks at the wave features. The South Island Slalom Championship was run very successfully at the Whitewater Park at 33 m^3/s. The Secondary School Championship was run at 31-32 m^3/s and it was still good; although not as ideal as 33 m^3/s when the bottom wave feature had a 'thumpy curler' which was quite difficult for the kids.
- Downstream of the waves, the slalom site is good over a range of flows, and is probably best around 30 m^3/s (which is requested for slalom events at this site), but can be paddled at any flow. The best flows for training are at 10-50 m^3/s (and above that everyone is attracted to the Whitewater Park instead).
- Anything above 50 m^3/s is good for playboating although the 80-150 m^3/s range provides some of the best options, but different people have favourite flows. It is possible to playboat on the top wave feature at the Park at above about 30 m^3/s, but the bottom wave feature only works for playboats above 50. Playboaters prefer the Park when both features are running.
- The ideal range for surfing is 55-60 m^3/s, (ideally 55 m^3/s), and becomes rideable at 48 m^3/s, but is also good from 50 to 70 and anything above 140 m^3/s.

For those not requesting specific flows and travelling a distance to the River – such as Dunedin-based clubs – the likelihood of experiencing a preferred flow is low, and the management regime

best suits locals (who can see immediately what the flow is), or education groups and clubs who request flows.

2.7.4 Recreation conflict

Since angling is preferred in the lower River and at low flows, there is generally very little conflict between anglers and whitewater users, apart from the occasional child passing on a boogie board.

The Whitewater Park is increasing in popularity and crowding is likely to be a growing issue.

2.8 Upper Clutha River/Mata-au – below Hāwea confluence

Figure 23 and Figure 24 show the hydrological regime of the upper Clutha River/Mata-au below the Hāwea confluence. This section of the River is subject to flow variation resulting from the operation of the Hāwea Dam by Contact (as discussed in relation to the Hāwea River in section 2.7). This means this section of the Clutha can be augmented by up to 200 m^3/s, with a consented maximum flow of 800 m^3/s in the Clutha, unless in flood. This maximum was never exceeded in the 2008 -

Figure 23: Upper Clutha River/Mata-au flow duration curve, 2008 – 2018, below Hawea confluence

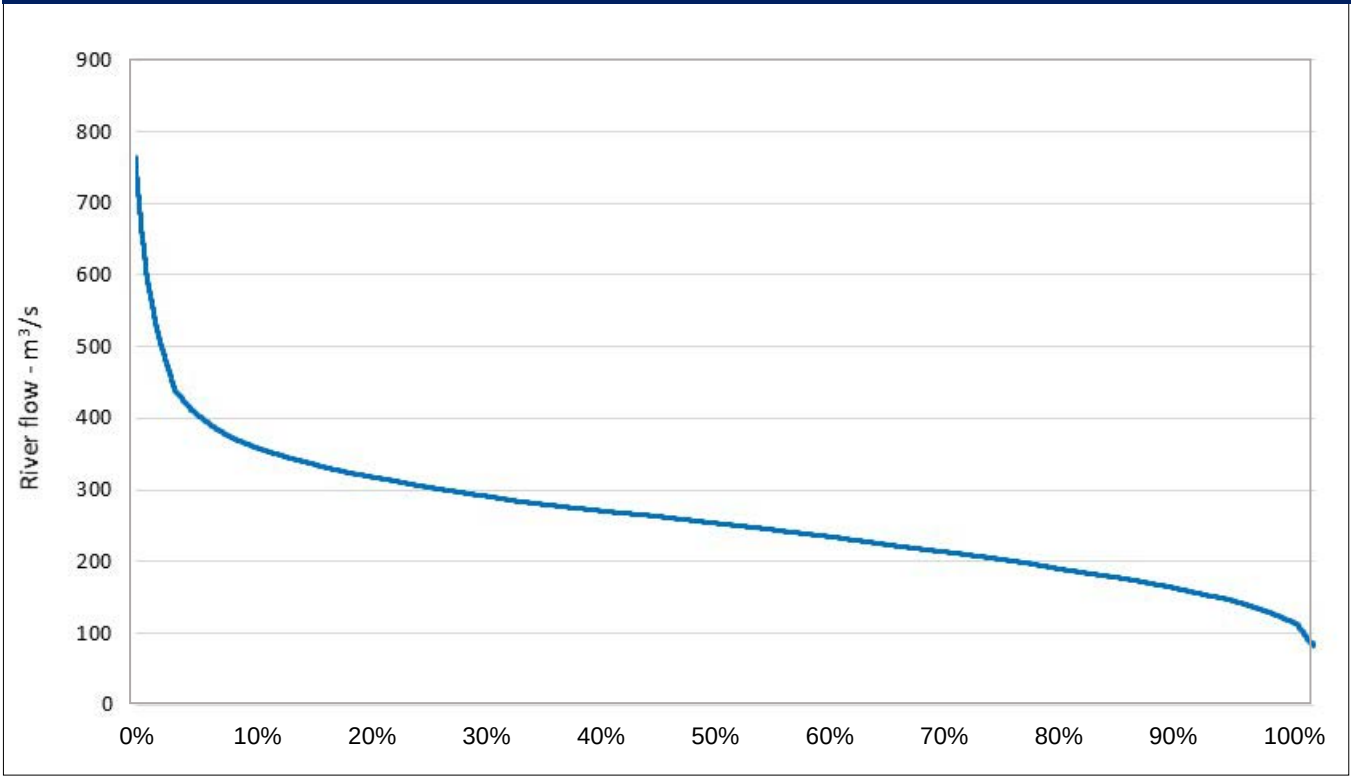
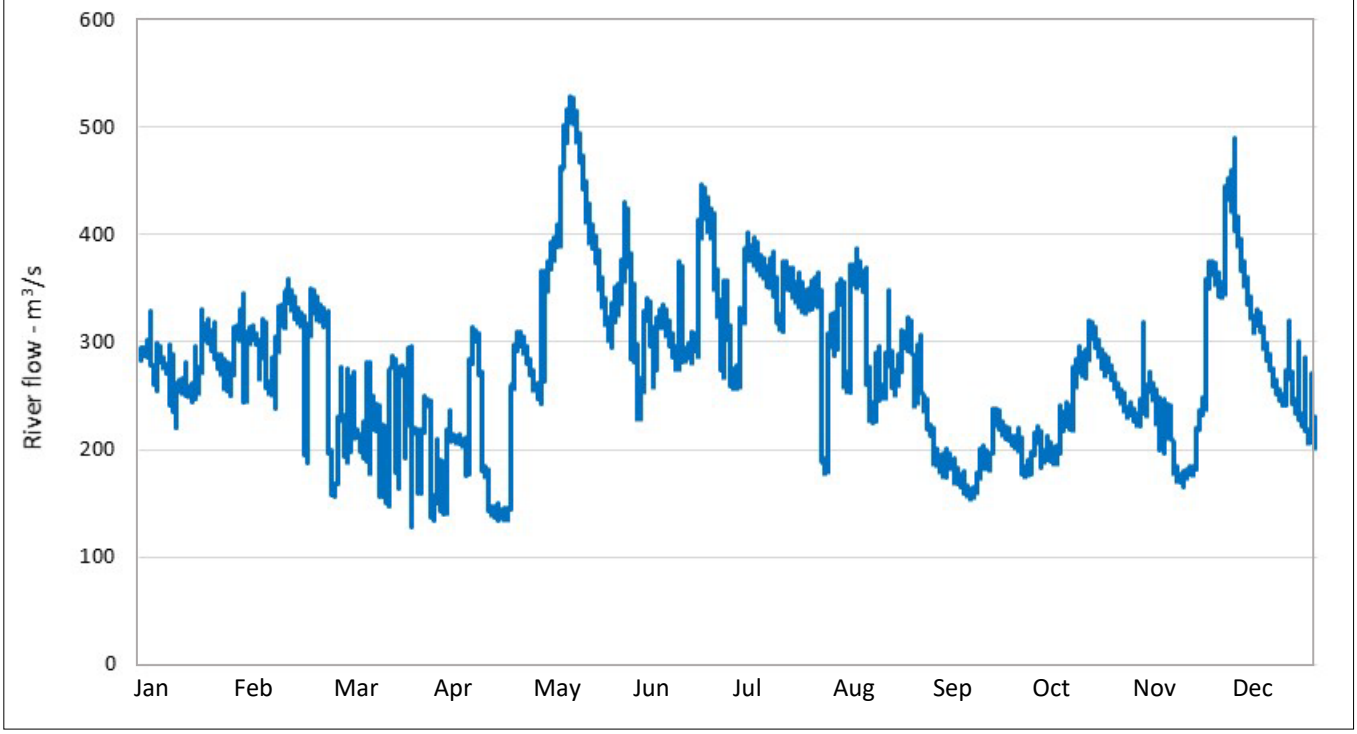


Figure 24: Upper Clutha River/Mata-au full year hydrograph for 2015, below Hawea confluence

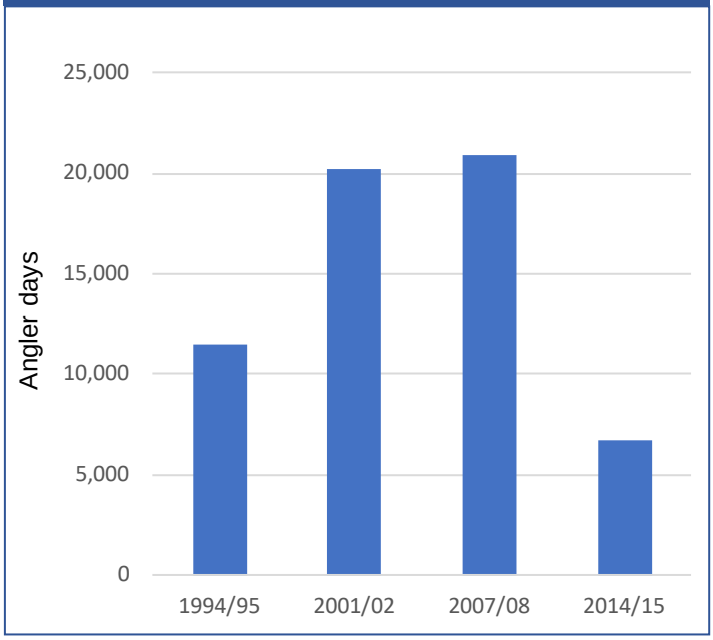


2018 time-period shown in Figure 23. There is no requirement to maintain a minimum flow in the upper Clutha River/Mata-au under the existing Regional Plan, but various consents (especially the more recent ones) have minimum flow conditions.

2.8.1 Recreation and tourism values

The upper Clutha River/Mata-au below the Hāwea confluence supports a range of recreation values, with use easing below the Luggate (Red) Bridge. Recreational values present in this stretch of the River include shore and boat angling (casual and commercial), easy kayaking, canoeing and rafting experiences, jet boating, swimming, and riverside walks and cycling. Several sheltered beach areas below the Hāwea confluence are suited to swimming. It is a popular river section, but not crowded. The Devil's Nook is a popular swimming and picnicking area.

Figure 25: Upper Clutha R angler days 1994 – 2015



For angling, there is more drift boating and spinning and less bank access compared with upstream of the Hāwea confluence – although there are several easy access areas, such as at the Devil's Nook. Foot access from the cycleway for anglers is not so easy as it is mostly high above the River. The section is described as having a different character to above it, and has some lovely areas to fish from, providing a good spectrum of fishing options in a reasonably small area.

Fish & Game NZ's national angler surveys do not divide the upper Clutha River, and so only data for NZ resident licence holders for the section from Lake Wānaka to Lake Dunstan are available. These indicate peaks in fishing activity in the 2001/02 and 2007/08 seasons, followed by a significant drop in 2014/15 (Figure 25).

The delta area at the head of Lake Dunstan is popular for wildfowl hunting.

The Department of Conservation had issued, at August 2018, 24 concessions for commercial recreation activities on Conservation land adjacent to the upper River, mostly guided walking and mountain biking and sporting events.

2.8.2 Significance

The upper Clutha River/Mata-au is significant at the national level for angling, despite the drop in angler activity in 2014/15.

This section of the Clutha is not identified as a separate reach in the literature reviewed. While it is likely to be nationally significant for angling by virtue of its high angler numbers – which could exceed 10,000 angler days – there are no other individual in-river activities of significance above the regional level; apart from the area's scenic values for river-side activities such as walking and cycling. Considering the range of activities possible, and the high angler counts, this section should be regarded of national significance *in toto*.

2.8.3 Experience of hydrology

There are no significant impediments to recreational use of the Clutha below the Hāwea confluence, although the experience of the River is affected by high flows.

When the Hāwea River is running high, the flow in the Clutha can be swift, and shore fishing areas and braids can be inundated – and there is often more free-floating didymo. The River is reported to seem less comfortable and more intimidating for angling and swimming in these conditions. When the Hāwea River is low, anglers are more likely to be able to fish the sides of this section of the Clutha River, and the middle when the Hāwea River is running high. At high flows, the river banks are not considered safe areas for kids to fish or swim, and there is little room at any of the beach areas. The best times are when Lake Wānaka is low and the Hāwea River is at low or moderate flows.

High and unpredictable ramping rates can mean anglers risk being stranded on braids, and high levels of didymo can clog boat engines – in one such event a boat was washed into bankside willows. Anglers do not appear to have accessed the text system operated by Contact (and the subsequent COW tweets) for flow changes on the Hāwea River.

For wildfowl hunting near the delta, high flows can wash out bird resting areas and low flows can strand maimai and empty backwaters. High flows are also considered dangerous for all hunters, but particularly younger ones, and dogs. In the 1990s hunters occasionally requested a certain lake level for Dunstan – possibly 194.25 m – but hunters seem to work around the existing regime now, and there have been no complaints received by the Otago Fish & Game Council in recent times.

The Hāwea confluence itself can feature strong eddies when the Hāwea is flowing high (200 m^3/s), although this has little effect on the ability to use the Clutha River/Mata-au or pass this section in small boats, such as kayaks, rafts and jet boats – although, as discussed, at high flows there may be a lot of free didymo which is a hazard for jet boat intakes; and some caution may be required by the unwary (although kayakers and rafters can consider the eddies a bonus feature on an otherwise reasonably featureless river experience).

Flows below 150 m^3/s are considered too low and slow for rafting and other paddling activities, with rock hazards exposed, increased risk of foot entrapment in shallow water, and unsightly weed and algae. Increased periods of low flows were described as particularly undesirable if they encourage the growth of weeds on river banks and beaches and affect in-river habitat.

2.8.4 Recreation conflict

The upper Clutha River/Mata-au from the Outlet to the Luggate (Red) Bridge is administered according to the QLDC Navigation Safety Bylaw 2018, which is one of the more comprehensive navigation bylaws nationally, reflecting the intensity of commercial and recreational activity on the relevant water bodies. Submissions on the proposed revision of the 2014 bylaw were dominated by concerns over potential conflict between jet boaters and other river users in this river section. The uplift for jet boating was approved in the 2018 bylaw.

Below the Luggate Bridge, the River is controlled according to Maritime NZ rules, and has an uplift for jetboating (allowing boats to travel at more than 5 knots within 200 m of the shore).

There were some comments in the 2017/18 ORC swimming survey (section 3.6) noting concern about the speed and subsequent hazards posed by jet boats, but little concern was apparent amongst interviewees for this study, considering the relatively low level of use by jet boats, their transitory nature and, in the main, consideration shown by drivers. One kayaker noted that while jet boats can be intimidating for rookies, the River is wide and the boats are easily avoided.

2.9 Mid Clutha River/Mata-au

Figure 26 and Figure 27 show the hydrological regime of the mid Clutha River/Mata-au, below the Clyde Dam, which is managed by Contact for hydrogeneration. This is similar to the data for the discharge pattern for the lower Clutha River/Mata-au at Roxburgh (Figure 30). Contact's consent requires a minimum operating dam release discharge of 120 m^3/s at Clyde, "other than between 1

Figure 26: Mid Clutha River/Mata-au flow duration curve, 2008 – 2018, at Clyde

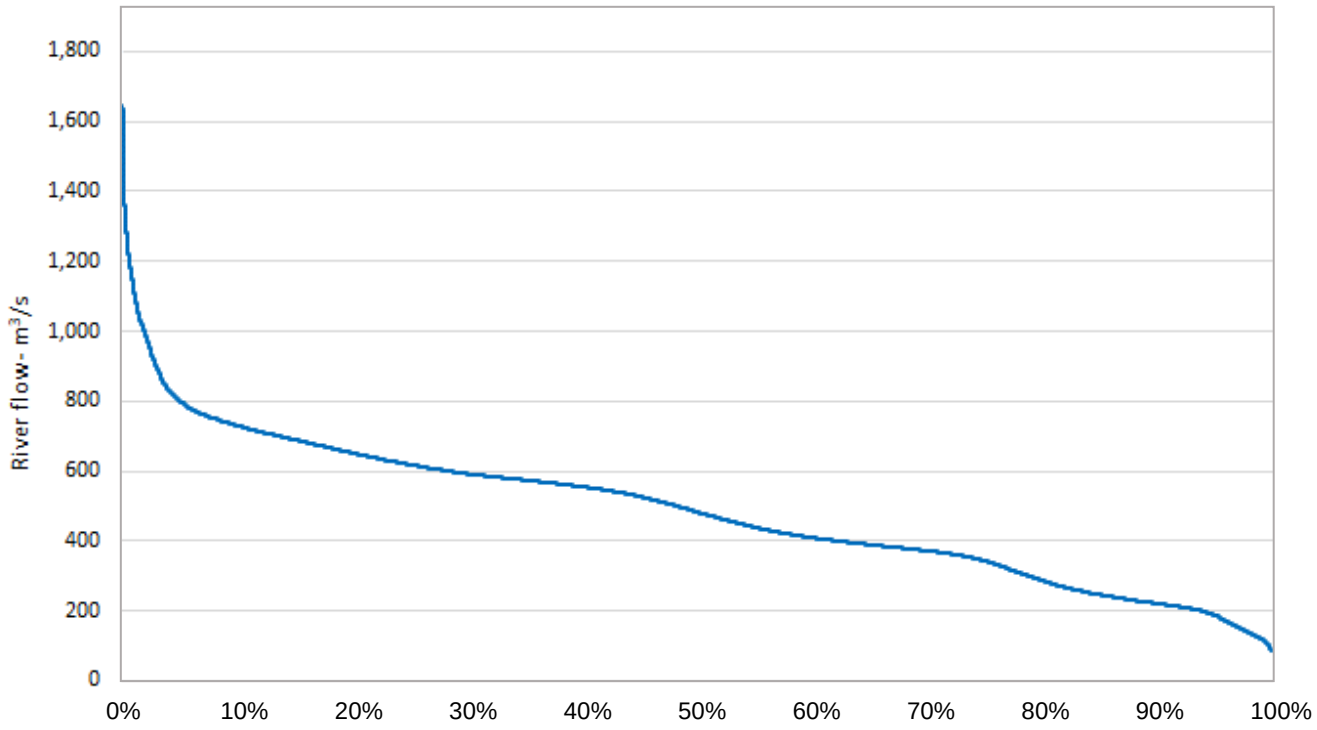
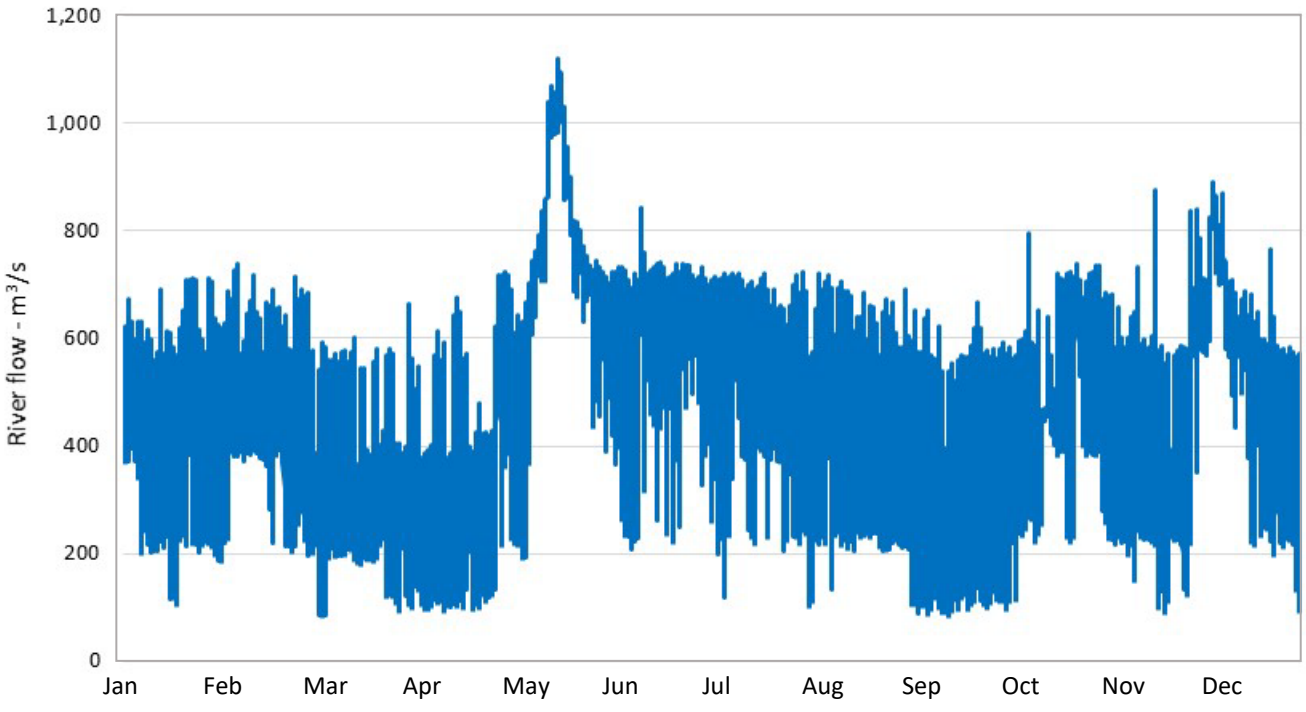


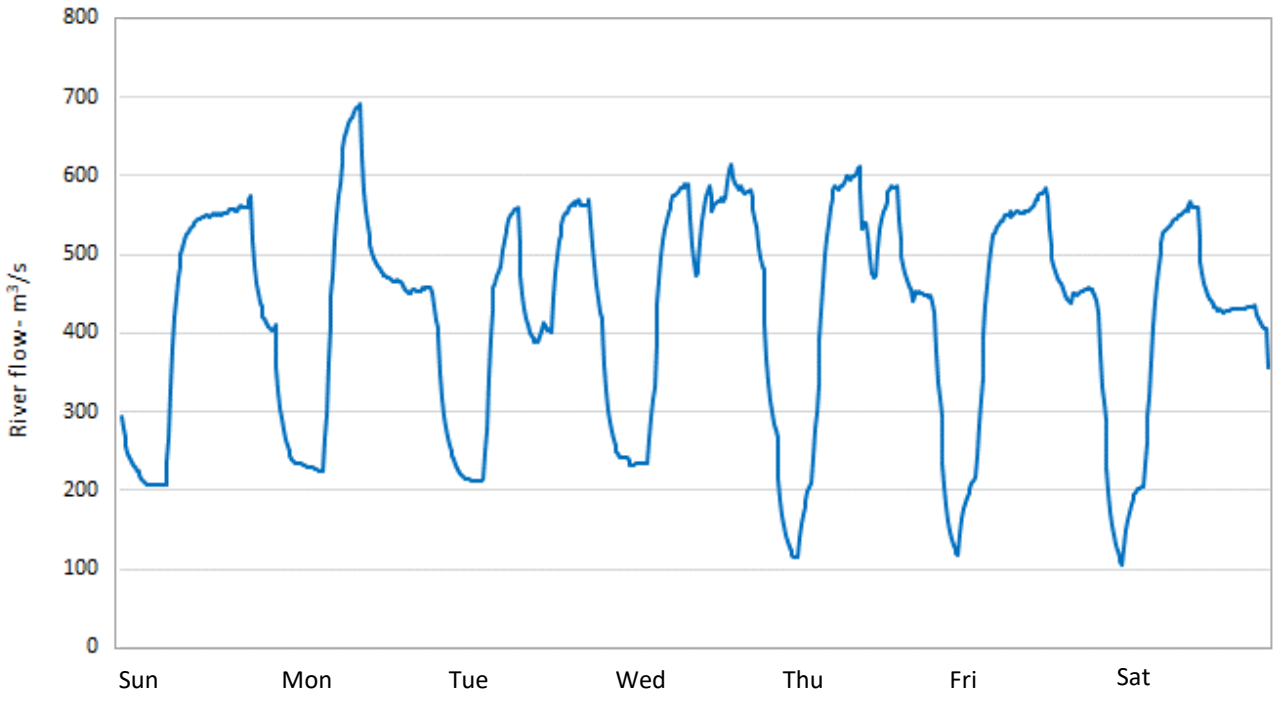
Figure 27: Mid Clutha River/Mata-au full year hydrograph for 2015, at Clyde



hour after sunset and 1 hour before sunrise provided that the level downstream of the Clyde Dam as measured at Clyde site (Site No. 75213) gauging station does not fall below 130.30 m above datum".

Figure 28 shows a hydrograph for a period of a week to illustrate the normal experience of daily flow variability, with a rising flow in the morning and a reasonably stable peak during the middle of the day.

Figure 28: Mid Clutha River/Mata-au one week hydrograph January 2015 – at Clyde



2.9.1 Recreation and tourism values

The mid Clutha River/Mata-au appears to have a lower recreation profile than other River sections. There is one main commercial on-water user – Clutha River Heritage Cruise, although this travels downstream from Alexandra to Doctors Point in Lake Roxburgh. Department of Conservation concessions in the area relate to guided walking, mountain biking and one event.

Reach-specific F&G NZ national angler survey data for NZ resident licence holders were first gathered for the mid Clutha River/Matau-au for the 2014/15 season, with 1,280 ± 770 angler days for that season (4.1% of all angling on the River). Twenty international anglers were also reported for that season. A few rainbow and brown trout are resident. Locals report seeing few anglers in this section. Large fish can be sighted below the dam feeding on left-overs from the turbines, but these are not accessible from the shore or by boat due to their proximity to the dam. Local angling clubs tend to fish elsewhere (such as the Poolburn and Manorburn Reservoirs), but there are a few favoured spots on the mid-Clutha/Mata-au where eddies and backwaters appear at low flows. Regular flow fluctuations mean timing fishing activity is important, and therefore visitors are unlikely to experience a good catch-rate.

Swimming is reported near Clyde and Alexandra, and at similar levels to Lake Hāwea and the upper Clutha River/Mata-au. The main boat access point for both this section of the River and Lake

Roxburgh is at Alexandra. The Alexandra Boat Ramp was improved in 2011.[5] Jet boating and jet skiing are popular uses.

The Southern Lakes Multisport Club stages one winter kayaking event on this section. The Millennium Track (or The River Track) runs between Alexandra and Clyde on the true right of the Clutha River/Mata-au and this is probably the most heavily-used recreation setting in the middle section. The reach features strongly as part of the scenic backdrop to Clyde and Alexandra and is therefore an important asset for tourism.

2.9.2 Significance

The mid Clutha River/Mata-au does not appear in any pre-existing significance assessment. It appears to have been largely ignored by most reporting, rather like Lake Roxburgh; and a similar level of significance most likely applies – that is, regionally significant for recreation largely due to its position as a scenic backdrop to Clyde and Alexandra, and with mostly local angling, swimming and boating values.

2.9.3 Experience of hydrology

Flow variability affects angling opportunities, with low levels preferred. River speed near Clyde reduces boating and angling amenity.

2.9.4 Recreation conflict

No conflict has been reported.

[5] See: https://www.odt.co.nz/regions/central-otago/boat-ramp-improvements-welcomed

2.10 Lower Clutha River/Mata-au

Figure 30 and Figure 29 show the hydrological regime of the lower Clutha River, below the Roxburgh Dam, which is managed by Contact for hydrogeneration. Contact's consent requires a minimum operating dam release discharge of 250 m^3/s, unless combined natural inflows dictate a lower flow. From the beginning of September to mid-October each year the conditions require

Figure 30: Lower Clutha River/Mata-au flow duration curve, 2001 – 2018, at Roxburgh

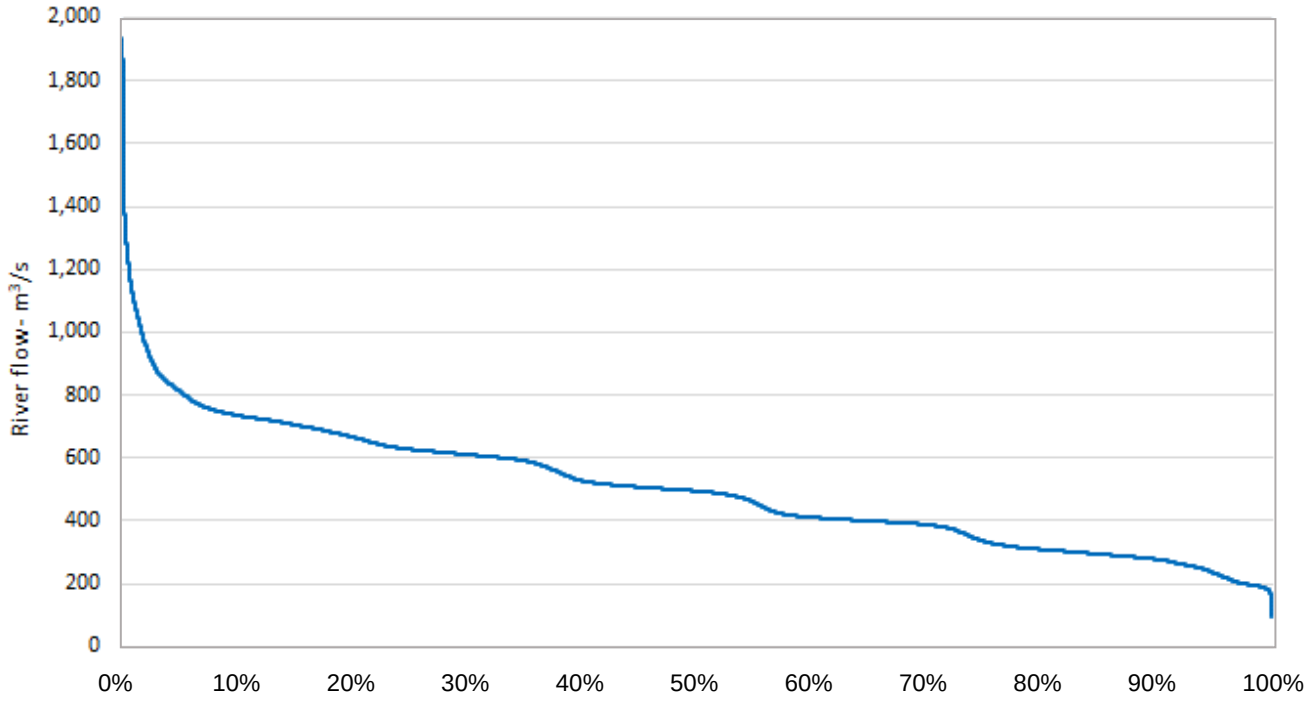
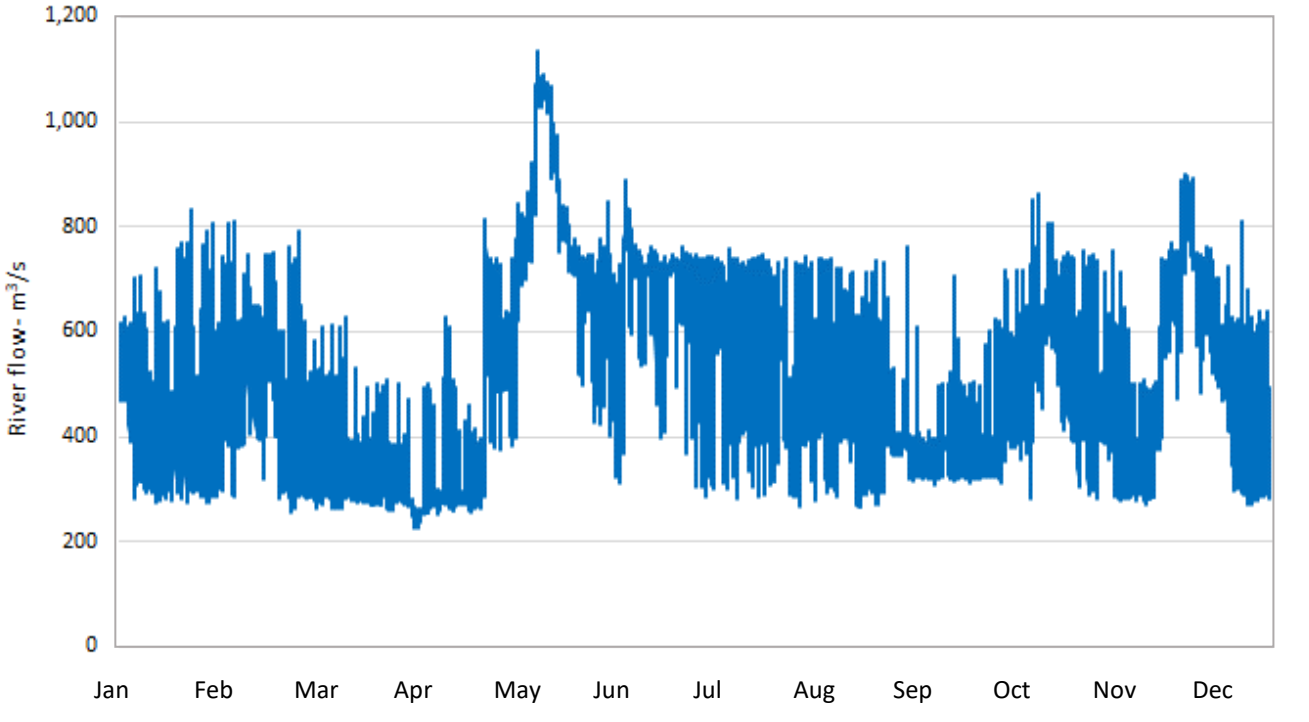


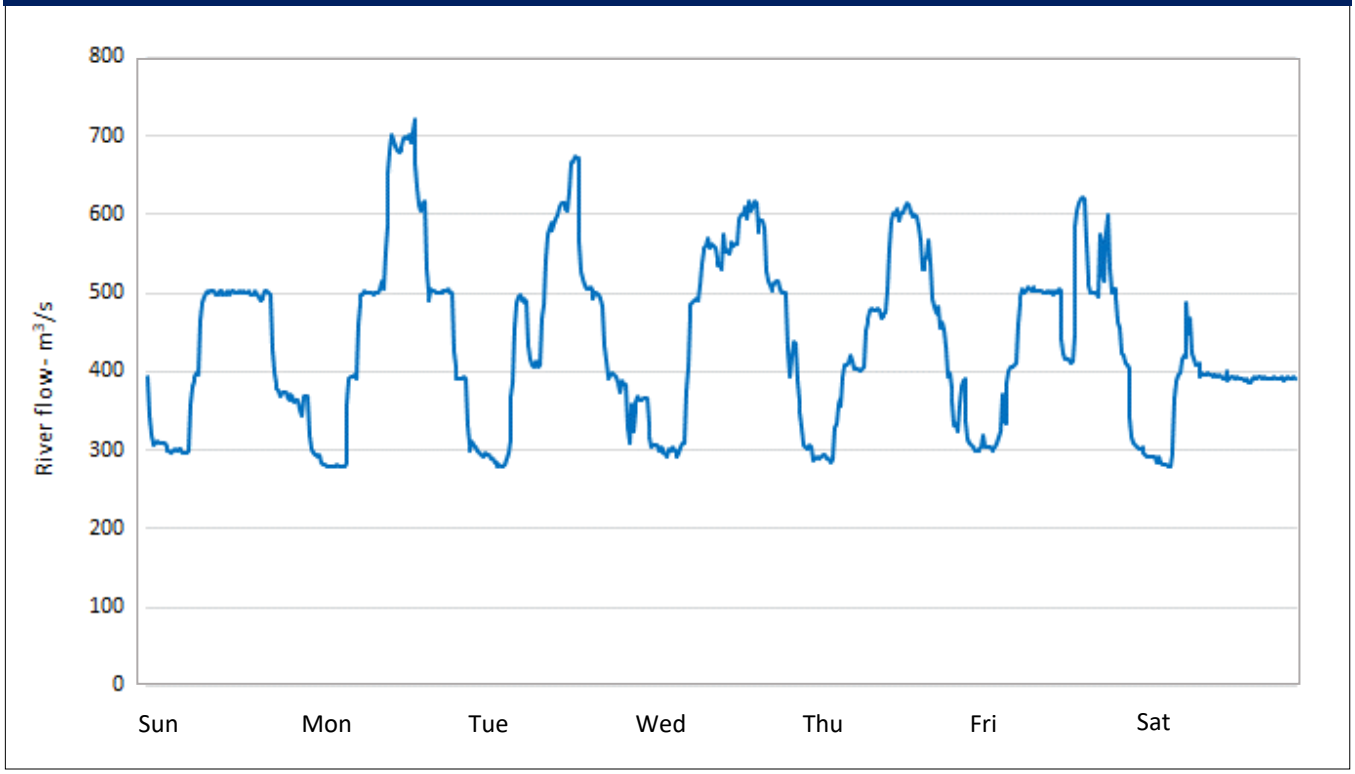
Figure 29: Lower Clutha River/Mata-au full year hydrograph for 2015, at Roxburgh



Contact to make “reasonable endeavours” to maintain a stable minimum flow regime between 300 and 400 m^3/s “to limit the dewatering of salmon redds when eggs are hatching, having regard to natural catchment inflows, plant maintenance requirements, and electricity supply and demand considerations”. The provision of suitable flows for wildfowl hunting on opening day (first weekend in May) is also required to be considered.

Figure 31 shows a hydrograph for a period of a week to illustrate the normal experience of daily flow variability, with a rising flow in the morning and a reasonably stable peak during the middle of the day.

Figure 31: Lower Clutha River/Mata-au one week hydrograph January 2015 – at Roxburgh



2.10.1 Recreation and tourism values

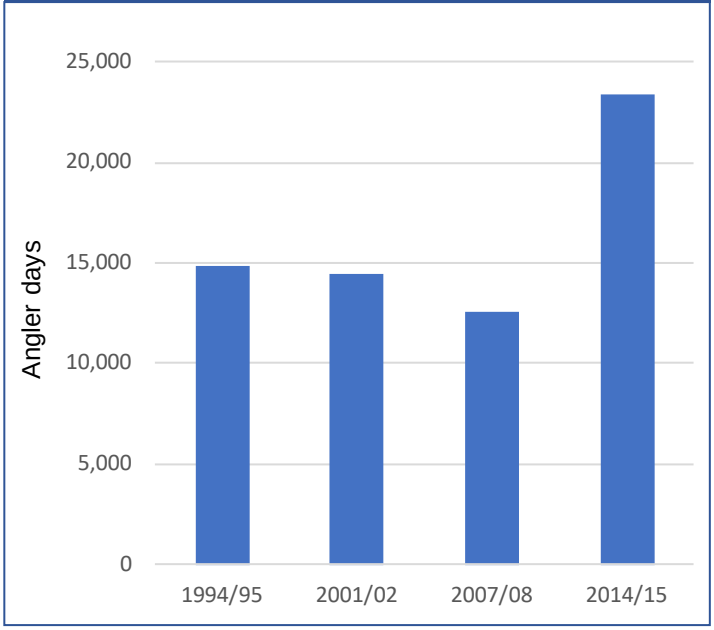
The lower Clutha River/Mata-au is popular for kayaking, jet boating, rafting, whitebaiting, wildfowl hunting and trout and salmon angling (mostly casual). Camping and cycling are popular on the river margins, with the Clutha Gold Trail running from Roxburgh Village to Beaumont on the true left bank (and then on to Lawrence). Formed boat launching ramps are located at Balclutha, Kaitangata and Clydevale, and the Tuapeka Mouth Ferry (‘the punt’) operates from two floating pontoons at Tuapeka Mouth.

There is some swimming, particularly associated with users of the Clutha Gold Trail, occasionally occurring in areas considered unsafe by some experienced River users, with swift flows and nearby tree hazards.

The Tuapeka Mouth Ferry is available 7 days a week, 2 hours in the morning (8-10 am) and 2 hours in the afternoon (3-5 pm in winter and 4-6 pm in summer). Use is growing, by both locals and visitors. Local farmers with run-off blocks on either side will use it at least once a day. Strengthening work on the Clydevale Bridge in 2017 meant the bridge was closed for periods and the punt operated “full bore” for 9 to 10 hours per day.

Angler days in the lower River include salmon and trout angling as well as perch (mostly downstream of Balclutha for the latter). Most salmon fishing occurs at the Roxburgh dam, which is the upriver limit for migrating fish. Trout are caught throughout the lower River, and include seasonal runs of sea-run trout. Some boat or drift fishing occurs.

Figure 32: Lower Clutha R angler days 1994 – 2015



Contact administers a Sports Fish Management Plan for the lower Clutha, in consultation with the Otago Fish & Game Council as per its consent conditions. Under this Plan, nearly 900,000 smolt were released near Roxburgh Dam between 2010 and 2016, but this has not been reflected in an increase in salmon catches. Contact is currently developing a programme to build a dedicated hatchery to provide salmon smolt to the fishery, likely to be built at the Roxburgh Dam. Salmon angling is generally described as 'as poor as it has ever been'.

However, Fish & Game NZ's national angler survey data for NZ resident licence holders show a significant increase in fishing activity since 2001/02 (Figure 32), and almost 30% of that effort was for salmon in 2014/15 (the first year data was gathered for each species in this reach).

The river mouths, on the Matau and Koau Branches, provide the most popular whitebaiting settings in the region.

There is currently very little, if any, commercial jet boating, with the main operator shifting to servicing cyclists on Lake Roxburgh (see section 2.5.1).

The lower River provides a significant educational resource (with a commercial element) for whitewater activities – kayaking and rafting mostly – as well as river safety training.

The Department of Conservation had issued, at August 2018, six concessions for commercial recreation activities on Conservation land adjacent to the lower River, all for guided walking.

2.10.2 Significance

The lower Clutha River/Mata-au has been previously assessed as of regional significance for trout and salmon angling and whitebaiting. In the opinion of the author, this status should also be applied to its use for whitewater activities associated with education programmes. It is locally significant for jet boating and currently has very little commercial recreation use, beyond that associated with tourism activity on the Clutha Gold Trail and the Tuapeka Mouth Ferry. The latter two activities are also regionally significant, which is an appropriate description for this section of the River's recreation values generally.

2.10.3 Experience of hydrology

Flows in the lower River do not impede use unless they are very high. The scale of the flow and the width of the River means it is easy to avoid hazards – such as willows. Even up at 1000 m^3/s, while the River might look scary, it is quite safe. At high flows (>350 m^3/s) the River becomes discoloured,

there is more loose didymo (river users can get coated in it) and the River loses its most interesting hydraulic features – it becomes just a float down a big river. At low flows (<350 m^3/s) the River is generally clear, and the four main rapids between Millers Flat and Beaumont Bridge are working well (although they progressively disappear as the River rises).

Anglers report that at high flows, they often only have access to fish over unproductive cobbles (since they have previously been dewatered at low levels). Angling is better at lower levels (undefined but generally 'very low') when there is better and safer river-side access and anglers can fish over weed beds and around river-side vegetation.

The ramping rates are generally quite predictable, and the day's activities are able to be planned around them. If the rates were random, it would be difficult to offer an ideal experience. Jet boaters report that an occasional boater might go to lunch in Beaumont and find their vessel beached when they return, but this is not a big issue.

At flows below 300 m^3/s the access ramps for the Tuapeka Mouth Ferry are too steep for low-slung cars, but work for SUVs and high vehicles. Below 200 m^3/s the service is not available for cars as the River is too shallow and the punt hits the bottom.

At flows above 800 m^3/s the ramps are also too steep for low cars but work for SUVs and other high vehicles.

At flows above 900 m^3/s the punt is moved to the western side (the non-home side) to avoid any mobile debris in the River. At flows above 1250 m^3/s the ramps are pulled from the water.

The punt relies on river flow to drive it across. At flows below 300 m^3/s, strong easterly or westerly winds can result in it being stuck on one side. An upstream sandbar on the eastern (home) side means more shelter from flow, and the punt is therefore more likely overpowered by wind on the home side.

Operational flows for the Tuapeka Mouth Ferry are taken from the Roxburgh flow meter, with an eight-hour delay for flows to reach the punt site at Tuapeka Mouth.

Contractors operating the punt have a direct phone contact with Contact and normally get ample warning of any high flows. Contact has also adjusted flows in the past to allow maintenance works. For example, the punt is removed from the water every five years for maintenance and Contact has raised the flow in the past to allow the punt to get closer to the bank, and the crane needed to lift it.

Flow variation during the day, when flows pass the various thresholds, can mean that the service is interrupted, but this is not so common as to be a major issue.

Rare major flushing events can mean that the punt does not operate for several days – but Contact gives ample warning and they are infrequent.

2.10.4 Recreation conflict

The lower River has low levels of use and there is low recreation conflict, reported by interviewees as an occasional negative interaction between some casual (not commercial) jet boat operators and whitewater activities. The ORC has received complaints in the past about the actions of motorised vessels in the lower River, as well as whitebait stand structures and activity.

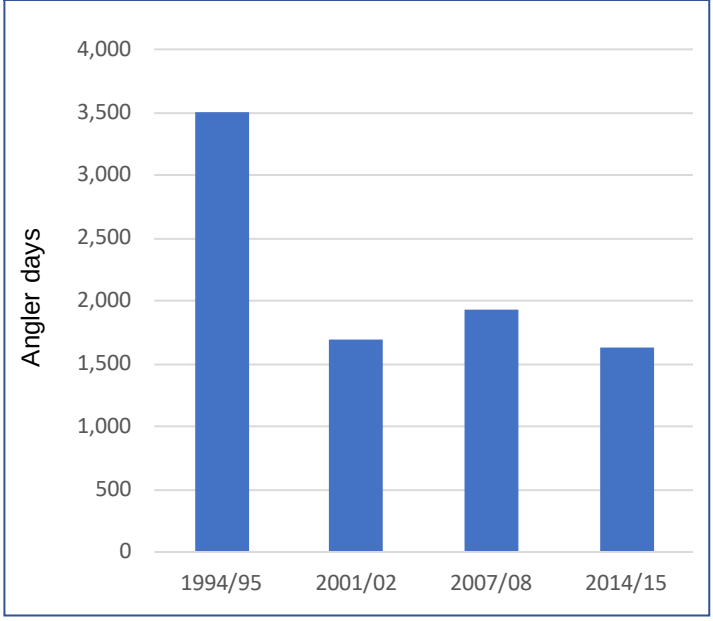
2.11 Kawarau River

Flows on the Kawarau River are measured above the gated control structure near the Lake Wakatipu as a stage height, and strongly reflect the behaviour of the Lake; and at Ripponvale on Lake Dunstan, which better illustrates the natural flow regime of the River (see Figure 13 on page 20).

2.11.1 Recreation and tourism values

Like Lakes Wānaka and Wakatipu, the Kawarau River is a significant setting for commercial recreation, including; below the Arrow confluence, river boarding and sledging, rafting, bungy jumping and kayaking; and above the confluence with the Shotover River (which carries a heavy silt load), angling (casual and commercial) and jet boating – the latter associated with accessing the lower Shotover River and supporting activities on Lake Wakatipu. The section between the Shotover and Arrow confluences offers some angling (although of lesser quality) and easy family-focused rafting.

Figure 33: Kawarau River angler days 1994 – 2015



The Kawarau below the Arrow confluence is one of the most significant whitewater settings in the region for kayaking and rafting (less-so than the Shotover for the latter), with five named runs ranging from grade 3 to the maximum of grade 6.

Fish & Game NZ's national angler survey data for NZ resident licence holders show a stable level of activity since a decline after 1994/95 (Figure 33).

The Queenstown Trails 26 km Twin Rivers Ride from Kawarau Falls Bridge to Morven Ferry Road passes along the true left of the River to Morven Ferry Road upstream of the Arrow Confluence. For 2016 the Queenstown Trails reported 31,352 journeys counted at the Kawarau Falls Bridge and 11,218 at Morven Ferry.

2.11.2 Significance

The Kawarau River is an outstanding water body, as indicated by the Water Conservation (Kawarau) Order 1996. Use and value will have increased since the Order was made.

2.11.3 Experience of hydrology

The Kawarau River has a natural flow regime.

2.11.4 Recreation conflict

The Kawarau River is administered according to the QLDC Navigation Safety Bylaw 2018, which is one of the more comprehensive navigation bylaws nationally, reflecting the intensity of commercial and recreational activity on the relevant water bodies. There were no submissions to the proposed bylaw relating to recreation conflict on the Kawarau River. Individual commercial operators' behaviour is controlled by QLDC licences to operate.

3 Literature review and agency data

This section summarises activity-specific data available in published popular guides and academic papers, gained from interviews or sourced by request from local and central government. Data which define flow preferences are largely presented in section 2 and in the interview summaries in section 5.

3.1 Otago Regional Council consultation for water quantity plan change

The ORC carried out a process of consultation between November 2017 and February 2018 to provide advice for the planning process for the water quantity plan change proposal. A summary is provided in ORC (2018). Key findings for recreation and tourism values included:

- Many respondents to a series of regional drop-in sessions discussed the importance of the river and lakes in sustaining different recreational uses and opportunities. Recreational activities discussed include fishing, swimming, kayaking, white-water rafting, and boating, as well as walking and biking along the lakeshore or the riverbanks. Other recreation activities discussed include wading or paddling, camping and picnicking, gamebird hunting, sunbathing, wildlife spotting, exploration of historic sites and sight-seeing.

  While recreational activities were reported to occur throughout the entire lake and river system, a higher number of responses were received about recreation in the following areas:

  - Lake Wakatipu and Kawarau River near Queenstown;
  - Lake Hāwea and the Hāwea River;
  - Lake Wānaka; and
  - Upper Clutha River between Lake Wānaka outlet and Alexandra.

- Most respondents considered that the Clutha River/Mata-Au, Kawarau and Hāwea Rivers and Southern Lakes are generally in good health. Some noted that in recent years the levels of Lakes Wānaka and Hāwea and the flows in the Upper Clutha have been lower than usual at times, while others noted a gradual decline in water quality. Increasing proliferation of noxious water weeds (e.g. lagarosiphon) and algae (e.g. didymo and lake snow) in the rivers and lakes were seen as a symptom of declining water quality in the upper Clutha and Wakatipu Basin. Others considered that declining water quality is noticeable downstream of Cromwell, especially in the lower reaches of the Clutha River/Mata-Au. In most instances respondents attributed the changes to urban development, the growth of the primary and tourism industries and hydro-electricity generation. While most responses generally indicated that the rivers and lakes are currently able to maintain the diversity of uses and values, some expressed concern about growing conflict. The latter focused mostly on issues with motorised boating – jet skis and jet boats – in Lake Wānaka and the upper Clutha River/Mata-au (noise, safety at speed and impacts on water quality from oil contamination), particularly in light of increased use by non-motorised activities.

Separately, the ORC has received complaints about motorised vessels in that lower Clutha River/Mata-au, and the activities and structures associated with whitebaiting near the mouths.[6]

[6] Richard Pettinger, ORC, pers comm

3.2 Commercial activities

This section considers all surface water boating activity on the Clutha River/Mata-au that may be controlled by the Maritime Rules administered by Maritime New Zealand, with additional local controls enacted by territorial authorities which operate their own Navigation Safety Rules via an appropriate navigation bylaw prepared in accordance with the Local Government Act 1974. Regional councils are generally responsible for preparing regional navigation safety controls where required, but may delegate power to another public authority. This is the case with the Central Otago District Council (CODC) for Lake Dunstan, and the QLDC for all its waters.

Maritime New Zealand generally retains authority over licensing commercial vessels under the Maritime Rules (prepared in accordance with the Maritime Transport Act 1994). Part 80 of the Maritime Rules controls 'marine craft' used for adventure tourism (specifically commercial jet boats operating on rivers, and commercial rafting). Certificates awarded by Maritime New Zealand under this Part of the Rule are limited to specified rivers, and compliance is audited by Maritime NZ. Part 40 of the Rules controls general passenger (Part 40a) and cargo-carrying (Part 40c) in commercial marine craft (such as water taxis and recreational fishing boats), excluding adventure tourism, with audits completed by approved private companies. Anyone licensed under Part 40 would be able to undertake a commercial trip on a water body, but not for the purposes of adventure tourism.

Administration of navigation safety in New Zealand varies from district to district, with different levels of engagement by local and regional authorities and Maritime NZ. The study area includes three districts and one region:

- The ORC administers navigation safety on the Otago and Karitane Harbours and has no role in the management of the Clutha River, besides delegating some authority to develop navigation safety bylaws to the CODC and QLDC.
- The QLDC applies its Navigation Safety Bylaw 2018 to – within the study area – the Clutha River/Mata-au from the Lake Wānaka outlet to Red Bridge, Lakes Wānaka, Wakatipu and Hāwea, the Kawarau River and Hāwea River. The QLDC and the Director of Maritime Safety have a memorandum of understanding permitting QLDC to administer Part 80 of the Marine Rules within the district, in consultation with Maritime NZ.
- The CODC administers the surface of Lake Dunstan and its tributaries via the Central Otago District Council Lake Dunstan Navigation Safety Bylaws 2017. The Council does not administer those parts of the Maritime Rules which control licensing of commercial waterborne activities.
- The Clutha District Council (CDC) has no navigation safety rules.
- Maritime NZ administers navigation safety on all waters where no local bylaws apply in accordance with the Maritime Rules. It also applies Part 40 of the Maritime Rules to the entire study area, and Part 80 to all areas bar that administered by the QLDC, in accordance with the MOU between the Council and Maritime NZ.

The QLDC recognises numerous (30+) commercial operators on the upper Clutha River/Mata-au under Part 80 of the Maritime Rules, including whitewater activities and jet boating on the Kawarau River and upper Clutha River/Mata-au, and power and sail boats on the Lakes.[7]

[7] Complete lists of specific operators can be gained from the QLDC Assistant Harbourmasters (David and Marty Black).

3.2.1 Department of Conservation concessions

Table 2 identifies the number of commercial recreation concessions issued by DoC for Conservation land adjacent to each water body (at August 2018). This will include some double-counting of individual operators as some hold concessions for more than one reserve or other conservation area. Appendix 1 includes the full list by individual site. The names of concession holders are not provided. The data merely help indicate the relative levels of commercial activity in each water body, and obviously concessions are not required when Conservation land is not used. There are no relevant concessions for Conservation land adjacent to Lakes Hāwea and Roxburgh or the Hāwea River. The concession gained by the NZ Professional Fishing Guides Association for Lake Wānaka applies to all members of the Association.

Table 3: DoC commercial recreation concessions by type and location

Setting / Activity	Lake Wakatipu	Kawarau River	Lake Wānaka	Upper Clutha River	Lake Dunstan	Mid Clutha River	Lower Clutha River
4WD guiding	1	7					
Accommodation	1						
Bike trail						2	
Boat transport			29	1			
Commercial dog walking	1						
Fishing guides	1	2	1	2			
NZ Professional Fishing Guides			1				
Gold fossicking	2						
Guided cycling	1						
Guided kayaking, walking, camping			1				
Guided mountain biking	14		5	6		1	
Guided photography	2						
Guided walking	35	20	17	8		5	6
Golf Course			1				
Horse trekking	1						
Jet Boating		1					
Kayak guiding	2						
Mountain bike guiding		3					
Rafting		2					
Rock climbing guiding	4						
Sporting event		2	4	7	1	1	
Tourist attraction		1					
Trail licence		1					
Totals	**65**	**39**	**59**	**24**	**1**	**9**	**6**

3.3 Water Safety New Zealand

Water Safety NZ provided an analysis of its Drownbase preventable drowning fatalities database for Otago between 1 January 2008 and 31 December 2017 for this study.[8] The figures provided are described as 'provisional as at 24/10/18' and are heavily anonymised.

Preventable fatalities include recreational and non-recreational drowning deaths. They do not include those fatalities arising as a result of road or air vehicle accidents, homicide, suicide or of unknown origin, as these are not considered applicable to the prevention and rescue efforts of the water safety sector.

- There were a total of 812 preventable drowning deaths within New Zealand for the period 1 January 2008 – 31 December 2017.
- Of these, 47 occurred in the Otago region.
- 18 fatalities occurred in streams or rivers in the Otago region.
- Of these, five occurred in flooded rivers. The flooded rivers were all due to rainfall. The rivers were:
    - Clutha
    - Young
    - Kakanui
    - Dart
    - Silverstream
- A further four fatalities were noted to be in rivers with a strong or swift current, but the water level appeared to be normal.
- There were 13 deaths in lakes in the Otago region. No lake fatalities appeared to be due to rising water levels.
- In a couple of incidents, the water flow from dams was lowered so that bodies could be recovered.

3.4 Recreational and competitive jet boating

The QLDC Navigation Safety Bylaw 2018 uplifts the 5-knot rule (allowing jet boating) on the:

- Kawarau River upstream of the Arrow confluence, although no "waterskiing, aquaplaning or towing of persons" is permitted.
- Upper Clutha River/Mata-au from a 5-knot buoy located just over 1000 metres downstream of the Lake Wānaka outlet to Red Bridge – which is the QLDC boundary - all year between the hours of 10am to 4pm in the winter and 10am to 6pm in summer. Like the Kawarau, no "waterskiing, aquaplaning or towing of persons" is permitted.
- Hunter River to Ferguson Creek, accessed via Lake Hāwea, 1 November to 12 December and 19 March to 30 April.
- Makarora (to Young River) and Wilkin (to Kerin Forks) Rivers, accessed from Lake Wānaka.
- Dart and Rees Rivers, accessed from Lake Wakatipu.

[8] Felicity Fozard, Water Safety NZ, pers comm

- Ten waterski access lanes on Lake Wakatipu (as well as four general high-speed access lanes), six on lake Wānaka and one on Lake Hāwea.

The remainder of the Clutha River/Mata-au is open to jet boating (the 5-knot rule does not apply).

Jet Boating NZ offered the following online advice about boating on the Clutha River/Mata-au in 2011 (this data is no longer provided online or in the JBNZ year book):[9]

> *SECTION 1: Lake Wānaka to Lindis Junction. Class 1*[10] */rocks/trees/275m* [altitude at start of section] */44km* [length of section]. *Launching: Concrete ramp at Lake Outlet. Alternative launching: Lake Wānaka. NOTE: Restrictions between Lake Wānaka and Albert Town, concrete ramp below bridge.*
>
> *SECTION 2: Lindis Junction to Clyde dam. Lake /190 m/40km. Launching Lowburn. Bannockburn, Clyde Dam.(New by-laws affecting Lake Dunstan/Clutha access are being drafted)*[11]
>
> *SECTION 3: Clyde to Roxburgh Dam. Launching: Millers Flat bridge. Class 1/rocks/shallows/lake/logs/150 m/46km. Launching: Alexandra Boat Club ramp signposted. Concrete ramp on top of dam /true leftside.*
>
> *SECTION 4: Roxburgh Dam to Millers Flat. Class 1/easy boating/95m/25km. No easy launching. Possible behind golf course depending on river conditions (4 wheel drive an advantage). DANGER: Hydro controlled.*
>
> *SECTION 5: Millers Flat to Clydevale. Class 2/rocky/75m/59km. Launching (1) Off beach below Beaumont Bridge. (2) Concrete ramp above Clydevale Bridge, true right side. DANGER: Hydro controlled. BEWARE: Rock shelves in gorge below Beaumont.*
>
> *SECTION 6: Clydevale to Balclutha. Class 1/some shallows/shingle/30 m/25km. Launching: (1) Clydevale as for section 5. (2) Balclutha below main road bridge, true right bank. NOTE: Low wire almost 2km below Clydevale Bridge between true left bank and island. There is a bank erosion problem in this section. Take extreme care, don't travel too fast or too close together.*
>
> *SECTION 7a: Balclutha to sea (Matau Branch, true left). Class 1/easy boating/15m/28km.*
>
> *SECTION 7b: Balclutha to sea (Koau Branch, true right) Class 1/ easy boating/15m/18km. Launching: (1) Balclutha as for section 6. (2) Kaitangata (Matau Branch) beside Miners Union Hall (4 wheel drive or possibly tractor).*

Multiple ski lanes are marked on Lakes Wakatipu, Wānaka, Hāwea and Dunstan.

3.5 Angling

The 1979/81[12], 1994/96, 2000/01, 2007/08 and 2014/15 national angler surveys (NAS) report the following use levels, in angler days, for the lakes and river section of the study area (Table 4). Data are shown for only NZ resident angler licence holders to allow comparison over time – the early surveys did not include overseas anglers.

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[9] http://www.nzjetboating.com/index.php?option=com_content&view=article&id=126&Itemid=141

[10] Class 1. Easy boating/suitable for beginners/family boating.
Class 2. More advanced boating/comfortable after 1 season.
Class 3. Difficult/adventure/skill required/families not recommended.
Class 4. Unlikely to be boated/lack of flow/obstructions

[11] Assume this refers to the current CODC Navigation Safety Bylaw for Lake Dunstan

[12] The original national angling survey relied on respondents to consider their angling activity over the prior 3-5 years, so the concept of season is elastic, but 1979/81 is used as a nominal reference point (M. Unwin, pers comm.).

The “upper Clutha” begins at Lake Wānaka and ends at Lake Dunstan, the middle section runs from Clyde to Alexandra (and was first included as a separate section in the surveys for the 2014/15 season), and the “lower Clutha” begins at the face of the Roxburgh dam and ends at the sea. The 2014/15 season survey divided angling activity between trout and salmon in the lower River.

Table 4: National angler survey data, NZ resident angler days by season

	1979/81	1994/95[13]	2001/02[14]	2007/08[15]	2014/15[16]
Clutha upper	8,100[17]	11,440 ± 2,130	20,160 ± 2,760	20,900 ± 3,220	6,670 ± 1,330
Clutha mid					1,280 ± 770
Clutha lower salmon					6,760 ± 2,700
Clutha lower trout					16,660 ± 2,770
Clutha lower	30,000[18]	14,890 ± 2,390	14,450 ± 2,950	12,550 ± 1,940	
Clutha undefined			2,710 ± 980	4,640 ± 1,140	
Clutha total		26,340 ± 3,210	37,320 ± 4,160	38,090 ± 3,930	31,370 ± 4,160
Lake Wakatipu		21,410 ± 2,180	17,720 ± 1,910	20,970 ± 2,230	21,860 ± 3,170
Lake Dunstan		22,250 ± 1,750	19,480 ± 2,910	26,030 ± 2,800	17,080 ± 2,120
Hāwea River	1,700[19]	1,920 ± 470	4,970 ± 1,310	710 ± 310	480 ± 170
Lake Hāwea		18,820 ± 2,260	28,160 ± 3,670	21,920 ± 2,750	13,640 ± 2,490
Lake Wānaka		25,530 ± 2,370	25,270 ± 2,310	39,070 ± 5,710	22,410 ± 3,180
Lake Roxburgh		50 ± 40	210 ± 90	3,080 ± 1,150	1,420 ± 580
Kawarau River	1,300[20]	3,500 ± 1,000	1,700 ± 770	1,930 ± 750	1,630 ± 600

The high angling figure for the lower Clutha in 1979/81 may have been the product of salmon ranching attempts made during that period by ICI (Imperial Chemical Industries) and Watties.

The 2007/08 data show that 64% of NZ resident angling on the Clutha occurred on the upper River and 35% on the lower River (rounding effects noted and assuming unspecified activity was distributed as for specified), while in 2014/15 the figures were 78% and 22% respectively (excluding the middle section to allow comparison). The total angling effort for the entire River in 2014/15 was 31,370 ± 4,160 days, representing 21% of all angling effort in the Clutha catchment (a very extensive area, and including the significant fishery of the Pomahaka River), and 17% of all angling in the Otago region, including lake fisheries (the same percentages as in 2007/08).

There is a 12-month angling season on the Clutha River, bar the Deans Bank section (defined by landmark posts 1 km below Lake Wānaka and 600 m above the Albert Town Bridge) where the season begins on the 1st of October and runs to the 31st of May. The lakes in the study area are open to fishing all year, and to all methods (Fish & Game 2018).

The Clutha River/Mata-au downstream of Balclutha is one of only three rivers in Otago where trolling for fish from a powered boat is permitted. Other fishing methods from a boat, canoe or

[13] Unwin & Brown 1998. Does not include figures for child licence holders.

[14] Unwin & Image 2003. Does not include figures for child licence holders. Figure for the ‘total river’ count includes angler days on unspecified sections of the Clutha River.

[15] Unwin 2009a.

[16] Unwin 2016

[17] Richardson *et al* 1986.

[18] Richardson *et al* 1984.

[19] Richardson *et al* 1986.

[20] Richardson *et al* 1986.

pontoon, or other flotation device is permitted on the River downstream of the Albert Town Bridge (Fish & Game 2018).

Didymo first appeared in the Clutha and Hāwea Rivers in 2005 (Unwin 2009a). It did not appear to have altered the level of angling activity on the Clutha (37,320 ± 4160 in 2001/02 and 39,730 ± 3950 in 2007/08), while (p33), "Some infected rivers (e.g., Mararoa, Hāwea [4,970 ± 1,310 in 2001/02 and 710 ± 310 in 2007/08], Buller, Mataura, Motueka, Manuherikia) show evidence of a significant decline in usage from 2001/2002 to 2007/2008, irrespective of infestation levels, but others have either shown little change (e.g., Clutha, Oreti, Ahuriri, Aparima) or have experienced a moderate increase (e.g., Waiau, Twizel, Clarence, Opihi). The absence of any clear trend in relation to known didymo incursions indicates that its presence is only one of a suite of factors which potentially influence angling usage".

The upper Clutha River/Mata-au has since experienced a significant decline in angler days – from 20,900 angler days in 2007/08 to 6,670 in 2014/15.

Unwin (2016) states:

> *…. there has also been a significant redistribution of effort along the mainstem of the Clutha River, where reduced effort on the upper reaches from Lake Wānaka to Lake Dunstan (20,900 ± 3,220 angler-days in 2007/08 vs. 6,670 ± 1,330 angler-days in 2014/2015) has been largely offset by increased effort on the lower reaches below Roxburgh (12,550 ± 1,940 angler-days in 2007/08 vs. 23,420 ± 3,870 angler-days in 2014/15).*

Jellyman (1987) noted that netting surveys in the lower Clutha River/Mata-au indicated that a "good number of trout could be caught only in areas where the flow was reduced, such as backwaters and willow-lined silty banks. Such habitats are limited to only 1% and 8% of the total river area." He noted that daily fluctuations in river depth caused by the hydro regime had adverse effects on the quality and quantity of this habitat.

Interviewees indicate that the section of the River between the Lake Wānaka Outlet to below the Cardrona River confluence is the most popular part of the upper River for angling (where fish density is high), and perhaps as much as 25% of angling effort in the upper section occurs below this point. The sections above and below the Cardrona provide quite different experiences, and so may provide the same level of amenity value, although with different use levels.

Unwin (2016) notes, in reference to non-Otago resident NZ anglers, and overseas anglers, fishing in the Otago region in the 2014/15 season:

> *New Zealand resident licence holders from other FGNZ regions (particularly Southland, Central South Island, and North Canterbury) fished for 37,110 ± 3,170 angler-days within the Otago region, contributing 20% of the regional total. Most of this effort (26,700 ± 2,800 angler-days; 72% of the visitor total) was expended on lakes, primarily the Clutha source lakes (Hāwea, Wānaka, Wakatipu) and Lake Dunstan. The most popular river fisheries used by visitors were the Clutha River/Mata-au (3,570 ± 870 angler-days, evenly divided between the lower and upper reaches); the Taieri River below Outram (1,480 ± 810 angler-days); and the Pomahaka River (1,150 ± 500 angler-days). Overseas visitors expended 5,210 ± 860 angler-days within the Otago region (2.8% of the regional total), almost all of which (4,920 ± 840 angler-days) was recorded in the Clutha catchment.*

Table 5 shows the estimates for overseas angler days for the 2014/15 season (for "non-resident" fishing licence class holders). Lake Wānaka had the greatest number and proportion. The majority of "non-resident" fishing licences sold in 2014/15 – 84% – were for 24 hour periods, and which are usually arranged through a fishing guide (Unwin 2016).

Table 5: Overseas angler survey results for 2014/15 season (Unwin 2016)		
	Overseas angler days	**Percent of all angler days**
Clutha upper	60 ± 60	0.9
Clutha mid	20 ± 20	1.5
Clutha lower salmon	0	0
Clutha lower trout	100 ± 100	0.6
Clutha total	190 ± 120	0.6
Lake Wakatipu	330 ± 180	1.5
Lake Dunstan	210 ± 180	1.2
Hāwea River	0	0
Lake Hāwea	210 ± 120	1.5
Lake Wānaka	1,330 ± 650	5.6
Lake Roxburgh	0	0
Kawarau River	20 ± 20	1.2

3.5.1 Popular angling commentary

Kent (2009) (the most comprehensive South Island trout angling guide) and Turner (2003) provide, mostly, extensive descriptions of the angling options on the water bodies in the study area. For brevity, snapshots from the F&G access brochures for each water body are summarised here. These are undated but available via the F&G website at the date of writing:

Lake Wakatipu

> *It takes the average angler approximately two hours to catch a fish in the lake. These fish will average 380 mm in length and 600gms in weight. Large 'double-figured' trout are caught annually. Brown trout comprise 43% of the catch followed by landlocked Chinook salmon and rainbow trout. It is estimated that over 5000 fish are caught each season. Fishing method is a complex issue as all three target species react differently throughout the year.*
>
> *Trolling is the method employed by over three-quarters of the lake anglers. It is also the most successful method for catching salmon. Many anglers prefer rapalas although black toby's, silver hexagon wobblers and Tasmanian devils especially in traffic light patterns are also favoured. Salmon travel in large schools and are located close to shore when in pursuit of small native fish in spring. During the summer months salmon are often caught in deep water but return to the large river mouths in Autumn for the annual spawning run.*
>
> *Good road access is available to the lake edge from Kingston to Glenorchy. Most of the Southwest and Northwest shoreline can only be accessed by boat. Good boat launching facilities (see map) are available at Kingston, Frankton Marina, Kelvin heights, Queenstown (parking can be difficult at peak periods), Sunshine Bay and Glenorchy. Small boats can also be launched at Kinloch. Boaties should be aware that surface lake water temperatures reach a maximum of about ten degrees.*

Lake Wānaka

> *Lake Wānaka can be very challenging to the average angler, and consistently unpredictable, but when the fish are feeding the rewards speak for themselves. The lake holds three sports fish species: brown trout, rainbow trout and landlocked Chinook salmon.*

Trolling is very popular and accounts for about 60% of the total angling effort, giving an average catch rate of 1 fish for three hours fishing. This compares favourably with other lakes in the area.…

Access to the lake is mainly clustered around the Wānaka Township, with boat ramps positioned at the town marina, Waterfall Creek, Glendhu Bay and at the Outlet. Heading north, boats can be launched from the Dublin Bay and Camp Creek beaches with 4WD vehicles and at the head of the lake suitable 2WD launching facilities are available at Wharf Creek. Most of the western shoreline is only accessible by boat. Shore anglers will appreciate reasonably good access to the bays near the boat launching facilities and if you feel adventurous there is potential for some rock hopping along the Eastern shoreline near the head of the Lake.

Lake Hāwea

Lake Hāwea is a relatively easy lake to fish for anglers of all abilities, with many regarding it as the best freshwater sportsfishery in the South Island. Rainbow trout make up 60% of the total catch with Chinook salmon 29% and brown trout 11 %. The most popular method is trolling, which accounts for nearly 70% of the total angling effort with an average catch rate of 1 fish for every 2 hours of angling. However, spinning provides the best catch rate and is particularly productive in spring and early summer when landlocked chinook salmon congregate at the south end of the lake.

Good access to the western shoreline of the lake is provided off State Highway 6 and by taking the gravel road at The Neck that leads to the Kidds Bush recreation reserve. In the other direction past the Hāwea township access is available to the southern end of the lake and heading north to the Timaru River delta. A short distance past this point the road becomes private and access by 4-wheel drive is at the discretion of the Dingle Burn Station owners.

The top of the lake and the Hunter River is accessed mainly by boat, but 4-wheel drive access is possible with permission of the Hunter Valley Station owners. The only formed boat ramp is at the southern end of the lake through the Lake Hāwea Holiday Park entrance. Four wheel drive boat-launching sites are situated at the Neck and Kidds Bush.

Lake Dunstan

Public access is available to most parts of the lake. The entire eastern shoreline of the Dunstan and Clutha Arms is easily accessed from SH8. The Clutha Arm is the most productive part of the Lake Dunstan fishery and can also be accessed directly off SH6 (Wānaka - Queenstown), and through Pisa Moorings, Smiths Way and Amisfield. Main boat ramps (see map) can be found at Dairy Creek, Champagne Gully, Bannockburn Inlet, Old Cromwell, McNulty Inlet, Lowburn Harbour, Pisa Moorings and Bendigo. Several rest areas are provided around the lake, complete with barbecues and picnic tables.

Lake Dunstan has extensive aquatic weed beds which often reach the surface of the lake. While beneficial to fish and wildlife, anglers need to apply some thought to their angling techniques and equipment.

Trolling: This is a popular method of angling on the lake. If using a leadline stay out in the more open water, targeting a depth of 3-6 metres….

Harling: An excellent method for fishing in and around weed beds, harling is a successful method on Lake Dunstan all year round. A fly rod and reel is generally used but it can be adapted to any fishing rig….

Spinning: When fishing around the weed beds lures such as Tobys, Veltics and other similar lures should generally be kept as small and light as possible…. Fish frequently cruise the weed edge only metres off the shoreline, so approach the shore carefully. A short delicate cast is often all that is required. Don't rush, as often the fish is on a beat and will return if not spooked. From May to November try targeting the mouths of the inflowing streams such as John Bull and Devils Creek and the Clutha River/Mata-au inflow. Note the streams themselves are closed to fishing 1 May till 1 'November.

Fly Fishing: Fishing the shores of Lake Dunstan with fly rod in hand is an excellent way to spend the day, especially around the Clutha Arm.

Bait Fishing: As Lake Dunstan is a weed based fishery it requires a change in technique to increase your chances of taking a fish or two on a bait. By replacing the sinker with a float, the bait can be drifted along the edges of the reed beds and will not become buried deep in the weed. Also try a bait with little or no weight and drop it a mere rod length out from the shore just inside the weed edge. This is where fish cruise looking for food and provides the added exhilaration of witnessing the fish approach and take your offering.

Upper Clutha River/Mata-au (little information is provided)

The Clutha is New Zealand's largest river in terms of catchment and water volume. To successfully fish a river of this size it helps to break it down into smaller sections, identifying those areas most likely to hold trout.

Trout are lazy. As general rule trout seek the maximum amount of food for the minimum amount of effort. So initially search for holding water (where fish can sit without expending excessive energy)…

Mid Clutha River/Mata-au

This is a huge river, and unless you have a boat, angling opportunities are limited. Between Clyde and Alexandra the river is deep, swift and swirly, and occupies one channel. It holds small numbers of brown and rainbow trout, which can be fished to with spinning gear.

Lower Clutha River/Mata-au

Very large river, predominantly single-channelled with gravel and cobble beaches. Some sections are fast flowing, lined with bedrock and quite gorgy, particularly between Millers Flat and Tuapeka Mouth. The section between Tuapeka Mouth and Balclutha is quite attractive to the angler with a medium gradient, wide open ripples and runs and well defined pools, especially when river flows are low (less than 400 m^3/sec). From Balclutha to the sea the river splits in two around a large flat island (Inch Clutha). Here the gradient is much shallower, hence there are less runs and riffles and the river rakes on a more uniform flow….

Small brown trout (0.5kg) are plentiful throughout the lower river and tend to make up the bulk of the angler's catch. There are larger resident fish present (1-2kg) and chose who persevere will be rewarded, also there are seasonal migrations of searun brown trout which average 2-3kg and can be much larger. Returning chinook salmon average 2-6kg. Some rainbow trout are caught upstream of Clydevale, these are usually small (up to 1kg). Perch are found mostly downstream of Balclutha and can be quite large (up to 2kg have been recorded)….

Fishing can be good at any time of day. Mayfly hatches are likely to occur from about mid-day through to late afternoon, depending on the weather. Caddis hatches can occur in the

evenings, particularly in the early part of summer. Spin fishing for migratory fish (either trout or salmon) is most productive at dawn and dusk or on the incoming tide. The best times of year for sea-run trout are September-October and January-March. The salmon run usually peaks from January- April

There are no F&G access brochures for the Kawarau or Hāwea Rivers or Lake Roxburgh. Of Lake Roxburgh, Kent (2009) merely notes, “Lake Roxburgh is deep and rather sterile, hence holds few fish. Access is by boat.” For the Kawarau River he states, “Other spots to explore in the Queenstown area include the Kawarau River from the outlet down to the Shotover confluence. This is best fished from a drifting boat, and most trout are caught on spinners.” More information is given by Kent for the Hāwea River:

The Hāwea River has been modified for power generation so watch for fluctuating flows. However, it generally remains constant throughout summer. Rainbow and brown trout are present and fish up to 4 kg have been caught. The river is difficult to wade because of large slippery boulders, which make night fishing hazardous. It is a large river, and although some trout can be spotted in the shallows, most lie in deeper water sheltered by rocks. Fish can be taken on all legal methods, although fly fishing in summer when the flows ae low is the most productive. The algae Didymosphenia geminata *has recently been discovered in this river.*

Millichamp (2013) describes salmon angling on the Clutha:

CLUTHA RIVER

Median flow: 530 cumecs

Recent runs: 50-1000 fish

Historical maximum run: 5000 fish

Angler days/year: 12,550 (below Roxburgh Dam)

Best fishing: February-April

The Clutha is another river where the salmon fishery has been affected by dams and hydro-electric generation. The remaining run is of reasonable size but tends to disappear into the great expanses of water. Natural spawning does take place below the Roxburgh dam but must be compromised by the variability of flow and water level that arises from the generation regime. Fish and Game research has shown that many returning Clutha salmon are the offspring of land-locked stocks above the dam, suggesting some survive a trip over the spill-way or through the turbines. Contact Energy and Fish and Game are working together to try to restore the run to its former glory and have set the ambitious target of 5000 returning adult salmon per year, which would make the Clutha one of the best salmon fisheries in New Zealand.

Most salmon fishing in the Clutha takes place at the Roxburgh dam, which is the end of the road for migrating fish. Anglers stand on the concrete apron overlooking the discharge tailrace, cast into the fast water and swing lures into the calmer water at the edge. Anyone who has been to Roxburgh will know that the apron is some distance above the water and so a drop net is needed to retrieve fish at the end of the fight. There is generally a communal net left there for anyone to use. Some salmon are caught in the Clutha lagoons (there are two mouths) by anglers trolling or shore fishing for kahawai.

When a restocking programme was operating near Kaitangata in the 1980s, salmon were caught in the lower reaches by dedicated salmon anglers, but that is less common today.

3.6 Hunting

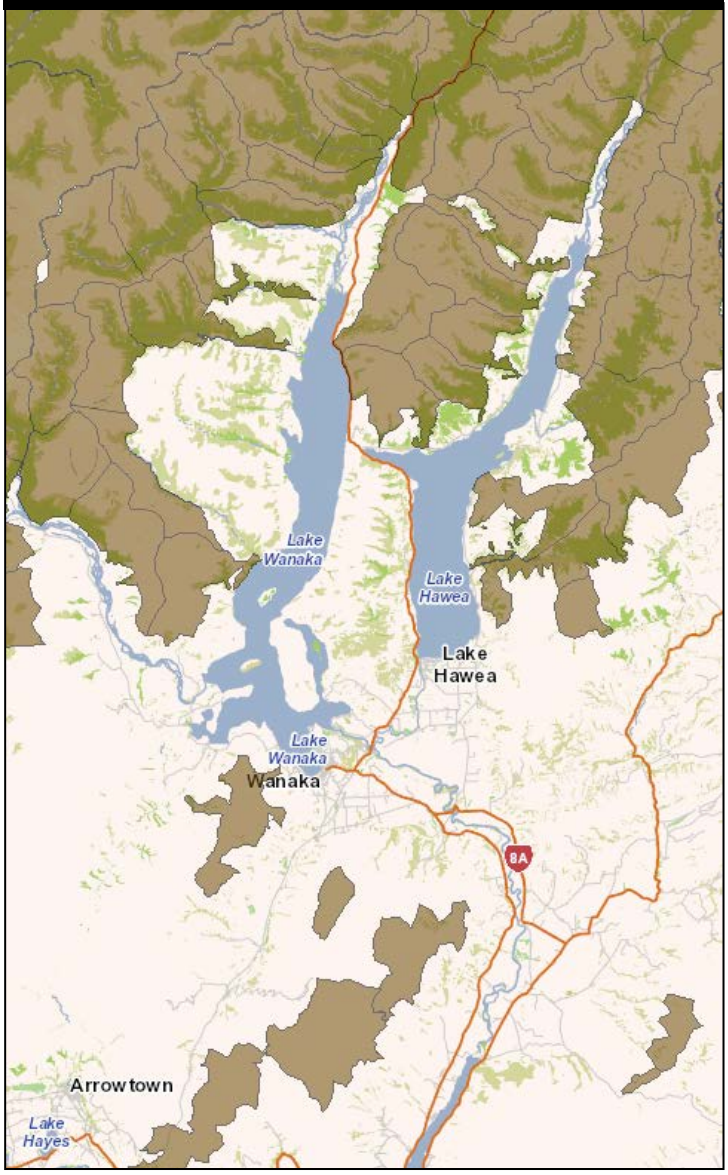
Fish & Game NZ provides little information online about game bird hunting in Otago, beyond:[21]

> *The Otago Region offers veritable smorgasbord of game bird hunting from mallards on large coastal wetlands to upland game upon briar rose-strewn Central Otago hills.*
>
> *In between there are countless pond and river bank hunting opportunities, along with small stream stalking and evening shooting over grain crops. Otago pretty much has it all when it comes to game bird hunting - all you have to do is get a licence and get out there.*

No hunting sites are identified.

There are no Recreational Hunting Permit areas (or 'Open Areas') administered by DoC adjacent to Lakes Wakatipu, Dunstan or Roxburgh.[22] Much of the Public Conservation Areas adjacent to Lakes Hāwea and Wānaka are Open (Figure 34). The only Open Area adjacent to the lower Clutha River/Mata-au is the Tuapeka West Scenic Reserve.

Figure 34: DOC Recreational Hunting Permit areas



Open Areas may be accessed using standard hunting permit conditions for deer, pigs, goats, chamois, tahr and wallabies, and can be applied for online. Hunting is possible on other Public Conservation areas (Restricted Hunting Areas), but applications must be made at local DoC offices.

Game bird permits are required when hunting for wildfowl on Conservation land, in addition to a bird hunting licence from F&G (regardless of where the hunting occurs).

Small game hunting is likely throughout the study area, particularly rabbits.

The Tribunal hearing the *Local Water Conservation Order for the Pomahaka River and lower Clutha River/Mata-au from the Pomahaka confluence to the sea* (1989) noted:

> *The wildlife habitat and recreational hunting values of the Lower Clutha River/Mata-au are based on 25 bird species that inhabit this reach, with high bird counts, particularly of waterfowl and waders. The 1986 study by the (then) Wildlife Service of the birds of the*

[21] fishandgame.org.nz/otago/game-bird-hunting-in-new-zealand/
[22] maps.doc.govt.nz/mapviewer/Index.html?viewer=dto&baseLayer=Map&layers=Open%20Hunting%20Permit%20Areas,Public%20Conservation%20Areas

lower Clutha from Roxburgh to the sea, evaluates the importance of wildlife as "moderate-high" (mid-range in national scale). The recreational hunting of waterfowl in the lower Clutha is evaluated by the applicant as being moderate to high. No quantitative information is available.

The Roxburgh Power Station Discharge Permit operated by Contact requires the following consideration for recreational hunting on the River below Roxburgh:

18. Recreational Flows

The consent holder shall use its reasonable endeavours to discharge 380 cumecs during the daylight hours of the Saturday and Sunday of the first weekend in May each year, being the opening weekend of the duck shooting season having regard to natural catchment inflows, plant maintenance requirements, and electricity supply and demand considerations.

Contact and F&G communicate prior to opening day to ensure that all parties are aware of the flows that can be delivered (see section 5.5.1).

3.7 Non-motorised surface water activities - Strava

This section is based on data provided publicly by Strava – a popular online physical activity recording and comparison service. The data are based on GPS records from smartphones uploaded to a central database, allowing speed and time comparisons with others, and monitoring of individual activity or training targets While the service is popular with professional athletes, its membership is dominated by casual recreation participants. There were more than 17 million subscribers internationally in 2016, and while there are no public data for national or international membership, various sources suggest membership has been growing by a million every 40 days. Some caution needs to be applied to the use of these data as they show participation by only Strava members, and some data accumulates from users staying logged in when they are driving or are on a ferry. However, they give a good indication of, particularly, the relative levels of use of different settings (no absolute data are provided publicly by Strava).

Global heat maps show the relative level of activity by all members for several activity groups, including running and walking, cycling and water sports. The latter includes swimming, canoeing and kayaking, kitesurfing, rowing, surfing and windsurfing. The following figures show the relative popularity of Lakes Wānaka, Wakatipu, Hāwea and Dunstan, and the upper Clutha River, for water sports, based on the Strava data.

There is almost no record of water sports activity on Lake Roxburgh or the lower Clutha River. White water kayaking is very unlikely to feature in these data as the records are for journeys rather than single-location activities like playing on the Hāwea wave features – although some activity on the Kawarau River is shown. Many of the records are likely to be locals taking regular routes for exercise, and visitors recording their activities. The data are based on records from 2015 and 2017 (a Strava programming issue meant 2016 data were not included). The data are only indicative of relative use levels and do not provide a census or even a random sample (only subscribers to Strava). Some ‘hot’ areas may be created by one person repeating the same route on a regular basis.

The Frankton Arm is clearly the most popular area on Lake Wakatipu with most activity fading towards Wilson Bay to the west and Jacks Point to the south, and remaining close to the shore. The Kawarau River had relatively few activity records (Figure 35). There was a very small number of records along the Kingston shoreline and at Glenorchy.

Figure 35: Strava heat map, water sports, Lake Wakatipu and upper Kawarau River

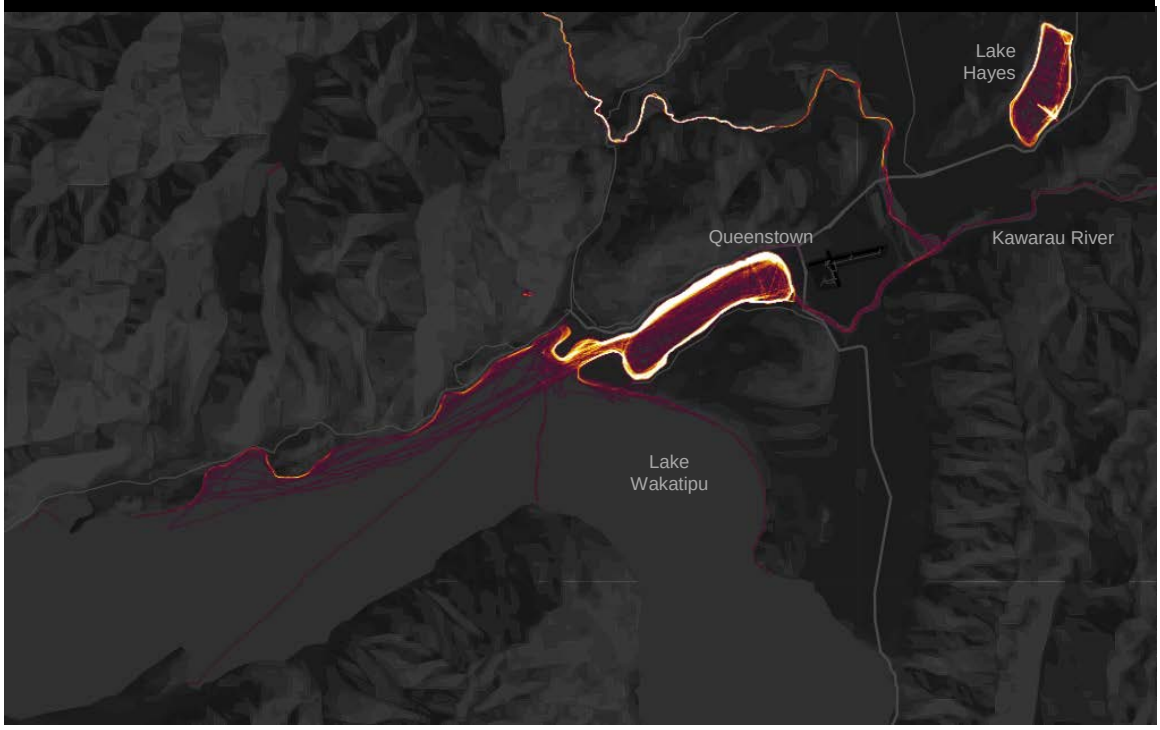
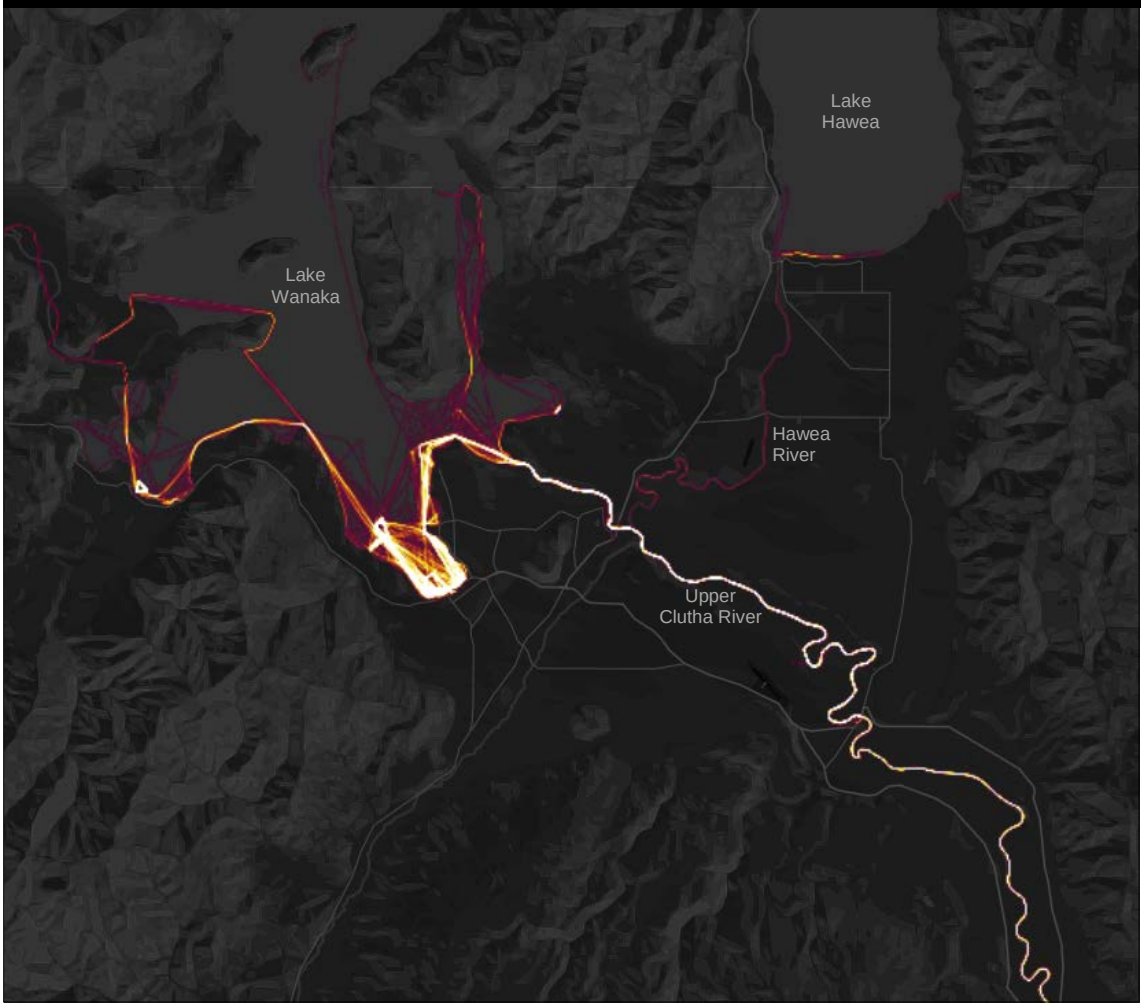


Figure 36: Strava heat map, water sports, Lakes Wanaka, Hawea and Hawea, Clutha Rivers

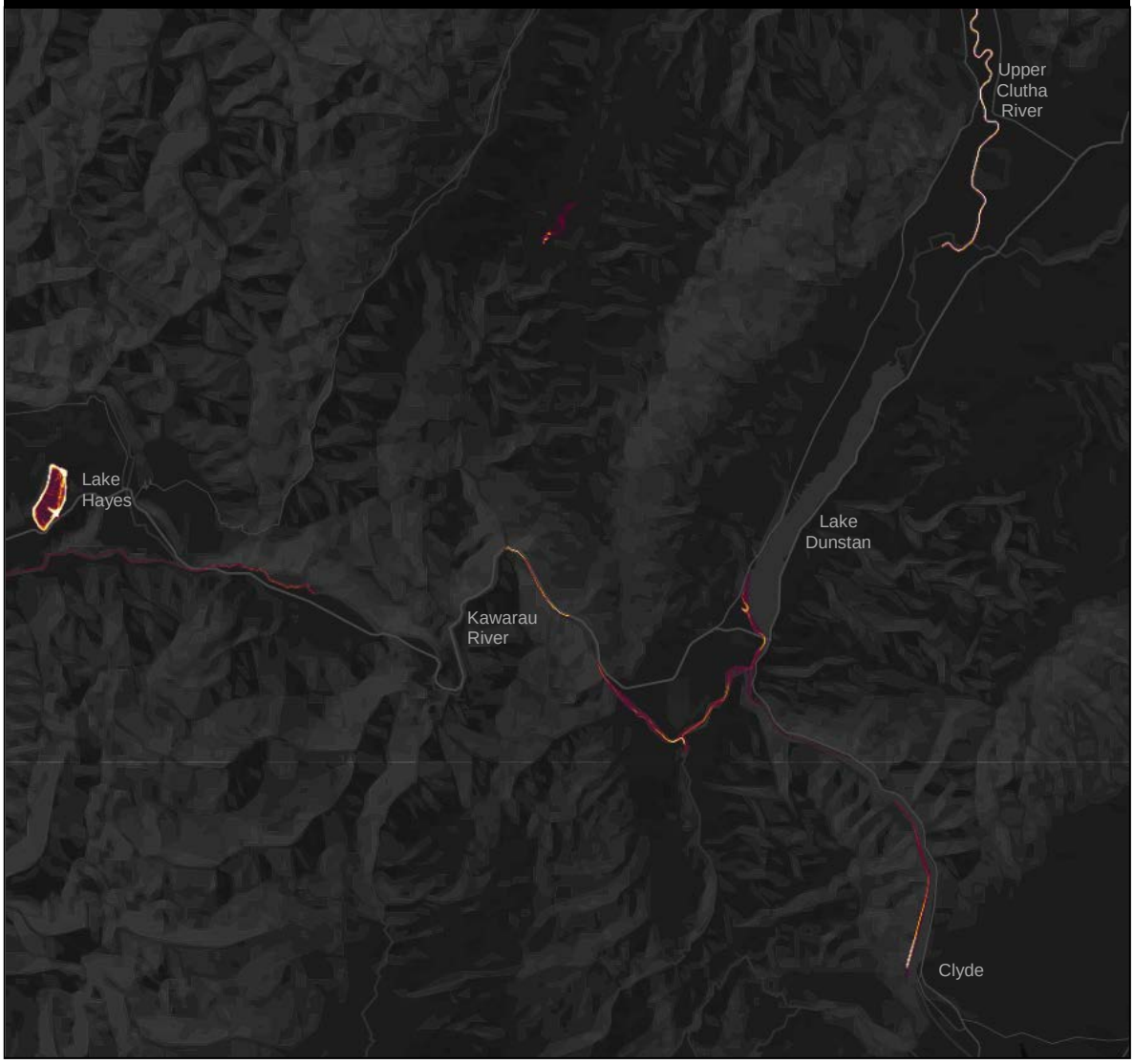


Lake Wānaka data show much activity around Roys Bay, around Ruby Island and around to and at Glendhu Bay to the west, and the Outlet to the east, with a little activity up to Stevensons Island. The route around Roys Peninsula could be an event, considering its very direct lines (Figure 36). Swimming at Roys Bay appears to be responsible for much of the activity shown in Roys Bay, occurring within the buoyed swimming area or following the Challenge Wānaka Ironman swim course.

There is very little activity shown on Lake Hāwea, and only near the township. Activity on the upper Clutha River/Mata-au fades at the Luggate Bridge and ceases at Lindis Crossing (Figure 37).

Figure 37 shows relatively little activity on Lake Dunstan, with it concentrated around Cromwell township, the Roaring Meg kayak run on the Kawarau River, and to and from the Dunstan Arm Rowing Club just above the Clyde Dam.

Figure 37: Strava heat map, water sports, Lake Dunstan, Kawarau and upper Clutha Rivers

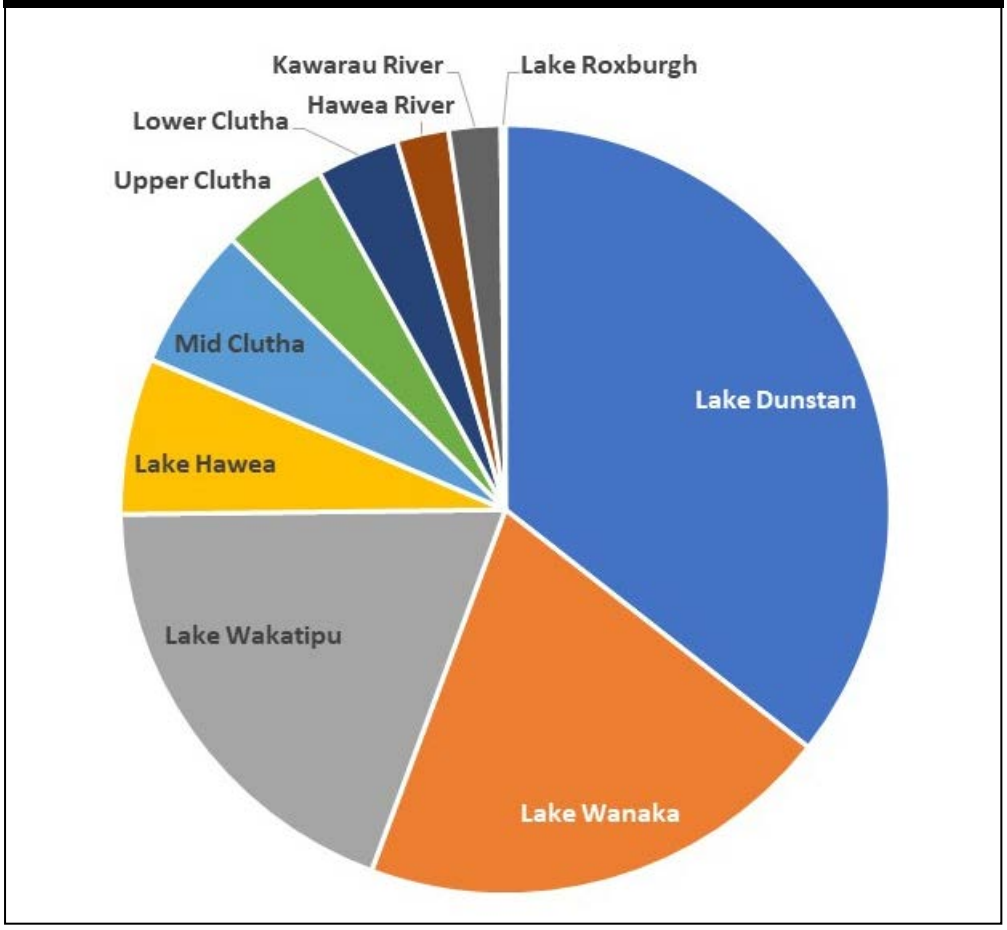


3.8 Swimming

This section reports, mostly, on the findings of the 2018 ORC survey of swimming activity in the region. This relied on a self-selected sample of respondents who answered a simple set of questions about swimming location and quality, and indicated their swimming sites by dropping a pin on an online map. Not all pins were dropped accurately, but over 1000 responses were gained, which should give a reasonable indication of the main swimming locations and issues, at least at a relative level.

Over half of all responses – 548 – were for water bodies in the study area, with Lake Dunstan the most frequently referenced (Figure 38). Considering the method, it is best to describe the results showing, for example, high levels of popularity for swimming at Lakes Dunstan, Wānaka and Wakatipu, compared with the other water bodies, rather than describing precise response rates (although these are discussed in the following sections specific to each water body).

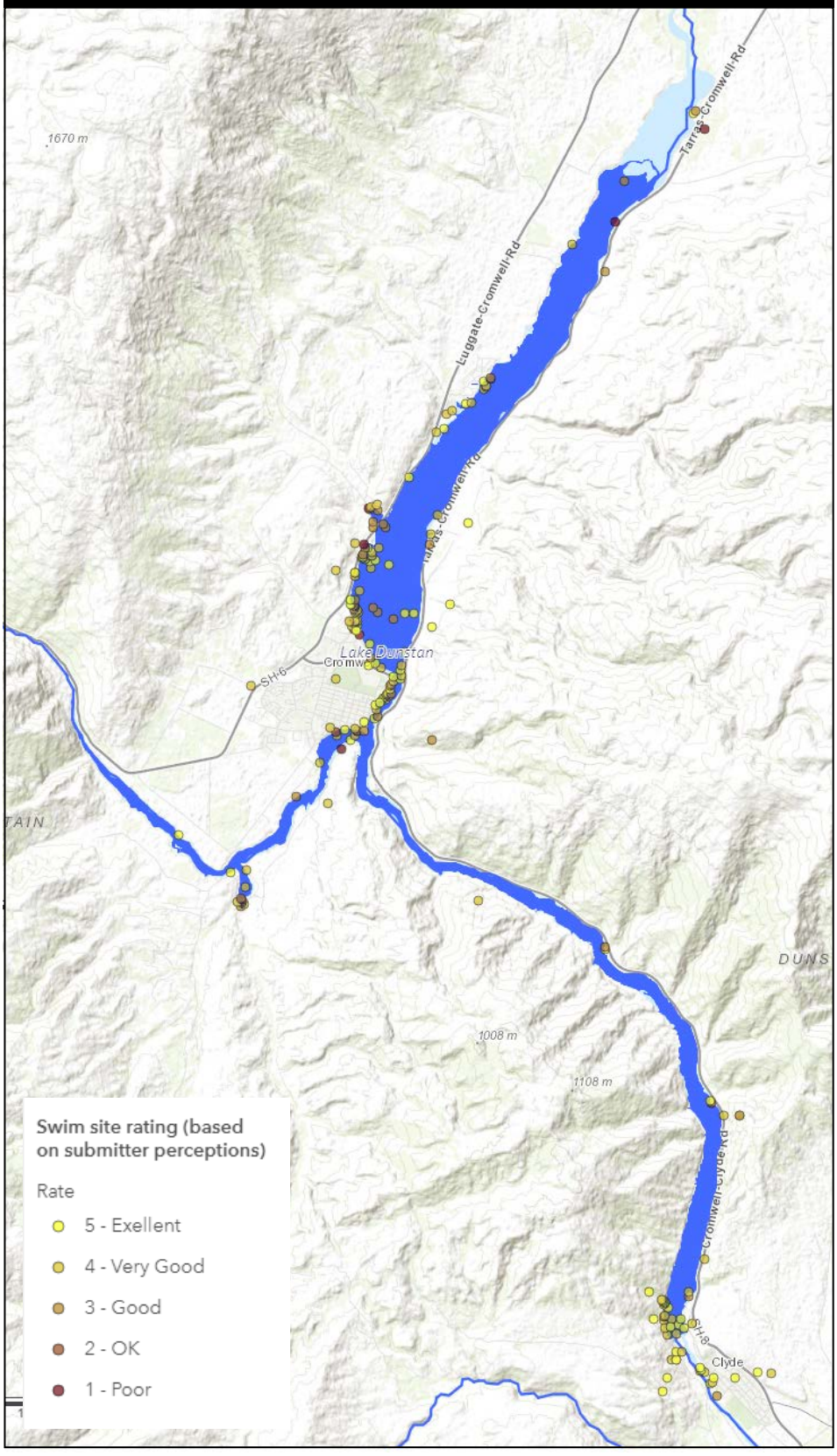
Figure 38: ORC 2018 swimming survey, responses by water body



3.8.1 Lake Dunstan

On a scale of 1 to 5, with five indicating an 'excellent' swimming location, Lake Dunstan scored an average of 3.9 (almost 'very good'), from 195 records. Figure 39 shows the locations and ratings for Lake Dunstan responses, noting that some of the pins are quite carefully placed, some just indicate swimming in the Lake generally, and some are misplaced (the poor score for one Clutha River/Mata-au delta site refers to Bendigo in the text, for example). Low scores appear to result from water quality concerns (some regarding the unknown toileting habits of freedom campers), lakeside rubbish, crowding – particularly from boats – duck itch and water weeds. Depth ranges were acceptable and generally suited to what was sought – shallows for the kids and deeper water for adults. The marked swimming beach was considered a safe site, although some boats passed too quickly and nearby.

Figure 39: Swimming records Lake Dunstan. ORC 2018 data

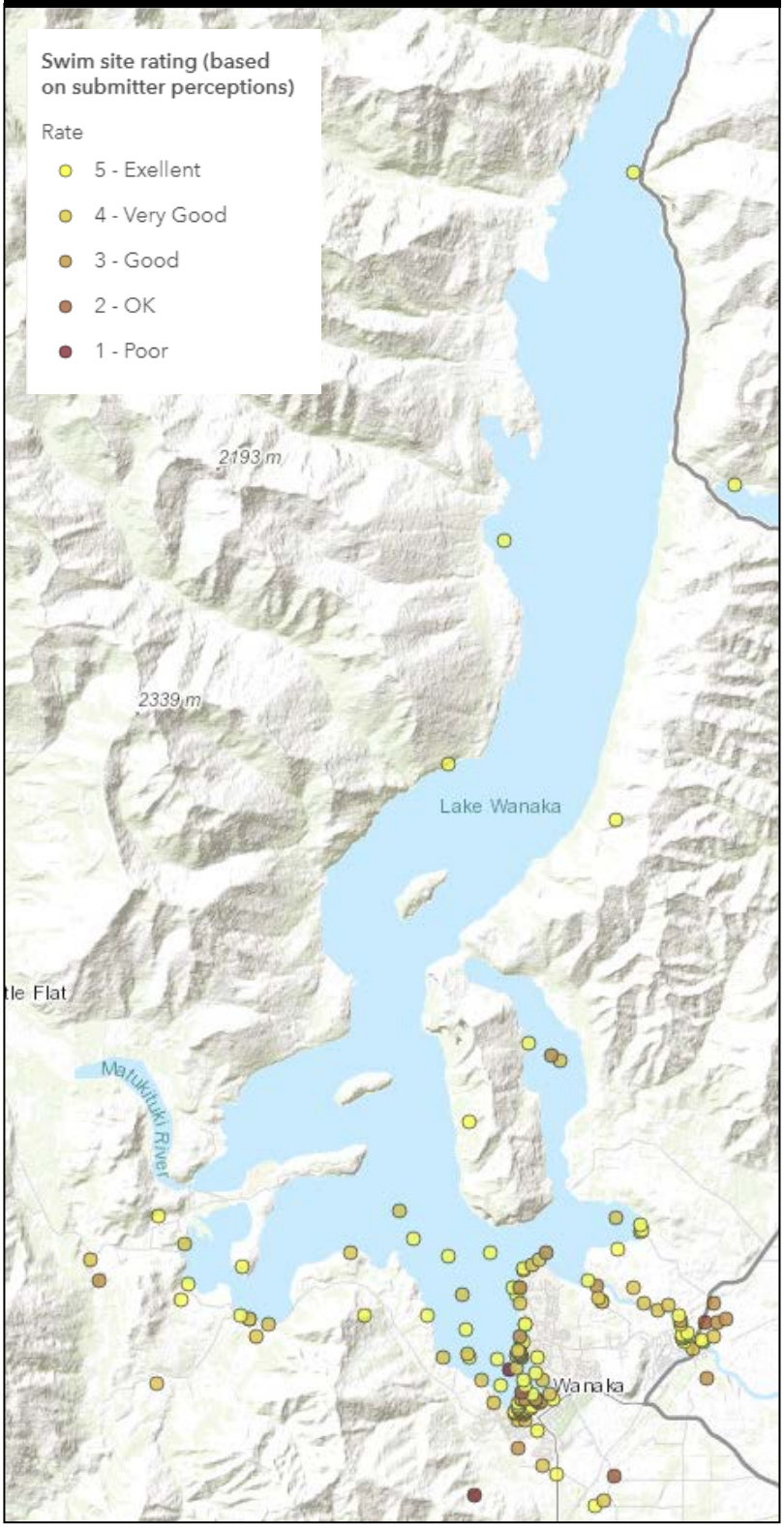


3.8.2 Lake Wānaka

On a scale of 1 to 5, with five indicating an 'excellent' swimming location, Lake Wānaka scored an average of 4.2 (better than 'very good'), from 110 records. Figure 40 shows the locations and ratings for Lake Wānaka responses, noting that some of the pins are quite carefully placed, and some just indicate swimming in the Lake generally. Low scores – and there were not many (only four under 3) appear to result from a low lake level, some weeds, lake snow and duck itch. Depth ranges were acceptable and generally suited to what was sought – shallows for the kids and deeper water for adults – although there was some comment about the low lake level over the immediate season. Like Lake Dunstan, a marked swimming area was considered to improve safety for children.

Lake Wānaka has an active lake swimming group and hosts several competitive swimming events annually, such as the Challenge Wānaka Ironman. Section 5.4.5 includes a full summary of advice from the Wānaka Lake Swimmers about swimming safety and interactions with rowers and motorised vessels.

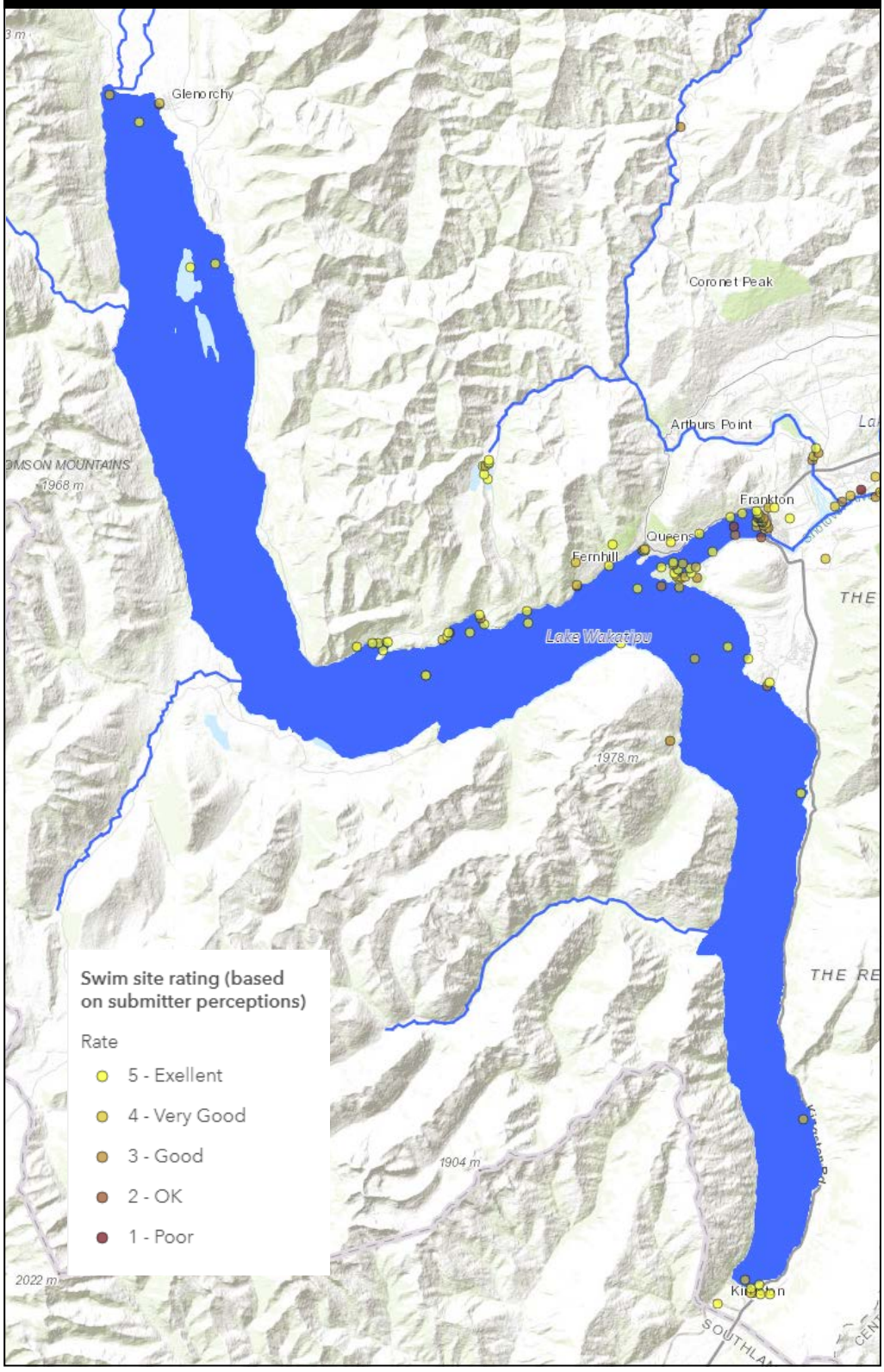
Figure 40: Swimming records Lake Wānaka. ORC 2018 data



3.8.3 Lake Wakatipu

On a scale of 1 to 5, with five indicating an 'excellent' swimming location, Lake Wakatipu scored an average of 4.3 (better than 'very good'), from 105 records. Figure 41 shows the locations and ratings for Lake Wakatipu responses, noting that some of the pins are quite carefully placed, and some just indicate swimming in the Lake generally. Low scores – and there were not many (only six under 3) appear to result from a low lake level, some weeds, duck itch, litter, crowding (people and power boats), and water quality perceptions, one respondent commenting about campers washing dishes and themselves in the Lake. Depth ranges were acceptable and there was a collection of comments about it being a safe setting for kids.

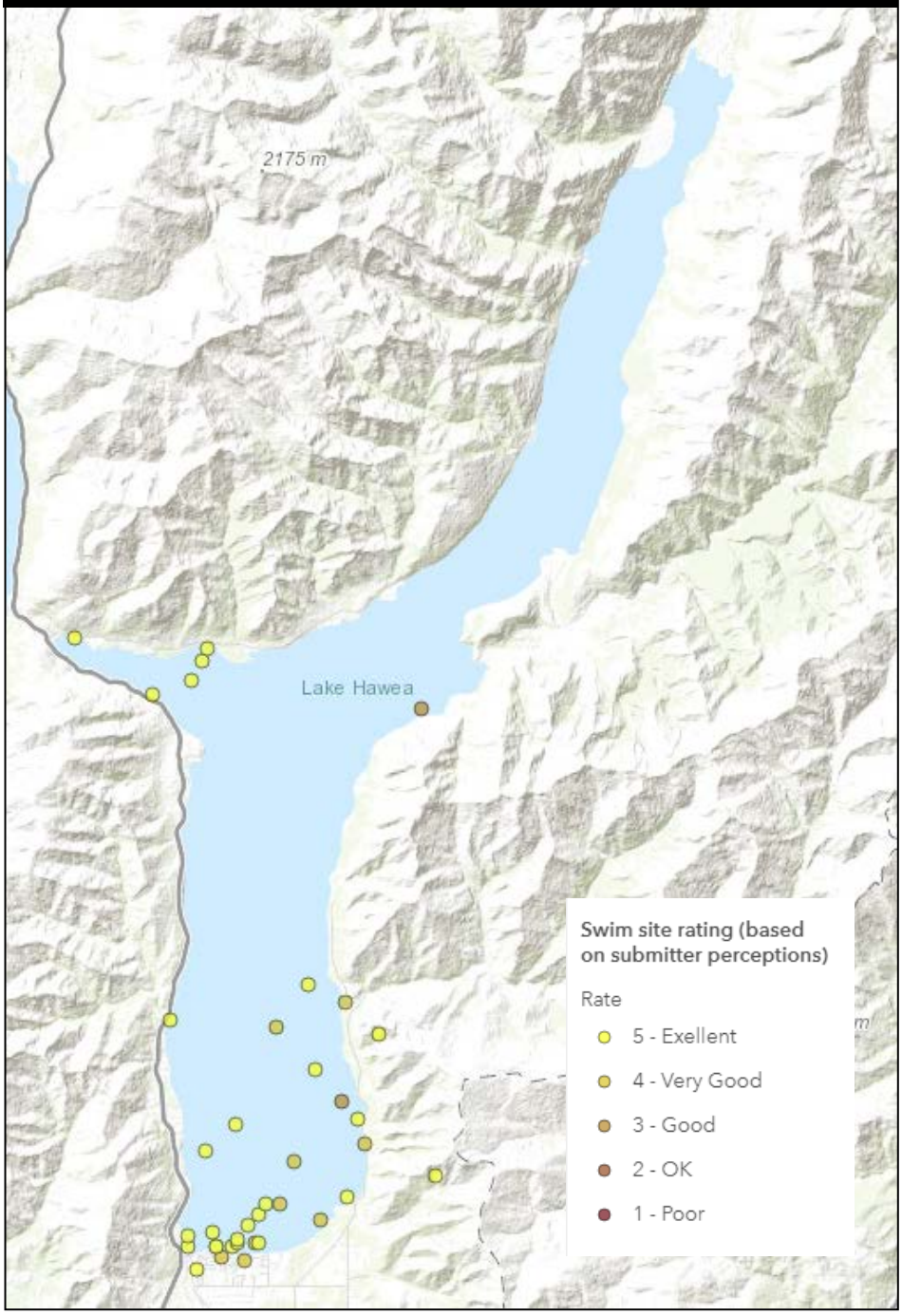
Figure 41: Swimming records Lake Wakatipu. ORC 2018 data



3.8.4 Lake Hāwea

On a scale of 1 to 5, with five indicating an 'excellent' swimming location, Lake Hāwea scored an average of 4.7 (almost 'excellent'), from 35 records. Figure 42 shows the locations and ratings for Lake Hāwea responses, noting that some of the pins are quite carefully placed, and some just indicate swimming in the Lake generally. There was only one low score of 3 referring to a lack of safe swimming sites – which contrasts with the many positive comments about good swimming areas, a lack of crowding (with some comments about noisy boats) and clear water. There were no adverse comments about lake depth.

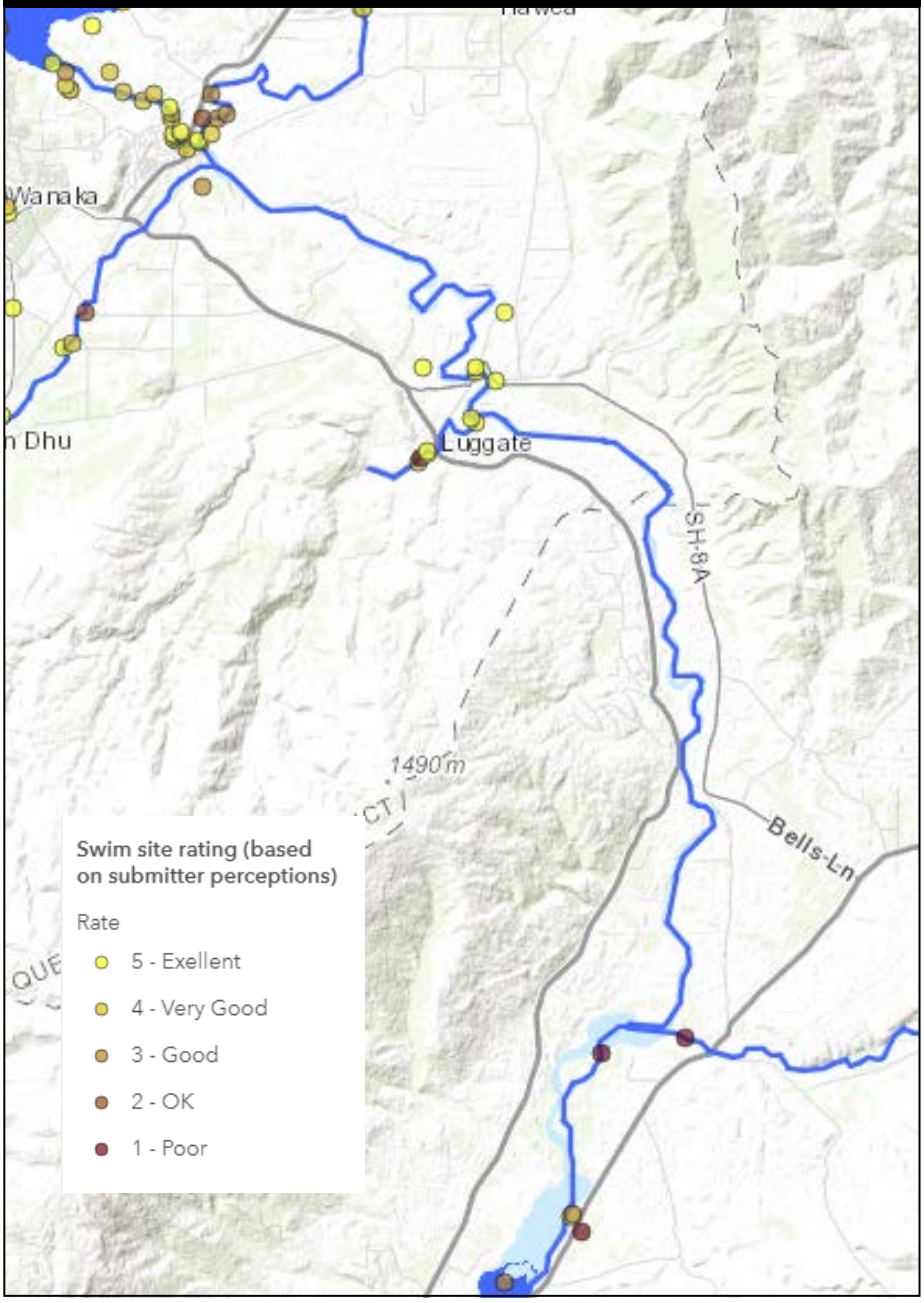
Figure 42: Swimming records Lake Hāwea. ORC 2018 data



3.8.5 Upper Clutha River

On a scale of 1 to 5, with five indicating an 'excellent' swimming location, the upper-Clutha River/Mata-au (between Lakes Wānaka and Dunstan) scored an average of 4.5 (almost 'excellent'), from 26 records. Figure 43 shows the locations and ratings for upper Clutha River/Mata-au responses, noting that some of the pins are quite carefully placed, while all of the 'poor' ratings are inaccurate, referring to Bendigo, and the Lindis Creek. The poor rating at Luggate refers to the Luggate Creek. There were no ratings below 3 for the upper Clutha River. Water quality and flows were considered good, with some safe eddies and shallows for children and swift areas for adults. Noisy motorboats were noted as a negative by four respondents.

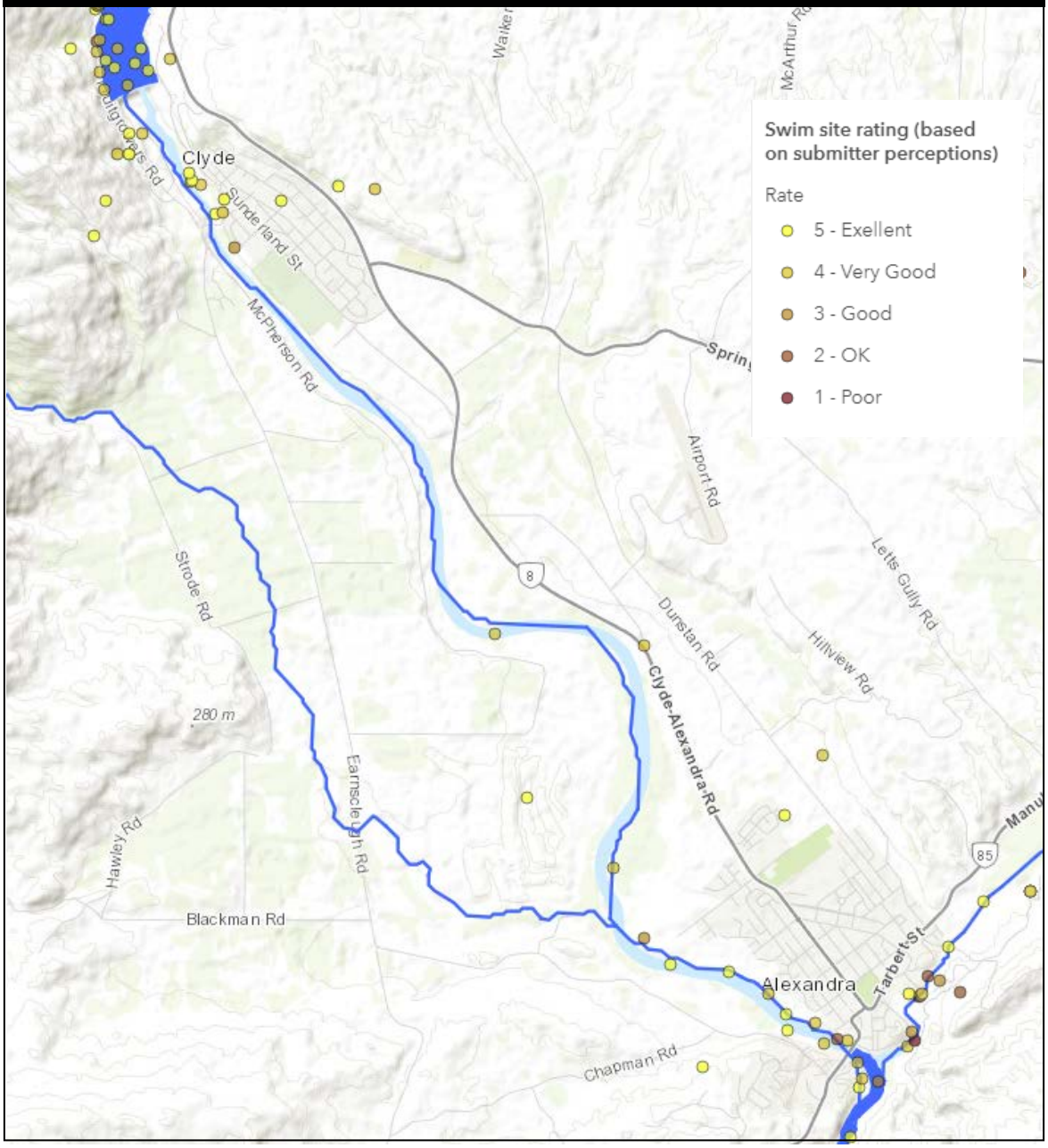
Figure 43: Swimming records upper Clutha River/Mata-au. ORC 2018 data



3.8.6 Mid Clutha River

On a scale of 1 to 5, with five indicating an 'excellent' swimming location, the mid-Clutha River/Mata-au (between the Clyde Dam and Lake Roxburgh) scored an average of 4.3 (better than 'very good'), from 33 records. Figure 44 shows the locations and ratings for mid-Clutha River/Mata-au responses, noting that some of the pins are quite carefully placed, and some were wide of the mark – although referring to the River but located in the suburbs. Only one score was lower than 3, referring to it being only suitable for paddling when the boat launching ramp was clear. Some weed and rubbish was noted, and the speed of the current needed to be watched. Otherwise the setting was considered clean and clear. One comment was made that it could have a low flow in summer, but comments regarding flow and depth mostly related to the water speed away from the bank, although several respondents noted some safe swimming sites for kids.

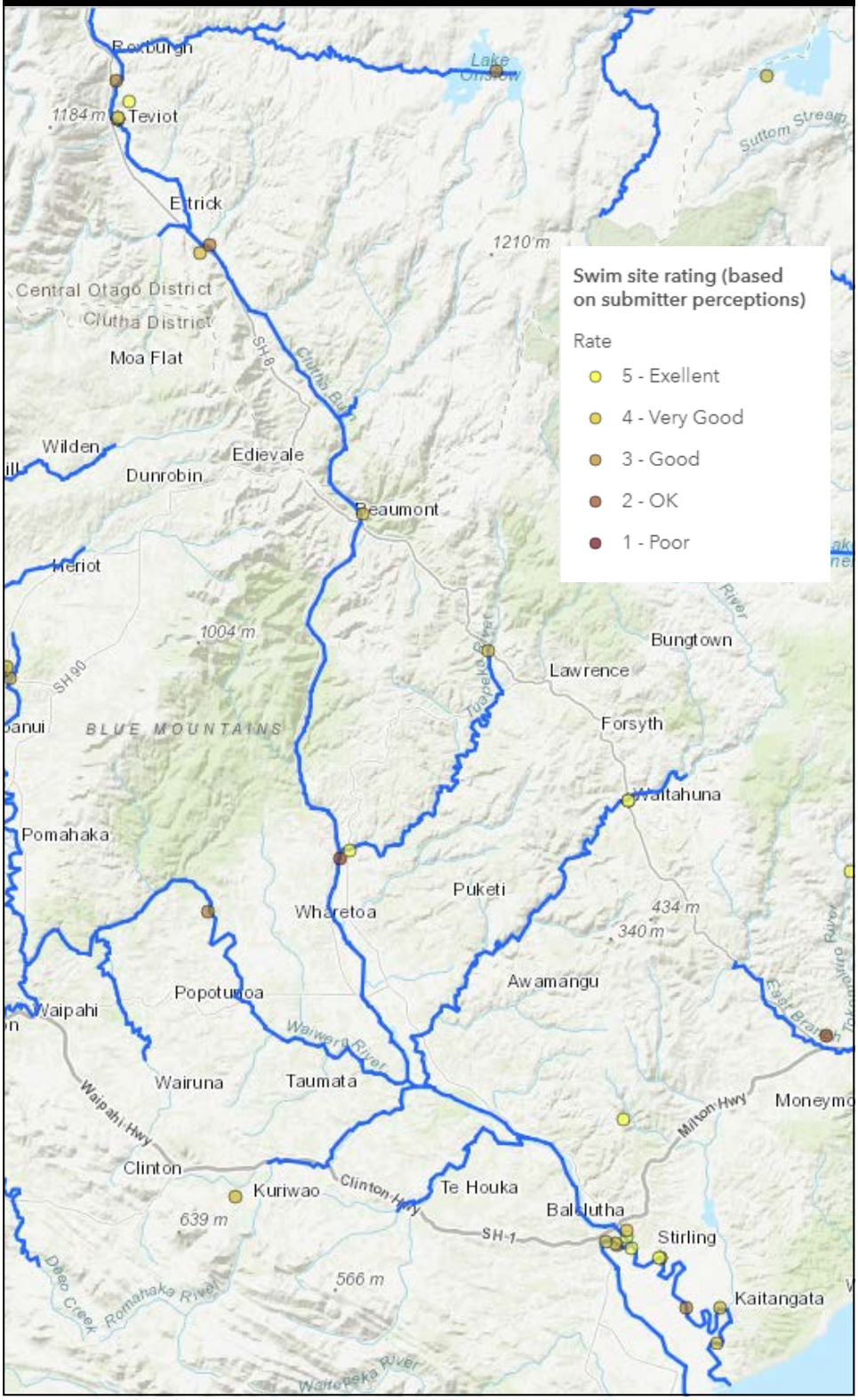
Figure 44: Swimming records mid Clutha River/Mata-au. ORC 2018 data



3.8.7 Lower Clutha River

On a scale of 1 to 5, with five indicating an 'excellent' swimming location, the lower Clutha River/Mata-au (between the Roxburgh Dam and the sea) scored an average of 4.0 ('very good'), from 25 records. Figure 45 shows the locations and ratings for lower Clutha River/Mata-au responses, and most of the pins are in the right spot in this case. There was one rating below 3, describing the River as too swift for children, and several others noted this was a caution. Water quality and flows were generally considered good, with some safe shallows and pools for children and swift areas for adults.

Figure 45: Swimming records lower Clutha River/Mata-au ORC. 2018 data



3.8.8 Hāwea River

There were 12 responses for swimming on the Hāwea River, located at either Camp Hill Bridge or Albert Town campground. On a scale of 1 to 5, with five indicating an 'excellent' swimming location, the River scored an average of 3.8 (almost 'very good'). There was only one rating below 3 with concerns about camping waste and rubbish and therefore water quality. Other concerns related to algae and slippery rocks, and more camping rubbish. Otherwise the River was considered clean and clear, with only one reference to flow rates (not good for swimming at high flows).

3.8.9 Kawarau River

There were 12 responses for swimming on the Kawarau River, located mostly downstream of the Shotover confluence near the Ladies Mile subdivision, and two near Gibbston. The River also scored an average of 3.8 (almost 'very good'). There was no rating below 3 and the relatively middling score resulted from concerns over water speed, a lack of amenities for swimming and jet boat activity, although half of the respondents noted the River offered good, clean swimming spots.

3.8.10 Lake Roxburgh

One respondent reported swimming in Lake Roxburgh at Doctors Point, giving it an excellent score (5) and noting that it was 'beautiful and warm'.

3.9 Kayaking and rafting

Charles (2013) identifies four whitewater kayak runs on the Kawarau River (Dog leg Run, Nevis Bluff, Waitiri / Citroen Rapids and Roaring Meg Run) operating at flows between 90 and 400 m^3/s. No other runs are identified in the study area by Charles. Interviewees identified the Hāwea River (and particularly the Hāwea Whitewater Park), the upper Clutha River, middle section between Clyde and Alexandra (for downriver kayaking) and the lower Clutha – particularly around Beaumont – as the most frequently used sections. The Kawarau River is dominated by commercial use, including a range of white water activities such as sledging (boogie boarding) kayaking and rafting. The Hāwea Whitewater Park, constructed in 2012 and with its flow controlled by Contact Energy, is the most intensely used kayaking venue in the study area, and is also popular with surfers, bodyboarders and rafters – all with different flow preferences. A slalom course is also available on the Hāwea River.

The majority of kayaking activity on the Clutha River/Mata-au – 70 to 80% – is estimated to be educational; and training and teaching are significant features of use of the Hāwea River Whitewater Park and the Hāwea slalom course. Educational and training users include secondary schools (particularly Mt Aspiring College, Cromwell College, Gore High School and Wakatipu High School), Otago Polytechnic, various clubs (such as Southern Lakes Multisport Club, Otago Canoe and Kayak Club, Central Otago Whitewater Club and the Otago University Canoe Club), and private trainers, such as Paddle Wānaka and Bill Godsall (who uses the upper Clutha River/Mata-au predominantly for multisport training) and Wild Earth Adventures (which uses the lower River for raft, kayak and river safety training).

Other multisport events like The Goldrush – a three-day multisport event which first ran in 1997, beginning and ending in Alexandra and including 30 km of paddling through the Roxburgh Gorge to the Roxburgh Dam and 39 km on the upper Clutha from Albert Town to Bendigo – have waned in popularity and have not been staged recently – but might again in the future.

The Southern Lakes Multisport Club stages various annual events on the upper Clutha River, including the Clutha Classic (up to 90 participants) – 54 km from the Lake Wānaka foreshore to Bendigo (or 39 km from Luggate to Bendigo) – and various locations for a winter series of events,

including on Lake Wakatipu, Lake Dunstan, Lake Wānaka and the Clutha River/Mata-au from Clyde to Alexandra. Multisport events generally rely on more delicate fibre (carbon or glass) boats compared with robust plastic whitewater boats, and so are rarely used on the likes of the Hāwea River, where the Whitewater Park constructed wave features are a significant impediment.

Rafting is limited to commercial activities on the Kawarau River (see section 3.2.1), Pioneer Rafting on the upper Clutha River/Mata-au (as a fundraising activity for river conservation work) and Wild Earth Adventures on the lower River – although some private rafting is likely, particularly associated with drift fishing. Paddle Wānaka also offers guided kayaking and stand-up paddle board experiences, mostly above Luggate.

Egarr (1995) describes the upper Clutha River:

> *From the outlet of Lake Wānaka to the Albert Town bridge is a distance of 4.5 km, with a very swift flow. Rapids are few and do not exceed grade II in difficulty. They consist mostly of waves created by swift flow over stones. Some willow snags need to be avoided, but they are not as common here as in the lower river. The most popular trip on the Upper Clutha is from the Albert Town bridge to the Luggate bridge. A number of swirling eddies and cross-currents in this section need skill to negotiate.*
>
> *Two kilometres below the Luggate bridge lies Devil's Elbow Rapid, which is the most difficult rapid on the upper Clutha. It lies on a sharp corner, where a powerful surging wave off the bank can create grade III conditions at some flows. It is the speed and volume of the flow that creates this wave, but the worst of the rapid can be avoided if you have adequate warning. It is best to keep to the left bank of the river around the rocky island below the Luggate Bridge. From this rapid down to the confluence with the Lindis, the river retains its swift flow and snags are a major problem. The river widens gradually below the Lindis and numerous willow islands occur. The current is still swift and care is needed to avoid tree strainers. Carefully select a route around the islands, as currents can set you across the river into strainers. This section of river flows into the newly formed Lake Dunstan, that inundated what used to be the grade III - IV Cromwell Gap Rapids above the Kawarau confluence.*

and the lower Clutha River:

> *From the Miller's Flat bridge to the Beaumont bridge are a number of rock outcrops in the river bed. They produce some interesting grade II conditions, with powerful boils and eddies at times of higher and swifter flows. This is particularly so in the last few kilometres down to Beaumont. This is a popular section with local kayakers for instruction and slalom training. A road up the true left bank from the Beaumont bridge provides access to this section of the river.*

3.10 Whitebaiting

The Department of Conservation is responsible for managing and regulating New Zealand's whitebait fisheries, although the ORC is responsible for consenting, where applicable, whitebait stands (as structures) near waterways. The whitebait fishing season in Otago (and all NZ besides the West Coast and the Chatham Islands) runs from 15 August to 30 November (inclusive) and fishing is only permitted between 5 am and 8 pm or between 6 am and 9 pm when New Zealand Daylight Saving is being observed.

Whitebait stands are permitted on the Clutha River/Mata-au and its branches by the ORC, but need resource consent everywhere else in Otago. The ORC webpage for whitebaiting states:[23]

> *No one can 'own' a whitebait spot, even if you have a stand there and have been fishing in that location for years. Any disputes over the use or location of stands is a civil matter and not ORC business.*
>
> *Otago Regional Council does not hold a register for whitebait stands.*
>
> *Some years ago, ORC instituted a 'peg' system to identify whitebaiters with the intention of making it easier for us to chase up people who left mess or damage at the end of the season. Whitebaiters were able to get a numbered peg from ORC in Balclutha, which marked their site. This morphed into a belief that ORC officially designated people sites. We no longer provide the pegs, but the belief remains. These pegs do not prevent anyone else from fishing for whitebait at that location.*

Glova *et al* (2000) carried out a survey of whitebaiting effort on the Clutha River/Mata-au over the 1999 season. The survey method relied on the use of 'powerful binoculars', and is described thus (p6):

> *During each survey, the number and type of nets in the water and the combined number of fishermen and observers seen on the bank, were recorded. From a distance it was not possible to differentiate between fishermen and observers, so the numbers of all people present were recorded. Notes on water clarity, weather, and tidal conditions were also recorded. The surveys were conducted twice weekly, once each during the week (usually Wednesday) and weekend. A total of 28 surveys were made in all, four on Sundays, 10 on Saturdays, and the rest during the week. It was assumed that total fishing effort was related to catch rates.*

The results were:

> *Whitebaiting on the Koau and Matau Branches occurred for 6 and 10 km from the sea, respectively. Nearly 90% of the effort on the Koau Branch took place in the first 2 km, whereas the effort on the Matau Branch was more dispersed. In terms of number of whitebaiters, the Matau Branch was more heavily fished (524 fishers) than the Koau Branch (435 fishers). Approximately 50% of the fishers used the Southland sock in either branch. The set net was more commonly used in the Matau Branch, whereas the scoop net was more popular in the Koau Branch River….*
>
> *Early in the season, whitebaiting activity was much greater on weekends than weekdays, with up to 30 whitebaiters seen on Saturdays and never more than 10 during midweek, with most of them on the Matau Branch. Smoothing the data by plotting two-day moving-averages shows there was a gradual increase in whitebaiting activity during August. As the season progressed, the distinct weekly periodicity in fishing effort became less pronounced.*
>
> *During August to early September, flows in the Clutha River/Mata-au ranged from 300-400 m^3. Following a fresh exceeding 700 m^3 between 8 and 11 September, whitebaiting increased threefold. Although river flows receded to approximately 400 m^3 through to the end of September, fishing effort remained high till late in the month when the weather deteriorated as well as the morning tides were not favourable for fishing.*
>
> *With the return of favourable weather and morning tides during 7-9 October, whitebaiting peaked with 95 fishermen recorded. Unfavourable tides and weather in mid-October*

[23] https://www.orc.govt.nz/managing-our-environment/water/what-you-need-to-know-about-whitebait at 21 July 2018

reduced the fishing effort, but very large catches (e.g.,70 kg/fisher) on 19 October resulted in an increase in whitebaiters (60-77) during 19-23 October. Although favourable weather existed along the coast in late October, increasing river flows led to declining numbers of whitebaiters. With major flooding in the upper catchment in early November resulting in high river flows and dirty water, whitebaiting declined dramatically with only six seen by 14 November. The following week, the flows rose to major flood levels, exceeding 4000 m^3 on 19 November. Many of the whitebaiting stands on the Matau Branch were damaged or washed away, and our whitebaiting survey was temporarily halted….

Although fishing effort had begun to decline in late October, flood flows in November prematurely ended the whitebaiting season.

An inventory of whitebaiting rivers in the South Island was completed by MAFFish (now Ministry of Fisheries, via several permutations) in 1988 (Kelly, 1988) which identified the Clutha River/Mata-au as of 'major recreational importance' and 'minor commercial importance' for whitebaiting, stating:

Undoubtedly the most popular whitebaiting river in Otago, the Clutha can attract up to 200 whitebaiters on a good day. Although it is basically recreational, the Clutha fishery does support a small number of commercial whitebaiters. Many Clutha whitebaiters use platforms or stands from which to fish, which is a feature more commonly found on Southland and West Coast rivers. Catch rates on the Clutha River/Mata-au are consistently higher than on any other river in the district.

The Clutha District Plan (Sept 2005, Sec 2.4.4) states that the Clutha River/Mata-au is the most important whitebait resource in the Otago Region, followed by the Taieri River (see section 4.8 of this report).

The DoC Otago Conservation Management Strategy (CMS) (1998, section 2.1.4) noted, "The lower reaches of the Clutha, as well as being an important water resource for a variety of primary production purposes, support a salmon fishery of importance and whitebait and brown trout fisheries of regional significance" and at section 10.8.6, ".. the most significant whitebait fishery in Otago exists at its mouth (up to 200 baiters per day when a run is occurring)." The 2016 CMS describes the River only as regionally significant for whitebaiting (see section 4.5 of this report).

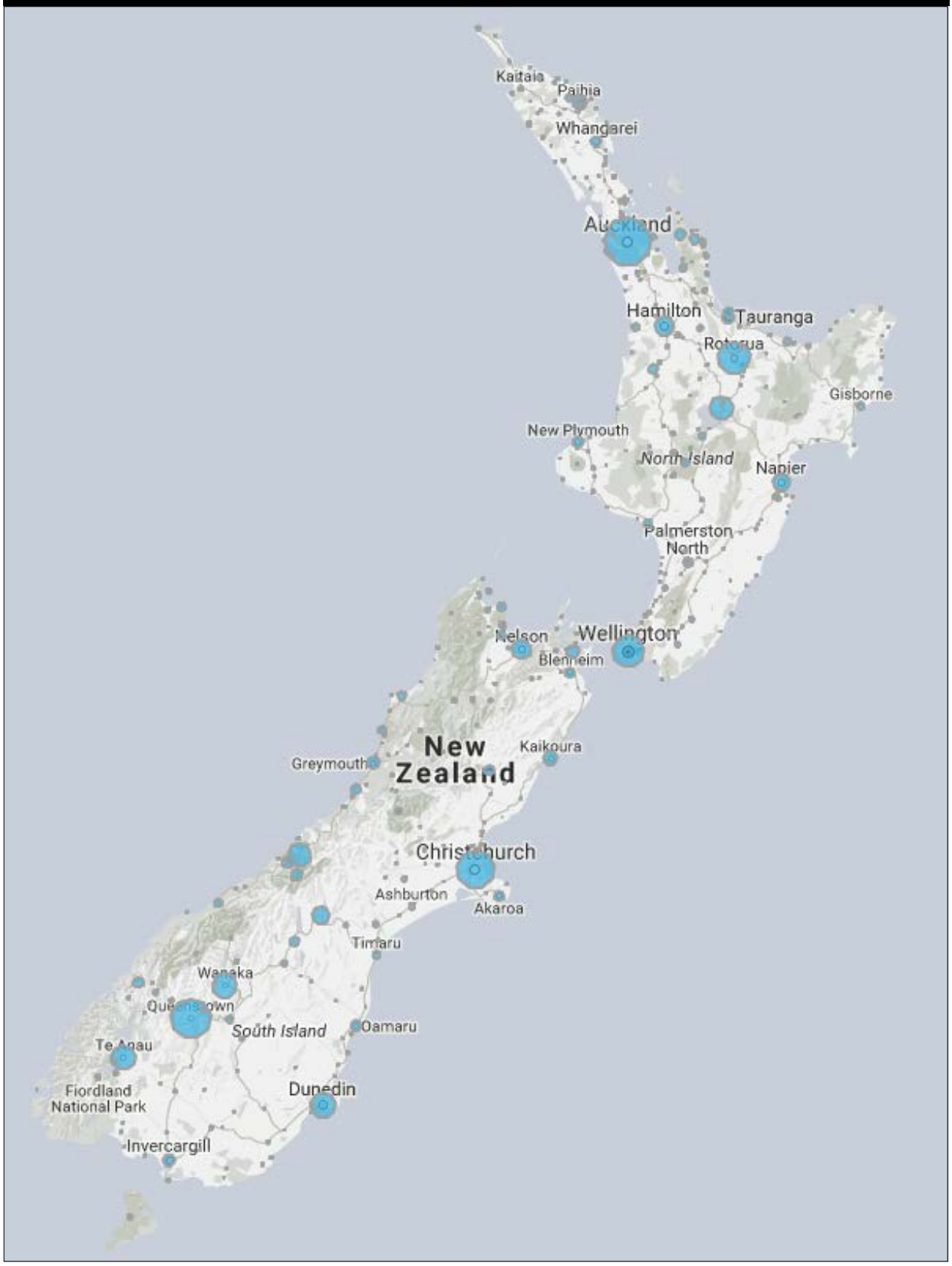
3.11 Eeling

This is little data available about the recreational eel harvest in the Clutha River. Jellyman (1987) described a small commercial eel fishery in the River and in Lake Roxburgh, but quoted one fisher who stated that the River below Roxburgh, "has a large stock of eels in it but it is hard to fish as the water level can vary too much from the hydro." Beentjes & Jellyman (2001) report on eel enhancement activities on Lake Hāwea, based on the measuring the survival and growth 9500 juvenile longfin eels transferred into Lake Hāwea in 1998, finding, that "although survival could not be quantified, based on a similar study, and notwithstanding the possible emigration of males out of the lake, we estimate that more than 80% of eels released into Lake Hāwea have survived."

3.12 Tourism activity

The Ministry of Business Innovation and Employment administers the International Visitor Survey (IVS) and up until 2012 the Domestic Travel Survey (DTS). Because of the way the IVS was developed, it is not possible to give any regional data by activity undertaken, or indeed by any other attribute at the regional level other than visitor numbers and nights. (The IVS only specifies what

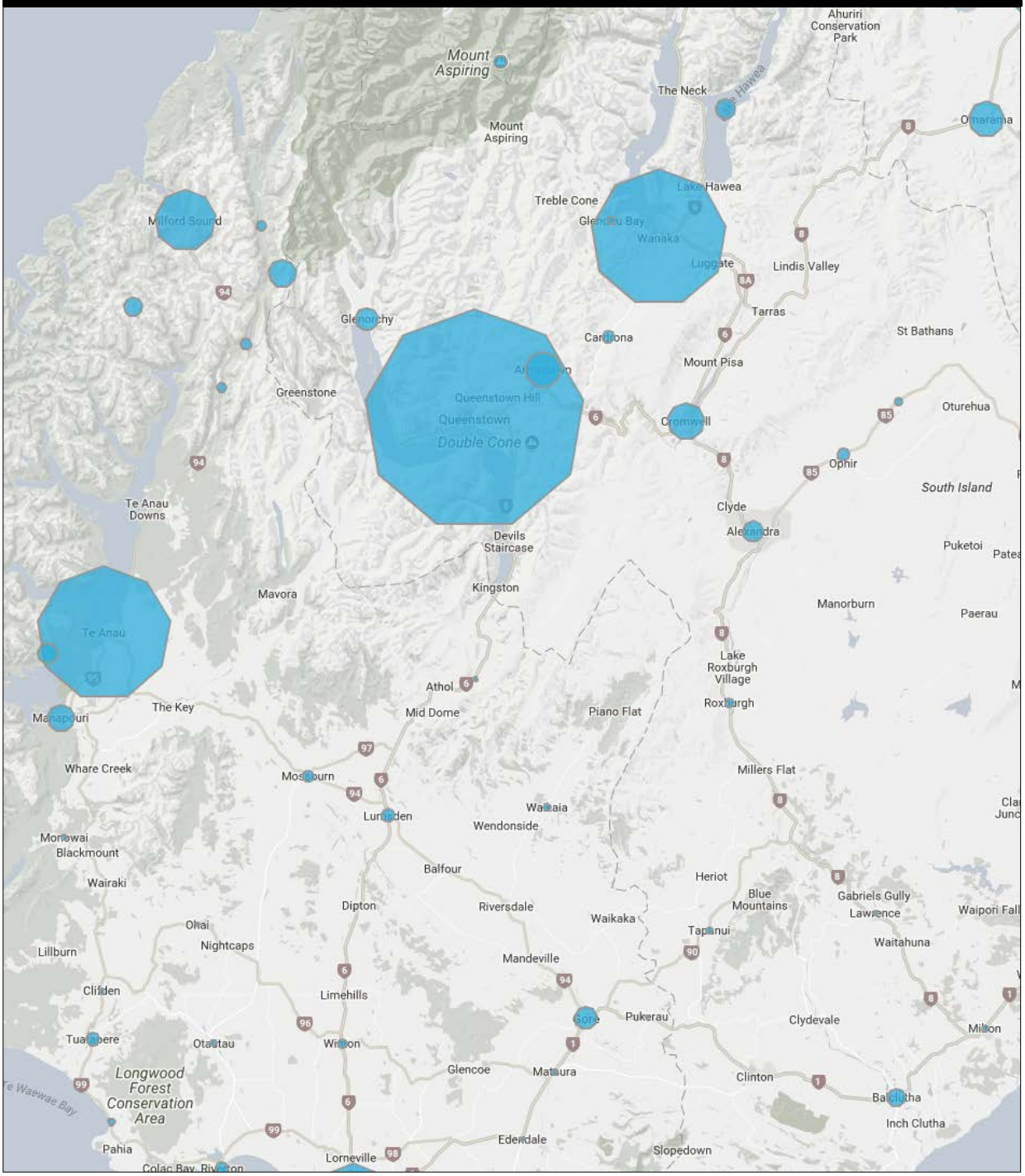
Figure 46: Five year average annual international visitor numbers to first quarter 2018, NZ. MBIE data



regions a visitor went to in New Zealand, and what activities they did while in New Zealand). Bed nights are also provided by the Commercial Accommodation Monitor.

For the purposes of this study, a coarse assessment is required to illustrate the relative values of each setting for international tourism, rather than any absolute figures. Figure 46 shows the relative level of activity in international visitor numbers for the main visitor settings nationally, as an annual average based on the past five years of data up to the first quarter of 2018.[24] Auckland tops the list with 1,665,250 international visitors, followed by Queenstown with 896,643 and Christchurch at

Figure 47: Five year average annual international visitor numbers to first quarter 2018, Otago. MBIE data



[24] http://www.mbie.govt.nz/info-services/sectors-industries/tourism/tourism-research-data/ivs/international-visitors-nights-interactive-map

873,312. Rotorua, Wellington and Taupo are in fourth, fifth and six place respectively.

Figure 47 shows, in more detail, the same MBIE data for Otago. Queenstown and Wānaka are the main international visitor destinations (896,643 and 355,415 visitors respectively), while Lake Hāwea, Cromwell and Alexandra have relatively low profiles (7,637, 25,587 and 8,106 visitors respectively); and the sample sizes upon which these estimates are based are starting to be small enough to result in the need for caution (186, 517 and 199 respectively). Even more uncertain are the data for Roxburgh with an estimate of 1,542 annual international visitors and 8,883 visitor nights, based on a sample size of 35. Balclutha has an estimate of 5,188 international visitors, and 12,308 bednights based on a sample of 120.

These data serve to support an assessment of Lakes Wānaka and Wakatipu as outstanding, but provide little weight for any of the other water bodies in the study area – although the upper Clutha River/Mata-au could be included as a visitor attraction relevant to the Lake Wānaka dataset.

3.13 Public access, lakeside reserves and recreation assets

A full inventory of river and lake-side recreation assets for the full study area has not been collated for this report. Assets are owned, maintained and/or administered by a number of agencies (including QLDC, CODC, CDC, ORC, DoC, Land Information New Zealand (LINZ), Contact, commercial agencies and private individuals) and include such items as navigation beacons and buoys (including ski lane markers), boat launching ramps, moorings, signs, tracks, marinas, wave structures (such as on the Hāwea River), jetties, wharves, vehicle ramps (such as for the Tuapeka Mouth Ferry), BBQs, picnic tables, toilets, rubbish bins, bridges, car parks and areas of managed vegetation; and informal structures such as rope swings. The *Clutha River/Mata-au Plan (including Lakes Dunstan and Roxburgh)* (CODC 2011), provides a detailed description of the recreation assets and settings beside Lakes Dunstan and Roxburgh, including ownership, administration and management.[25] De Winton & Clayton (2016), when setting priorities for managing lagarosiphon in Lake Dunstan, gave the recreation settings identified in CODC (2011) relative priorities for attention based on their level of 'amenity development'.

Recreational boating guides published by the QLDC detail the main recreation assets on Lakes Wānaka and Hāwea[26] and Lake Wakatipu[27]. Fish & Game NZ detail angling and boating access assets in various publications and their online GIS for water bodies throughout the catchment.[28] There are few built recreation assets near the lower Clutha River, but include recreation access and assets at Roxburgh, the Millers Flat Holiday Park, access around Horseshoe Bend and the Lonely Graves, and the Tuapeka Mouth Ferry. A search of resource consents issued by ORC, CODC, QLDC and CDC would supplement a full list of all relevant assets. Alexandra has a well-developed river boundary for recreation. The river mouth area has little development for recreation and little public land.

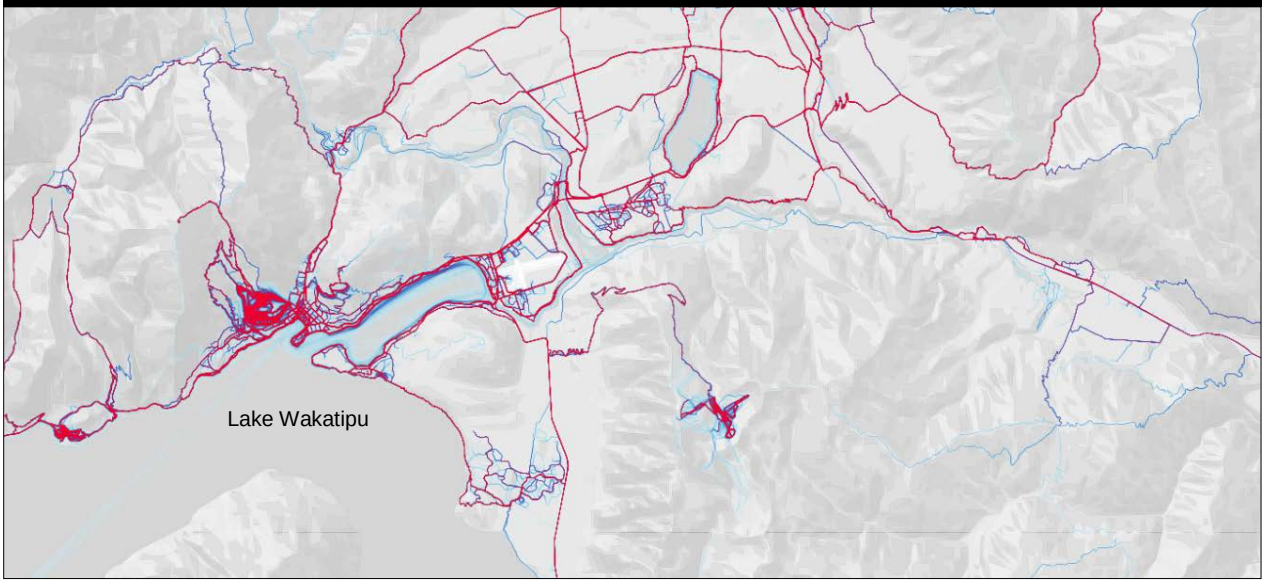
Cycle and walking trails are likely to be the most heavily used water-side recreation assets in the study area. These include:

- Queenstown Trail tracks on the Wakatipu lakeshore at Queenstown and Kelvin Heights and from Queenstown to the Arrow River confluence on the true left of the Kawarau River and on to Gibbston on the true right (see Figure 48 for the Strava heatmap for this area for all activities, including running and cycling, and snowsports on the Remarkables, and see section 0 for an explanation of the Strava data – in these figues, red indicates a

[25] www.codc.govt.nz/SiteCollectionDocuments/Strategies/Community/Clutha%20management%20plan%20Final%20Dec11.pdf
[26] www.qldc.govt.nz/assets/Uploads/Leisure-and-Culture/Lake-Wanaka-and-Hawea-Boating-Guide.pdf
[27] www.qldc.govt.nz/assets/Uploads/QLDC-Boating-Guide-Lake-Wakatipu.PDF
[28] fishandgame.org.nz/otago/freshwater-fishing-in-new-zealand/fishing-locations-and-access/

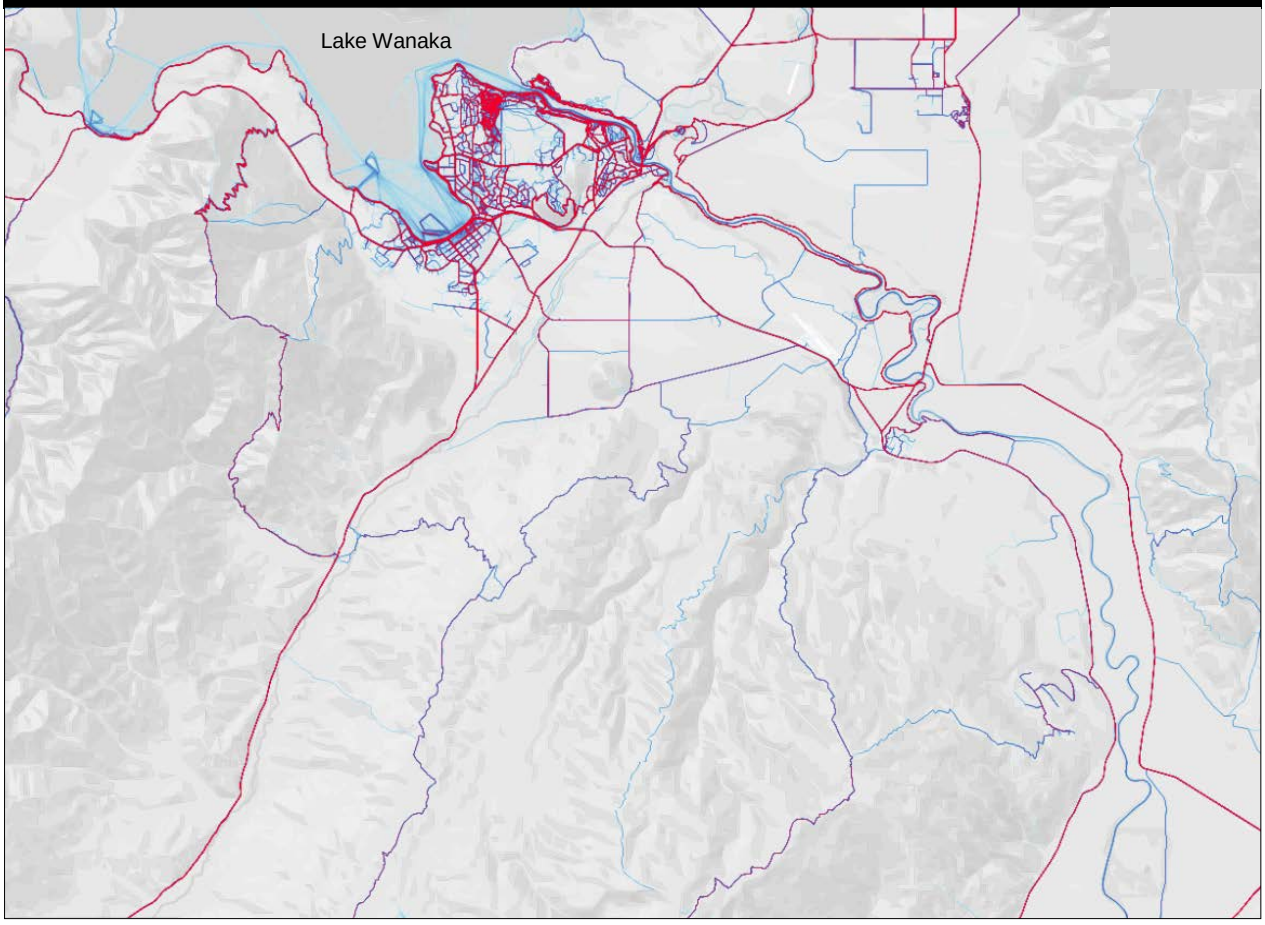
relatively high level of activity and blue a relatively low level, and each indicate the location of used tracks and trails).

Figure 48: Strava heatmap for all activities (mostly run and cycle, also ski) for Frankton, Kawarau



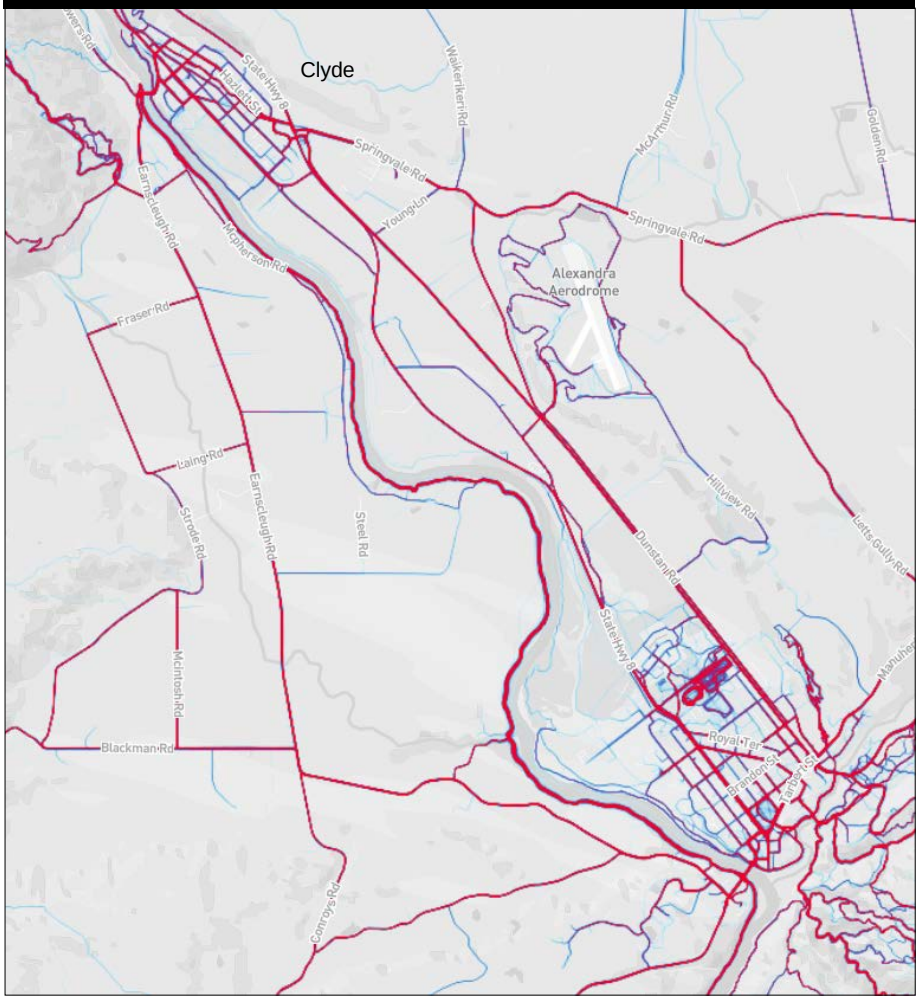
- Trails around the Lake Wānaka foreshore to Glendhu and Parkins Bay and to the Outlet, and downstream on the upper Clutha River/Mata-au to Luggate on both sides and within the Reko's Point Conservation Area (Figure 49).

Figure 49: Strava heatmap for all activities (mostly run and cycle) Wanaka and upper Clutha



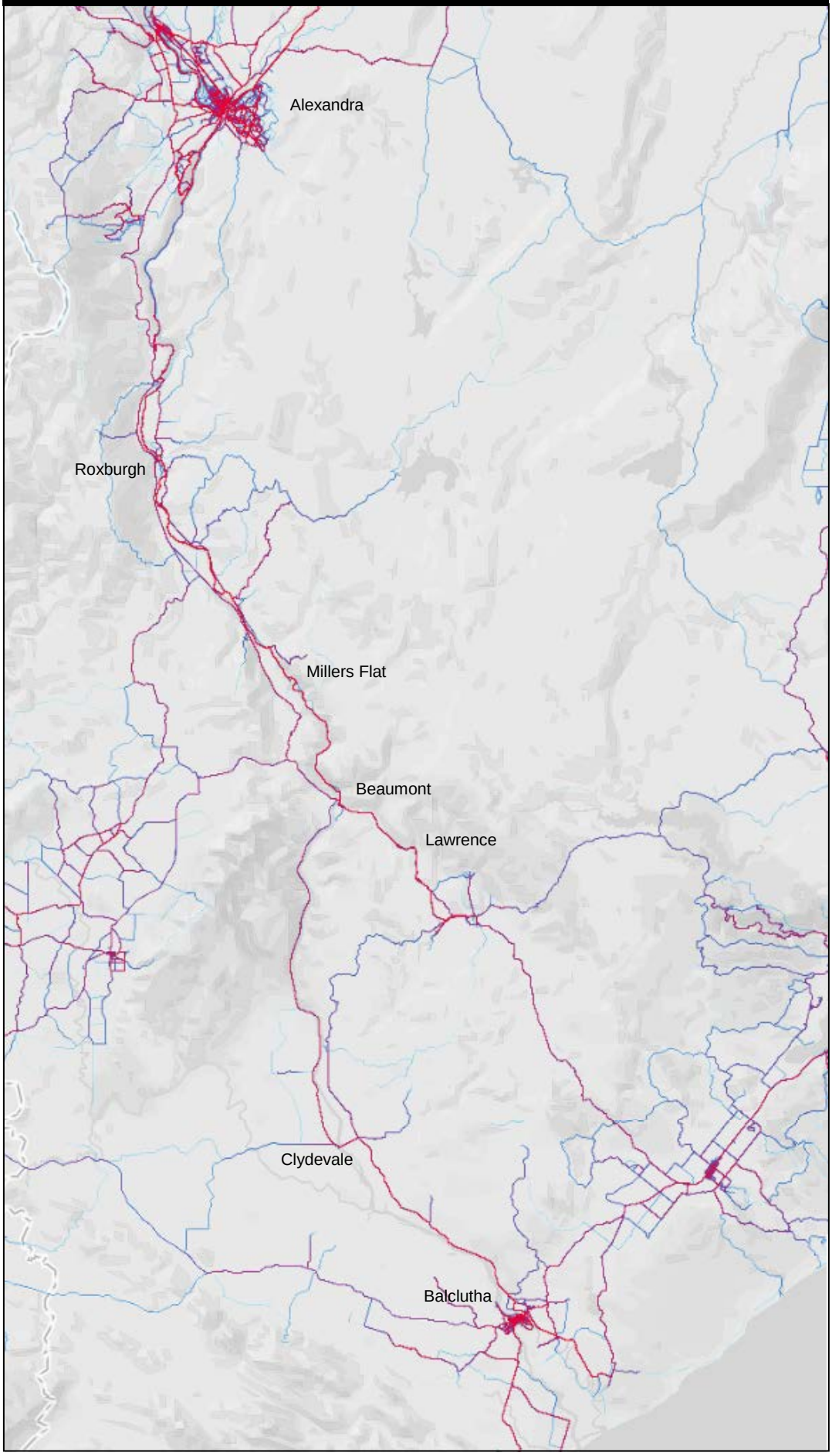
- The Millennium Track (or The River Track) between Alexandra and Clyde on the true right of the Clutha River/Mata-au (Figure 50).

Figure 50: Strava heatmap for all activities – Clyde to Alexandra



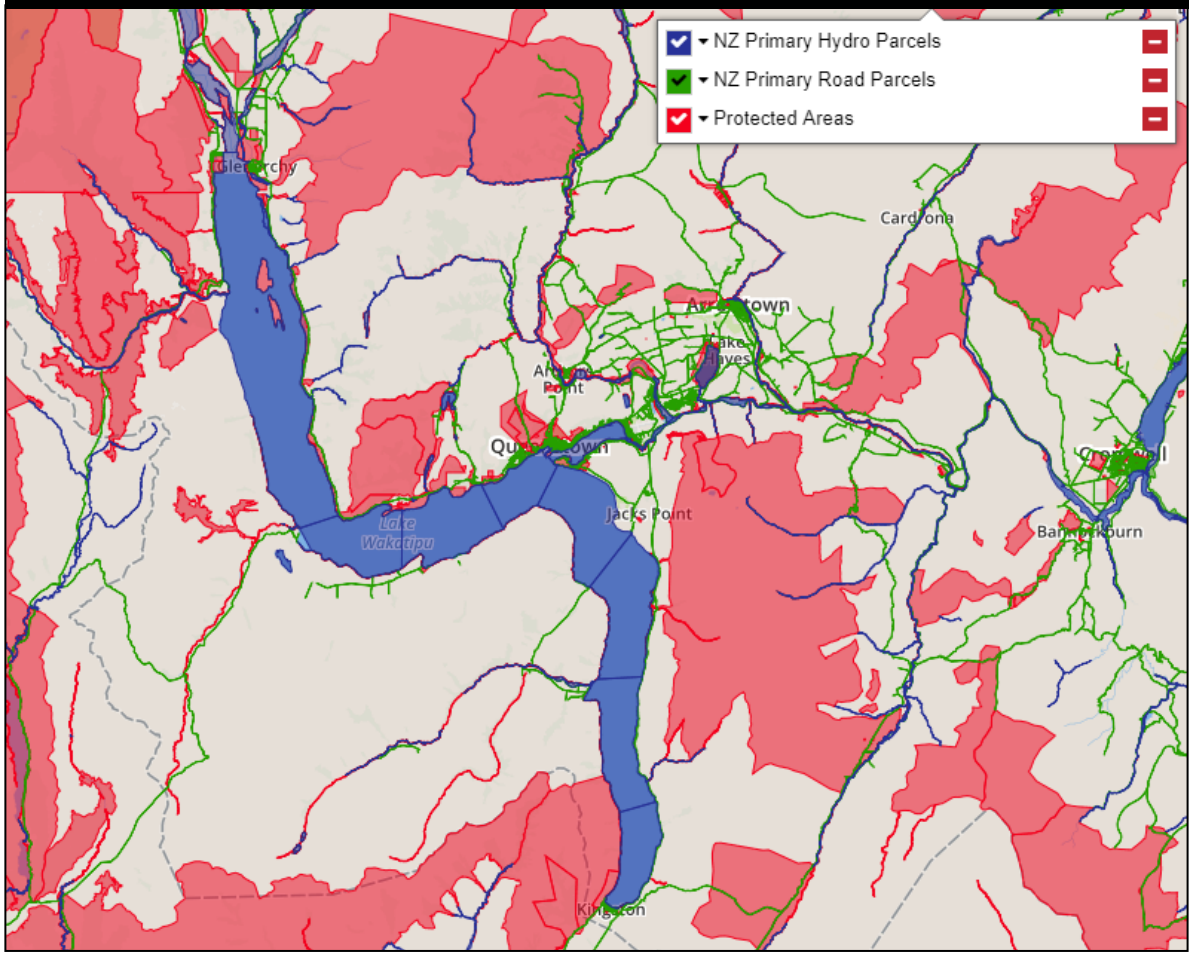
- Roxburgh Gorge Trail from Alexandra to Roxburgh Village, via the true right bank of the Clutha and Lake Roxburgh to Doctors Point, with an 11km boat shuttle to Shingle Creek, and then on to Roxburgh Village via the true right, and
- Clutha Gold Trail from Roxburgh Village to Beaumont on the true left bank of the Clutha River/Mata-au (and then on to Lawrence). Clutha River/Mata-au Road and Clutha Valley Road are aslo popular cycling routes, crossing the River at Clydevale (Figure 51).

Figure 51: Strava heatmap for all activities – lower Clutha River/Mata-au



There are few expansive areas of reserve directly adjacent to the water bodies in the study area. Public access to the water is largely achieved mainly via legal road and marginal strip. Exceptions are the Queenstown-Glenorchy Road on Lake Wakatipu with large areas of reserve between the road and the Lake, also connecting with the Mt Crichton Scenic Reserve north of Bob's Cove; and the extensive Taka Ra Haka Conservation Area extending to the water's edge west of Frankton. Figure 52 shows the LINZ cadastre records for hydro parcels, roads and protected areas for Lake Wakatipu and the Kawarau River. Protected areas include land leased for various purposes and which may not necessarily provide public access. LINZ administered Crown land is not shown and includes extensive areas of pastoral lease around Lake Wakatipu, most of which does not provide for public access.

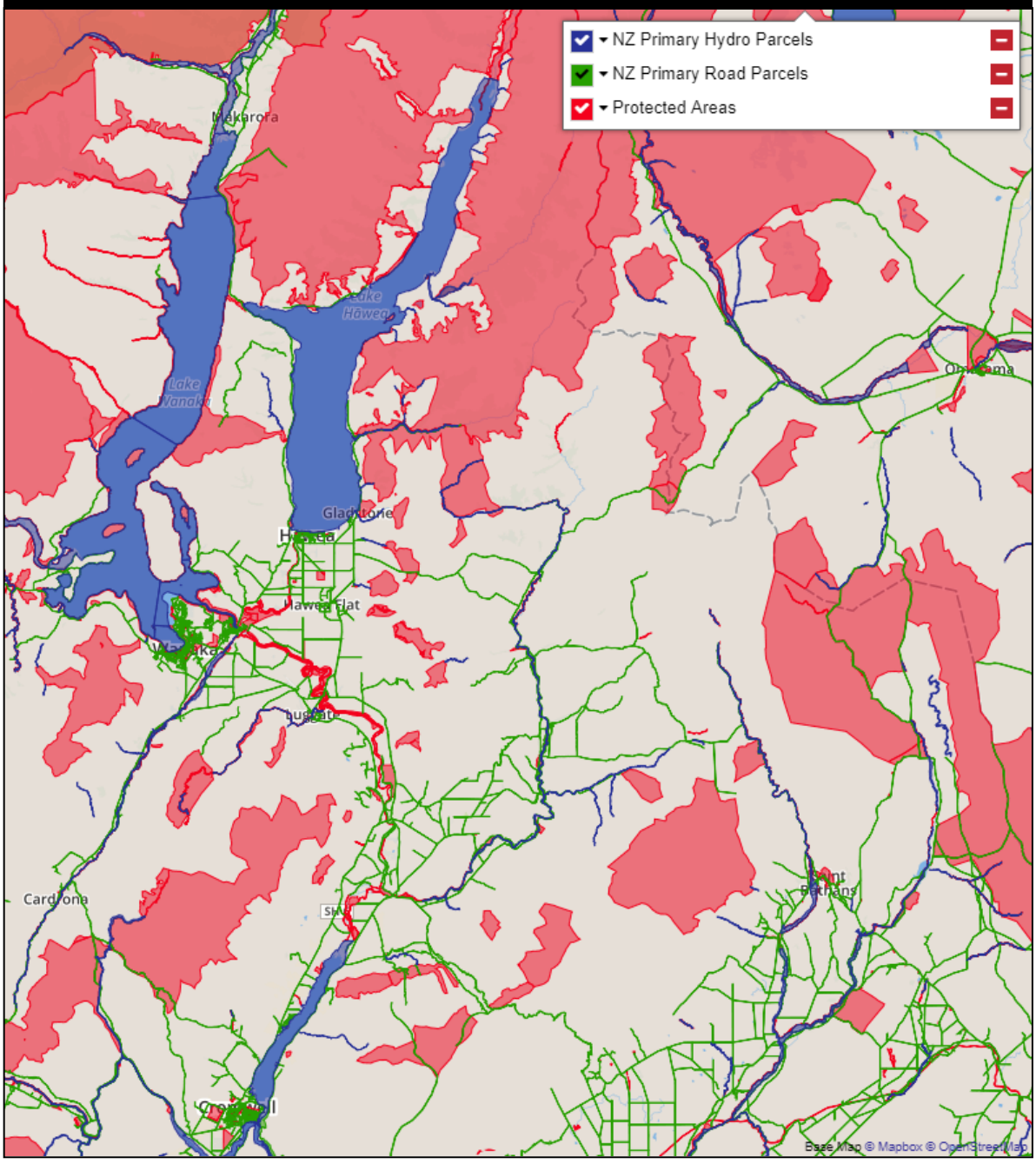
Figure 52: LINZ cadastre – Wakatipu and Kawarau hydro parcels, roads, protected areas



Lake Wānaka is bounded almost entirely by marginal strip and legal road with only two large areas of conservation area abutting it – Hāwea Conservation Park via the Boundary Creek Scenic Reserve in the north-east and the Matatiaho Conservation Area in the west. Recreation Reserve and legal road administered by the QLDC extends almost completely from Glendhu Bay to the lake outlet. Lake Hāwea has splinters of protected land reaching the lake edge, but poor connectivity in general, with legal road only on either side of the lake's southern arm. Lake Dunstan is largely bounded by legal road with public access facilitated by the bed of the lake (hydro parcels administered by LINZ, which is also responsible for management of the lake bed and its weeds) or legal road (Figure 53).

The lower Clutha River/Mata-au is bounded by incomplete stretches of marginal strip and legal road, but few large reserve areas – the exception being the Blue Mountains Forest Conservation Area south of Beaumont and west of Birch Island. Lake Roxburgh has marginal strip on only a small portion of its shores and very limited terrestrial access.

Figure 53: LINZ cadastre – Wānaka, Hāwea and Dunstan hydro parcels, roads, protected areas



3.13.1 Casual shore-based activities

There are little data available to describe or quantify the uses of river and lakeside areas for casual recreation such as picnicking, dog walking, horse riding and photography. That available – discussed below – suggests that participation in shore-based recreation far outweighs water-based activities.

Greenaway (2004) reported on observation-based studies of recreational use of Lake Dunstan completed in 1993, 1994 and 1995 by the planning consultancy Johnston Whitney of Alexandra for the Electricity Corporation of NZ (ECNZ) and the Office of Crown Lands. The survey method involved counts of recreational use of the shoreline and water-based activities over 12 days between mid-December and late January. Table 6 summarises the key findings for the number of people recorded. The results show up to an average of 255 people per day recreating on Lake Dunstan during the summer school holiday period.

Table 6: 1993 – 1995 Lake Dunstan recreation survey results - Johnston Whitney

Year, location	Number of participants noted	Number of sites visited	Average visitors per day	Weather conditions
1993 shoreline	1147	52	126	Changeable
1993 water-based	369			
1994 shoreline	2101	64	255	Wet with flooding
1994 water-based	965			
1995 shoreline	1979	71	238	Very hot
1995 water-based	884			

Table 7 and Table 8 give an approximate indication of the types and proportions of recreation activities undertaken during the survey period during the three survey periods. The results for each study area for each year have been combined to give the figures shown. In each survey year, some different types of activities have been listed which may have previously been grouped under the category of 'other'. For example, the category 'preparing to boat' was only used in the 1995 study, where it made up almost 6% of observations. The results in Table 7 and Table 8 should therefore only be considered indicative (as studies of this type always are).

These data indicate a 'flexible' recreation setting, able to be used for a variety of purposes. Considering the types of activities identified, including playing and paddling, the data also suggest a wide age range is catered for. They also indicate that shore-based activities outnumbered water-based activities by almost a factor of two.

Table 7: Shoreline activities on Lake Dunstan (1993 – 1995) - Johnston Whitney

Activity	Percent (n=5149)
Relaxing	39
Picnicking	14
Sightseeing	14
Playing	6
Sightseeing from vehicle	6
Walking	4
Fishing	3
Sunbathing	2
Preparing to boat	2
Walking on dam	1

Table 7: Shoreline activities on Lake Dunstan (1993 – 1995) - Johnston Whitney	
Activity	**Percent (n=5149)**
Barbecuing	1
Photography	<1
On boat	<1
Driving	<1
Walking dog	<1
Cycling	<1
Collecting driftwood	<1
Lunch in vehicle	<1
Gold panning	<1
Other	3
Total	**100**

Table 8: Water-based activities on Lake Dunstan (1993 – 1995) - Johnston Whitney	
Activity	**Percent (n=2218)**
Boating	39
Fishing	14
Paddling (shore-based, not quite swimming)	10
Waterskiing	9
Swimming	6
Rowing	6
Biscuiting	4
Canoeing	3
Sailing	3
Windsurfing	<1
Jet skiing	<1
Diving	<1
Other	6
Total	**100**

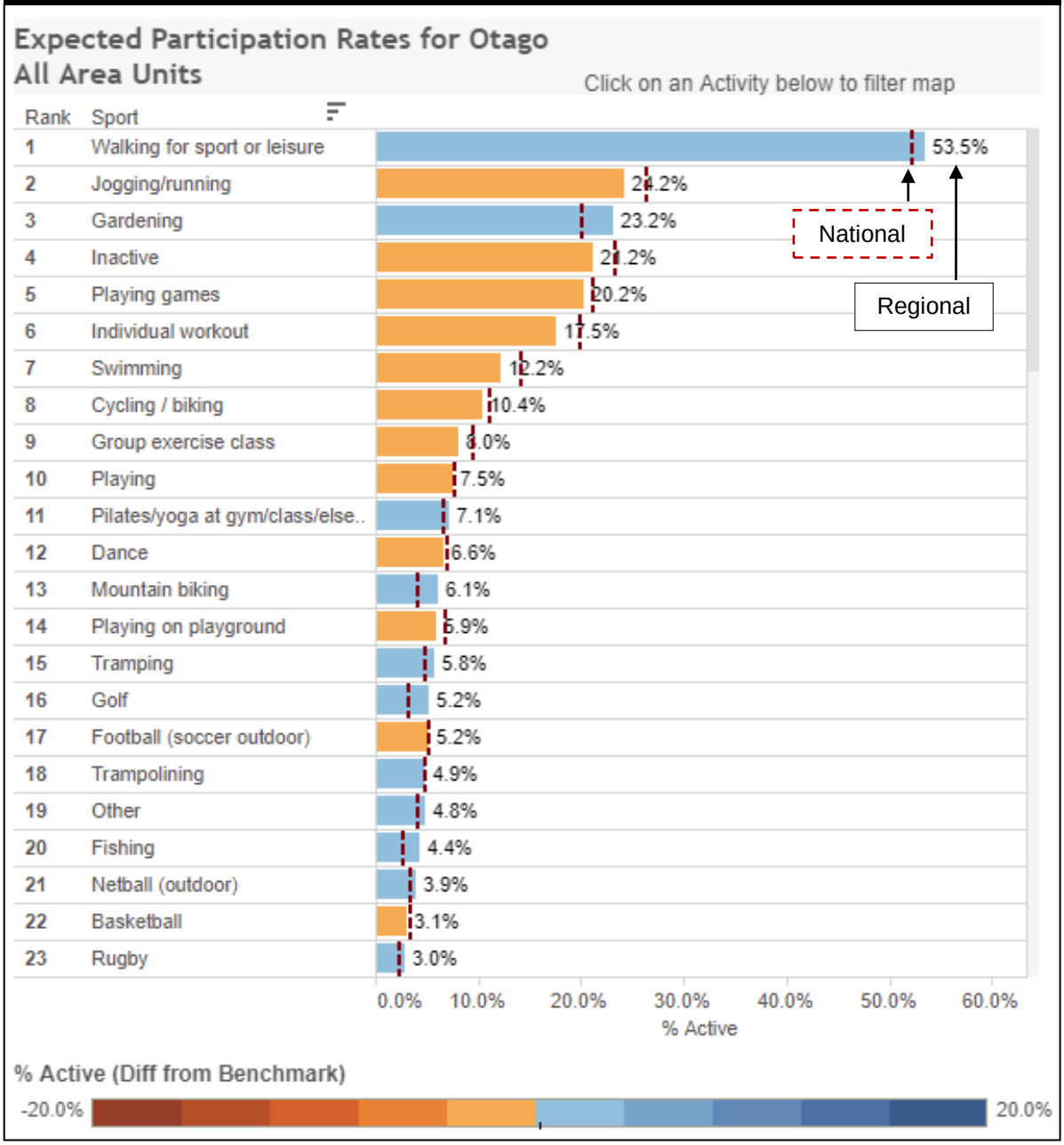
3.14 Regional recreation participation

This section briefly provides a quantification of participation in the recreation activities identified in this review, for context. Figure 54 shows the 7-day participation data[29] for Otago from Sport NZ's 2017 Active NZ survey – a very large-scale quantification of national participation levels and trends. This indicates the very high levels of participation in walking and running and swimming – all of which need a venue, generally outside the home. Compared with national data, Otago participation levels are lower for running and swimming, but are much higher for mountain biking and fishing. Participation data for activities with lower levels of participation than those shown in Figure 54 come with high error margins, considering they are modelled from smaller response sets, and it is dangerous to read too much into the specifics – other than to note that the following are more specialist sports (but in the same range of participation as tennis at 2.0% participation and rugby union at 3.0%):

[29] Sport NZ also provides similar data based on 12 month participation – which give much higher figures for most activities. The 7-day data show regular participation levels. 12 month participation data are used in section 0

- Kayaking and canoeing – 1.0%
- Surfing / body boarding – 1.8%
- Hunting – 1.3%
- Rowing – 0.5%
- Sailing / yachting – 0.4%
- Water skiing – 0.1%
- Stand-up paddle boarding – 0.1%

Figure 54: Sport NZ 7-day participation data, Active NZ 2017 survey



4 Significance of the water bodies for recreation

Smith (2009) completed a review of national and international literature to identify the status of significance methodologies for river values, including recreation. A key finding of the review was that, "to date, the work associated with assessing river values is *ad hoc*, and much is based on subjective assessments. Work which attempts quantitative assessment tends to address one (or at most two) values; none appears to offer a satisfactory method …". Nonetheless, there are numerous references to the water bodies in the study area in a number of resources; sufficient to be reasonably confident of their high levels of significance. This section summarises the most relevant assessments and then presents all in more detail.

4.1 What is 'outstanding' or significant?

A review of literature relating to Water Conservation Orders (WCOs) and comparative recreation assessments of freshwater bodies illustrates 35 years of struggle with identifying the significance of rivers and lakes for recreation; and identifying their use and value for recreation at national and regional levels (Greenaway 2016). Research began well, with an exceptional national review of river recreation by the Egarr brothers (Egarr & Egarr 1981). This, and the National Angler Surveys (NAS) carried out for F&G NZ (the Unwin, and Unwin *et al,* reports from 1998 to 2016, and other reports based on those data) appear to be the only relevant comprehensive and methodologically sound pieces of work completed at the national level since 1981. Egarr & Egarr (1981) is now out-of-date, and the NAS apply only to angling.

Several studies have reviewed specific recreation activities, and the significance of rivers for those activities. Examples at the regional or sub-national level include whitebaiting in the South Island (Kelly 1988), kayaking on the West Coast (England 2011) and river and lake recreation at the regional level (Sutherland-Downing 2004) and river recreation at the national level (Galloway 2008). These rely on unique methodologies, apply to single activities, or are desktop studies relying on anecdotal data and, in some cases, weak methodologies. More recently, comprehensive and stakeholder-led reviews have provided more comprehensive data – but these are region-specific (not in Otago) and include River Values Assessment System (RiVAS) analyses for, for example, angling, swimming, kayaking and jetboating;[30] and the likes of Rankin *et al* (2014) for kayaking in Canterbury.

Most recently, and most relevantly, the *Community Environment Fund: Outstanding Freshwater Bodies Project* (Harper 2017) summarised the findings of multiple specialist reviews of the history and methods of assessing significance of in-river values and summarised these for definitions of 'outstanding' and approaches to identifying recreation significance in WCOs. The author of this report was a member of the technical advisory group for the Project and contributed the specialist report on recreation. The full recreation review is appended to Harper (2017) (Greenaway 2016). The Project did not set out to identify outstanding rivers, but to consider methods and definitions. Harper made the following very useful summary points based on legal opinion and review of existing WCO decisions:

- Being outstanding is a high test. The term 'outstanding' distinguishes something from others based on its exceptional qualities and is typically used to describe the 'best of the best'. An outstanding value has a higher threshold than a significant value. An outstanding value will always be significant, but a significant value will not necessary be outstanding.

[30] See https://researcharchive.lincoln.ac.nz/ and search on the phrase 'rivas'

- A water body needs to have at least one outstanding value before qualifying as an Outstanding Freshwater Body under the National Policy Statement for Freshwater Management 2014 (NPSFM). A sum of significant values is not enough to qualify the water body as outstanding, based on legal opinion. There will be exceptions and a water body with a sum of significant values (none alone individually outstanding) could potentially be incorporated this way.
- A water body can only be reviewed in the context of its present condition. It cannot be assessed on its past condition or its potential under the NPSFM.
- Water Conservation Order decisions are clear that where sufficient data about a particular value of a water body are not available, then the value is not outstanding until the appropriate evidence is provided.
- Individual recreation values have contributed to WCO protection decisions and include for recreation: whitebaiting, eeling, angling amenity, jet boating, caving, canoeing, kayaking and rafting.
- There is no clear method for identifying outstanding whitebaiting settings.
- There is no one 'obvious' set of characteristics and associated thresholds which can be applied to determine whether angling amenity is outstanding. The combinations of the characteristics assessed depend on the type of fishing experience being sought e.g. large trophy fish, high numbers of fish, salmon or trout, wilderness, and/or scenic natural characteristics. However, it is implicit in WCO decisions that in order to be outstanding as a recreational fishery or angling amenity, the water body must contain an exceptional biological feature such as an abundance of fish, exceptionally large fish, high salmon run numbers, or high numbers of large fish, and have an exceptional angling amenity to justify a finding that it contains an 'outstanding recreational fishery'.
- There is no conclusive evidence in literature which suggests that any of: bird watching, tramping, walking, biking, camping and picnicking, can be outstanding in their own right.
- Jet boating, caving, canoeing, kayaking and rafting have been specifically recognised as outstanding and subsequently protected under a number of WCOs. As such, all are identified as key sub-values which have the ability to be outstanding in their own right. The preliminary findings from the WCO review on this value set show that in order to qualify as outstanding for boating, the water body must be reliable/predictable for the activity under normal flows, and meet at least one of the following criteria:
    - have participation rates which are significantly higher than anywhere else in the country,
    - non-local usage of 20% or more,
    - contains a unique/rare characteristic shared by few other rivers in New Zealand,
    - additionally, water bodies identified in WCO decisions as being outstanding for boating activities also typically provide a highly scenic and/or wilderness experience.
- There is no conclusive evidence in literature which suggests that any other boating activities such as rowing, sailing, wind surfing, kite surfing, river boarding, water skiing and wakeboarding can be outstanding in their own right.

- While it is clear that swimming is a national value that needs to be accounted for in management decisions, it is unclear whether alone it would make a water body outstanding for the purposes of the NPSFM. Swimming has not been identified in any of the WCO decisions as being outstanding in its own right.

Nationally significant water bodies are not necessarily outstanding.

4.2 Summary for the study area

The Clutha River/Mata-au has not been subject to a nationally-accepted assessment of its significance to recreation at the local, regional and national levels. Sections 4.3 to 4.21 provides a summary of various national and regional reports and plans which consider the significance of the River, *in toto* or by section. However, it is doubtful that any of these historic assessments could be considered robust or definitive – apart from the statutory protections. Relevant comments from and on each of these assessments reviewed in this section are:

- Lake Wakatipu and the Kawarau River (from the lake outlet to Scrubby Stream) are protected by the Water Conservation (Kawarau) Order 1996 and have 'outstanding' amenity values for, on the Kawarau River: wild and scenic characteristics; natural characteristics, in particular the return flow in the upper section when the Shotover River is in high flood; recreational purposes, in particular rafting, jetboating and kayaking; and on Lake Wakatipu its: fishery; scenic characteristics; scientific value, in particular water clarity, and bryophyte community; and recreational purposes, in particular boating.
- The Lake Wānaka Preservation Act 1973 suggests outstanding status for Lake Wānaka in general terms, although the Act does not refer to recreation values, apart from requiring the Guardians of Lake Wānaka to (5(2)(a)), "report and make recommendations to the Minister of Conservation on any matter affecting the purposes of this Act, on the use of the lake for recreational purposes…"
- The Department of Conservation's Otago CMS (2016, section 2.10) describes the Clutha River/Mata-au as of regional significance for whitebait, trout and salmon fishing. The CMS is otherwise shy of applying statements of significance to many specific resources. The previous 1998 CMS described the upper Clutha River/Mata-au as providing a 'world class' (section 10.28.5) and an 'internationally renowned' angling resource (section 10.28.6), and a fishery and game bird hunting area of 'regional importance' in the lower River (section 10.8.6); and at t section 2.1, "The lower reaches of the Clutha, as well as being an important water resource for a variety of primary production purposes, support a salmon fishery of importance and whitebait and brown trout fisheries of regional significance."
- The Ministry for the Environment (MfE 2004a, MfE 2004b, Ministry of Tourism 2004) identified 'potentially nationally significant' rivers and lakes for recreation and tourism. This work has many inconsistencies and relies on several weak methodologies and marginally relevant historic data sources. The work was intended to represent a starting point, rather than a definitive list of important waterways. The MfE assessments identified the Clutha and Kawarau Rivers and Lakes Wakatipu, Wānaka and Dunstan as potentially nationally significant for recreation as a result of a variety of recreation values, and Lake Hāwea for scenic values, and potentially nationally significant for tourism.
- The QLDC District Plan (July 2016) states (4.6.1): "These lakes and rivers are nationally and internationally recognised as one of the principal bases for the District's importance as a visitor destination, as well as one of the reasons for residents to settle and stay in the area." And "The rivers and lakes are also outstanding natural features, with high natural and scenic

values, providing habitats for a range of indigenous and acclimatised bird and fish species." The upper Clutha River/Mata-au is described as a nationally important trout spawning area and a nationally important trout fishery, "…with the Deans Bank area between the Wānaka outlet and Albert Town being recognised internationally for trout angling (both brown and rainbow trout)." The other relevant water bodies in the QLDC component of the study area are not described in terms of significance but are generally described as popular and/or important.

- The CDC District Plan (1998 at July 2018) describes the (lower) River as regionally significant for angling below Balclutha, but provides no data to support the assessment, or any review of the River for other recreation values besides whitebaiting: "The Clutha River/Mata-au is the most important whitebait resource and the Taieri River is the second most important whitebait resource in the Otago Region."
- Schedule 1 of the ORC Regional Plan: Water for Otago (updated to 1 July 2018) lists the natural and human use values of Otago's surface water bodies. Schedule 1A focuses on 'natural values', which includes reference to recreation attributes of the region's rivers and lakes. Sources of data for the conclusions made are dated and limited, and include, in relation to recreation, Grindel & Guest (1986), Grindel (1984) and the 1982 draft document for Grindel (1984). The Beaumont and Rongahere Gorges are identified as an 'outstanding natural feature or landscape' of the Clutha River, but no reference is made to local recreation values. Salmon and trout spawning values are identified for all sections of the Clutha River. Regionally significant gamebird areas are identified on the River between Balclutha and the sea and between Island Block and Balclutha. The Kawarau River and Lake Wakatipu are defined as outstanding in accordance with the WCO.
- The CODC District Plan (April 2008 at July 2018) does not attempt to define the significance of the Clutha River/Mata-au for recreation, although it notes that the River is an important recreation setting for the region.
- The Sports Fish and Game Management Plan for Otago Fish and Game Region 2015-2025, prepared by the Otago F&G Council, describes the Hāwea River as a regionally important sports fishery and the upper Clutha River, Lake Hāwea, Lake Dunstan, Lake Wakatipu and Lake Wānaka as nationally important, and the lower Clutha River/Mata-au as regionally important.
- Unwin (2009) indicates that the fisheries of the upper and lower Clutha Rivers are amongst the most popular in Otago, if not the most popular, and that they are considered 'important' (a rating midway between, 'This fishery consistently provides enjoyable angling' and, 'This fishery provides a very enjoyable angling experience, and is one of my personal favourites'). Of 23 popular Otago rivers, the upper River was considered the 7th most important, and the lower River the 9th most important.
- Unwin (2016) indicates more than 10,000 annual angler days (a benchmark for national significance for angling)[31] on the: upper Clutha up to the 2007/08 national angler survey (and less in 2014/15); the lower Clutha River; and Lakes Wakatipu, Wānaka, Dunstan and Hāwea.
- The Tribunal hearing the Application for a *Local Water Conservation Notice In Respect Of The Pomahaka River, its Tributaries and The Lower Clutha River/Mata-au* (1989) found, "The lower Clutha River/Mata-au downstream of Balclutha provides for a regionally significant

[31] See section 4.16.1. The 10,000 threshold is also commonly used in F&G NZ's sports fishery management plans where significance assessments are made, and has been used in various resource consent hearings, such as for the Hurunui and Wairau (Marlborough) Rivers, and RIVAS assessments for angling (see https://researcharchive.lincoln.ac.nz/ and search on the phrase 'rivas').

recreational fishery for migratory brown trout." The Tribunal also found that, "The existence of the quinnat salmon and whitebait fisheries add to the importance of this reach [from the Pomahaka confluence to the sea] for recreational fisheries values. However neither these fisheries nor the waterfowl recreational hunting values are seen by the Tribunal as being sufficiently significant in themselves to warrant specific inclusion in a local notice."

- Richardson *et al* (1984) state that, "Although the lower Clutha does not qualify as a nationally important angling river based on the criteria developed by Teirney [et al 1982], it is clearly of at least regional significance to anglers from throughout the lower half of the South Island." Jellyman (1987) repeats this finding.
- Richardson *et al* (1986) describe the upper River as a nationally important river fishery.
- Other studies (Galloway (2008), Grindell & Guest (1986), Grindell (1984), Teirney et al (1982), Egarr & Egarr (1981), Egarr *et al* (1979)) indicate the general importance of the Clutha River/Mata-au to recreation, particularly the upper River, but these studies either make no explicit assessment of significance (such as Galloway 2008) or predate such major developments as the Clyde Dam. Teirney et al (1982) found the River to be nationally significant for angling above the Roxburgh Dam and regionally significant below it. The River was not identified in Grindell & Guest (1986) and Grindell (1984).
- Teirney & Jowett (1990) recorded high numbers of large brown and rainbow trout in the upper Clutha River/Mata-au below the Lake Wānaka outlet, and estimated a fish biomass of 291.5 kg/km, placing this section of river second only to the Buller River at the Lake Rotoiti outlet for fish biomass amongst 158 river sections sampled nationally. No comparative count was completed in the lower River.

Considering the data available and the assessments quoted above, the upper Clutha River/Mata-au is clearly nationally significant for angling; and also potentially nationally significant in the lower River considering its high level of angling activity (especially so with more than 20,000 angler days in 2014/15 – more than Lake Wakatipu). Considering the use of the upper Clutha River/Mata-au for rafting, kayaking and jet boating, and especially the commercial value of those activities, the upper River is likely to be nationally significant for recreation generally, although it might not be for each activity *per se* (considering the relative value of the Shotover and Kawarau Rivers, for example). The significance of the lower River to activities other than angling is likely to be regional, and regionally significant *in toto*.

All Lakes and the Kawarau River are clearly nationally significant for recreation, apart from Lake Roxburgh which is regionally significant. This assessment for Lake Roxburgh could be challenged by its increasing value as part of the Clutha Gold Trail.

4.3 Water Conservation (Kawarau) Order 1996

Lake Wakatipu and the Kawarau River (from the lake outlet to Scrubby Stream) are protected by the Water Conservation (WCO) (Kawarau) Order 1996 and have 'outstanding' amenity values for, on the Kawarau River: wild and scenic characteristics; natural characteristics, in particular the return flow in the upper section when the Shotover River is in high flood; recreational purposes, in particular rafting, jetboating and kayaking; and on Lake Wakatipu its: fishery; scenic characteristics; scientific value, in particular water clarity, and bryophyte community; and recreational purposes, in particular boating.

The WCO indicates outstanding status for the two water bodies, with specific reference to recreation.

4.4 Lake Wānaka Preservation Act 1973

The Lake Wānaka Preservation Act 1973 (at 22 Oct 1998) is "An Act to make provision for the preservation of the normal water levels and shoreline of Lake Wānaka, and the maintenance and improvement of its water quality." It also establishes the Guardians of Lake Wānaka, whose functions are to:

(2) (a) generally, to report and make recommendations to the Minister of Conservation on any matter affecting the purposes of this Act, on the use of the lake for recreational purposes, and on any other matter concerning the lake which the Minister of Conservation may from time to time specify; and

(b) in particular—

(i) to declare as an emergency any state of affairs existing when the lake water appears likely to attain such a level as to cause loss or damage to human life, livestock, or property by flooding:

(ii) to consult the Otago Regional Council from time to time on those functions of the Otago Regional Council which may affect the lake, and to advise the Minister of Conservation of any such consultation and its outcome:

(iii) to give advice to the Minister of Conservation on any matter referred to the Minister under subsection (1) of section 11.

The Act seeks to maintain the Lake in a 'natural state', which, (section 2) "in relation to the water levels of the lake, means the levels the water in the lake attains naturally from time to time without control or obstruction by or through the agency of any person; and, in relation to the shoreline of the lake, means the natural contours of the shoreline formed from time to time by the water levels of the lake, or formed from time to time by natural changes to the shore of the lake."

The presence of the Act clearly suggests outstanding status for Lake Wānaka in general terms, although the Act does not refer to recreation values, apart from requiring the Guardians of Lake Wānaka to (5(2)(a)), "report and make recommendations to the Minister of Conservation on any matter affecting the purposes of this Act, on the use of the lake for recreational purposes…"

4.5 DoC Otago Conservancy Conservation Management Strategy

The Otago CMS (2016, section 2.10) describes the Clutha River/Mata-au as of regional significance for whitebait, trout and salmon fishing:

Some of New Zealand's largest rivers flow through Otago. The Clutha River/Mata-au catchment is the largest in New Zealand, draining some 20.5 million hectares of land. It is the country's second-longest river and its lower reaches have extensive natural and historic resources. The Clutha River/Mata-au is important for hydroelectric power generation and farming, and supports salmon, brown trout and whitebait fisheries of regional significance. A variety of tributaries feeds into the river during its progress to the sea, which have important natural and scenic values in their own right.

The CMS is otherwise shy of applying statements of significance to many specific resources (although, for example, it describes the Greenstone Recreational Hunting Area as providing nationally important hunting for fallow deer (p61) and the Taieri River as regionally important for trout fishing (p101)). There is no reference to the other water bodies in the study area, apart from in general terms and via their roles in contributing to Otago's unique landscape.

The 'Outcome, policies and milestones for the Freshwater/Wai Māori Place' (section 2.10) include:

Otago's large river systems and lakes, including the Clutha River/Mata-au , Dart River/Te Awa Whakatipu, and Taieri and Kawarau rivers, and lakes such as Wakatipu (Whakatipu-waimāori), Wānaka and Hāwea, are recognised for their ecological, cultural, landscape and recreational values and their contribution to conservation and the region's well-being and prosperity.

4.6 Queenstown Lakes District Plan

The QLDC District Plan (July 2016) considers the lakes and rivers of the District to be defining features (section 4.6.1):

The outstanding natural environment of the District is dominated by mountains, lakes and rivers. The abundant and varied lakes and rivers provide the basis for a wide range of recreational opportunities, both private and commercial, from jet-boating and rafting to angling, picnicking and swimming. The changing moods and aspects of the lakes and rivers, particularly combined with the District's other magnificent scenery, provide ceaseless opportunities for viewing, contemplation and enjoyment. These lakes and rivers are nationally and internationally recognised as one of the principal bases for the District's importance as a visitor destination, as well as one of the reasons for residents to settle and stay in the area.

… With the District's excellent climate, the lakes and rivers are very popular for a wide range of recreational activities. The rivers and lakes are also outstanding natural features, with high natural and scenic values, providing habitats for a range of indigenous and acclimatised bird and fish species.

***i The Kawarau River** … The large volume and steep fall of the Kawarau, two characteristics that made it a candidate for hydro-electric development, also make it a valued recreational and scenic resource. This river is one of the few remaining unmodified whitewater rivers in New Zealand. The main recreational uses are rafting, bungy jumping, jetboating, kayaking and more recently body-surfing. The river is used intensively for commercial recreation but because of its width and the different requirements of the various boating activities there are little conflicts between the activities. Jetboats operate from the Frankton Arm down to the confluence with the Arrow River. Below that point the rapids are too rough for commercial jetboating but suitable for rafting, surfing and kayaking. Fishing is important from the outlet from Lake Wakatipu to the confluence with the Shotover River.*

***ii Lake Wakatipu** …. is a popular holiday and visitor destination, adjoining the towns of Queenstown, Glenorchy and Kingston. All forms of recreational boating are undertaken on the lake. The shores of the lake are popular for lakeside picnicking, swimming and passive recreation. The lake is extensively used for recreational fishing both from the lakeshores and by boat. Commercial use of the lake has increased enormously over the last 20 years, with jetboat operations, small boats for hire, lake cruising and fishing guiding and paragliding.*

***vii The Clutha River/Mata-au** …. is wide and deep, flowing swiftly from bank to bank, with easy rapids. It is one of the few uncontrolled river outlets in the country from a large lake. It provides a scenic natural environment with a sense of remoteness, yet is readily accessible from Wānaka. The Clutha is a nationally important trout fishery, with the Deans Bank area between the Wānaka outlet and Albert Town being recognised internationally for trout angling (both brown and rainbow trout). The river is a recreational fishery of high use, valued for its above average catch rate and fish size, as well as for its scenic qualities. It is also a nationally important trout spawning area. Two commercial jetboat operations use the*

river from Lake Wānaka to below Albert Town. The Clutha is also popular for private, recreational jetboating. Although it is not exciting for experienced jetboaters, the Clutha River/Mata-au is easily navigable by the average boater. Rafting, kayaking, canoeing, drift diving and bodysurfing are popular with private recreationalists and school groups, with limited, but growing commercial kayaking, rafting and bodysurfing. These commercial operations rely on the grandeur of the river and the peaceful scenic surroundings for the experience offered to their clients. Swimming is mostly limited to an area between an island and the true right bank at Albert Town above the bridge. The riverbank walkway between Outlet and Albert Town is a popular route for walking, picnicking and mountain biking. For Albert Town residents, the Clutha is part of the scenic view from many riverside properties and the camping area.

viii Lake Wānaka *…. is an extremely popular holiday area and is of growing popularity for permanent residence and retirement. All forms of recreational boating are undertaken on the lake. A marina in Roys Bay adjoins the boat launching ramps. The area is popular for lakeside picnicking, camping, swimming and passive recreation. Walking tracks are maintained around the lakeside from beyond Waterfall Creek to the Lake Outlet. Commercial use of the lake includes jetboat operations; launches for lake cruises and guided fishing; hire of jet-skis and small boats; and paragliding; mostly concentrated on and near the main jetty in Roys Bay. Recreational fishing is primarily for brown and rainbow trout and quinnet (sic) salmon, by trolling, spin and fly fishing.*

ix Lake Hāwea *…. has been dammed at its outflow to the Hāwea River and is used as a storage lake for the Roxburgh hydro-electric station. The lake level has been raised significantly above its natural level, although lake levels have varied markedly over recent years, with severe dust problems at times. Lake Hāwea is a popular holiday area and is growing in popularity for permanent residence and retirement. It provides a scenic setting for the township of Lake Hāwea, lakeside rural properties and camping areas. A variety of recreational boating activities take place on the lake. Lake Hāwea is particularly popular for experienced wind-surfers in high winds. Lakeside picnicking, swimming and passive recreation is principally undertaken on the main beach at Lake Hāwea township and around the motor camp. Fishing for brown and rainbow trout and quinnet* (sic) *salmon is largely of a recreational nature.*

x The Hāwea River *- Flow in the Hāwea River is controlled by the dam at the outlet from Lake Hāwea. The normal summer flow is now low and the river is braided in places, particularly near its confluence with the Clutha River. When water is being released from the dam, white water rapids and pressure waves are created. The Hāwea River is a popular and important trout fishery, despite the alterations to river flows as a result of the dam. The river provides spawning grounds for brown and rainbow trout. At normal low flow the river is predominantly used for fly-fishing. Being a shallower and gentler river than the Clutha River, the Hāwea is well used by family groups for picnicking, camping, swimming and floating. Rafting, kayaking, canoeing, drifting and bodysurfing are popular with private recreationalists and school groups, with limited commercial bodysurfing and kayaking. A jet sprint course was recently established adjacent to the main river in the river bed towards the Clutha River/Mata-au confluence.*

4.7 Central Otago District Plan

The CODC District Plan (April 2008, at July 2018) does not attempt to define the scale of significance of the water bodies in the study area for recreation, although they are described as 'significant'.

Section 2.3.4 of the Plan (Land Use) states:

> *Recreation, particularly activities based on the outdoors, is becoming an increasingly significant land use in the District. The popularity of activities such as cross country skiing, mountain biking, motorised snow activities, tramping, boating, game bird hunting, and fishing is increasing. Passive recreation activities such as picnicking and sightseeing are also popular activities for both locals and visitors alike. Development of the Otago Central Rail Trail, will further enhance recreation opportunities. Section 2.4.3 demonstrates that water based recreation in the District is significant.*

And

> *Tourism, which relies to a large degree on a number of the land uses listed above (eg. viticulture, recreation, conservation) is an increasingly important component in the Central Otago economy. The development of the Otago Central Rail Trail, improved public access to back country areas through the tenure review process; conservation and promotion of heritage values including those associated with the Otago Goldfields Park as promoted by the Otago Conservation Management Strategy, the burgeoning viticulture industry, and the comprehensive integrated golf course, hotel, viticultural and residential resort development at McArthur Ridge are likely to strengthen Central Otago's tourist industry.*

Section 2.4.3 (Use of Water Resources) notes in relation to recreation:

> *Recreation is a significant use of the District's water resources and one which is likely to increase particularly during vacation periods. The recently created hydro lake, Lake Dunstan is proving to be a popular recreational resource. While the creation of the lake has resulted in the preclusion of recreational pursuits that relied on swift currents and rapids it has made other forms of recreation for which still water is needed or preferable (eg. swimming, sailing, water skiing, rowing) more accessible to a greater number of people.*
>
> *The majority of recreational pursuits on the lake revolve around boating and fishing. Boating activities predominantly occur in the vicinity of the Cromwell boat ramp, Lowburn boat harbour, the Burton Creek and Dairy Creek recreation areas and at Bannockburn Inlet, while fishing is concentrated at the Clyde Dam end of the lake and in the vicinity of Bendigo Wildlife Area. The Alexandra Rowing Club* [the Dunstan Arm Rowing Club] *uses the area around the Burton Creek recreation area extensively during the rowing season and this part of the lakeshore is also used by passive recreationalists.*
>
> *Fast water recreation such as jet boating and kayaking are available in the Kawarau River and the Clutha River/Mata-au between Millers Flat and Beaumont. The Beaumont Gorge offers a number of sections of white water rapids offering some challenge. This section of the river is used for the kayak section of the Beaumont triathlon. Most parts of the Clutha River/Mata-au are used for kayaking instruction, racing and cruising, and low impact rafting.…*
>
> *Boating activities also occur on Lake Roxburgh, the Manuherikia River and at Blue Lake.…*
>
> *Fishing is possibly the most popular recreational activity involving the District's water bodies. Most of the District's water bodies have significance for fishing in particular Lake*

Dunstan, the salmon fishing of the Clutha River/Mata-au below the Roxburgh Dam, Lake Onslow and the Pomahaka, Taieri and Teviot Rivers. The Poolburn, Manorburn, Falls and Frasers reservoirs and a number of smaller irrigation reservoirs (such as Rutherfords Dam) and rivers such as the Manuherikia and Nevis are also popular and productive fishing spots.

The productive nature of the Lake Dunstan fishery has been due initially to the increased availability of food submerged by the reservoir. This is likely to be only temporary. The Clutha Sports Fisheries Trust has been established to manage the fish stocks of the lake.

4.8 Clutha District Plan

The CDC District Plan (1998, Sec 2.4.4, at July 2018) describes the significance of the lower Clutha River/Mata-au thus:

Water-based recreation in the main stem of the Clutha River/Mata-au falls into three general categories, namely, angling and hunting, boating (particularly in that stretch of river between Clydevale and the Central Otago District boundary), and passive recreation (which includes the aesthetic appreciation of the landscape). Angling is regionally significant below Balclutha and on the Pomahaka, a major tributary of the Clutha, and the Waipahi River, a tributary of the Pomahaka. In other parts of the District the Catlins and Lower Taieri Rivers are considered to be regionally significant fisheries….

Whitebaiting is an important recreational activity in all the catchments that are mentioned above. The Clutha River/Mata-au is the most important whitebait resource and the Taieri River is the second most important whitebait resource in the Otago Region. The Tokomairiro River and the rivers in the Catlins also support this same activity

4.9 Otago Regional Council Regional Water Plan for Otago

Schedule 1 of the ORC Regional Plan: Water for Otago (updated to 1 July 2018) lists the natural and human use values of Otago's surface water bodies'. Schedule 1A focuses on 'natural values', which includes reference to recreation attributes of the region's rivers and lakes. Sources of data for the conclusions made are dated and limited, and include, in relation to recreation, Grindell & Guest (1986), Grindell (1984) and the 1982 draft document for Grindell (1984). These documents are reviewed later in this section of this report.

Schedule 1A identifies the following regional water bodies as having a recreation or scenic value contributing to an 'outstanding natural feature or landscape':

- Kawarau River between Lake Dunstan and Lake Wakatipu – defined as outstanding in accordance with the Water Conservation Order.
- Lake Wakatipu – defined as outstanding in accordance with the Water Conservation Order.
- Lake Wānaka – "Scenic values within the wider landscape context of the surrounding mountains, particularly the unmodified lake level, water quality and colour of the water."
- Lake Hāwea – "Scenic values within the wider landscape context of the surrounding mountains, particularly colour of the water."

The Beaumont and Rongahere Gorges are identified as an 'outstanding natural feature or landscape' of the Clutha River, but no reference is made to local recreation values. Salmon, eel and trout spawning values are identified as ecosystem values for all sections of the Clutha River, and Lakes Wānaka, Wakatipu and Hāwea. None of the water bodies in the study area are identified as regionally significant for trout (only the Pomahaka and Waipahi Rivers are so identified).

Regionally significant gamebird areas are identified on the:

- Clutha River/Mata-au /Mata-Au between Balclutha and the sea,
- Clutha River/Mata-au /Mata-Au between Island Block and Balclutha.

4.10 Sports Fish and Game Management Plan for Otago Fish and Game Region 2015-2025

The Sports F&G Management Plan for Otago Fish and Game Region, prepared by the Otago F&G Council, "provides a framework for the management of Otago's sports fish and game bird resources. The plan has a ten-year horizon and is both strategic, in outlining issues and providing long term organisational outcomes, and operational in outlining management objectives and policies." It includes an assessment of the significance of the water bodies in the study area for angling:

Hāwea River

- A regionally important trout fishery [Internal assessment by OFGC, Unwin and Brown 1998]
- Users: Local, regional, junior, commercial

Lake Hāwea

- A nationally important sports fishery [Internal assessment by OFGC, Teirney et al 1984, p 106]
- Users: Local, regional, national, international, commercial, junior

Lake Dunstan

- A nationally important sports fishery [Internal assessment by OFGC]
- Users: Local, regional, national, international, commercial, junior

Lake Wakatipu

- A nationally important sports fishery [Water Conservation (Kawarau) Order 1997, Internal assessment by OFGC; Teirney et al 1984, p106]
- Users: Local, regional, national, international, commercial, junior.

Lake Wānaka

- A nationally important sports fishery [Internal assessment by OFGC; Teirney et al 1984, p106, Hutchinson 1980]
- Users: Local, regional, national, international, commercial, junior

Upper Clutha River

- A nationally important recreational sports fishery, with particularly high angling values between the Lake Wānaka outlet and Cardrona River confluence. [Teirney et al 1984, Teirney and Jowett 1990]
- Activities: fly, spin, bait
- Users: Local, regional, junior

Lower Clutha River

- A regionally important area for sports fish, game and for angling and hunting [Local Water Conservation (Pomahaka River and Tributaries and Lower Clutha River) Notice 1989, NZ Gazette 1989, No. 212, p6032, Hughey et al 1986]
- Users: Local, regional, national, junior, commercial

The Management Plan only refers to the mid Clutha River/Mata-au in one section about sports fish populations (there is no significance assessment for this reach):

> *Fisheries in the mid Clutha have been adversely impacted by fluctuations in flow due to the operation of the Roxburgh hydroelectric dam although the extent of fluctuating flows has been moderated with the renewal of the resource consents to operate the hydroelectric scheme. The Lower Clutha fishery and river remains in good health.*

4.11 The Local Water Conservation (Pomahaka River and Tributaries and Lower Clutha River) Notice 1989 (repealed)

The repealed Local WCO for the Pomahaka River and lower Clutha River/Mata-au [from the Pomahaka confluence to the sea] (1989) noted, in relation to regionally significant features for angling:

> *3. REGIONALLY SIGNIFICANT FEATURES*
>
> *(1) It is hereby declared that the protected waters include and provide for regionally significant recreational and fisheries features in respect of the Pomahaka River and its tributaries, and in particular, that:*
>
> *(a) the upper tributaries provide for:*
>
> *- a regionally significant recreational fishery (trophy fishing of brown trout).*
>
> *- a regionally significant fish habitat (brown trout spawning and rearing).*
>
> *(b) the Pomahaka River from Switzers Bridge to its confluence with the Clutha River/Mata-au provides for a regionally significant recreational fishery-(brown trout).*
>
> *(c) the Waipahi River provides for a regionally significant recreational fishery (brown trout fly fishing).*
>
> *(2) It is further hereby declared that the Lower Clutha River/Mata-au provides for a regionally significant recreational fishery in the Pomahaka River and its tributaries by providing passage for migratory brown trout to and from the Pomahaka River and its tributaries and the sea.*

In the decision, the Tribunal offered the following description of the recreation values of the Clutha River/Mata-au below the Pomahaka confluence:

> *The applicant seeks protection of the Lower Clutha River/Mata-au primarily as a means of securing fish passage to the Pomahaka River and tributaries. Nevertheless, the evidence presented for the applicant clearly establishes the presence of a significant recreational brown trout fishery. The fishery is primarily migratory, en route to the Pomahaka River, but resident populations are present also. The National Angling Survey evaluated the lower Clutha River/Mata-au (from Roxburgh to the sea) as "regional" and "highly valued for its access, fishing opportunity, above average catch rate and popularity. The applicant reports that the reach from Balclutha to the sea at the mouths, sustains the highest angling pressure for any river reach in the Otago Acclimatisation District, both summer and winter. The winter catch rate and size of the migratory catch is indicated as being very high.*

The applicant and the New Zealand Salmon Anglers Association report the presence of the quinnat salmon fishery, developed in the lower Clutha River/Mata-au particularly since 1979 by the (then) ICI Wattie Salmon Development Project, from its hatchery at Kaitangata. Latterly, the release of salmon smolt into the river from the hatchery has been discontinued by the (now) Southland Salmon Company, thus significantly affecting the potential development of this fishery. A three year experiment is in train involving smolt releases into the Waitahuna River upstream from the Pomahaka confluence, and subsequent monitoring. No quantitative evaluation results are to hand for this fishery.

Whitebaiting is reported by the applicant as being a popular recreational fishing activity below Balclutha, although no clear evaluation of this fishery is available.

The 1981 survey by Egarr and Egarr describes the lower Clutha River/Mata-au as being of "intermediate" value for canoeing.

The wildlife habitat and recreational hunting values of the Lower Clutha River/Mata-au are based on 25 bird species that inhabit this reach, with high bird counts, particularly of waterfowl and waders. The 1986 study by the (then) Wildlife Service of the birds of the lower Clutha from Roxburgh to the sea, evaluates the importance of wildlife as "moderate-high" (mid-range in national scale). The recreational hunting of waterfowl in the lower Clutha is evaluated by the applicant as being moderate to high. No quantitative information is available.

The Tribunal explained its significance assessment for the lower Clutha thus:

The Tribunal by a majority decision is satisfied that the lower Clutha River/Mata-au is worthy of protection by a local water conservation notice because of its regionally significant recreational brown trout fishery, and because of its contributory value to the integrity of the Pomahaka fishery, through the provision of fish passage. The existence of the quinnat salmon and whitebait fisheries add to the importance of this reach for recreational fisheries values. However neither these fisheries nor the waterfowl recreational hunting values are seen by the Tribunal as being sufficiently significant in themselves to warrant specific inclusion in a local notice. But of course, the protection to be provided for the recreational fisheries in both the Pomahaka and the lower Clutha Rivers could also provide some measure of protection for other instream values.

4.12 Values of New Zealand Angling Rivers

Unwin (2013) is the report of the national implementation of the method piloted in Unwin (2009b), with slight amendments to the questions and reporting method, and with the lower Clutha River/Mata-au differentiated by salmon and trout angling – noting that one respondent angler could do both (Table 9).

The upper Clutha River/Mata-au (Wānaka to Dunstan) was ranked (out of 57 popular rivers in Otago):

- 1st for level of use,
- 19th equal for importance,
- 41st for close to home,
- 7th for close to holiday home,
- 11th equal for ease of access,
- 2nd for area fishable,

- 41st equal for scenic beauty,
- 48th equal for wilderness feeling,
- 45th equal for angling challenge,
- 6th equal for anticipated catch rate,
- 17th equal for anticipate large fish.

The Clutha River/Mata-au below Roxburgh - trout was ranked (out of 57 popular rivers in Otago):

- 2nd for level of use,
- 28th for importance,
- 24th equal for close to home,
- 22nd equal for close to holiday home,
- 7th equal for ease of access,
- 4th for area fishable,
- 44th equal for scenic beauty,
- 48th equal for wilderness feeling,
- 42nd equal for angling challenge
- 8th equal for anticipated catch rate,
- 17th equal for anticipate large fish.

The Clutha River/Mata-au below Roxburgh - salmon was ranked (out of 57 popular rivers in Otago):

- 3rd for level of use,
- 50th for importance,
- 30th equal for close to home,
- 26th equal for close to holiday home,
- 21st for ease of access,
- 16th equal for area fishable,
- 41st equal for scenic beauty,
- 53rd equal (last) for wilderness feeling,
- 36th equal for angling challenge,
- 30th equal for anticipated catch rate,
- 7th for anticipate large fish.

The Hāwea River was ranked (out of 57 popular rivers in Otago):

- 7th for level of use,
- 46th for importance,
- 45th equal for close to home,
- 4th for close to holiday home,

- 16th equal for ease of access,
- 13th equal for area fishable,
- 39th for scenic beauty,
- 46th equal for wilderness feeling,
- 55th equal (last) for angling challenge,
- 30th equal for anticipated catch rate,
- 31st equal for anticipate large fish.

The Kawarau River was ranked (out of 57 popular rivers in Otago):

- 23rd for level of use,
- 33rd equal for importance,
- 12th for close to home,
- 31st for close to holiday home,
- 30th equal for ease of access,
- 37th equal for area fishable,
- 21st equal for scenic beauty,
- 29th equal for wilderness feeling,
- 42nd equal for angling challenge,
- 11th equal for anticipated catch rate,
- 17th equal for anticipate large fish.

Table 9: Values of New Zealand angling rivers - Otago. Source: Unwin 2013.	**Total responses**	**Mean Enjoyment Score**	**Close to home**	**Close to holiday home**	**Ease of access**	**Area of fishable water**	**Scenic beauty**	**Wilderness feeling**	**Angling challenge**	**Anticipate good catch rate**	**Anticipate large fish**	**Other**
Clutha River/Mata-au (Wānaka to Lake Dunstan)	191	2.42	15%	25%	45%	51%	17%	3%	19%	26%	7%	4%
Clutha River/Mata-au (below Roxburgh - trout)	169	2.24	25%	13%	48%	44%	15%	3%	20%	25%	7%	3%
Clutha River/Mata-au (below Roxburgh - salmon)	115	1.83	22%	11%	37%	35%	17%	0%	23%	12%	15%	3%
Hāwea River	83	1.98	13%	35%	42%	35%	22%	5%	8%	12%	4%	10%
Kawarau River	30	2.2	43%	10%	30%	20%	43%	20%	20%	23%	7%	0%
Mean (all Otago Rivers)	**39**	**2.31**	**27%**	**13%**	**31%**	**25%**	**37%**	**24%**	**27%**	**14%**	**7%**	**4%**
Mean (all NZ rivers)	**41**	**2.38**	**27%**	**10%**	**33%**	**29%**	**32%**	**25%**	**32%**	**16%**	**8%**	**4%**

Comments that were included as “other” (for which the Hāwea River received relatively many) were not attributed in the report to any specific river.

4.13 Attributes Characterising River Fisheries – pilot survey

Unwin (2009b) updated the survey methodology used in the national angler surveys of the 1979/81 season (Richardson *et al* 1984, for example) and re-applied it to the Otago and Nelson/Marlborough F&G regions as a pilot study. Respondents were contacted by telephone and asked to nominate any rivers they had fished over the previous three years. They were then read a list of eight attributes (e.g., close to where you live, scenic beauty, anticipation of catching a large fish), and asked to identify the three most important attributes for each river they had fished. They were also asked to rank the importance of each river on a 1-5 scale, and to nominate any other attributes which they considered important but were not included in the survey.

The five-point importance scale was presented thus:

1. *This fishery can provide enjoyable angling, but is not exceptional;*
2. *This fishery often provides enjoyable angling, but is not exceptional;*
3. *This fishery consistently provides enjoyable angling;*
4. *This fishery provides a very enjoyable angling experience, and is one of my personal favourites;*
5. *This fishery provides an exceptional angling experience, and has few peers.*

Sixty-nine Otago rivers were identified in the pilot study, but only 23 were fished by ten or more respondents (and did not include the Hāwea River). The data below represent the results from only those 23 (base figures are shown in Table 10):

The upper Clutha River/Mata-au was ranked (out of 23 popular rivers in Otago):

- 1st for level of use,
- 7th for importance,
- 11th for close to home,
- 2nd for close to holiday home,
- 10th equal for ease of access,
- 15th for area fishable,
- 16th for scenic beauty,
- 20th for wilderness character,
- 5th for anticipated catch rate,
- 13th for anticipate large fish.

The lower Clutha River/Mata-au was ranked (out of 23 popular rivers in Otago):

- 2nd for level of use,
- 9th for importance,
- 8th for close to home,
- 8th for close to holiday home,
- 11th equal for ease of access,
- 5th for area fishable,

- 19th for scenic beauty,
- 21st for wilderness character,
- 13th for anticipated catch rate,
- 9th for anticipate large fish.

Table 10: Relative value of popular Otago rivers for nine attributes. Source: Unwin 2009b.	Total responses	Importance (5 point scale)	Close to home	Close to holiday home	Ease of access	Area of fishable water	Scenic beauty	Wilderness character	Anticipated catch rate	Anticipate large fish
Clutha River/Mata-au (upper)	117	3.52	0.55	0.32	0.66	0.38	0.36	0.05	0.49	0.14
Clutha River/Mata-au (lower)	79	3.5	0.62	0.16	0.66	0.51	0.31	0.06	0.4	0.25
Kawarau River	23	3.27	0.75	0.17	0.67	0.41	0.37	0	0.32	0.09
Mean (all Otago Rivers)	**30**	**3.32**	**0.52**	**0.14**	**0.57**	**0.38**	**0.45**	**0.22**	**0.37**	**0.21**

4.14 New Zealand Recreational River Use Study

Galloway (2008) reported on the findings of a survey of individuals who recreate on and around rivers in New Zealand (New Zealand Recreational River Use Study). Individuals were invited to participate in an internet survey via direct contact at river recreation-related events and electronically via a range of related web sites, group membership, internet bulletin boards, magazines and newspapers. Just over 1300 respondents completed the survey which ran from October 2007 to March 2008.

Twenty-three activities were represented in the data, and the dominant respondents were white water kayakers, anglers and multisporters. Respondents were grouped into four broad activity groups: Boating (non-motorised) (55.4%), Fishing (21%), Boating (motorised) (2.4%), and Shore-based (21.2%).

The survey was designed to evaluate respondents' motivations and site preferences, in relation to their level of specialisation in their activity. It was not designed to ascribe values to defined reaches of rivers throughout New Zealand. A list of 1,043 rivers was compiled and respondents were asked to indicate up to ten rivers that they had last visited, and the next ten that they wished to visit. This provides a snapshot, rather than a complete picture of the respondents' experiences and views. A total of 4921 rankings was provided for 513 rivers. Rivers ranked more than 100 times include the Waimakariri (227), Tongariro (191), Buller (154), Hurunui (128), Kaituna (118), Mohaka (116), and Clutha (113) (55% boating non-motorised, 27% fishing, 15% shore based and 3% boating motorised). The Kawarau River was ranked 65 times (almost all boating non-motorised) and the Hāwea 30 (almost all boating non-motorised).

For each visited river, respondents were asked to rate its scenic beauty, wilderness feeling, degree of challenge, and opportunity to develop Whanaungatanga / companionship, on a 9-point Likert scale, with 1 being the lowest and 9 the highest ranking. The question was phrased generally, and therefore is not able to take into account the different values supported by different reaches of each

river. At best, it provides a general, broad brush impression of the values ascribed to the whole river, compared to the general values ascribed to other rivers. While 513 rivers were identified by respondents as of recreational value, insufficient responses were gained from most of those to support further analysis for these values.

The Clutha River/Mata-au was ranked (out of 71 rivers):

- 47th for scenic beauty (a mean of 6.06 within a range of 3.05 for the Avon River to 8.6 for the Arahura River),
- 58th for wilderness feeling (a mean of 4.99 within a range of 2.0 for the Avon River to 8.38 for the Whataroa River),
- 52nd for challenge (a mean of 5.11 within a range of 3.1 for the Avon River to 7.8 for the Ruakituri River), and
- 50th for companionship feeling (a mean of 4.99 within a range of 3.25 for the Hinemaiaia River to 6.82 for the Waitaha River).

The Hāwea River was ranked (out of 71 rivers):

- 60th for scenic beauty (a mean of 5.75 – same ranges as above),
- 66th for wilderness feeling (a mean of 4.37),
- 59th for challenge (a mean of 4.74), and
- 44th for companionship feeling (a mean of 5.7).

The Kawarau River was ranked (out of 71 rivers):

- 27th for scenic beauty (a mean of 6.9 – same ranges as above),
- 41st for wilderness feeling (a mean of 5.67),
- 25th for challenge (a mean of 6.06), and
- 45th for companionship feeling (a mean of 2.19).

Respondents were asked to indicate the importance of selected site values in general terms (not specific to any river). The highest rated items were 'clean and unpolluted river water' and 'wilderness character' and 'scenic beauty'. The lowest rated items were the availability of a car shuttle service, and the presence of bathrooms, changing rooms, showers, etc. Large differences were reported in terms of how important the four groups rated the importance of preferred site values. Wilderness values were highest rated among all activity use groups, and facility values lowest. The Fishing group placed significantly greater importance on wilderness values than the other three groups. The Boating (non-motorised) group placed greater importance on social-skill values than the other groups.

4.15 Contact Energy Limited reconsenting 2004

To advise the reconsenting of Contact's assets and operations, Greenaway (2004) presented as Environment Court evidence an assessment of significance for recreation by activity and setting on Lakes Dunstan, Wānaka, Hāwea and Roxburgh and the upper and lower Clutha River/Mata-au and Kawarau River, including a review of how the hydro scheme had affected each setting (Table 11). A full description with photos for most settings is included in Appendix 2. In retrospect, the author of this report (and that evidence) still feels reasonably comfortable with that review, but would be likely to push significant assessments to the higher option where he equivocated, and would note – as he

does in this report – that the combination of activities indicates national significance for recreation and tourism *in toto* for each setting.

Table 11: Recreation settings and opportunities within the study area – Greenway 2004		
Activity	**Location**	**Effect of scheme, significance**
Swimming (areas with specific facilities only – almost all parts of the area with access offer swimming sites)	Lake Dunstan: Bannockburn, Cromwell foreshore, Lowburn Harbour, Burton Creek.	Provided as part of scheme, Regional
	Lake Hāwea swimming area immediately west of dam.	
	Mackenzie Beach, Lake Roxburgh	Provided as part of scheme Local
Windsurfing	Northburn, Lake Dunstan (noting many other locations on the Clutha Arm are also suitable)	Provided as part of scheme Local
Water skiing, biscuiting (formal ski lanes only - the activity occurs throughout the lakes)	Lake Dunstan: McNulty's Inlet, Lowburn Harbour, Northburn.	Provided as part of scheme Regional
Boating (formal launching sites only).	Lake Dunstan: Bannockburn ramp, Crippleton ramp, Cromwell boat ramp and jetties, McNulty's Inlet ramp and jetties, Champagne Creek ramp, Lowburn Harbour ramp, and jetties, Lowburn Inlet, Northburn ramp, Bendigo ramp, Burton Creek ramp and jetties, Dairy Creek ramp and jetties, Richards Bay ramp.	Provided as part of scheme Regional
	Clutha River/Mata-au above Hāwea confluence	Unaffected Regional
	Alexandra, Clutha River: Rotary Park.	Modified Regional
	Roxburgh Dam ramp and jetties	Provided as part of scheme Regional
Fishing (trout and salmon)	Lake Hāwea	Modified Regional
	Hāwea River	Modified Regional
	Upper Clutha River/Mata-au	Modified Regional / National
	Kawarau River	Modified (landlocked fish) Local / Regional
	Lake Wānaka	Modified (landlocked fish) Regional / National
	Lake Dunstan	Provided as part of scheme Regional / National
	Lake Roxburgh	Provided as part of scheme Local / Regional
	Clutha River/Mata-au below Roxburgh	Modified Regional

Table 11: Recreation settings and opportunities within the study area – Greenway 2004		
Activity	**Location**	**Effect of scheme, significance**
White-baiting	Clutha River/Mata-au below Roxburgh	Possibly modified Regional
Rafting	Clutha River/Mata-au below Hāwea Confluence	Modified Regional / National
	Kawarau River below Scrubby Stream	Modified Regional / National
Rowing	Dunstan Arm Rowing Club (Burton Creek)	Provided as part of scheme Regional
Kayaking	Sargoods Weir	Lost National
	Cromwell Gap	Lost Regional / National
	Hāwea River	Modified Regional / National
	Clutha Gorge	Lost Regional / National
	Clutha River/Mata-au below Hāwea River	Modified Regional
	Lake Dunstan (flatwater)	Provided as part of scheme Regional
	Clutha River/Mata-au below Roxburgh	Modified Regional
	Kawarau River below Scrubby Stream	Modified National
River boarding / sledging	Kawarau River below Scrubby Stream	Modified Regional / National
	Hāwea River	Modified Regional / National
	Clutha River/Mata-au above lake Dunstan	Modified Regional / National
Picnic, passive (formal managed sites only)	Lake Dunstan: Bannockburn, Cromwell foreshore, Lions, Northburn, Lowburn, Rocky Point, Bendigo, Dead Man's Point, Crippletown, Dairy Creek, Lowburn, Burton Creek, John Bulls, McNulty Inlet, Jacksons	Provided as part of scheme Regional
	Hāwea River (DoC reserve)	Modified Regional
	Lake Hāwea, many sites	Modified Regional
	Lake Roxburgh: McKenzies Beach, few other sites	Provided as part of scheme Local / Regional
Walking (major walkways only)	Riverside to Drs Point, Lake Roxburgh	Post scheme Local / Regional

Table 11: Recreation settings and opportunities within the study area – Greenway 2004		
Activity	**Location**	**Effect of scheme, significance**
	Alexandra to Clyde	Post scheme Local / Regional
	Cromwell to Bannockburn	Post scheme Local / Regional
Cycling / mountain biking	Round Lake Dunstan	Post scheme Regional
	Alex to Clyde (rail trail circuit)	Post scheme Regional
	Doctors Point	Post scheme Regional
Jet boating (river)	Clutha River/Mata-au below Hāwea River	Modified Regional
	Clutha River/Mata-au below Roxburgh	Modified Regional
Education (formal structures only)	Cromwell College Education Centre, McNulty Inlet, Lake Dunstan	Post scheme Regional

4.16 Sustainable Water Programme of Action (MfE)

The Ministry for the Environment (MfE) has completed several national reviews of the sustainable management of water bodies to advise government policy. Various studies have been commissioned by MfE to identify and quantify various freshwater values, and a process of consultation completed. Three studies commissioned by MfE are relevant to this exercise.

4.16.1 Water bodies of national importance for recreation

All water bodies in the study area, besides the Hāwea River and Lake Roxburgh, were identified as 'potentially nationally significant for recreation values' by the Ministry for the Environment (MfE) within the report, *Potential Water Bodies of National Importance for Recreation Value* (2004a). Lake Hāwea was identified for only 'scenic values' relating to tourism.

The MfE study is based on a weak methodology and its findings are open to challenge – noting that MfE's report is designed to be a catalyst for discussion rather than provide a conclusive analysis.

Five criteria were used to identify potentially national significant water bodies:

- *That the National Angler Survey results for the 2001/02 and/or 1994/96 showed at least 10,000 angler days for the wate rbody*. The Clutha River/Mata-au exceeded this threshold for each section, also Lakes Wakatipu, Wānaka, Hāwea and Dunstan.
- *Of a national telephone survey (Fink-Jensen et al 2004a) of just over 1000 'freshwater recreational users' at least ten*[32] *respondents had to report use of a water body*. Lake Taupo topped the list with 250 references, the Waikato River 36 and the Whanganui River 16. For most water bodies this represents a very small sample from which to draw any conclusions. Also, the response rate for the survey was only 21.5%, so the sample cannot be considered

[32] The MfE report states 'over 10 people' as a measure in its text (p9), but uses ten (more than nine people) as the threshold in its summary table which presents the relevant rivers.

to be random. Lake Wakatipu gained 52 responses[33] (the 3rd most frequently mentioned water body nationally), Lake Wānaka 47[34] (4th nationally), the Clutha River/Mata-au 16[35] (20th) and Lake Hāwea 12[36] (26th). The Kawarau River and Lake Dunstan were not identified in the telephone survey.

- Selected recreation groups were requested to respond to an internet-based survey to identify significant water bodies (Fink-Jensen et al 2004b). The threshold was a mention of a water body by more than ten people. Canoeists and kayakers were reported by MfE to be well-represented in this survey. The Clutha River/Mata-au gained 13 responses (17th nationally), with canoeing or kayaking, fishing and swimming cited as recreational uses. Lake Wānaka gained 19 responses (10th nationally) with canoeing or kayaking, fishing, jet boating, tramping, water skiing, wake boarding, windsurfing and yachting identified. The other water bodies were not identified in the internet survey.
- *The presence of a water conservation order* – applicable only to the Kawarau River and Lake Wakatipu.
- *Reporting of significance for whitebaiting by a number of key informants.* The Clutha River/Mata-au was not listed.

4.16.2 Waters of national importance for tourism

The Ministry of Tourism used the results of their International Visitor Survey (IVS) (2002 data) and Domestic Travel Survey (DTS) (2001 data) to describe how tourists use freshwater resources in New Zealand, and to locate their activities (Ministry of Tourism, 2004).

For international tourists, the Ministry identified the top eight locations of importance for freshwater-based activities undertaken by international visitors, including those locations where more than 20,000 visitors participated in the activity in 2002. The regions in decreasing order of importance were:

1. Queenstown	4. Taupo	7. Hanmer Springs
2. Waitomo	5. Te Anau	8. Auckland
3. Rotorua	6. Christchurch	

The assessment identified, in Queenstown Lakes Wānaka ("predominately for scenic cruises and sitting on the foreshore"), Wakatipu ("predominately for scenic cruises and sitting on the foreshore") and Hāwea ("predominantly used for jet boating, swimming and fishing"). There is an error in the report relating to Lake Hāwea where it is classed as having important on-water values, and then it is also purely for scenic values based on it not having been considered important for on-water values). The Kawarau River ("predominately used for jet boating and white water rafting") and the Clutha River/Mata-au ("predominantly used for jet boating and fishing") were also identified as potentially nationally significant. The assessment presumably applies only to the upper Clutha River/Mata-au (in the "Queenstown" area).

The data from the DTS showed parallels between international and domestic visitors and their preferred freshwater locations. The Ministry selected the top four locations from the DTS data, as

[33] Canoeing or kayaking 6, Fishing 6, General sightseeing 2, Jet boating 2, Picnicking 2, Swimming 9, Tramping 12, Walking 3, Water skiing, wake boarding 6, Windsurfing 1, Other 5
[34] Canoeing or kayaking 6, Fishing 10, Jet boating 5, Tramping 12, Water skiing, wake boarding 6, Yachting 2, General sightseeing 3, Picnicking 12, Swimming 12, Walking 2
[35] Canoeing or kayaking 2, Fishing 15, General sightseeing 11, Picnicking 13, Walking 24, Water skiing, wake boarding 14, Yachting 8, Other 1
[36] Fishing 20, General sightseeing 11, Picnicking 12, Tramping 12, Walking 14

these were the only statistically significant locations. The top locations for freshwater activity by domestic tourists did not include Otago and were:

1. Taupo 2. Hamilton/Waikato 3. Auckland 4. Rotorua

4.16.3 Waters Programme of Action: Potential water bodies of national importance. Technical Working Paper

This report summarises the findings of a variety of studies into the significance of the nation's waterways, including the two studies listed above (although the technical report apparently pre-dates those).

The technical report notes the following 'assumptions and limitations' in the method applied to identifying water bodies of potential national significance for recreation:

- *Some of the initial list (survey, angling and whitebaiting information) is based on numbers of people using water bodies for recreational activities. This approach assumes there is a correlation between the number of people who visit a water body and its value for recreation. Under this approach the very special and remote places that are not highly visited may be under represented.*
- *Some of the initial list is based on dated reports or unclear information.*
- *Comparison across the different sources of information may not be a valid approach.*

The technical report listed, as of potential national significance for recreation and for tourism in Otago: Lake Wānaka; Clutha River; Lake Wakatipu; Shotover River; Kawarau River; Lake Hāwea (for only scenic value); Lake Dunstan (for only scenic value); and Lake Hayes. There are therefore some inconsistencies with the antecedent reports.

The technical report notes the following 'assumptions and limitations' in the method applied to identifying water bodies of potential national significance for tourism:

- *Assumptions were made about the actual water bodies visited based on the location and the type of activity undertaken, and from discussions with regional tourism organisation representatives, local councils and tourism operators.*
- *The list does not include water bodies that may be nationally important for tourism outside of the nine regions identified by the International Visitor Survey and Domestic Travel Survey, with the exception of those identified for their scenic values.*
- *Information is based on 2002 data for the International Visitor Survey and 2001 data for the Domestic Travel Survey.*
- *The list does not include water bodies that may be of national importance for tourism in the future.*
- *The economic value of tourism for individual water bodies has not been determined.*

4.17 National Angler Surveys

Fish & Game NZ carry out national surveys of angler activity ever 6 or 7 years. The national-level research from 1979 to 2015 is summarised in section 3.5 of this report. For completeness, detail from the earliest studies – which were carried out at regional levels – is summarised here.

Richardson *et al* 1984 and Richardson *et al* 1986 surveyed angling effort, angler origin and values. Richardson *et al* 1984 stated, in relation to the lower Clutha River:

> *Below Roxburgh the lower Clutha was fished mainly by anglers from the Otago District, and it was the second most heavily fished river by Otago anglers. However, anglers were recorded from throughout the South Island, particularly Southland and Canterbury, as well as from Auckland. The trout fishery was the major attraction; it received nearly four times as much effort as the salmon fishery and was ranked ahead of the salmon fishery in terms of overall importance. Several anglers commented on the large sea-run brown trout which are caught near the mouth of the Clutha.*
>
> *Respondents thought the lower Clutha had good access, an abundance of fishable water, and an average to good catch rate. Neither scenic beauty nor solitude were rated particularly highly. Artificial spinners were the most popular lure used; though nearly 50% of trout anglers used live bait. Virtually all salmon anglers fished with a spinner, but a substantial minority (over 20%) also used live bait. This contrasts with the major salmon fisheries of the Canterbury rivers, where anglers use spinners almost exclusively. Picnicking was virtually the only other activity combined with angling; nearly 50% of respondents indicated that they included picnicking with their fishing visits.*
>
> *Many anglers noted other aspects of the lower Clutha. Four comments were received about access being hampered by locked catchment board gates and extensive willow growth, and three comments were made about the speed of boats and water skiers. In general, anglers stressed the positive aspects of the fishery. Their comments included:*
>
> *- great river*
>
> *- poor fishing due to fluctuating flows*
>
> *- excellent winter fishing*
>
> *- limit bags on 90% of my visits*
>
> *- good evening rise*
>
> *- fish hard to catch*
>
> *- excellent for thread line*
>
> *- good at the right time*
>
> *- mouth is good value.*
>
> *Although the lower Clutha does not qualify as a nationally important angling river based on the criteria developed by Teirney, Unwin, Rowe, McDowall, and Graynoth (1982), it is clearly of at least regional significance to anglers from throughout the lower half of the South Island. Despite the fluctuating flows from hydroelectric developments upstream, and extensive abstraction of many of its tributaries, the lower Clutha supports an important angling resource….*
>
> *The two most heavily fished rivers in Otago were the Taieri River and the lower Clutha River. Although neither of these met the criteria for fisheries of national importance, both are of major importance to Otago anglers…. The lower Clutha was also valued for its convenience to anglers rather than for its high quality fishery. The river supports sea-run sticks of brown trout and quinnat salmon, both of which contribute to its value. We consider that the Taieri and lower Clutha fisheries should be recognised as being of regional importance.*

Richardson *et al* 1986 noted, in relation to the upper Clutha River, which was found to be nationally significant for angling (and the only river in the study area to be defined as significant in any way (even locally)):

> *The Clutha originates from Lake Wānaka and is New Zealand's largest river in terms of mean annual flow.… Between Cromwell and Alexandra, the Clutha is seldom fished owing to turbid water, poor access, and apparently low fish stocks (Glova and Davis 1981)….*
>
> *Between Lake Wānaka and Cromwell the Clutha is a clear, swiftly flowing river and attracted the most visits of any river in the district. When data from external anglers was combined with that of internal respondents, it was estimated the upper Clutha received 13,000 visits annually by adult whole season licence holders (Teirney et al. 1982). However, part-season and junior licence holders are also likely to make a substantial contribution.*
>
> *Characterised by good access and an extensive area of fishable water, the upper Clutha also provided anglers with pleasant surroundings and the opportunity of fishing in peace and solitude. Apart from the Greenstone and Hunter Rivers, the upper Clutha had one of the best catch rates in the catchment. The most popular stretch of the upper Clutha was from the lake outlet to the Cardrona mouth, where road access is readily available to either bank. A drift dive survey of this reach has confirmed a high fish density per km (B.J. Hicks pers. comm.). Fish in this section of the upper Clutha are also thought to be slightly larger than those further downstream (Anon. 1975), a characteristic shared by other nationally important lake outlet trout fisheries such as the Tarawera River, or the Hurunui River below Lake Sumner (unpublished survey data).*
>
> *Fifty-four respondents from nine other acclimatisation societies, from both North and South Island, also visited the upper Clutha. They came mainly from the neighbouring societies of Otago and Southland and usually fished near the lake outlet. The seven factors which contribute to the angling experience were assessed similarly by both visitors and local anglers, who agreed that the upper Clutha offered an exceptional angling experience. However, angling method varied somewhat. Anglers from the SLWC* [Southern Lakes Wildlife Conservancy] *preferred spinners,, after which wet and dry flies were the most popular, whereas visiting anglers employed these three types of lure, as well as nymphs, about equally. Enjoying the scenery, picnicking,. camping, and swimming were popular activities with both groups of anglers.. Comments relating to the upper Clutha included:*
>
> - *I'm concerned about the number of locked gates between Wānaka and Cromwell which stop access*
> - *very few small fish*
> - *good fast water stretches*
> - *becoming inaccessible without a set of pruners due to growth of roses*
> - *too many willows*
> - *access becoming impossible because of increasing numbers of willows and manuka probably caused by fluctuations in water level caused by Hāwea dam*
> - *no catch yet*
> - *good fishing*
> - *enjoy fishing this river while camping at Wānaka*

- hydro dam must not be allowed to affect this section.

….Anglers in the SLWC are fortunate in having access to a wide variety of angling rivers, including some of the best in New Zealand. The availability of excellent angling opportunities in several catchments, including numerous lakes and lake-fed rivers such as the upper Clutha, means that some fishing water is always available, regardless of weather. Five of the rivers discussed in this report (upper Clutha, Eglinton, Hunter, and Greenstone/Caples) have been identified as supporting fisheries of national importance (Teirney et al 1982). Only 16 South Island rivers qualify for nationally important status and 3 of these are principally salmon fisheries. Therefore, SLWC is remarkably well endowed with high quality river fisheries….

The high regard SLWC anglers have for the upper Clutha is clearly shown by the survey results. It attracted over 50% of the respondents, and 33% of the total fishing effort, and was said to offer an exceptional angling experience. Its attraction to anglers from throughout the South Island is also notable and these attributes clearly grant the upper Clutha a place among New Zealand's most important trout fisheries.

Richardson *et al* 1986 described the Kawarau River as "not … an important trout fishery, [but] it is heavily used by canoeists, rafters, and jet boaters, including a number of commercial firms."

The Hāwea River was described thus:

The Hāwea flows for only 16 km from Lake Hāwea to the upper Clutha. A 22-m-high dam at the lake outlet controls the flow in the Hāwea, and as a result, discharge varies markedly depending on demand at Roxburgh. Most of the time, the river tends to be low and is braided in places, particularly where it joins the Clutha. Angling use of the Hāwea was fairly high; it attracted the third highest number of visits within SLWC and 30 respondents from other societies, mainly Otago, but most other South Island districts as well.

Access to the Hāwea was quite easy and this was reflected in the high frequency of visits it sustained from both internal (6.5 visits per angler) and external (5.1 visits per angler) respondents. In all other respects, except size of fish, outside respondents' assessments of the Hāwea were superior to those of SLWC, but generally none of the Hāwea's attributes stood out. Both groups of respondents judged the catch rate as fairly low, but preferred different fishing lures. Nearly 75% of the SLWC anglers used spinners, then dry (53%) or wet (27%) flies, whereas only 37% of the external respondents used spinners, and dry (53%) and wet (47%) flies were nearly equal in popularity among external respondents. The middle reaches were the most fished by both groups, but the area below the dam also attracted over 50% of the anglers. Respondents comments appear to indicate that hydro-electric development has negatively affected the Hāwea fishery though it is still a fairly popular river. Comments included; - spoilt by hydro development

- don't drink the water

- concerned about jet boating and rapid influxes of water level caused by the Hāwea dam

- fluctuations due to hydro storage have ruined the normality of fishing here

- hydro dam fluctuations have affected fishing

- height variations thru hydro dam operations have greatly affected this river for fishing

- have caught occasional salmon but not actually fishing for them.

4.18 National inventory of wild and scenic rivers

In 1982 the National Water and Soil Conservation Authority released a draft inventory of wild and scenic rivers and sought submissions. A resulting document was published in 1984 (Grindell 1984), which provides a list of what were considered to be "*nationally important wild and scenic rivers*". A total of 43 rivers were identified in the South Island. The Clutha River/Mata-au was not identified, although many of its tributaries were, including the Pomahaka.

The Ministry of Agriculture and Fisheries made a substantial submission to the draft inventory in relation to freshwater angling values (Tierney *et al* 1982). The recommendations made in this document were based on the national anglers surveys carried out between 1979 and 1981. The Clutha River/Mata-au was recommended as nationally significant for its recreational fishery values. The report predated the Clyde Dam and so divided the River above and below the Roxburgh Dam, finding it regionally significant below this point and nationally significant above, but most especially upstream of the Kawarau confluence (as it was at the time). The authors also proposed a 'provisional' list of nationally important lakes containing salmonid fisheries, including Lakes Hāwea and Wānaka.

4.19 A list of rivers and lakes deserving inclusion in a Schedule of Protected Waters

In 1986 the Protected Waters Assessment Committee released its recommendations for a, "*list of those lakes and rivers which the committee commends as suitable for inclusion in a Schedule of Protected Waters*" (Grindell and Guest 1986). The intention of the study was to advise the then Ministers of Works and Development and Conservation of, "*those waters deserving inclusion in a schedule of Protected Waters that can be attached to the Water and Soil Conservation Bill.*"

The Committee's analysis built on the *National Inventory of Wild and Scenic Rivers* (Grindell 1984), but expanded the scope of assessment from that study's limit of wild, scenic, recreational and scientific values to include, in addition: fisheries, wildlife habitat, flora, tourism and cultural values.

The Committee developed a three tier classification (groups one, two and three) to define an order of importance for the waters identified as outstanding. In terms of including the waters in a schedule of protection (p12), "*anything less than the first group would provide an inadequate representation. If the Schedule should be bigger, then the second group should be used for making a selection. If the two together are insufficient then the third group should be used for making a selection*."

The Clutha River/Mata-au was not identified at all, but the Kawarau was as a Group One river ("a major resource for rafting and boating"). Lake Wakatipu was also recognised in Group One, with the review: "Along with Taupo and Rotorua, [Lake Wakatipu] is one of New Zealand's most important tourist lakes. The scenic values deriving from the Remarkables and the Main Divide, the recreational values of fishing and boating, including scenic steamer trips and historic values of goldrush and pastoral homesteads, are attractions for the enormous numbers of overseas tourists. It, together with the Shotover and the Kawarau, make the area an outstanding experience for any visitor."

In terms of recreational values, the relevant assessment procedure for identifying an outstanding water body was well-outlined (p7). This process was drawn, in the main, from the approach used in the *National Inventory of Wild and Scenic Rivers*:

> *"This category includes those rivers where the existing water regime plays an essential and dominant role in providing an outstanding recreational experience or range of experiences. An area which has an unrealised potential for providing an outstanding amenity may be considered. While the surrounding landscape may contribute significantly to those experiences the water, the river or lake bed and possibly a narrow riparian strip are the*

crucial elements for the recreational value. The recreations are mainly instream use (angling, jetboating, canoeing, packfloating, etc) but this committee recognised that picnickers, etc, also went there because of the water, not in spite of the water. An area may be considered outstanding because of one or more of a number of characteristics. It may provide a wide variety of recreational experiences and be used often by people within and, to an extent, outside its region. Or its present level of use may be low but provide an exceptional type of recreational experience, possibly requiring advanced skills so that people from other regions or overseas travel to the area to use it.

"Summary of characteristics

A The characteristics vary and largely reflect the recreational uses for which the river is outstanding.

B The river satisfies the recreational needs of a large number of people, or constitutes an amenity for a wide variety of recreational activities, or provides an outstanding recreational experience.

C A river in this category may be under-utilised at present but have potential for varied, intensive or specialised use.

D The area may be readily accessible, frequently by road. The surrounding land may show signs of human activity and settlement.

E The water may be subject to some minor diversions and there may be some development such as bank protection works, but not to the extent that the river regime is controlled.

F While there may be some waste discharges, the water will usually be of a quality compatible with the recreation activities.

"Rivers are the focus of a great variety of recreational activities. A range of recreational facilities for present and future recreationists must be protected throughout the country.

A Wilderness and expedition type facilities : generally wild and scenic rivers of sufficient size to permit a range of recreational values.

B White water : essential for whitewater rafting, canoeing, jetboating.

C Placid water : essential for boating activities where coastal waters unsuited to boating.

D Small urban streams : close to populated areas for general recreation and picnicking.

E Routes as access and as a form of recreation."

4.20 New Zealand Recreational River Survey

Although almost 30 years old, the New Zealand Recreational River Survey (Egarr & Egarr 1981) is often quoted in recreation assessments as it is the only national analysis of recreational river values available based on actual site visits. As a result of the increased use of plastic kayaks, the growth of commercial rafting and the development of creek boating, many of the assessments made in the study are out-of-date. However, they can assist when identifying the significance of a waterway at a national scale.

The survey grouped river sections according to four categories:

Category A: All rivers with:
Exceptional recreational value and exceptional scenic value.

Category B: All rivers with:
Exceptional recreational value and impressive scenic value,
High recreational value and exceptional scenic value.

Category C: All rivers with:
Exceptional recreational value and picturesque scenic value,
High recreational value and impressive scenic value,
High recreational value and picturesque scenic value,
Exceptional recreational value and moderate scenic value.

Category D: All rivers with:
High recreational value and moderate scenic value,
Intermediate recreational value and exceptional scenic value,
Intermediate recreational value and impressive scenic value,
Intermediate recreational value and picturesque scenic value.

The Clutha River/Mata-au assessment predated the Clyde Dam. Those sections of river which remain, and relevant data include:

- Wānaka to Lowburn: Excellent jet boating and drift boating opportunity. Frequently used for rafting. Popular for canoeing and kayaking. Not used much for pack floating or swimming. Impressive scenic values and High recreation values.
- Roxburgh to Beaumont: Power boating possible, used a great deal for jet boating, used often for drift boating and rafting but not of great value due to lack of white water, kayaking and canoeing easy for beginners but not used much, unused for pack floating and some local swimming where there is less current. Picturesque scenic values and Intermediate recreation values.
- Beaumont to Balclutha: Navigable to Pomahaka and Tuapeka Mouth by power boats and used often, one of the heaviest used sections of River for jet boating, becoming more popular for drift boats and rafting with an annual raft and canoe race above Pomahaka, much use by canoes and kayaks and excellent for novices, unused for pack floating, unknown swimming use. Moderate scenic values and High recreation values.

The Kawarau River was assessed as having Impressive scenic values and Intermediate recreation values – the assessment predated the running of the Nevis Bluff Rapids by modern kayaks (they were considered unnavigable at the time).

The Hāwea River was assessed as having ‘Uninspiring’ scenic values and ‘Low’ recreation values. The assessment noted: “There is a dam at the lake outlet which controls the flow, as the lake is used as a holding basin for the Roxburgh Hydro Scheme. The river tends to be low most of the time and is braided in places, particularly as it joins the Clutha. Large rocks and boulders litter the bed providing some small rapids when the river is flowing high. The river banks are gravel and are free of willows and snags.” Also noted for canoeing and kayaking was: “Not used greatly as the Upper Clutha is better and much preferred. Before the control dam was built the river often used to flow with a far greater volume and there was good, fast, white water with large pressure waves.”

Lakes were not assessed.

4.21 NZ Canoeing Association 64 NZ Rivers

In 1979 the NZ Canoeing Association published a national assessment of the scenic values of 64 rivers with recreation values (Egarr *et al* 1979). The assessment considered seven scenic qualities: vegetation, banks and riverbed, landscape, wilderness quality, water quality, water movement and 'other qualities'; and ranked each attribute by river section using a five point scale (0 = dull and 5 = exceptional). An 'exceptional' river was identified when it gained a score of 16 or more, and included the Clarence, Kawarau, Hollyford, Grey and the Buller in the South Island. The Clutha River/Mata-au was assessed in five sections (Table 12), with the upper River scoring more highly than the lower, and the Kawarau as one section.

Table 12: Clutha River/Mata-au scenic evaluation (Egarr et al 1979)	**Vegetation**	**Banks and Riverbed**	**Landscape**	**Wilderness quality**	**Water quality**	**Water movement**	**Other qualities**	**Total**
Lake Wānaka to Lindis	2	2	3	1	2	1		11
Lindis – Deadmans Point	2	2	3	1	2	2	1	13
Cromwell Gap and Dunstan Gorge	1	3	2	2	1	3	2	14
Roxburgh Dam – Pomahaka	2	2	2	1	1	1		9
Pomahaka – Sea	1	1	2	1	1	1		7
Kawarau	1	4	3	2	1	4	1	16

5 Interview summaries by activity

This section presents full summaries of interviews with recreational users of the study area. The focus is on those water bodies with controlled or modified hydrological regimes. Each interview has been reviewed and confirmed by the interviewees and were carried out between July and November 2018.

5.1 Kayaking, rafting and surfing

5.1.1 Russell Godfrey, Otago Canoe and Kayak Club

The Otago Canoe and Kayak Club is based in Dunedin and uses a variety of rivers in Otago. The Clutha and Hāwea Rivers are one of several of interest in the area.

The lower Clutha River/Mata-au between Millers Flat and the Beamount Bridge at lower flows and with the right precautions can be a reasonable beginners' river. The Club uses this section generally for day trips two to three times a season. Generally most flows tend to be ok as features come and go. However, Russell was unsure if he had paddled it at flows over 800 m^3/s, and at flows over 1000 m^3/s suspects most of the interesting water would be washed out or would be too pushy / powerful for less experienced paddlers.

The Club has used the Wānaka to Luggate section of the upper Clutha a few times, but it's not very exciting. The input of the Hāwea River to this section doesn't have a great effect and wouldn't change any decision to use it. This might be different for flatwater racing events.

Jet boaters on the upper Clutha River/Mata-au (or any river) can make kayakers nervous – especially beginners – but there aren't too many and they are generally well-behaved (but some aren't), and the river is wide and you can generally hear them coming.

The Hāwea River is a great venue – but since the Club travels travel from Dunedin it's a bit tricky being sure about what flow will be available when they get there (it's better suited to locals who can take advantage at short notice when it's good). The Club has never requested flows from Contact. Russell is not on the text list, but does check the tweets on the COW website. The club uses the the Hāwea River from the Dam to Camphill Bridge or as far down as Albert Town at flows from 30 m^3/s to 50 m^3/s as an easy river for beginners and would be used more by the club if flows were known in adavance.

The play waves at Camp Hill Bridge are a great asset for the more experienced paddlers/play boaters at flows from 50 to 120 m^3/s, but it can be quite crowded during the peak of summer. The trees below the bridge are of serious concern for any swimmers. The flow tends to take paddlers that swim (fall out of their boat) towards the true left side, where there are significant risks in getting caught up in the trees. The inexperienced river user may also think it an advantage to use the trees to slow their progress downstream, and this flawed thinking can result in the person becoming pinned and drowning.

The Club has planned club days around the 30 m^3/s consent flows on the Hāwea – or at least put them on the club calendar – 30 m^3/s is needed as a minimum for the river but the flow is more attractive at 50 m^3/s at the waves for longer kayaks such as RPMs when there is good carving (it can get too steep at higher flows for the longer kayaks) and from 50 upwards is more suited to play boats. Eighty creates too deep a wave for a long boat (like an RPM). Thirty is a good flow for training on the River generally – down to Camp Hill or Albert Town – but not so much on the wave features. The top wave can be a bit retentive – sucking in and not releasing kayaks – although

longer boats can work on the lower wave while shorter play boats can work on the upper; and 10 m^3/s is too low for anything.

However, in general, if the club travels to Central Otage most trips head to the upper Shotover and and Kawarau rivers.

The Tekapo whitewater ocourse can be better for play boats with more variety in the wave features easier features to learn on for play boat begineers. The big advantage at Tekapo is its variety with more play spots and slalom.

5.1.2 Steve Brown, Wild Earth Adventures

Wild Earth Adventures offers a range of outdoor adventure activities (including sea kayaking, rafting, bush craft and orienteering), and training programmes throughout Otago, including taking 1200 school students annually on the junior ACC RiverSafe programme. The company regularly uses the lower Clutha River/Mata-au for rafting, and until recently the upper Clutha for Canadian canoeing. As the upper River has become more developed, particularly with housing and more jet boats, the sense of remoteness has declined and the company prefers the relatively remote aspect of the lower River – which also features very good conditions for the rafting and camping options they offer. The Hāwea River is not used.

Flows in the lower River do not impede use unless they are very high. The scale of the flow and the width of the River means it is easy to avoid hazards – such as willows. Even up at 1000 m^3/s, while the River might look scary, it is quite safe. At high flows (>350 m^3/s) the River becomes discoloured, there is more loose didymo (clients can get coated in it) and the River loses its most interesting hydraulic features – it becomes just a float down a big river. From around 220 m^3/s the River is clear and the four main rapids between Millers Flat and Beaumont Bridge are working well (and progressively disappear as the River rises). The rapids are called different names by different activity groups – but Steve's team calls them Millers Flat, Bridge Pillar, Seagull Island and Big Whirly. Get-in and get-out points work at all flows.

High ramping rates tend to free more didymo.

The ramping rates are generally quite predictable, and the day's activities are able to be planned around them. If the rates were random, it would be difficult to offer an ideal experience.

Steve phones Contact before taking clients on the lower River to check if there are any unusual flows likely over the following 24 hours – as part of his health and safety routine – but generally gets very vague responses. He suggests that a tweet system, such as the one operating for the Hāwea Whitewater Park advising of flow releases – operated via Central Otago Whitewater – would also be useful for the lower River.

They often camp on the lower River as part of the experience. Several sites have become part of the Clutha Gold Trail but alternative campsites have been found on opposite banks. The cycleway has also attracted a lot of people to swim in the River, often at quite dangerous sites. Steve notes that additional signs at the start of the ride indicating safe swimming spots, and signs along the track at dangerous sites, are needed.

There is occasional conflict with jet boaters – casual, not commercial – with the odd boat broadsiding rafts and drifting and following rafts down rapids. Alcohol appears to play a part in the behaviour. Smaller 'mini' jet boats are becoming popular, and these can be more of an issue – rather like jet skis.

Steve is also an angler and notes that very low flows are best for fishing – exposing more features to walk on, with clear water.

When the company used the upper River for Canadian canoeing, the Hāwea confluence never created a problem. Even at 200 m^3/s (from the Hāwea) when a large eddy forms, it can be caught and played in, and is a bonus when it occurs.

5.1.3 Ngaio Hart

Ngaio lives locally to the Hāwea River, is a regular kayaker, surfer and observer on the River, and an active member of Central Otago Whitewater (COW).

She notes that there are many strongly held opinions about ideal and preferred flows on the Hāwea River, based on activity. However, at almost all flows there is some group that will be able to use it.

At low flows – 10 to 30 m^3/s – kids with boogie boards are on the wave features and young kids can safely swim in the River, although it is safest for little kids at 10 m^3/s, and is a very nice swimming site at 10 – 15 m^3/s when kids can dive off rocks into nice, deep water. Low flows also suit anglers. Flows below 30 m^3/s are not ideal for white water activities on the wave features but still suit younger families and kids, and can be used by slalom and beginner kayakers using the current and eddies (the waves are too small). Thirty to 50 m^3/s is ideal for slalom kayaks at the wave features – and below 30 m^3/s is generally considered too low for any play boating at the waves, but is useful for the River as whole for teaching beginners and school groups (schools often request flows around the 12 to 15 m^3/s range for beginners). Fifty to 70 m^3/s is thought to be the ideal range for surfing – particularly considering easy access off the rocks to the wave – but as skills have improved, surfers are using higher flows.

Anything above 50 m^3/s is good for playboating although 80-150 range is probably some of the best, but this is probably very subjective – different people will have favourite flows. Can playboat on the top feature above about 30 m^3/s but the bottom feature only works for playboats above 50, which is why playboaters prefer the park when both features are running. Slalom boats can surf the bottom wave at 30 to 50 m^3/s.

Downstream of the waves, the slalom site is good over a range of flows, and is probably best around 30 m^3/s (which is requested for slalom events at this site), but can be paddled at any flow. The best flows for training are at 10-50 m^3/s, and above that everyone is attracted to the whitewater park instead.

An ideal summer day for recreation flows on the River might start with low flows to suit kids and families, with an increase over the day to white water kayaking flows on the wave feature – allowing for surfing opportunities as it rises – followed by a gradual decline to low in the evening to suit families again.

Some kayakers have been concerned seeing useful flows – around 60 m^3/s – being spilled overnight with low flows during the day; preferring to see those flows available during daylight. Ngaio notes that the availability of such flows is important, but equally so is maintaining flow variation to suit the many different user groups.

Contact has been as accommodating as possible and generally communicates well with kayak groups – and from time to time has gone out of its way to ensure set flows during special events, such as the 2018 NZ Secondary Schools Hāwea Whitewater Games (24 – 28 March). Gordon Rayner has operated as the key contact for COW. When Contact has agreed to aim at a set flow range for an event, and a generation or flow requirement means it might not be possible on, or for all the day, Contact will normally phone ahead of time – and has generally worked really hard to ensure the right flow for as long as possible. The likelihood of some variation in flows over time is clearly expected, as would occur with a natural river.

The South Island Slalom Championship was run very successfully at the Whitewater Park at 33 m^3/s. Was ideal! Secondary School Championship was run at 31-32 m^3/s (requested flow of 30 but got a slightly different level) and it was still good, although not as ideal as 33 m^3/s as the bottom wave feature had a thumpy curler which was quite difficult for the kids.

The Hāwea Flow Forecast Twitter system is useful but does not provide certainty. The original texts from Contact went to only a set number of people and so do not come direct to Ngaio. She refers to the Twitter feed on the COW website and the live flow data on the ORC website, and uses the tweets as only a likely scenario rather than a guarantee of near-future flows. The reliability and frequency of the Twitter information seems to vary depending on who is managing the service within Contact. For Ngaio, unanticipated flow variation is not a problem since she lives nearby. Kayakers and surfers living further afield would prefer more guarantees to ensure a journey is worthwhile; but there are equal chances that a natural river would be similarly unpredictable.

Ngaio is keen for the flow regime to help maintain the River's ecological values and has noted really large eels in the Hāwea. The River has featured some quite high flows over the past couple of years and she has noticed quite a lot of new scour and bank damage at the slalom site, and wonders if this is being monitored.

5.1.4 Andy Thompson, Otago Polytechnic

Andy has been a professional teacher since 1988. A large part of this includes 17 years' experience as the Principal Lecturer, programme coordinator for the Institute of Sport and Adventure, and he now is the Village Manager for Te Pā Tauira Otago Polytechnic Student Village, Otago Polytechnic. He also continues with private coaching, national assessments and consultancy on safety and risk management – in addition to a very wide range of other national and international outdoor education, supervision and adventure roles in expedition leadership and photography.

The Clutha River/Mata-au catchment supports a very wide range of recreation pursuits – from the likes of highly skilled kayakers and jet boaters to local and visiting swimmers and individuals with very few water skills floating on rubber tubes. The river edges are becoming more popular with cycle trails, walking, photographers, mountain biking, international visitors – particularly FITs (free independent travellers) – and increasingly busy camping areas, such as at Albert Town. The quality of the landscape setting is as important as the flow rate in the rivers. Educational institutions and professional guides carry out training, educational programmes and personal coaching.

There are so many demands for use that it is not possible to specify a set of preferred flows. The range of flows on the Hāwea River, for example, from 10 m^3/s to 200 m^3/s will suit family groups through to expert kayakers. A kayaker on the Hāwea wave is likely to scrunch their head if they roll at a flow of 12 – 14 m^3/s, but kids will be swimming and boarding. Sixty to 100 m^3/s creates a really good wave, but it's also really good at 200 m^3/s, but that's not everyone's cup of tea (although it is one of Andy's preferred flows).

So there is no hard and fast rule. However, one of the most important issues is managing flows to maintain the natural habitat of the rivers. The hydro schemes have clearly had a significant impact on the various ecosystems of the Clutha, and while the need for generation is clear, and to support recreation, the flow regimes need to preserve, as much as possible, remaining environmental values – particularly with managing low flows and high flushing flows (sediment and scouring for the latter). Effects on the sediment supply to the coast and the natural and recreation settings north of the River mouth also need to be understood – such as Aramoana Spit and St Clair beach areas.

Managing flooding below the Clyde – around Beaumont and Tuapeka for example – is also important, and hydro has the benefits of allowing some control here. There is a complex mix of values to manage.

In terms of recreational flows, especially on the Hāwea River, Andy is accustomed to checking what is available on the day and working with that. While the flows vary and can be too high for some activities, it is probably more consistent than a natural flow – hydro has stabilised and made more predictable the white water resource – although it then raises a new raft of issues about managing the timing and scale of flow. Those who travel furthest want the most predictability. As an example, Andy used to run training exercises on the Waipori River and would communicate with Trustpower's scheme operators in Tauranga to identify likely flow availability – but the lack of certainty and the vagueness of the information means the Waipori is rarely used for education.

Since there is no black and white answer to what flow is best, and when – and considering the generator's need to make electricity and money – and manage natural values and flooding – the company's relationship with the community is the critical issue. Having set flows on agreed days – as per consent conditions – is really useful, but more important is the ability to maintain a dialogue and relationship over time to make sure the flows remain relevant over time as use evolves (for example, as skill levels change or use increases). It is hard to say how many fixed releases are enough and it is more important to develop an active relationship of goodwill between recreation groups and generators – and to sustain these over time. This requires the appropriate culture on both sides – and currently Central Otago Whitewater and Contact seem to be doing a pretty good job thanks to specific individuals. The relationship is the gold.

Crowding may be becoming an issue on the Hāwea wave – managing this over summer is going to be a necessary focus in the near future.

Andy has not heard of any issues relating to the flow of the Hāwea River – and its variability – into the upper Clutha River/Mata-au – not to say that there aren't any, but none come to mind.

5.1.5 John Heasley, surfer

John has been surfing at the Hawea Whitewater Park for the past six or so years and has taken on an informal leadership role in introducing new surfers to the Park, particularly for safety purposes.

The bottom wave works best for surfing at between 48 and 55 m^3/s – and at the high end the wave can be shared by more people. The wave structures were originally designed to work best at 30 m^3/s, but the final build height does not develop a rideable wave at that flow. The structure has a narrow sweet spot in the flow range to run clean without a big foam ball which reduces its quality. When it is running clean within that preferred flow range, it is a perfect surfing wave – clean with a really glassy face and easy to carve. Kayakers also enjoy those flows and up to 60 m^3/s for ideal waves (other flows are also suitable but not as good).

Having said that, getting on and staying on the wave is a real challenge and it takes a lot of practice. When the flow range occurs frequently, the locals get the right amount of experience and there is a really good level of use. When the right flows rarely occur, use suffers doubly – there is not enough practice time, and there is not enough opportunity generally. Over the past summer – 2017/18 – the wave was operating well over January, but then it was very rarely available for the rest of the season and the local surf scene died.

The surfing community is quite big. If the flow is regularly available there might be a line-up of 50 people on a Friday evening after work. If the flows are irregular, this level of use fades. John sees the wave features as extraordinary community assets which should be used to the maximum. Conflicts are few – everyone generally adheres to the protocol of a two minute ride, and most

people can't stay on the wave that long regardless. There's a really good atmosphere and if someone overstays on the wave, they will be politely reminded of the local rules. It's a very friendly and encouraging activity – it's not easy and quite technical, so there is plenty of friendly advice on offer. Tourists see it as excellent entertainment and there are generally a lot of viewers from the sidelines. Kayakers and surfers work well together.

At flows over 55 m^3/s the wave starts foaming and while it can be used, it does not have the quality, and is not as much fun. At high flows – like 170, it's cumbersome and not as pleasant. It does not get any cleaner as flows increase – at 80 it's not too bad but foaming starts to increase.

The top wave is not surfed very much as there is not enough of an eddy created to easily hold a board. It is used by families, kayakers and children learning to surf.

Didymo is a real nuisance. After long periods of low flows, there is vast quantities of it washed through the wave. It makes for very slippery access to the wave, and when flows are low (just below 48 m^3/s) individuals have taken to trying to scrub it from the access area. At low flows even a few extra centimetres of safe walking access can make all the difference to catching the wave – which becomes very challenging to catch and stay on.

Surfers looks for the 'golden hour' of flow. They keep a close eye on the COW tweets and when the flow is reducing or increasing they can calculate when there will be about an hour within the ideal range. The tweets are vital and are generally very accurate – although sometimes the flow range passes sooner than expected and is missed or it does not occur – but this is rare.

John has made the odd flow request to Contact for safety training for new surfers – a couple of years ago now – but did not get it approved due to generation demands, which he understands. He hasn't bothered making requests since. There are real hazards in the area, particularly the bridge pillar with the potential for leash entrapment (the board on one side of the pillar and the person on the other – which even at moderate flows like 40 m^3/s – can be fatal) and John feels there should be more planned opportunities for surfers and kayakers to learn a few rules under controlled flows. Quick release leashes are essential.

John feels there could be more attention by Contact given to managing flows for recreation. While he understands the necessity of operating the River for hydro, he would like to see a better protocol for delivering the right flows at the right time – rather than at night, for example. This is a matter of having good communications with Contact – and this can vary depending on who is on the other end of the phone at the time. It's a matter of having stronger communication and perhaps a designated contact for recreation groups. John is happy to assist this coordination.

5.1.6 Bill Godsall, Sport Otago, Southern Lakes Multisport Club

Bill has worked with Sport Otago as a regional coordinator based out of Cromwell since 2001, is a very experienced multisporter and adventure racer, president of the Southern Lakes Multisport Club and kayak trainer, particularly for multisporters wanting a grade 2 kayaking certificate for the likes of the Coast to Coast and the Clutha Classic.

The Southern Lakes Multisports Club was formed in 2006 and has 80 members. The main purpose of the Club is to run events, which includes the Clutha Classic – a 54 km kayak race from the Wānaka foreshore to the lake outlet and down the Clutha to Bendigo Reach or a shorter 39 km option starting at Albert Town – the Winter Series with four kayak events (in 2018 in Lakes Wakatipu, Dunstan, Wānaka and the Clutha River/Mata-au from Clyde to Alexandra), and a multi-day adventure race, where courses are kept secret until the event. Eight-five to 90 kayakers participate in the Clutha Classic and 20 to 25 in each of the Winter Series. The Goldrush Multisport

event – a two or three day race with a kayak leg on Lake Roxburgh and around 100 participants – hasn't been held for several years, but might be in 2019.

Bill kayaks the upper Clutha River/Mata-au most weekends and notes that there seems to be less didymo at the moment and more trout than in recent years.

Prior to the development of the Hāwea Whitewater Park, it was possible to run multisport events down the Hāwea River. The wave structures are not suitable for downriver racing kayaks – which are generally made from glass or carbon fibre – and the River is no longer a racing venue.

Bill notes the various hazards downstream of the Whitewater Park, particularly the bridge pillar which has trapped individuals by the leash on their boards. This has now ropes and a ladder to ease rescue. Willows are an issue, but at low flows when less skilled people are on the wave feature, there is less water running into them, but they are also more exposed.

Educational use of the upper Clutha and Hāwea River dominates – with probably 70 to 80% of activity related to secondary schools and (especially Mt Aspiring, Wakatipu and Cromwell) and kayak training for certification. Bill notes, however, that there is a shortage of kayak trainers.

The upper Clutha River/Mata-au is an excellent training setting, and flows are generally stable. Normal high flows means there is little risk of foot entrapment if someone swims. However, if it's running high – about 360 m^3/s – Bill would avoid taking learners due to the risks from willows. The River gets a bit more challenging at flows from 300 to 360 m^3/s and 400 m^3/s is too swift for an easy rescue and the kayak trip is very short. The Clutha Classic will be moved to the Matukituki River if the upper Clutha is running above 360 m^3/s.

The River looks good at flows between 120 and 300 m^3/s, but below this it becomes unsightly with exposed didymo and sludge and rocks and spits are exposed that are hazards and create more foot entrapment hazards. All measurements are from the ORC gauge at Cardrona, which is a vital tool for River users.

While flows from the Hāwea River are not normally an issue for using the upper Clutha, when taking school groups Bill will phone Contact Energy to check if there are any major flow changes planned.

Bill notes the encroachment of new housing into the lower Clutha River/Mata-au and the loss of the sense of a remote experience – although there may be some safety advantages from being seen, and it's still beautiful. The leg from Clyde to Alexander remains 'easy and scenic' with little visibility of cars or houses.

Adventure racing appears to be a popular activity with local schools, and participation levels look promising. Bill notes a lack of skill, however, with many older participants who like the idea of the sport but have not got the right outdoors experience. He also notes the increasing and high number of kayaks on campervans and freedom campers – and the lack of skill of the paddlers. He reports increasing concern over the behaviour of a minority of freedom campers – dumping toilet waste directly into Lake Dunstan for example.

5.1.7 Chris Thornton, Paddle Wānaka

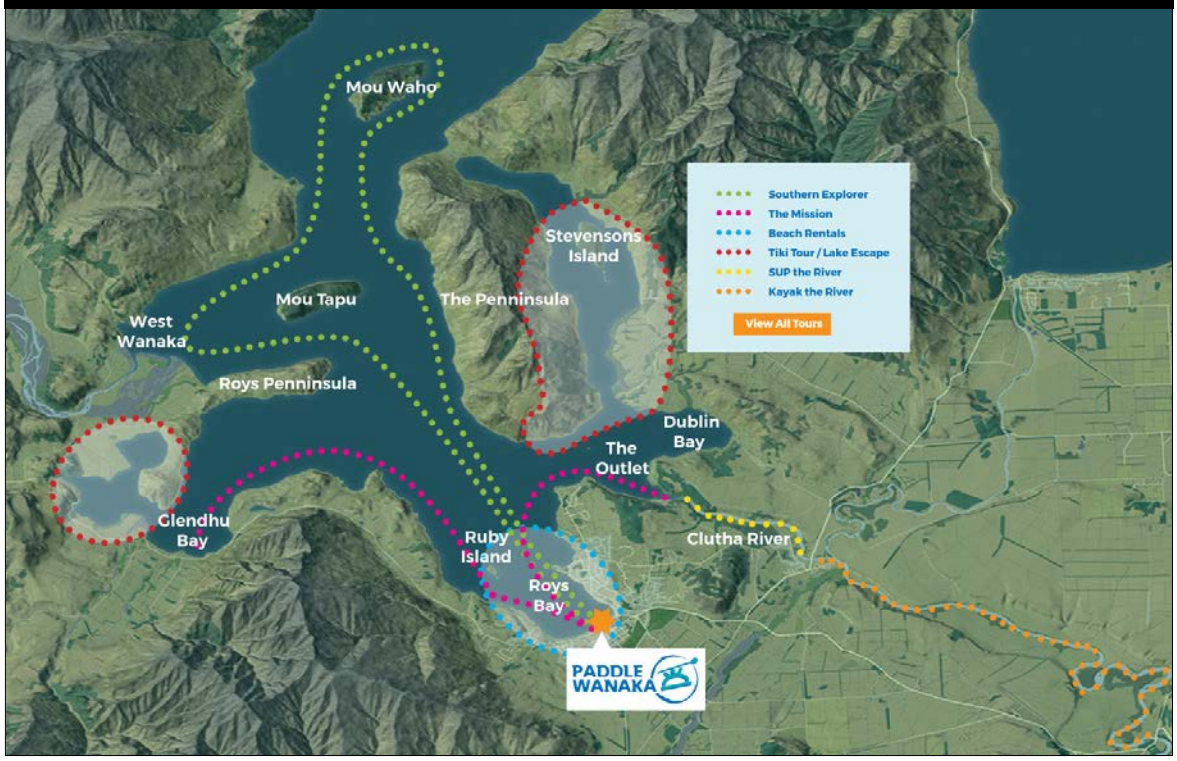
Chris is the co-owner, co-director and operations manager and guide for Paddle Wānaka. The company is based in Wānaka and offers guided kayaking and stand up paddle (SUP) boarding on the Lake and upper Clutha River. On the upper Clutha, the standard route for SUP is down to Albert Town, and kayaking down to Luggate – using sea kayaks or sit-upons for the latter. Figure 55 shows the various tour routes. Chris also does kayak training for grade 2 certification, as required for participating in many multisport and adventure racing events. He has very extensive conservation, recreation management and adventure tourism experience and qualifications.

Flows of between 280 and 320 m^3/s on the upper Clutha are preferred – measured at Cardrona. 450 m^3/s is the maximum and 180 or lower makes for a very slow trip. Flows coming in from the Hāwea are not an issue unless they contribute to a flow higher than 450. The SUP paddling stops above the Hāwea and so is not affected.

Chris notes the level of boat and kayak activity on the River and on Lake Wānaka growing, with increasing numbers of jet skis and jet boats, particularly over January. While it occurs over a short period it does affect the quality of the quiet paddling experiences and guided tours need to take into account the added risks.

Water quality in the Lake has declined with lake snow and didymo in the River. However, most visitors still see the water as pristine and are not aware of the issues until they are pointed out.

Figure 55: Paddle Wanaka standard tour routes



5.1.8 Lewis Verduyn-Cassels, Pioneer Rafting

Lewis has a long association with the Clutha River/Mata-au, rafting it first in 1981. In 2003 he initiated the Clutha Mata-Au River Parkway project aiming to create a river-length park and trail, and in 2015 he co-founded the Red Bridge River Park native restoration project.

Pioneer Rafting is a non-commercial eco-rafting service on the upper Clutha River. The online description of the half- or full-day experience is:[37]

> *We volunteer our time and equipment to take families and groups eco rafting so that we can promote and fund native restoration, using plants from our on-site nursery.*
>
> *Eco rafting is offered free of charge to donors on a strictly peer-to-peer basis, using no third-party booking agents, which reduces costs, such that donations can be less than the cost of a commercial trip.*

[37] http://www.ecoraft.co.nz/index.html

We navigate the mighty Clutha Mata-Au River, a wild and scenic river forming the heart of the Upper Clutha Valley.

The Clutha Mata-Au is New Zealand's largest and most powerful river, flowing swiftly from Lake Wanaka into the golden semi-desert landscape of Central Otago.

We encounter peaceful river sections, surging eddies, native birdlife, gold-rush tailings, and exciting but easy Grade 2-3 whitewater rapids that everyone can enjoy.

Every trip includes time to relax on the riverbank, where we "boil the billy" to make Tea-Tree tea (picked fresh), and often pan for fine alluvial gold.

Lewis operates a large oar/paddle raft designed for high volume rivers, which offers quite a different experience to the common whitewater activity on the Shotover or Kawarau. The large raft allows entire families to safely experience an eco-focused raft trip on the high volume Clutha River/Mata-au. Donations are used to fund the Red Bridge River Park project.

Flows of 250 to 300 m^3/s are preferred on the upper Clutha River/Mata-au. Flows below this make for slower trips and more in-stream rock hazards. When the Hawea River reduces its flow sharply from a high level, the effect on the experience on the Clutha can be quite dramatic. However, the status quo, in terms of flow availability and levels, is acceptable. The only improvement could be a more gentle ramping rate on the Hawea River to create a more natural flow regime and to reduce hazards.

However, the critical issue is maintaining the health of the River. No additional water should be removed from the system so as to sustain existing recreational amenity values and to conserve natural in-river and riparian values. Low flows for extended periods encourages the growth of riparian weeds such as lupins and briar which choke beaches, and the growth of lagarosiphon and didymo in shallow river sections. Lewis would also like to see more research into, and management of, didymo and lake snow.

5.2 Angling

In addition to those below, interviews were also carried out with representatives of the Alexander District Fishing Club (Bob Mason, who sought the opinions of seven club members) and the Breens Angling Club (Danny Stevens), for data specific to the mid Clutha River/Mata-au. These findings are summarised in section 2.9.1.

5.2.1 Ian Hadland, Morgan Trotter, Cliff Halford, Paul van Klink. Fish and Game NZ Otago Branch

The **Hāwea River** was a world-class dry fly fishing resource pre-hydro, particularly with the evening hatch and rise. Now it's a shadow of its former self. Didymo has also had an additional adverse effect and is now very prominent. The loss of gravels coming in naturally from Lake Hāwea has reduced spawning areas. Ramping and frequent high flows scour the benthos and reduce food stocks, and force fish out of the River. Ramping rates seem to be slower than in previous years when it could go from 5 to 200 m^3/s overnight, and any reduction should have some ecological benefits.

Having said that, the River does still have some good fish – mostly smaller rainbows – which move up from Lake Dunstan, and at low flows – from 10 to 14 or 16 m^3/s – the lower River is reasonably accessible along its banks, and presents some good water for dry flies. Improved foot and cycle access around the River has been a benefit. It is also good for junior anglers to learn skills in an accessible area.

The results of the 2013 F&G National Angler Survey (*Values of New Zealand angling rivers*, Unwin 2013) ring true, in that the River is favoured for its proximity to where people have a holiday home, its ease of access and area of fishable water, rather than for an expectation of catching many or large fish or having a wilderness experience. Anglers do use the local camping sites.

Ideal flows for angling are in the low range – 10 to 16 m^3/s – to create fishable water, but also to allow access along and across the River – with the dusk hatch and rise the best time. But the main issue for angling is a lack of trout habitat caused by high ramping rates, didymo, regular high flows and a lack of gravels for redds.

The **Upper Clutha**, above the Hāwea confluence, is a world-class accessible fishery, and the best stretch of the Clutha River. Deans Bank is the premier site. There is occasional backing-up of flow when the Hāwea River is running high, but otherwise it has a natural flow pattern and is stable. Evening dry fly fishing is excellent. There is some didymo, but this is more of an issue below the Hāwea confluence where the didymo flushed from there can be quite extreme. Below the Hāwea confluence there is more drift boating and spinning and less bank access – although there are several access areas, such as at the Devil's Elbow. Foot access from the cycleway is not so easy it is mostly high above the River. The River below the Hāwea confluence has a different character to above it and has some lovely areas to fish from, providing a good spectrum of fishing options in a reasonably small area. When Hāwea is running high, the flow can be swift and shore fishing areas and braids can be inundated – and there is more didymo. The River seems less comfortable and more intimidating in these conditions – and this can be seen from road areas. When Hāwea is low, anglers are more likely to be able to fish the sides, and when it is high, the middle. At high flows the river banks aren't safe areas for kids to fish or swim, and there is little room at any of the beach areas. The best times are when Lake Wānaka is low and the Hāwea River is at low or moderate flows.

High ramping rates can mean anglers risk being stranded on braids, and high levels of didymo can clog boat engines – in one such event a boat was washed into bankside willows. Warning signs about ramping changes are on the Hāwea River, but not on the Clutha. Anglers have not accessed the text system operated by Contact for flow changes on the Hāwea.

Lake Dunstan remains a very good fishery. The Clutha delta area – although changing rapidly with sediment build-up and extension – is a good fly fishing area and fishes quite steadily. When the lake level drops it exposes areas of shoreline and weed and there are areas where you can't fish. However, anglers have come to see lagarosiphon as part of the lake environment and to provide fishing amenity. There are far fewer complaints about the weed than there used to be.

The Kawarau Arm also has sediment issues all the way to Cromwell and boaters need to be wary when navigating in the area. The area is not fished as much as the Clutha arm since the Kawarau tends to be cloudy from the Shotover – but you can still get good fish.

Lake Hāwea is fishing very well and it seems that anglers are using it more – currently it's the best it's ever been ("the Lake Taupo of the south"). There are some fine rainbow and browns as well as salmon. There are issues with low lake levels and spawning access to tributaries, and the exposure of redds when lake levels drop (which also occurs naturally on the upper Clutha River/Mata-au and Lake Wānaka), and the stranding of breeding fish when they return to the Lake. For example, in the Craig Burn, spawning conditions start in April and May and the fish return in June and July when the lake is generally much lower and can run aground. Deltas at the tributaries are building up and they can meander over shallow gravels at low levels. High levels inundate these areas and provide extensive areas of fishable water. Using diggers to maintain connectivity for fish (as part of

Contact's consent conditions) doesn't appear to be feasible with the soft sands. Reasons for the current productivity of the Lake are not clear – it's a complex thing.

Lake Roxburgh is a recently-discovered fishery – with the three species of salmonid as well as perch. Users are still experimenting with the best approach to fishing it. The cycleway has improved access but not for boats – which must either launch at Roxburgh or come down from Alexandra. Many boat anglers in the area are accustomed to flatwater boating and can find the rapids below Alexandra quite intimidating, especially for families. There is little awareness of the 2013 lake level raising, and it's not clear what it meant for anglers – there was not a lot of angling activity on the Lake before then.

The SH8 bridge at Alexandra is the defined top of Lake Roxburgh for fishing regulation purposes. There is good and easily accessible fishing at the mouth of the Manuherikia and the ramps at Clyde and Alexandra – spinner and bait fishing particularly. The effects of ramping rates and flow levels in this stretch is unclear.

On the **Lower Clutha River/Mata-au** the effects of ramping and exposure of weed beds and redds also apply. At high flows, angers often only have access to fish over unproductive cobbles (since they have previously been dewatered). Angling is better at lower levels – although not sure what those are in cumecs – low to medium flows generally. The salmon fishery is in very poor condition currently – the worst in memory – with only 40 or 50 fish caught in the last season. There were fewer anglers and not a lot of talk about much success or interest. There are some low-key fishing clubs in the area.

Wildfowl hunting is popular on the lower Clutha River/Mata-au and at the head of Lake Dunstan. Contact's consent requires an attempt at maintaining a suitable flow range for the opening day, and when this works the hunting is good. High flows can wash out bird resting areas and low flows can strand maimai and empty backwaters. High flows are also dangerous for all hunters, but particularly younger ones, and dogs. In the '90s hunters used to request a certain lake level for Dunstan – possibly 194.25 from memory – but everyone just seems to work around the existing regime now, and there have been no complaints in recent times. There is also some hunting around the heads of Lakes Hāwea, Wānaka and Wakatipu, but these are often in wetland or pasture areas and low levels haven't been an issue.

There is not too much recreation conflict. Motorised craft in the Albert Town area can be an issue but the Clutha generally is quite wide and most boaters can avoid other users. There's always the odd idiot. Anglers generally seek peace and solitude, but the effects of encountering other users will depend on the individual. Kayaks on the Hāwea River have not posed any issues – they tend to use the higher flows that anglers don't – unless it's the odd kid in summer on low flows. Drift hunting on the upper Clutha River/Mata-au used to be popular, but with increased shore access – such as cycleways – and more residential development, this is no longer a popular option.

5.2.2 Rick Boyd, Fish and Game NZ Otago Branch councillor, Clutha Fisheries Trust trustee, fisheries scientist

Lake Hāwea – while fishing reasonably well at the moment – is not as good as has been under previous lake range management. Twenty years ago the lake tended to be full right through summer to spring and would begin to lower in early winter. It now seems to be rarely full and drops earlier in the season. The lake edge can be good for browns which hang around weed beds, which is the case in natural lakes. High levels mean the weed beds are inaccessible from the lake edge and the fishing is over barren cobbles. Very low levels mean weed beds are exposed. Median to low levels are best, and the wide range is not helpful.

While there are connectivity issues between Lake Hāwea and its tributaries, low lake levels do not affect the ability to fish the likes of the Craig Burn and Timaru Creek. Each require a bit of effort to reach fishable water, but before the rainbows drop back into the Lake after spawning, for short periods there is good fishing to be had. High lake levels mean there are pools at the tributary entrances, but this doesn't prevent access. Rick has little experience of the Hunter River.

Maintaining salmon spawning in the lakes is vital. Cawthron research (from limited data) indicates that up to half the salmon-run in the lower Clutha is recruited from fry originating from the headwater lakes, primarily Lake Wānaka. Connectivity with the spawning tributaries is therefore not just about local trout and lake-based salmon populations. It is good to see the potential for action on a Clutha-based salmon hatchery since releasing fry sourced from other rivers is unlikely to be of great benefit (with different genetic stock and a lack of local natality). Having said that, survival of salmon at sea is complex and little understood. Unfortunately, there is no guarantee of a significant improvement in sea runs into the lower Clutha from a hatchery – our knowledge base on factors governing survival is very limited.

River fishing in the upper Clutha and Hāwea River has been seriously affected by didymo. The Hāwea River – with its very rapid and high ramping rates and a lack of fines and gravels – now has poor habitat for caddisflies and other insect larvae that trout depend on. The Hāwea bed is now stable cobble, which appears ideal for didymo growth. Mobile fines and gravels – which pass through a natural system – are more unstable and difficult for didymo to adhere to. The mass of didymo growth in the Hāwea River means there is no space – interstices – in the riverbed for insects to occupy and less palatable algae to feed on – and therefore fewer trout. Didymo also traps very fine sediment and further fills niches previously occupied by insects. Adding gravels into the Hāwea system might help, but it would probably need to be accompanied by a more natural ramping rate to ensure that they aren't flushed straight through. The Hāwea remained a reasonable fishery post-hydro – not as good as it was – but really suffered after didymo. There are still a few fish to be caught though.

The Deans Bank dry fly fishing area on the upper Clutha has been similarly affected. Prior to didymo, this section was international class with very large evening and morning rises – with 100s of active fish. An evening routine would start with fish rising in the middle of the River chasing egg-laying mayflies and caddisflies – even jumping out of the water to catch them on the wing – through to dusk and night when the fish would move into the shallows pursuing newly-hatched caddisflies as they skate on the surface to the riverbank. Didymo caused the almost complete cessation of these events – although there has been a recovery in the past three years, with not as many browns as previously, but plenty of rainbows. There are some areas of the riverbed which appear to be clear of didymo, while others remain covered, and there is perhaps enough benthic habitat to support enough insects to attract the fish. The Clutha has plenty of cover for fish, and food availability is the key limiting factor.

Rick does very little fishing below the Hāwea confluence – although some others do. Access is not as complete in this lower section compared with the upper section.

Lake Dunstan had very good fishing after didymo as, most likely, fish were displaced from the upper Clutha and the Hāwea River. The fishing appears to have returned to normal since.

It is difficult to truly monitor trends in fishing satisfaction over time due to the fallibility of memory (recall bias), but amongst the angler community there is a sense of a gradual decline in quality and availability – and it's a complex issue with climate change, didymo, lake snow and other invasive species, the effects of fishing, and increasing nutrient loads and discharges from land and

development. Investment in more research would help identify the best actions required to stabilise and improve the fisheries.

5.2.3 Aaron Horrell, Clutha Fisheries Trust

The Clutha Fisheries Trust is a charitable Trust established in 1992 in settlement of Electricorp New Zealand's responsibility to mitigate its impacts on the sports fisheries of the Clutha River.

The primary purpose of the Trust is: To establish, maintain and enhance primarily the sports fisheries values and secondarily the conservation values of the waters of the Clutha catchment for the benefit of the people of New Zealand in recognition of the effects of the Clyde Dam development.

In terms of anglers responding negatively to changes in flows on rivers, and levels on lakes, any change induced by anything other than mother nature is likely to be considered poorly. Anglers will always prefer natural flows over anything artificial.

The upper Clutha below the Hāwea River was fishing well into the 2000s, but didymo flushed from the Hāwea has had an adverse effect, although the number of fish might be the same. Flushed didymo affects the Clutha and the Clutha arm of Lake Dunstan – although it can be periodic, with very poor periods followed by very good fishing, after didymo has settled and there have been no recent flushing flows. Drift fishing is popular in the reach below the Hāwea.

Aaron's current focus with the Trust is developing more angler access to the Clutha, and particularly below the Hāwea confluence. There were some question marks as to whether the work would be useful considering the quality of the fishery, but the Trust is keen to see what can be achieved.

The Clutha above Hāwea has been getting better in recent years with large rainbows turning up. The change may be due to natural ebbs and flows in the habitat or the recovery of an age class affected by previous flood events. It is also hard to say what the effect of didymo has been.

Hāwea River is clearly not the fishery it was pre-hydro.

Lake Hāwea has been fishing well recently, but concerns over the connectivity of tributaries remain – with dewatering of redds, loss of connections at important times, and potentially the triggering of runs over short periods (longer periods of good connections allows different classes of fish to access breeding areas at different times – while short periods trigger a "super-imposition" of large and small fish competing for space). It is not clear how connections between rivers and the lakes can best be maintained, particularly as deltas form and change at the tributary mouths – and are different at each.

Low lake levels mean rainbows stay out in deep water, which can be good for trolling.

Lake Dunstan has also seen some good rainbows in recent years – which are no doubt feeding the upper Clutha River.

Lake Roxburgh has been fishing well with access and use opening up – and more boating. It's more a slow-moving river than a lake.

Aaron has little experience of angling on the lower Clutha River.

Anglers' fishing styles have changed in recent years – with shorter visits over fewer days. This means the quality of the year's recalled fishing experience can vary widely. Longer periods of effort mean anglers are more likely to strike some excellent days when everything falls into place – and that might occur in the same location that was not fishing well a day or two earlier. These events colour angler satisfaction and it's often hard to get a clear picture of change over time. However,

there is a general feeling that fisheries are generally sliding backwards, with the likes of didymo, lake snot and poor water quality; even though the scale of change in satisfaction is hard to quantify.

5.3 Jet boating, and the Tuapeka Mouth Ferry

5.3.1 Dave Crawford, Beaumont Jet

Beaumont Jet has been operating since 2004 offering commercial jetboat river taxi and adventure trips on the Clutha River. With the advent of the Clutha Gold Trail, demand has been sufficiently high for the operation to service almost wholly cycle transfers through the Roxburgh Gorge.

The cycle trail ends approximately 9 km south of Alexandra within the gorge and restarts 6.5 km upstream of the Roxburgh Dam, requiring an 15 km transfer by boat. Services are provided by Beaumont Jet and Clutha River/Mata-au Cruises. Beaumont Jet uses two 10 seater purpose built tour boats.

To board cyclists and walkers, the service relies on a floating pontoon upriver and a jetty nearer the dam. The jetty is fixed and works with a wide lake level range. The pontoon does not work below a 2 m drop from the normal level.

Dave has over 31 years' experience of jetboating experience on the Clutha and nationally. He describes the Clutha River, and the Roxburgh Gorge area, as spectacular (but perhaps not as spectacular in the Gorge as before the dam) with some of the best water in the country.

Lake Roxburgh was until recently a very quiet recreation setting, with very low use. With the cycle trail in place, locals and others have begun to recognise it as an attractive setting, and boat and fishing activity has increased.

The recent raising of the Lake's normal operating level by Contact has had adverse effects on beach amenity with water pushing into creek outlets and further inundating what little gravel beaches exist. There is not a lot of variation in level experienced, although when the level was dropped up to 5 m by Contact for sediment flushing, both jetties were unusable. In that event, Contact gave the operators good warning of the event and they were still able to board clients with areas of beach exposed. Prior to the dam being built there was a 3 m waterfall in The Narrows – 1o km below Alexandra – and the location of these was evident with the Lake at the low level.

Below the Roxburgh Dam, the River is "as good as anywhere", with three excellent rapids and reasonable fall between Miller's Flat and Tuapeka Mouth, including Birch Island and Rongahere Gorge. Although quiet at present, there is the potential for growth in tourism as the area develops – particularly on the back of the cycle trail.

There is a sense that the River flow below the dam is natural, and the setting has a strong natural character. Most visitors would have no idea that it was hydro-controlled. Flow variation is generally predictable with morning and evening peak, and boat operators expect this. The scale of the flow is such that the River is always boatable, although flood flows can be a problem, but are not a hydro generation issue. The variation in flow adds interest for drivers and passengers, with lower flows exposing more of the rapids. Large and exciting eddies and whirlpools are feature above Beaumont. If flow variation was irregular and unpredictable, it could be an issue for operators; not knowing what to expect.

Dave has noticed a decline in water quality in the Roxburgh area, and in recent years has seen dead eels in the main stem, but is not sure where they come from – possibly tributaries affected by low summer flows and/or pollution. Water from the Manuherikia is clearly often polluted, including surface scums which adhere to boats and are difficult to remove.

5.3.2 Dave Wright, Jet Boating NZ, Otago Branch

JBNZ has uplifts for jet boating on the:

- Hunter River from Lake Hāwea to Ferguson Creek, 1 November to 12 December inclusive and from 19 March to 30 April.
- The upper Clutha River/Mata-au from below the Outlet Campground (where there is a 5 knot marker buoy) to Lake Dunstan. The upper section of this is in the QLDC district which limits activity between the hours of 10am to 4pm in winter and 10am to 6pm in summer.
- The remainder of the Clutha River/Mata-au and Lake Roxburgh. Lake Dunstan, Wānaka, Hāwea and Wakatipu have various local speed controls for access and swimming safety.

The Otago branch works with Contact Energy and QLDC to manage 4 or 5 annual uplifts on the Hāwea River (to limit conflict with kayakers and anglers), although they only use 1 or 2. Contact is good at providing adequate flows with adequate warning. These occasional uplifts must be advertised publicly through the QLDC and are quite a rigmarole; and the club is seeking streamline arrangements as they have on the Taieri and Manuherikia.

Low levels on Lake Hāwea can make accessing the Hunter River difficult, but use is low – the club holds a couple of events annually and there are probably fewer than 150 boats accessing it annually. The club's philosophy is one of accepting the need to operate the Lake – and the rivers – for hydro and are comfortable fitting in with the existing regime (treating boat access as a privilege). Good communication with Contact makes this approach work.

Flow variability in the upper Clutha below the Hāwea confluence is noticeable but is not an issue. If the club was holding an event on the River they would probably warn drivers of any likely change in flows at a safety briefing, but they would be very unlikely to have any effect on the ability to use the section. The club holds a couple of races annually from Lake Wānaka to Cromwell.

The River below Roxburgh is always boatable, and is especially interesting between Millers Flat and Beaumont when low – with more exposed rapids. Flow variability is not an issue, although an occasional boater might go to lunch in Beaumont and find their vessel beached when they return, but this is not a biggie. The club is happy with the status quo.

5.3.3 James Allison, Contract Manager Tuapeka Mount Ferry, Clutha District Council

The punt is available 7 days a week, 2 hours in the morning (8-10 am) and 2 hours in the afternoon (3-5 pm in winter and 4-6 pm in summer).

Operational flows are taken from the Roxburgh flow meter, with an eight hour delay for flows to reach the punt site at Tuapeka Mouth.

At flows below 300 m^3/s the access ramps for the punt are too steep for low-slung cars, but work for SUVs and high vehicles. Below 200 m^3/s the service is not available for cars as the River is too shallow and the punt hits the bottom.

At flows above 800 m^3/s the ramps are also too steep for low cars but work for SUVs and other high vehicles.

At flows above 900 m^3/s the punt is moved to the western side (the non-home side) to avoid any mobile debris in the River. At flows above 1250 m^3/s the ramps are pulled from the water.

The punt relies on river flow to drive it across the River and at flows below 300 m^3/s strong easterly or westerly winds will mean it is stuck on one side. An upstream sandbar on the eastern (home) side means this side is more sheltered from River flow and is therefore more wind-affected.

Use is growing, by both locals and visitors. Local farmers with run-off blocks on either side will use it at least once a day. Strengthening work on the Clydevale Bridge in 2017 meant it was closed for periods and the punt operated full bore for 9 to 10 hours per day ("resilience in the network").

Contractors operating the punt have a direct phone contact with Contact and normally get ample warning of any high flows. Contact has also adjusted flows in the past to allow maintenance works. For example, the punt is removed from the water every five years for maintenance and Contact has raised the flow in the past to allow the punt to get closer to the bank, and the crane needed to lift it.

Flow variation during the day, when flows pass the various thresholds, can mean that the service is interrupted, but this is not so common to be a major issue.

Rare major flushing events can mean that the punt does not operate for several days – but Contact gives ample warning and they are infrequent.

5.4 Lake use

5.4.1 Shayne Hitchcock, contract CODC Safety Officer for Lake Dunstan

Shayne has 23 years' experience as the Lake Dunstan Safety Officer and is a very experienced mariner generally.

The operating range of 1m for Lake Dunstan is well-understood by recreational users of the Lake, and there are no reports of any safety issues. The rise and fall is modest, predictable and easy for boaties to get accustomed to. It also means, compared with natural lakes, there is no flooding, which is especially good for lakeside recreation facilities – meaning they are operative all the time.

The only major issue is siltation in the Kawarau Arm, which presents a navigation hazard as flood flows deposit debris and shift channels. The reach between Cromwell and Bannockburn used to be popular for boating, but there is now almost nil use. The stretch above the waste water treatment ponds is now more like a braided river than a lake. This means the Bannockburn Inlet (which is dredged by Contact) is now an isolated boating setting. There have been several accidents with boats running aground in the shallows. New signs are being developed to warn users of this hazard.

The main ramp at Cromwell (Butchers Drive) gets sediment deposited on the ramp. This has formed an area of shallows directly opposite as a result of skippers driving their boats onto trailers and washing the sediment a short distance offshore. Removal of this by dredging is likely to be required in the near future.

In terms of compliance with local navigation bylaws, most of Shayne's efforts are directed at first0time boaters who are unaware of the rules and the responsibilities of the skipper. Compliance is, however, quite good. A lot of effort is directed to education rather than punishment, and local efforts are supported by national boating education promoted by Maritime NZ. Shayne notes that over the past six years, harbour masters nationally have been getting together more often to ensure better consistency with navigation and boating rules and education messages (whereas previously there was less consistency).

The new navigation bylaw for the Lake has removed skiing lanes and instead identifies safe swimming areas. The 50-metre 5-knot rule still applies outside those safe swimming settings. This suits Lake Dunstan very well since there are extensive beach areas and users are generally able to

spread themselves quite thinly – although in certain wind conditions boaties tend to congregate in smaller areas and this can cause some congestion – which is a common occurrence on all the southern lakes. The Lake also has the 5-knot rule applied to 200 m from both its shores north of Pisa Moorings to the Bendigo Wildlife area to support shore-based fishing and other casual recreation.

Boating activity on the Lake is growing only slowly year-by-year. The Lake has a lot of capacity for activity, and the peak period is confined to only a few weeks over Christmas – and weather conditions dictate how busy this period can be. There is ample scope for additional use – although more education will be needed as more new boaties arrive on the scene.

Jet skiers are generally becoming more responsible, and negative perceptions of the activity are more perception than reality. One or two percent are ignorant of the rules, but this is the same as for any other boating group. Jet skiers are, however, easy to hand to a newbie for a spin, which means there are occasionally unskilled and unaware drivers on the water.

5.4.2 Simon Smith, Coach, Dunstan Arm Rowing Club

Lake level variation has no effect on the ability to row on Lake Dunstan – the level is what it is on the day. The Lake is an excellent rowing venue – the best water in the country. The Club is healthy with 50 junior members.

Level variation has caused bank erosion immediately in front of the clubrooms where boats are launched. Every couple of years a 1 to 2 ft step forms on the lake edge, which is a hazard for crews carrying and launching boats. The club has approached both Contact and CODC to come up with a solution or temporary repairs and has gained no traction – so carries out its own work with a digger. A 10 m long easy access area is required. A floating pontoon would be ideal, but would need the right design.

Water quality appears to have declined over the years, with both didymo and lake snow now apparent, and the water is less clear generally. There used to be clean stones on the lake bed at the club foreshore, but it is now algae-covered and can be dangerously slippery.

There are no conflicts with other Lake users – rowing starts at 6am and there are very few other boats out at this time.

5.4.3 James Robinson, Clyde Coastguard skipper and Lake Dunstan Boat Club Commodore

Level variation on Lake Dunstan is quite obvious and does have an effect on boating and other lake recreation. However, it is generally taken for granted as part of the operation of the hydro scheme. Level changes are normally predictable – with the level dropping after 7 am and through the morning, stabilising around midday and dropping again in the afternoon, with it topping-up overnight.

Boaters can't leave their craft on the beach and expect it to be still floating a short time after. In some areas the lake edge is shallow and gently sloping, so a small drop in level – a few inches – can mean boats are well-stranded in a short time. In other areas – such as near the boat club – where the banks are more steep, this is less of an issue.

Boats often strike underwater obstructions. Submerged features can appear during the day as the Lake drops, and a short-cut in the morning might not be safe in the afternoon (there is one particular obstruction near the boat club).

Some boat ramps have holes at their ends which trailer wheels can fall into at low levels (CODC might have more data on these). The boat club ramp was built before the dam was filled and so

extends some 30 metres into the Lake – although it can get some sand drift, it is otherwise solid at all levels. The only issue with levels on Lake Roxburgh is during flushing events, which change the nature of the River and Lake substantially.

There is no chart for Lake Dunstan or Lake Roxburgh – unlike Lake Wakatipu. The Coastguard is aiming to progressively survey the Lakes over the next few years. Original pre-dam topo-maps can provide a good start, but the bed and shorelines have changed since then, with, for example, material from road and track construction added over the years.

In the upper Clutha Arm of Lake Dunstan, low levels and weed can mean it is inaccessible by boat. In the Kawarau Arm, caution is required as sand banks shift and vary in depth depending on lake level and flow in the Kawarau River.

In summary, lake hazards, considering the current scale of variation, are acceptable – they are what is known and experienced normally. Predictability is important.

There can be wide fluctuations in flow below the Clyde Dam, and never enough warning of timing and scale. Many users are not aware of specific submerged hazards in Lake Roxburgh that are affected by lake level, such as near the outlets of Shingle and Gorge Creeks. The Coastguard has rescued one cyclist on the trail in this section who had climbed a tree for a while and then discovered his bike was submerged.

Otherwise, no accidents attended to by the Clyde Coastguard appear to have been related to lake level or variation in river flow. Their call-outs are generally for drownings or man-overboard events (search and body recovery), the odd tow (although there are so many boats on Lake Dunstan over summer that most breakdowns are attended to by other boaters), picking up injured boaters or cyclists where road access is difficult, or working as a safety boat for events. On Lake Roxburgh, Coastguard has assisted commercial operators from time to time.

Most boating activity is close to the shores and the Lakes are not so wide that people get lost.

5.4.4 Don Robertson, Guardians of Lake Hāwea

The Guardians of Lake Hāwea is a sub-committee of the Hāwea Community Association and has been operating for over 25 years. Eight representatives are elected annually and have the role of helping to ensure that Lake Hāwea, its water and surrounds are well-managed.

Low lake levels generally cause the most concern, although in recent years the levels have not been as low as in the past. Dust blown off exposed gravels and sands during the prevailing northerlies and north-westerlies have been an ongoing issue, especially in the Johns Creek / Gladstone area.

Lower rainfall in recent years appears to have resulted in less flexibility in lake level management, and the Lake has also not been held as high as often as previously. This has meant the growth of more weeds in lakeshore areas – such as lupins and gorse – which die and break off when the lake is high. This material has not accumulated in any area, but can be an issue for anglers.

Swimming by the Lake Hāwea campground has always been popular and low levels have stranded the swimming platform and created a very poor level of amenity. Last season's work by Contact to extract gravel and bedrock from the area has addressed the problem and created a good recreation setting.

The launching ramp at the campground works well at all levels and has recently been three-laned, which is a good improvement, as is the new floating pontoon wharf. However, the unformed boat launching area at The Neck can get very difficult at low levels when soft sand is exposed. It would be good to have some more solid material there.

Contact generally works very well with the community and vice versa. Almost all Contact staff are very easy to deal with and are responsive.

While not an important recreation issue, longshore drift has built up the gravel bar in front of the dam and Contact will be drawing the lake down to enable the removal of 3500 m^3 of material to deposit at the Gladstone Gap, where it can replenish the foreshore as it drifts west again.

Jet skis have been a source of complaint, particularly around Scotts Beach where they come inside the moored marker lines for swimmers. These lines could be moved further offshore, but jet skiers also need to comply with the speed restrictions. Otherwise there is not a lot of recreation conflict on the Lake, considering its relatively low level of use (compared with Wānaka) and large scale. V8 jet boats can be noisy.

Low lake levels result in more exposed beach areas for freedom campers – such as on the Craig Burn fan – and some management of this might be necessary. Obviously it's less of a problem at high levels. The exposure of lake bed at tributary mouths is otherwise not an issue, besides the dust.

There is a strong perception that angling in the Lake and other water bodies in the catchment is declining in quality. Shore-based fishing is less productive and fish are harder to catch. Anecdotally, there appears to be fewer salmon in Lake Wānaka while they are doing well in Lake Wakatipu (at the expense of brown trout). Lake snow is evident in Lake Hāwea but not to the same scale as in Lake Wānaka.

Lagarosiphon is not an issue in Lake Hāwea as it cannot survive the significant changes in lake level, but there is some.

Otago Regional Council water sampling in Lake Hāwea indicates that it is microtrophic and is one of the clearest lakes in NZ. While the data does not include measurements of E.coli and contaminants such as pesticides, keeping the Lake's low nutrient status is very important – hence there is concern over the Overseas Investment Office's requirement for the buyer of Hunter Valley Station to implement higher stocking rates and more pasture development – with the potential for nutrient leaching and the introduction of herbicides and pesticides to the lake.

Other community concerns relating to lake-level management include:

- Apparent dewatering of residential and agricultural bores at Hāwea Flat,
- The potential for significant shore erosion opposite Lake View Terrace during very high lake levels and strong northerly or north-westerly winds,
- The potential effects of dam failure on residential and farming areas at and below Gladstone.

5.4.5 Wānaka Lake Swimmers

This summary is not from an interview, but is sourced directly from online information which provides an excellent summary for lake swimming from the Wānaka Lake Swimmers club.[38] The Club describes its formation:[39]

"We set this club up in September 2011 to help provide a forum for open water swimmers in and around Lake Wānaka. Last summer, we had up to 60 swimmers going into the water at a time and we felt that their presence needed to be acknowledged and accommodated. We felt that the best way to do this was to set up an official "Club" with a membership."

[38] https://wanakalakeswimmers.wordpress.com/safe-swim-area/
[39] https://wanakalakeswimmers.wordpress.com/about/

And offers local swimming advice:

SAFE SWIMMING AREA

A safe swimming area has been marked out at the Meadowstone Corner of Roy's Bay in Lake Wānaka. A line of red buoys, each buoy approximately 5 metres apart, marks an area about 200 metres off the shore line. The buoy line is approximately 380 metres long and is generally in water which is 2-3 metres deep. Occasionally, usually during winter, the lake level drops sufficiently to enable you to stand along this buoy line but the water is seldom this shallow in the summer swim season.

These buoys have been marked with text denoting it as a safe swim area where no boats are allowed. However, be aware that this text is too small to read from shore so, unless you boat out to the buoy line, you won't actually know that you should take care within the area! So swimmers be aware that you may find boats, jet skis, kayaks, kite surfers, wind surfers, rowing boats, etc within this zone. They are not legally required to stay out of the zone and the signage is not sufficient to warn them of possible swimmers so please be aware at all times that you may have a motorised or fast craft enter the safe swim area.

There are a few other safe swim zones marked with red buoys, one at the Log Cabin on the lake front, the other at Eely Point but these are small areas, set up more for splashing about than a distance swim.

NOT SO SAFE SWIM AREAS

We have a huge lake here in Wānaka with many different types of users. Areas to avoid if you want a decent swim would be around the Log Cabin, the Eely Point area (very popular in the summer for motor boat launching), the Yacht Club, the ski lane in the middle of the lake front, Waterfall Creek (again popular with boaties).

The Yacht Club runs regattas throughout the year. Thursday evenings they generally have an event and there's a regatta in January…

The Rowing Club currently boats from the Wagon Wheel area, about 200 metres along the beach from the purple sculptures. These quite fast and "tipsy" boats need to get outside the buoy line so please give them plenty of space while they do so….

Motorised Craft are not restricted as to where they go. They have a speed restriction within the 200 metre buoy line except where there is a designated ski lane zone – and occasionally other random spots – and do not always look out carefully enough for a swimmer when off shore. If the water is choppy, a swimmer is very difficult to see from a distance, no matter how vigilant the boaters are.

Also, craft such as Kite Boarders etc don't have any restrictions and are sometimes travelling fast. These lake users don't necessarily know that the safe swim zone is for swimmers only – writing too small to read from shore as mentioned above – so you need to be aware of this as they may be completely unaware that they shouldn't be where they are. So don't be rude!!

OTHER PLACES TO SWIM WITH CARE

If you want to go for a long swim, remember to wear a brightly coloured cap. If the buoyed area at the Purple Sculptures (now in capital letters!) is not sufficient for you, you can swim up the Edgewater side of the lake to The Rock. It is about a 2 km return trip, remaining fairly close to shore. However! There is a ski [lane] half way along this section and, especially from Christmas to New Year, you will get jet boats and – Gawd! – jet skis will come off the beach there with no apparent regard for swimmers, or anyone else. We generally stay out of the water at these times as they sometimes ignore speed limits or red buoys. If you want a longer swim, go in a group. If

possible take a kayaker with you as this makes you more visible. If you want to do a swim out to – say – Ruby Island (a lovely swim) or even around Ruby Island, then make sure you take plenty of clearly visible company. Kayaker is a good idea if you're in a small group of swimmers. The water is very deep there and the swim to the island is fascinating but that stretch is filled with boats in the summer time. Early morning would be the best time to go and it would be recommended to not attempt swimming in this zone during high tourist season. Any locals can tell you the times to avoid.

5.5 Hydro operations

5.5.1 Daniel Druce, Environmental Adviser, Contact Energy

Contact has a number of provisions in its resource consents that provide for the operation of the Hāwea, Clyde and Roxburgh Dams and that relate to recreation.

Lake Hāwea (Water Permit to Dam) – provisions relevant to recreation include:

- Lake level management – although not specified as being for recreation values – maximum 346 m, normal minimum 338 m, absolute minimum (for emergency generation or dam safety) 336 m.
- Foreshore Landscape Management Plan – "ensuring an appropriate level of landscape amenity in the area of lake margins and adjacent land affected by the consent holder's activities."
- Ensuring that during the months of April to November inclusive, adult trout are able to enter the Dingleburn Creek, Timaru Creek and the Hunter River – using a methodology agreed with Fish and Game Otago.
- Installing and maintaining safety signage.

Hāwea Dam (Discharge Permit to Discharge Water) – provisions relevant to recreation include:

- Providing safety warnings and signs along the Hāwea River
- Flows in the Hāwea River:
    - 10 m^3/s minimum.
    - 200 m^3/s maximum unless in flood.
    - 800 m^3/s maximum in the Clutha River/Mata-au below the Hāwea confluence, unless in flood.
- "The consent holder shall use reasonable endeavours to maintain a stable flow regime in the Hāwea River between 10 cumecs and 60 cumecs between 1 September in any year and 31 January the following year to provide for rainbow trout spawning and rearing and angling. A flow of 60 cumecs is not to be exceeded during the above period except when:
    (i) The flows in the Hāwea River are being managed to minimise the risk of high lake levels, or
    (ii) Recreational flows are provided for other recreational users, or
    (iii) Electricity supply and demand considerations require, or
    (iv) Plant maintenance requires."
- Provisions for a 3 m^3/s flow for an annual inspection of the Hāwea White Water Park.

- Specified ramping rates (regulating the rates of decreases and increases of discharge from the Hāwea Dam.
- Recreational flows: "… recreational flows of 30 cumecs in the Hāwea River … on the first Saturday of each November, December, January and February, from 8am to 8pm and at other times such flows as may be agreed between the consent holder and recreational users. The consent holder shall publicly notify the dates of the four mandatory annual recreational flows, between one and two months in advance of each recreational flow in the main daily newspapers circulating in the region."
- Requirements to fund in-river kayaking features (now the Hāwea River Whitewater Park).
- Certain contributions to riverbank and berm stability works with the ORC.

Clyde Dam (Water Permit to Dam) – provisions relevant to recreation include:

- Normal maximum operating level of 194.56 m
- Normal minimum operating level of 193.55 m
- Implementation of a Landscape and Visual Management Plan in the bed of the Kawarau Arm of Lake Dunstan
- Maintenance of bed levels within the Lowburn inlet and the Bannockburn Inlet. (Generally the Lowburn Inlet is used for passive recreation such as picnicking or swimming, while the Bannockburn Inlet is used extensively for 'biscuiting' and water skiing).
- Providing safety warnings and signage for Lake users.

Clyde Dam (Discharge Permit to Discharge Water) – provisions relevant to recreation include:

- Maintenance of bed levels within the Lowburn inlet and the Bannockburn Inlet.
- Providing safety warnings and signage for Lake users.

Roxburgh Dam (Water Permit to Dam) – provisions relevant to recreation include:

- Normal maximum operating level of 132.6 m (consent was granted to raise the lake to that level from 132.0 m in 2010, but which is clearly only evident in the hydrograph from 2013 – and is a return to the range originally operated by ECNZ).
- Normal minimum operating level of 130.15 m
- Permitted to reduce lake level to 129 m when Land Use Consent RM11.158.01 or Land Use Consent 2001.398 is being exercised to excavate the Manuherikia River (to reduce flooding into Alexandra, sediment input to Lake Roxburgh, and for amenity), but not on Saturdays, Sundays or Public Holidays and so long as boats are able to be launched at the Alexandra Boat Ramp.
- A Landscape and Visual Amenity Management Plan in response to that excavation for the Manuherikia River and adjacent Crown land.
- Safety warning and signs for river users.

Roxburgh Dam (Discharge Permit to Discharge Water) – provisions relevant to recreation include:

- Minimum operating discharge of 250 m^3/s unless combined natural inflows dictate a lower flow.

- "The consent holder shall use its reasonable endeavours to maintain a stable minimum flow regime between 300 and 400 cumecs from Roxburgh Dam for a period from the beginning of September to mid-October each year to limit the dewatering of salmon redds when eggs are hatching, having regard to natural catchment inflows, plant maintenance requirements, and electricity supply and demand considerations."
- Contributions to maintaining open river mouths.
- Safety warning and signs.
- Depositing and grooming 50 m^3 of gravel annually below the Roxburgh Dam for fish habitat purposes.
- Native Fish Management Programme in consultation with DoC - discussed below - and "a water release programme from Roxburgh Power Station for the period of 20 days before the highest spring tide in February to 60 days after this tide with the objective of enhancing inanga spawning in the lower Clutha/ Mata-Au."
- Sport Fish Management Programme with F&G NZ (Otago) – discussed below.
- Recreation flows for duck hunting on the opening weekend – preferably 380 m^3/s between 17:30 hours to 04:30 hours on the Friday preceding and the Saturday during the first weekend in May each year, depending in inflows. Contact and F&G communicate prior to opening day to ensure that all parties are aware of the flows that can be delivered.

In the 2016 calendar year Contact had 61 requests for recreation flows on the Hāwea River, all of which were granted to (in addition to the four 12 hour flows required by the consent conditions). This totalled 204 hours of requested flow releases for recreation, plus 48 hours required by the consent – almost two-thirds occurring from January to March. Requests were made by, Central Otago Whitewater, Mt Aspiring College, Cromwell College, Tai Poutini Polytechnic, Otago University Canoe Club, Aoraki Polytechnic, NZOIA (river safety training), Jet Boating NZ, Christchurch Whitewater Canoe Club and local groups for slalom training.

Flow requests for 2016 are summarised below by activity (almost all kayaking) and requested flow. Lower flows tended to be for beginner kayak training and slalom events. The NZ Outdoors Instructors Association request was for SAR swift-water safety and rescue training.

Table 13: Flows granted by Contact Energy for three activities, 2016 Hāwea River

Activity / Flow in m^3/s	10	12	15	20	25	30	40	60	65	70	75	80	85	90	100	120	Total
Jet Boat								1									**1**
Kayak	1	9	4	6	2	4	8	3	1	1	1	13	1	4	1		**59**
NZOIA																1	**1**

When the consents were granted for the Hāwea River, preferred kayak flows were expected to be in the 30 m^3/s area – hence the four specific flow events – but the reality has proven to be quite different. In 2016, almost half of all recreational flow requests were ≤30 cumecs. This reflects use of the river by school groups who want a low and safe flow for their use.

For its internal planning purposes Contact has a nominated a quantum of water for recreational use in addition to its consent requirements to satisfy flow requests. This allows recreational groups to request flows at specified dates, an arrangement that allows scheme operators the necessary flexibility to respond. In addition to these flows, requests for water are supported to enable regional, national and international events.

However, operational requirements to generate and maintain other consent requirements (such as lake levels) means all requests have to be timebound but are almost always granted. Ramping rate restrictions also affect the timing of flow delivery. Water storage requirements also mean that requested lower flows can generally be provided for longer periods than high flows (for example, 35 m^3/s for 10 hours is often the same to Contact as 70 m^3/s for 5 hours). Requested flows are not granted where they would cause or contribute to the spilling of water from the Clyde or Roxburgh Dams (i.e., when flows in the Clutha catchment would exceed storage and generation capacity).

Contact's philosophy is that the water is not owned by anybody and as a manager of the flow regime, there are responsibilities regarding the use, management and the stewardship of water. This means that the Company has a philosophy to sustain recreation and other community values.

The flow regime on the Hāwea has clearly benefited kayakers over anglers. Kayak requests are generally for large groups and educational programmes, and it would be unusual for Contact to respond to a flow request to provide for one or two anglers, kayakers or other users.

Over the years there has been a small number of requests to reduce flows in the Hāwea to the minimum to allow multisport events on the upper Clutha River/Mata-au when it has been naturally running very high. Flows on the Hāwea are also managed to support SAR training such as swift water rescue courses.

Contact has direct access to the Central Otago Whitewater (COW) online calendar, and details planned flow events there directly. Contact also operates a text system which notifies users of changes in flow. Outside of Contact these texts are normally forwarded by COW as tweets. Flows on the Hāwea River are also available through the ORC's website.

Contact excavated the Hāwea swimming embayment in 2017. This embayment is adjacent to the boat ramp by the Hāwea Dam and provides families with a safe sheltered swimming area. Previously, the embayment only became usable for swimming once the level of Lake Hāwea increased over the summer period. It now begins to fill at lower lake levels.

There have been no requests for specific lake levels on Lake Hāwea and they would be impossible to provide – the Lake being very slow to respond to any action taken, and meaningful increases being dependent on rainfall.

Lake Dunstan has a normal operating range of 1.0 m and Contact gets regular requests to maintain it at a stable level or as high as possible for powerboating, yachting and multisport events, largely to ensure that Lake levels provide fair conditions for all participants over the period of the event.

While Lake Dunstan and Roxburgh are generally kept high, they can occasionally drop rapidly (within their consented range) when electricity demand considerations dictate. This happens very infrequently.

There have been no requests for specific levels on Lake Roxburgh. When lake levels were raised in 2010 Contact carried out works on the lake edge to elevate existing BBQ, picnic and other amenity facilities, removing gorse from new beach areas, and augmenting a popular – and vehicle accessible – beach with fine gravel.

Flows released from the Roxburgh Dam are used to provide consistent water levels for downstream duck hunters. As above, these recreational flows only relate to the opening weekend of the hunting season (first weekend of May) and depend on natural inflows within the catchment.

Contact administers a Sports Fish Management Plan for the lower Clutha, in consultation with Otago F&G as per its consent conditions. Under this Plan, nearly 900,000 smolt were released near Roxburgh Dam between 2010 and 2016, but this has not been reflected in an increase in salmon

catches. Contact is currently developing a programme to build a dedicated hatchery to provide salmon smolt to the fishery. The hatchery is likely to be built adjacent to the Roxburgh Dam.

6 Benefits and trends in recreation participation

The benefits of recreation participation – which include physical, social and economic components (the latter including tourism and buying recreation equipment) – are well understood and reasonably well-researched, but are not easily attributed to a specific activity or location. Research – as discussed below – clearly proves the many benefits of walking, but there are no data to quantify the benefit of walking beside the upper Clutha River/Mata-au or the Kawarau River. Walking in natural settings has been shown to be significantly better for mental and physical health than walking in a built environment (Ewert & Chang 2018), but quantifying that benefit in relation to, say kayaking on the Hāwea Whitewater Park compared with the upper Clutha River, would not be a worthwhile endeavour.

Three discussions are presented below. The first considers regional economic values of recreation and tourism, which are very coarse and not able to attributed to the study area alone – although it is a major component of regional tourism and recreation product.

The second considers the health benefits of physical activity. These are well-established and incontrovertible, but again are difficult to relate directly to a specific activity in one setting.

The third considers the social and personal benefits of physical activity. Only two references are used in this section, since they are comprehensive and based on metadata analysis. Again, attributing these benefits in a quantified manner to a particular activity is not possible, but they are all applicable.

Trends in participation are considered in the final section, for recreation as well as domestic and international tourism.

6.1 Regional economic values

The economic value of study area for recreation and tourism is difficult to quantify. There is little accurate participation or expenditure data, only a handful of activity specific studies, and several regional economic reports which include a wide range of activities, of which river and river-side recreation are unseparated subsets.

Two activities, fishing and cycle trails, have economic values studies specific to Otago:

- TRC Tourism (2017) estimated that Queenstown Trail Users generated an annual total of $50.3 million in regional income and a total of 669 full time equivalent jobs in the region from their total spending while on their visit. Spending which is linked directly to their trail use generated $27.7 million and 149 full time equivalent jobs.
- Figuracion (2016) reported an estimated annual revenue from international visits using The Queenstown Trails cycle trail of $9,079,500, the Otago Central Rail Trail $846,500, Clutha Gold Trails $61,000 and Roxburgh Gorge Trails $77,800 – a total of $10,064,800. Nationally the Queenstown Trails had by far the highest revenue from international visitors for a NZ cycle trail. The four Clutha cycle trails represented 56.3% of the NZ total.
- Jiang (2014) estimated the economic value of access to Otago freshwater recreational fisheries by domestic anglers to be between $88 million and $130 million per annum (using the Travel Cost Method[40]).

[40] Where the cost of travelling to a destination is assumed to correlate to the value a visitor places on that destination (the more a person spends to get somewhere, the more value it has to them). It is difficult, however, to disentangle various visitor motivations which affect destination choices – such as, “I love fishing this river, but I only get the chance when I’m visiting my aunt.”

While not specific to the study area, other economic data about recreation in Otago describe the importance and growth of recreation in general.

- Westpac (2016) states that Queenstown Lakes District has a value added of $482million from tourism, hospitality and recreation (p5): "The Queenstown Lakes district, New Zealand's premier tourism destination, has the fourth largest share of Tourism, Hospitality and Recreation value added, despite a resident population estimated at just 32,400 in 2015. The bulk of Tourism, Hospitality and Recreation services in this district are consumed by international and New Zealand visitors, rather than local residents."
- Infometrics (2017a) describes the regional value of recreation and arts services[41] for Queenstown Lakes District. These services represented $110 m in activity, 5.7% of GDP in 2017 (year-ended March, as for all figures quoted). By comparison, national arts and recreation services contributed 1.4% of GDP. The service areas increased in activity regionally from $102.1m in 2016 to $110.4m in 2017, an 8.1% growth. For employment, arts and recreation services provided 1,992 jobs, or 7.7% of jobs in the District. Nationally arts and recreation servcies provide 1.9% of jobs. Regionally, arts and recreation were the fourth biggest employer after accommodation and food, retail trade and construction. Arts and recreation jobs grew 3.5% between 2016 and 2017 against an average of 7.2%.
- Infometrics (2017b) describes the regional value of recreation and arts services for Central Otago District. These services represented $11.8m in activity, 1.2% of GDP in 2017 (year-ended March, as for all figures quoted). By comparison, national arts and recreation services contributed 1.4% of GDP. The service areas increased in activity regionally from $11.0 m in 2016 to $11.8m in 2017, a 6.5% growth. For employment, arts and recreation services provided 226 jobs, or 1.9% of jobs in the District. Nationally arts and recreation servcies provide 1.9% of jobs. Regionally, arts and recreation were the 14th largest employer (out of 19). Arts and recreation jobs grew 3.1% between 2016 and 2017 against an average of 3.8%.
- BERL (2017) estimated that there are 620 people employed in tourism and recreation-related activities in the Wakatipu Basin. This was estimated to generate about $40 million direct GDP in the area and $70 million in the value chain in the Region.

6.2 Physical health benefits of physical activity

The health and social benefits of physical activity are well-established. There is ample literature supporting the relationship between physical activity and wellness. For example, a 2010 literature review by Janssen and LeBlanc into the health benefits of physical activity and fitness in school-aged children and youth found:

> *…a total of 437 citations were identified for cholesterol, 1151 for depression, 2505 for injury, 1181 for bone density, 1677 for blood pressure, 5824 for obesity, and 1677 for the metabolic syndrome. Thus, the grand total was 13,174. Many of these 13,174 citations were retrieved for 2 or more health outcomes, and after removing these duplicates there was a total of 11,088 unique citations. After the titles and abstracts of these 11,088 citations were reviewed, full-text copies of 454 potentially relevant citations were obtained and reviewed.*

Considering these data, the authors' number one recommendation was that children and youth 5-17 years of age should accumulate an average of at least 60 minutes per day and up to several hours

[41] This sector includes 'sport and recreation activities', 'heritage activities', 'artistic activities' and 'gambling activities' – and is dominated by 'sport and recreation activities'.

of at least moderate intensity physical activity per week. Some of the health benefits can be achieved through an average of 30 minutes activity per day.

And in more detail:

> *In summary, the findings of this systematic review confirm that physical activity is associated with numerous health benefits in school-aged children and youth. The dose-response relations between physical activity and health that were observed in several observational studies suggest that the more physical activity, the greater the health benefit. However, the results from several experimental studies suggested that even modest amounts of physical activity can have tremendous health benefits in high-risk youngsters (e.g., obese, high blood pressure). To achieve substantive health benefits, the physical activity should be of at least a moderate intensity, and it should be recognized that vigorous intensity activities may provide an even greater benefit. Aerobic-based activities that stress the cardiovascular and respiratory systems have the greatest health benefit, other than for bone health, in which case high-impact weight bearing activities are required.*

Angus & Associates (2017), in a review of benefits for Sport NZ summarised the relevant data based on the provability of the benefits (Table 14).

Table 14: Physical health benefits of Sport and/or Physical Activity and Standard of Supporting Evidence (Angus & Associates 2017)

Gold Evidence **(strong or significant evidence of effect)**	Reduced instances of: • Cardiovascular Disease (CVD) • Type 2 Diabetes • Obesity-related disorders
Silver Evidence **(moderate or probable evidence of effect)**	Beneficial impact upon incidences of: • Post-menopausal breast cancer • Colon cancer • Endometrial and ovarian cancer • Osteoporosis • Stroke Reduced risk of mortality and improved life expectancy
Bronze Evidence **(some or limited evidence of effect)**	Decreased levels of illness and sickness absence amongst employees Reduced risk of musculoskeletal injury Prevents onset of disability in older adults Decreased risk of incidence of lower urinary tract symptoms Improved physical competencies

Appropriately, the NZ Ministry of Health's 2016/17 *New Zealand Childhood Obesity Programme Baseline Report* has three of its fifteen baseline indicators related to physical activity (the others relate to, for example: eating well, sleep deprivation, and natal and neonatal measures):

- Time spent on physical activity, using similar guidelines to those quoted above;
- Active transport to and from school ("Research has shown that children who walk to school are less likely to be obese, and are more likely to have a lower BMI and a smaller waist circumference, than children who use more sedentary modes of transport, such as a car or bus"); and
- Use of a bicycle, noting that nearly 70 percent of families/whānau have one or more bicycles at home, and that, "The health benefits of regular cycling include increased cardiovascular fitness, increased muscle strength and flexibility, improved joint mobility, improved posture and coordination and decreased body fat levels."

For adults, the picture is the same. Bidwell (2012) found, via literature review, that in New Zealand, physical inactivity is third only to smoking and diet as a modifiable risk factor for poor health, associated with 9.5% of all deaths and estimated to account for over 2600 deaths per year. The direct gross cost of physical inactivity to the Australian health budget in 2006/2007 was estimated at around $1.49 billion. Australian studies reported that insufficient physical activity was the third largest single determinant on the Burden of Disease Scale in Queensland and that inactivity was costing Australia $13.8 billion.

Market Economics (2013), identified that physical inactivity cost New Zealand $1.3 billion in 2010 (just less than 1% of New Zealand's GDP), including on a regional basis: $402 million for the Auckland region, $106 million for the Waikato region and $141 million for the Wellington region, (the study area did not include Otago) stating:

> *Physical inactivity is costly. At an individual level, it can lead to suffering and disruption to a person's life with the onset of a disease that could have been avoided. Ultimately, it can lead to premature death which may impact on household economics and organisation. The premature death of 246 New Zealanders was caused by physical inactivity for the 2009 year. Seventy three of these deaths were in the Auckland region, 21 in the Wellington region and 18 deaths in the Waikato region. These premature deaths were estimated for those aged under 65 years only…. To put these figures into context, there were 420 motor vehicle fatalities and 510 deaths caused by self-harm for that same year. Physical inactivity is at a serious pandemic level in New Zealand, as in other countries. In a recent major report published in The Lancet medical journal, New Zealand was the 27th (out of 122) most inactive country, with nearly 50 percent of the population insufficiently physically active.*

The World Health Organisation (WHO) summarised all these issues in 2006 (Prüss-Üstün, 2006):

> *Physical inactivity is a risk factor for noncommunicable diseases including: ischaemic heart disease and stroke; cancers of the breast, colon and rectum; and diabetes mellitus. For these diseases, the attributable fraction for physical inactivity varied between 10% and 22% globally, depending on the disease. The prevalence of physical inactivity can be modulated by the environment, via factors that encourage physical activity… More than half of the global population gets insufficient physical activity to protect them from related risks causing death, chronic morbidity and disability from a range of noncommunicable diseases. Inactivity levels could be reduced by designing environments that are more conducive to physical activity in the workplace, at home, in transport and in leisure time.*

Similarly, the Capital and Coast District Health Board (CCDHB) reported in its *2015 Regional Health Needs Assessment*:

> *Physical activity helps protect against heart disease, stroke, type two diabetes, certain cancers, osteoporosis and depression. It is also important for maintaining a healthy weight and preventing and reducing obesity. The Ministry of Health recommends that adults do at least 30 minutes of moderate-intensity physical activity (eg, brisk walking) at least five days per week….*
>
> *Just under half of all adults in the sub-region (47%) were physically active. This was similar to the rate in 2006/07 and somewhat lower than the overall New Zealand figure (54%). CCDHB adults were significantly less likely to be physically active (45%) than New Zealand adults overall.*

The Southern DHB does not provide the same analysis, but notes:[42]

> *Rather than trying to fix disease and disability once it has happened, public health action aims to create environments and conditions that prevent harm and support health and wellbeing in the first place.*
>
> *We know that most health is influenced by the communities and environments in which we live. Healthcare makes only a small contribution to the health of the people in the Southern District. So while healthcare is important to those who already have disease or disability, working at a community and environmental level to increase health is really important too. Both approaches are needed.*
>
> *As an example, advocating for a network of safe cycle ways for commuters improves health through people enjoying improved air quality from less car emissions, increased road safety, increased physical activity and reduced stress. The cascade of effects means reduced risk of respiratory disease, cancers, disability and chronic diseases.*
>
> *Public health takes an evidence-informed approach to building healthy communities and environments. These activities are delivered in partnership with a range of groups and organisations. Public health activities from within the health service are led by Public Health South, as part of the Southern DHB*

Victorio (2016) estimated for MBIE that cycling on New Zealand's Cycle Trails in 2015 resulted in national savings of $11 million from reduced mortality risks; and more than 8% of this was from use of the Rimutaka Cycle Trail. The analysis used a very small level of change in participation levels; considered that:

> *It was also not known whether the trails might have changed prior exercise attitudes. There was no clear consensus as to whether facilities like cycle trails actually have an effect on exercise attitudes. Some researchers emphasise that their availability can have a strong influence upon activities like cycling. Others say that such facilities only create opportunities for exercise, with any effects being instead the result of individual and social factors.[43] Thus, a decision was made to assign only a small change, of one percentage point, to the number of individuals switching from being inactive to being active as a consequence of the trails being available for them to use.*

Walking and cycling does cause injuries and mortalities, but despite these, Janssen & LeBlanc (2010), via their meta-data analysis, maintained their significant recommendation that being active is better than not, and all the research quoted above maintains the same position (the benefits far outweigh the costs).

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[42] https://www.southerndhb.govt.nz/pages/public-health-services/
[43] This multi-factorial influence is noted, but it is significant that activity cannot occur without a venue.

The NZ Accident Compensation Corporation (ACC) reports on injury rates for all sports activities, which does not include walking. For cycling, 21,485 new injuries were reported in the year ended June 2018 (1,996 in the Otago region), compared with a high of 23,135 in the year ended June 2016 (1,888 in the Otago region), and a recent low of 19,683 in the year ended June 2014 (1,455 in the Otago region).

For kayaking, 1,302 new injuries were reported in the year ended June 2018 (105 in the Otago region), compared with a high of 1,467 in the year ended June 2015 (117 in the Otago region), and a recent low of 1,168 in the year ended June 2014 (89 in the Otago region).

By comparison, Rugby Union had 51,597 reported injuries in the year ended June 2018. Just 2.4% of the adult national population participate in rugby compared with 11.2% cycling; and 10% and 29% respectively for young people (aged 5-17) (average 7-day participation rates, Sport NZ, 2017).[44]

6.3 Other benefits of physical activity

Moore and Driver (2005) identified a significant list of specific types and general categories of benefits (or 'beneficial outcomes') attributed to leisure participation (including extreme physical endeavours and quiet contemplation) by one or more scientific studies. The entire list is not provided here – it is quite long. And for the purposes of this study, again, none can be quantified in relation to the opportunities offered for recreation within the study area. The categories include personal and social, as well as economic and environmental benefits, and just personal and social are listed here. They include:

PERSONAL BENEFITS: PSYCHOLOGICAL

Personal development and growth

- Self-esteem
- Self-confidence
- Self-reliance
- Self-competence
- Self-assurance
- Self-affirmation
- Values clarification
- Learn new skills and develop and apply other skills
- Academic/cognitive performance
- Independence/autonomy
- Sense of control over one's life
- Humility
- Leadership ability
- Aesthetic enhancement/greater appreciation of beauty
- Creativity enhancement
- Spiritual growth and greater appreciation/tolerance of different ethnic interpretations of spirituality
- Adaptability
- Cognitive efficiency
- Teamwork/cooperation
- Problem solving
- Nature learning
- Cultural/historic awareness/learning/ appreciation
- Environmental awareness/understanding
- Tolerance
- Balanced competitiveness
- Balanced living
- Willingness to take risks
- Acceptance of one's responsibility
- Academic and other mental performance

Mental health and maintenance

- Holistic sense of wellness
- Stress management (i.e., prevention, mediation, and restoration)
- Prevention of and reduced depression/ anxiety/anger
- Positive changes in mood and emotion

Personal appreciation/satisfaction

- Sense of freedom
- Self-actualisation
- Flow/absorption
- Exhilaration
- Stimulation
- Sense of adventure
- Challenge
- Nostalgia
- Perceived quality of life/life satisfaction
- Creative expression
- Aesthetic appreciation
- Nature appreciation
- Spirituality
- Positive change in mood/emotion
- Environmental stewardship
- Identification with special places/feeling of geographical belonging or physical grounding
- Transcendent experiences

[44] Participation rates based on 12 month and 7-day periods are used in the Active NZ surveys, and in this report both sets of data are used depending on which results are available for specific activities.

	▪ Catharsis	
PERSONAL BENEFITS: PSYCHOPHYSIOLOGICAL		
▪ Improved perceived quality of life ▪ Cardiovascular benefits, including prevention of strokes ▪ Reduced serum cholesterol and triglycerides ▪ Rehabilitation of patients with heart problems ▪ Improved control and prevention of diabetes ▪ Reduced consumption of alcohol, tobacco, and other drugs ▪ Reduced risk of lung and colon cancer ▪ Better muscle strength and joint functioning	▪ Reduced spinal problems ▪ Decreased body fat/obesity/weight control ▪ Reduced or prevented hypertension ▪ Improved neuropsychological functioning ▪ Increased bone mass and strength in children ▪ Promotion of better balance ▪ Increased muscle strength and better connective tissue ▪ Respiratory benefits (e.g. increased lung capacity, benefits to people with asthma) ▪ Improved response time	▪ Improved bladder control in the elderly ▪ Increased life expectancy ▪ Reduced anxiety and somatic complaints ▪ Management of menstrual cycles ▪ Management of arthritis ▪ Improved functioning of the immune system (i.e. resistance to illness) ▪ Reduced depression and improved mood ▪ Reduced incidence of disease ▪ Reduced need for some medications
SOCIAL/CULTURAL BENEFITS		
▪ Community satisfaction and morale ▪ Community identity ▪ Pride in community/nation (i.e. pride in place/patriotism) ▪ Keeping children engaged/away from less desirable activities ▪ Cultural/historical awareness and appreciation ▪ Nurture new community leaders ▪ Reduced social alienation ▪ Reduced illness and social impacts of such ▪ Community/political involvement ▪ Increased productivity and job satisfaction ▪ Conflict resolution/harmony ▪ Greater community involvement in environmental decision making	▪ Social support ▪ Support for democratic ideal of freedom ▪ Family bonding/better family life ▪ Enhanced worldview ▪ Developmental benefits in children ▪ Higher class attendance ▪ Lower dropout rates ▪ Cultural continuity ▪ Increased compassion for others ▪ Reduced loneliness ▪ Social mobility ▪ Improved image of public agencies ▪ Community integration ▪ Promotion of voluntary community efforts ▪ Reduced crime	▪ Nurturing of others ▪ Understanding and tolerance of others ▪ Environmental awareness, sensitivity ▪ Reciprocity/sharing ▪ Social mobility bonding/cohesion/cooperation ▪ Socialization/acculturation ▪ Cultural identity ▪ Increased trust in others ▪ Prevention of social problems by at-risk youth ▪ Ethnic social integration ▪ Increased independence of older people ▪ Networking by seniors ▪ Increased longevity and perceived quality of life

Angus & Associates (2017) reviewed only those benefits associated with physical activity, including those gained from volunteering to support others' active participation. Table 15 shows their assessment of the levels of proof for benefits other than physical health.

Table 15: Other benefits of Sport and/or Physical Activity and Standard of Supporting Evidence (Angus & Associates 2017)			
	Mental Health	**Social Cohesion**	**Educational Outcomes**
Gold Evidence		Development of the following amongst long-term volunteers: • Altruistic attitudes • Community orientation • Life skills • Leadership skills • Greater self-confidence	For children, a beneficial impact upon self-esteem and self-confidence which, in turn, has positive impacts upon perceptions of competence, achievement and engagement in meaningful activity
Silver Evidence	Reduced risk of: • Depression • Suicide • Alzheimer's Disease • Parkinson's Disease • Dementia Reduction in anxiety levels Improved self-esteem and life satisfaction	For individuals, beneficial impact upon: • Self-perception • Social competence Positive impacts upon community participation in rural areas Vehicle to empower local communities through regeneration and skill development Positive impacts upon social bonding and social interaction	Improved scholastic competence Behavioural improvements Small improvements in cognitive functioning Increased participation and identification with school values and pro-academic attitudes
Bronze Evidence	Amongst disabled people, potential for: • Improved self-confidence • Improved self-perception Improved mental health in children Therapeutic benefits related to: • Eating, addictive and body dysmorphic disorders • Some symptoms of schizophrenia	Increased levels of social integration for disabled participants Participants less likely to engage in social anti-social behaviours Increased levels of participation and community pride in New Zealand communities	Increased opportunities for educational equity for Māori and Pasifika students in New Zealand

6.4 Trends in participation

To save reading the following sections, the key point is: there will be more people doing more and different recreation activities in the future, *ceteris paribus* (all other things being equal). This means the potential for more recreation conflict (which can be managed), more biosecurity risks (which can be very difficult to manage), and the need for increased investment in recreation infrastructure – including hardening existing assets and increasing the diversity of options – if high levels of recreation enjoyment are to be maintained, along with the natural values which underpin recreation enjoyment. It is unlikely that NZ will seek to reduce or stabilise the number of international visitors in the near future (any reduction will be the result of external influences), and so new investment and

the careful management of natural attractions and access to them will remain important. Cycle tourism is a key trend to monitor (both domestic and international).

6.4.1 Domestic recreation

It is very difficult to use any existing data to identify trends in participation in the 'specialist sports' listed in section 3.14 of this report: kayaking had canoeing, surfing / body boarding, hunting, rowing, sailing / yachting, water skiing and stand-up paddle boarding. Changes in participation generally fall into the margins of error of national surveys, although, anecdotally, surfing has seen a clear resurgence over the past five years. Mass-participation activities are more easy to review, relying on Sport NZ's Active NZ surveys (Sport NZ 2014 and 2017) – although slightly different methods have been applied over the years. The 2013/14 results showed cycling and mountain biking was carried out by 24.8% of adult Kiwis over 12 months, while in 2017 the activities of road cycling and mountain biking were reported separately, with 34% of adult Kiwis participating in either over 12 months (20% and 14% respectively).[45] By separating the activities in 2017, the latest data will include some double-counting compared with the 2013/14 result (that is, respondents who mountain biked *and* road cycled in 2013/14 were recorded as participating in only one activity, whereas they are counted separately in 2017). Growth in participation cannot be assumed, but seems likely. Sixty percent of adult Kiwis were reported to have walked for recreation over 12 months in 2013/14 compared with 85% in 2017. This appears a very large difference and may be an artefact of the survey method, but it does suggest growth.

Unwin (2016) indicates a reasonably stable level of angler activity in Otago since 1994/95, although the 2014/15 season had the lowest number of angler days on record (albeit within the margin of error):

1994/96:	182,870 ± 6,470 angler days
2001/02:	218,710 ± 8,660
2007/08:	215,430 ± 9,370
2014/15:	181,360 ± 8,330

Unwin (2016) noted:

> *Total annual effort by New Zealand resident anglers in the Otago region over the four surveys since 1994/95 ranged from 181,360 angler-days (this season) to 218,710 angler-days (in 2001/2002), but showed no obvious long-term trend. Separate analyses for specific water types confirm the absence of any consistent trends for most types of fishery, the main exception being a marked decline for lowland rivers (from 22,300 ± 2,650 angler-days in 1994/95 to 8,870 ± 1,360 angler-days in 2014/15). However, there has also been a significant redistribution of effort along the mainstem of the Clutha River, where reduced effort on the upper reaches from Lake Wānaka to Lake Dunstan (20,900 ± 3,220 angler-days in 2007/08 vs. 6,670 ± 1,330 angler-days in 2014/2015) has been largely offset by increased effort on the lower reaches below Roxburgh (12,550 ± 1,940 angler-days in 2007/08 vs. 23,420 ± 3,870 angler-days in 2014/15).*

ACC data indicate reasonably stable levels of injury from kayaking and mountain biking over the past five years (see section 6.2). Assuming there has been no major change in injury per rate of participation, there is no indication of participation in these activities fading. In the experience of the author, there appears to have been a shift from 'extreme' kayaking (with a recent significant drop in

[45] Participation rates based on 12 month and 7-day periods are used in the Active NZ surveys, and in this report both sets of data are used depending on which results are available for specific activities.

kayak tourism on the West Coast for example), to more education-based activities. This may lead, in the future, to more high-level participation, but it is very hard to pick. In the meantime, it means increased popularity for the likes of the Hāwea Whitewater Park (which is substantiated by the interviews for this report).

Interviewees and ORC (2018) report increasing levels of motorised recreation – jet skis and jet boats – particularly on Lakes Wānaka and Dunstan and the upper Clutha River/Mata-au, and increased lake use generally in those popular areas.

6.4.2 Tourism – domestic and international

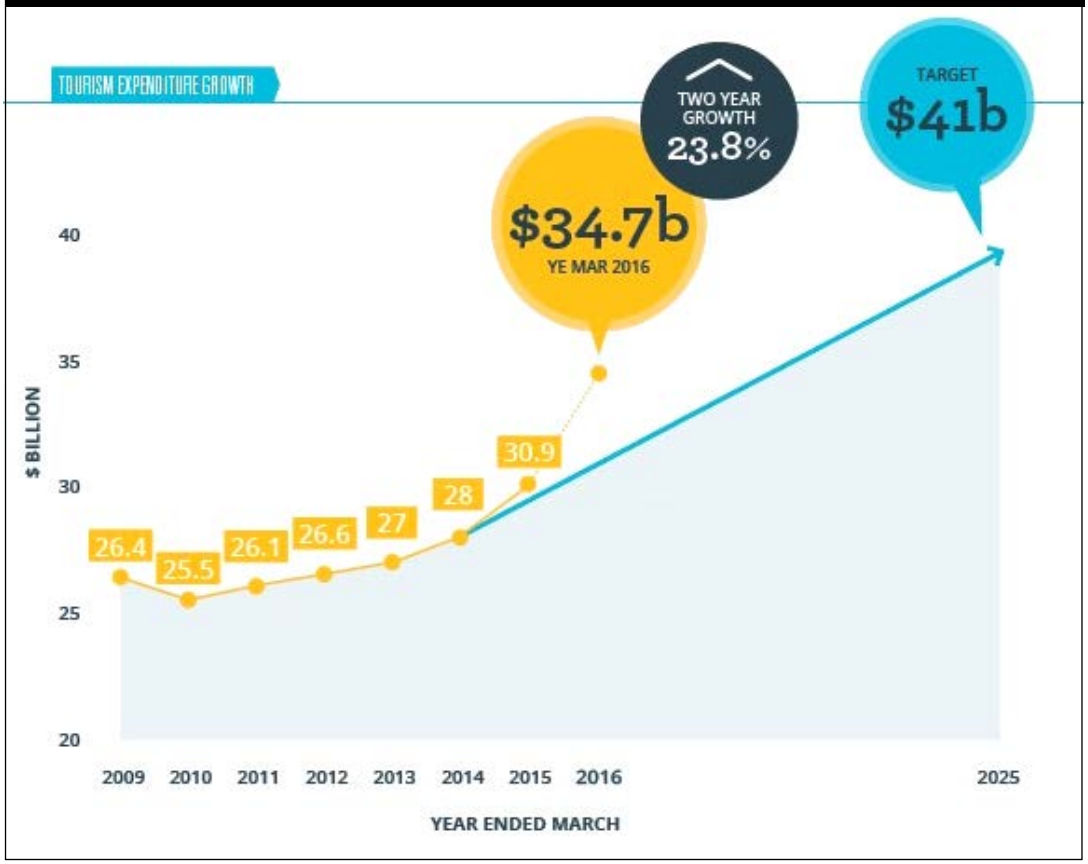
Tourism New Zealand has identified that New Zealand has an international point of difference in four special interest areas, and that these will form part of the nation's 'unique selling proposition':[46]

- Cycling and mountain biking
- Golf
- Skiing
- Walking and hiking

Tourism NZ reported:[47]

- 73% of international holiday visitors participated in walking or hiking in the three years to 2018, an average of 1.1 million people per year, 14% of whom reported walking and hiking as a factor in influencing their decision to visit NZ. 51% of the walking was short

Figure 56: TIA Tourism 2025, Tracking Progress



[46] https://www.tourismnewzealand.com/markets-stats/sectors/special-interest/
[47] https://www.tourismnewzealand.com/media/3076/special-interest-infographic.pdf

walks of between 30 minutes and three hours. Length of stay and average spend were near the average since most visitors participate in walking or hiking.

- 9% of international holiday visitors participated in cycling in the three years to 2018, an average of 138,000 people per year. This group spent on average 33 nights on the country compared with the average of 16 nights, and spent $4,900 compared with the average of $3,900, and tended to visit more regions (5 compared with the average of 3.5).

Cycle tourism in New Zealand has been growing. Methods for gathering tourism participation data via the International Visitor Survey have changed over the years and it is difficult to compare between survey periods. However, in 2013, NZ's Great Rides experienced 56% average growth, and between 2008 and 2011 international participation almost doubled.[48]

Tourism Industry Aotearoa's 2014 *Tourism 2025 - Growing Value* Together framework reports on the tourism and expenditure target and progress to 2016 in Figure 56. Growth in expenditure has been solid in recent years, although, at times, it has not kept up with international growth.[49] The projection is for continuing solid growth, assuming, in part, maintenance and improvement in key aspects of the industry identified in the MBIE Tourism Strategy[50], including:

- Strong international transport links and world-class border services,
- High value visitors throughout the year,
- A skilled and committed workforce,
- Sustainable and productive resource use,
- Robust tourism-related infrastructure,
- A great visitor experience,
- Authentic cultural experiences and support for Māori economic aspirations,
- Dispersal of visitors across regions,
- Employment opportunities and career development pathways in tourism, and
- A sector that's highly valued by New Zealanders.

These are almost all domestically controlled factors, and they are also demand-based – that is, they assume no capacity constraints in tourism infrastructure (such as a lack of international flights, or rental campervans) (MBIE 2016). There are of course also many international events that can severally affect international visitor numbers and the capability of Kiwis to take domestic holidays (the global economic downturn of 2007-08 for example). Such external risks are part and parcel of running any business, and require constant vigilance.

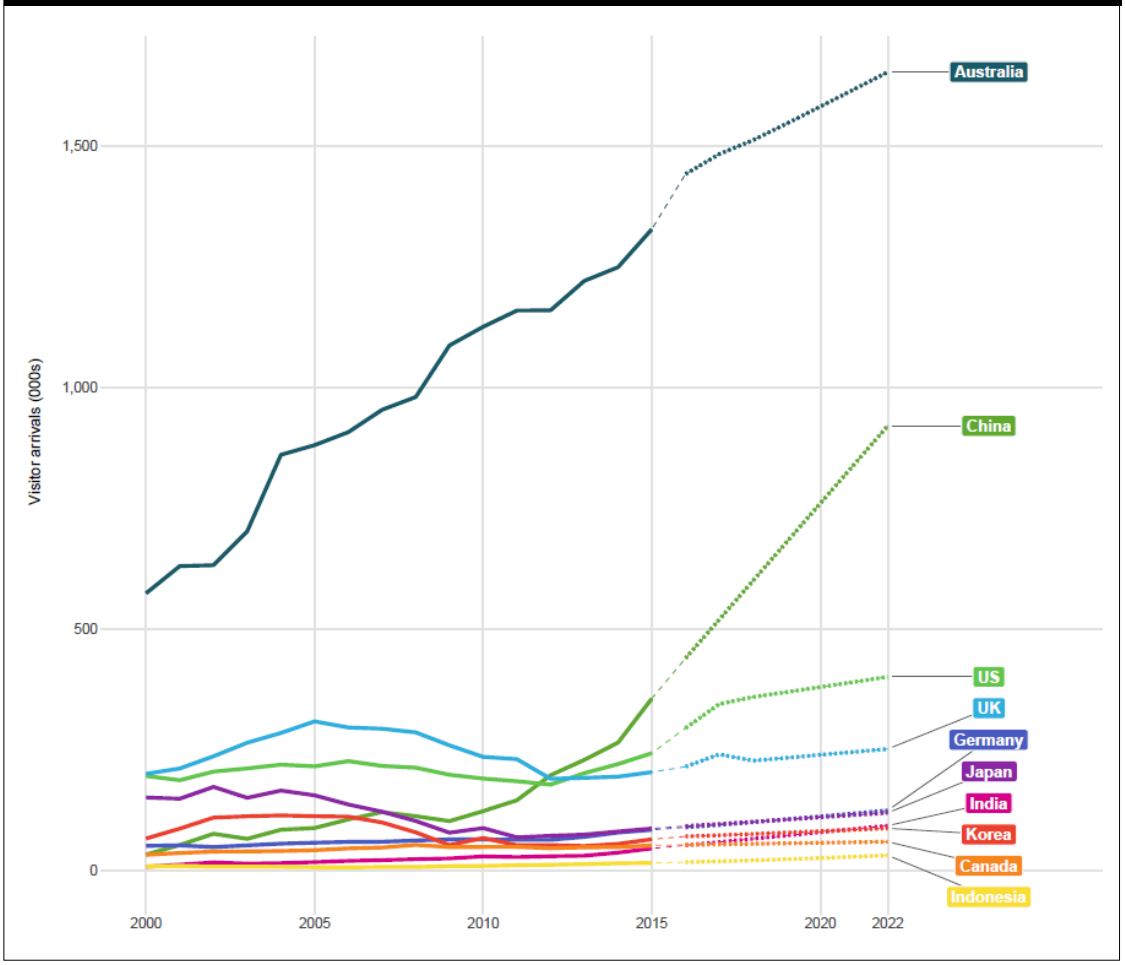
The following is this report author's summation of key visitor trends based on existing data and experience:

- More international visitors. In the year ending March 2017 international visitor arrivals were up for the fifth consecutive year at 8.9% to 3.54 million, but with an expenditure growth of only 1.9% to $14.5 billion (Weltec 2018).
- Growth in short domestic holidays. Domestic tourism expenditure was $21.4 billion, and grew by 4%, for the year ended March 2017 (Weltec 2018)

[48] https://www.tourismnewzealand.com/media/1764/cycling-tourism_profile.pdf and https://www.nzcycletrail.com/about/history/
[49] http://www.tourism2025.org.nz/making-it-happen/tourism-expenditure-growth/ and http://www.mbie.govt.nz/info-services/sectors-industries/tourism/tourism-strategy
[50] See: http://www.mbie.govt.nz/info-services/sectors-industries/tourism/tourism-strategy

- More interest from international visitors in Māori culture and ‘authentic experiences’, but only a little extra from the domestic market.
- More visitors from non-traditional origins and emerging markets, such as China and India (Figure 57) (MBIE 2016), and increasing expectations for targeted services – particularly by language. But also, potentially, high volatility and unpredictability in visitor numbers from emerging markets, including China.
- More professionalism in visitor services and higher expectations for honest, timely and quality experiences.
- Continuing very strong influence of social media on visitor choices, with some having very rapid effect on patronage – where quality, timeliness and honesty is lacking, if even only in one or two instances; and consequently the need to have a solid management plan for all relevant social media platforms.
- More adventurous and independent visitors – self-driving, freedom camping and using alternative transport – walking (Te Araroa) and cycling, for example.
- More interest in ‘authentic’, tailored and personal experiences.
- More interest in sustainable experiences – whether they be in natural or culturally important settings – as well as more scrutiny by national and international agencies of environmental and social indicators, and some influence of these indicators on international tourism choices. (Social media will still lead as the main influencer, however.)

Figure 57: International visitor arrivals, annual average, 2016–2022 forecasts. MBIE



- Continuing popularity in package tours, particularly in core NZ routes – Auckland-Rotorua, Christchurch-Queenstown – but growing interest in boutique travel packages to less-visited settings.
- The occasional emergence of unpredictable activities and motivations, mostly technology-led (such as geocaching, Airbnb, and selfie sticks) but also permutations on existing activities (such as stand-up and motorised paddle boards, and electric hydrofoil surfboards (Fliteboards)); some will enhance visitor experiences and some will present challenges, and all will need to be monitored.
- More concern by locals about visitor impacts on where they live and where they recreate, and more interest in local rates for visitor experiences.
- The effective use of simple accessible technology to enhance visitor experiences, which can be used to influcence behaviour (such as tourism information apps).
- Adverse events and publicity about the downsides of tourism, mostly caused by a very small number of visitors whose behaviour is hard to influence, and will include the routine (toileting on beaches) and the unpredictable (biosecurity incursions). Vigilance by NZ residents and other visitors, and immediate social pressure, in addition to surveillance and enforcement by agencies, will therefore be critical tools.[51]
- More concerns about tourism and biosecurity – potentially more-so from the domestic viewpoint considering potential losses to national taonga and economic resources.

[51] See for example: http://www.hortnz.co.nz/news-events-and-media/mikes-blog/getting-ready-for-biosecurity-incursions-we-need-all-new-zealanders/

7 Conclusion

This review indicates:

- The very diverse range of high quality recreation and tourism opportunities available within the study area; a reflection of the diversity of the settings – from placid lakes to an artificial whitewater course – and, generally, high water quality, excellent scenery, successful commercial recreation and tourism services, significant voluntary engagement, good access, protected natural regimes in the most significant areas, a reasonably predictable hydro-management regime elsewhere, and, usually, good communications by Contact Energy with specific user groups.
- The national status of almost all the study area for recreation and tourism and the high and growing significance of Lakes Wakatipi and Wanaka and the upper Clutha River/Mata-au (down to Albert Town) for tourism – although all components of the study area are national and international visitor destinations. Lake Roxburgh remains regionally significant – although the growing popularity of the Clutha Gold Trail (and cycling generally) could change this.
- The national significance of the lower Clutha River/Mata-au for angling (a difference in assessment from previous reviews) – a reflection of its high and apparently growing use by anglers – and its regional significance for all other activities, including whitebaiting particularly; and the retention of regional status *in toto* for recreation in the lower River.
- The high significance of the Clutha and Hawea river settings for outdoor education.
- The significant contribution the study area makes to regional economic wellbeing via national and domestic tourism and local recreation, and to social and personal health by those using it for recreation.
- A strong understanding of how the management of flows and lake levels for hydro affect recreation, and, in the main, a level of acceptance of that management regime, with only several site-specific concerns (such as flow effects from the Hāwea River on angling in the upper Clutha River/Mata-au below the Hāwea confluence, and flow effects on angling in the Hāwea River – where benefits for kayaking and hydro have come at a cost to fishing). Changing this regime would require full consideration of the potential for a range of positive and adverse effects.
- Notwithstanding that comment, peferences are for lower-range flows on the lower Clutha River/Mata-au (when interesting hydraulic features are exposed and weed beds and lies[52] are more accessible for angling), flow stability on the upper Clutha River/Mata-au below the Hāwea confluence – or a similar regime to that above the confluence – for angling, boating and swimming – and flow stability on the mid-Clutha River (although this would benefit one of the less-used sections of the Clutha River/Mata-au).
- A natural lake-level regime on Lake Hāwea and the Hāwea River would be preferred by anglers, but with the hydro scheme in place, at least reductions in ramping rates for the River. The managed flow regime and White Water Park is well-suited to kayakers, swimmers and surfers, although more opportunities for the desired flows are sought through optimising flow releases for hydro. Lake level variation on Lakes Dunstan and Roxburgh are well-accepted, albeit with concerns over increasing sedimentation in the

[52] Locations where fish are likely to be lurking, mostly where they can expend the least energy, be safe and get the most food, such as sheltered areas downstream of rocks, in eddies and under or near overhanging banks and vegetation.

Kararau Arm and Bendigo area of Lake Dunstan and its affect on boating opportunities. There is, however, general acceptance of national and local benefits from management of much of the catchment for hydro generation, including, particularly, the existence of Lake Dunstan.

- Concern about the effects of didymo, lake snow and lagarosiphon (albeit not-so-much in Lake Dunstan for the latter) and other water quality issues (freedom camping a growing concern).
- Lakes Hawea, Roxburgh and Dunstan and the lower and mid Clutha River/Mata-au have ample capacity for additional recreational use, not including whitebaiting where capacity appears to be constrained. Angling amenity largely depends on the quality of the fishing resource (including the size, variety and number of fish and anglibility), which has been advesely affected by didymo in one of the most popular settings – the upper Clutha River/Mata-au and the Hāwea River (although the controlled flow regime in the latter largely removes angling amenity). Otherwise, limited lake and river level variation and natural flows would clearly benefit angling and increase the scale of opportunity. Some recreation conflict between motorised and non-motorised activities are reported in Lake Wanaka and the upper Clutha River/Mata-au (mostly upstream of Albert Town and largely limited to January), and the capacity for growth in use in these areas should be monitored.

Table 16: Summary findings

Water body	Significance	Activities	Flow preferences
Lake Wakatipu	National	Major tourism setting. All lake and shore activities. Scenic.	Natural range. Water quality a key issue (a defining characteristic).
Lake Wānaka	National	Major tourism setting. All lake and shore activities. Scenic.	Natural range. Water quality a key issue (a defining characteristic).
Lake Hāwea	National	Moderate tourism setting. Swimming, angling, lake shore activities, boating. Scenic.	Natural range, but generally a high level of acceptance of current management, besides non-recreation issues (dust, erosion, dam risk) and effects on access to lakeshore angling opportunities. Water quality a key issue (a defining characteristic).
Lake Dunstan	National	Major domestic recreation settting. All boating activities, swimming, rowing, angling.	Current regime well-accepted with predictable and narrow range. ‘Weed fishery’ status accepted. Sedimentation in deltas of interest.
Lake Roxburgh	Regional	Growing use as a result of cycle trail and ‘discovery’ of minor fishing resource. Boating.	Current regime well-accepted with predictable and narrow range.

Table 16: Summary findings			
Water body	**Significance**	**Activities**	**Flow preferences**
Upper Clutha/Mata-au above Hāwea	National	International fishery at Deans Bank adversely affected by didymo, but still an important fishery. Boating, swimming. Scenic.	Natural range. Water quality and didymo (fish habitat, fouling lines) key issues.
Hāwea River	National	White water activities – kayaking and surfing, swimming, outdoor education.	Managed flow regime suits the use of White Water Park and kayak slalom, but more certainty and more frequent preferred flows – with a wide range of preferences – desired. Low flows (<16 m^3/s) preferred for angling, and more attention to ramping rate effects.
Upper Clutha/Mata-au below Hāwea	National	Boating, angling, swimming, hunting.	Local didymo that sloughs from upper Clutha/Mata-au and Hāwea River diminishes recreation values. Natural flow preferred, but managed regime largely acceptable to all but anglers (high flows avoided). Resistance to additional variability or reduced flows.
Mid Clutha/Mata-au	Regional	Boating, little angling, and angler access to Lake Roxburgh. Scenic.	Scale and speed of River, and poor angling access, limits amenity. Variability affects angler access to weed beds and eddies. Limited potential to improve setting, but lower flows preferred for angling, and little affect on other uses.
Lower Clutha/Mata-au	National	Angling, whitebaiting, Tuapeka Mouth Ferry, cycling, some boating.	Lower range flows (<300 m^3/s) preferred for access to weed beds and angling lies, and availability of hydraulic feautures for jet boating, rafting and kayaking. However, flow predicatability enables timing of use and access to a range of amenable flows.Tuapeka Ferry non-operable for low-slung cars at 300 m^3/s and aground at 200 m^3/s (and non-operable at 900 m^3/s+).
Kawarau River	National	Major tourism destination for white water activities below Arrow confluence and jet boating, angling and scenic values above.	Natural range.

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Appendix 1: Department of Conservation concessions

The table below identifies the type of tourism concession issued by the Department of Conservation by land area.

Activity	Location
	Lake Wānaka
Golf course	Marginal Strip Lake Wānaka (Parkins Bay)
Guided walking	
Sporting event	Waterfall Creek Recreation Reserve
Guided walking x 2	
Sporting event	Marginal Strip Lake Wānaka (West Side)
Boat Transport X 2	
Fishing guides	
Guided kayaking, walking and camping	
Guided walking	Boundary Creek Scenic Reserve
Fishing guides X 1 and NZ Professional Fishing Guides Association	Marginal Strip Lake Wānaka (East Side)
Guided walking x2	
Boat transport x2	
Guided walking	Matatiaho Conservation Area
Sporting event	
Guided mountain biking x 5	Dublin Bay – Outlet – Albert Town Recreation Reserve
Sporting events x5	
Boat transport	
N/A	Mou Tapu Scenic Reserve
Boat transport x 2	Mou Waho Scenic Reserve
Guided walking x 5	
Sporting event	Stevensons Island Scenic Reserve
Guided walking x 5	
Boat transport x 4	
Lake Wānaka Outlet to the head of Lake Dunstan	
Sporting Event x2	Hikuwai Conservation Area

Activity	Location
Guided walking x6	
Guided mountain biking x5	
Boat transport	
Fishing guides x2	Marginal Strip Clutha River
Guided mountain biking x3	
Guided walking	
Sporting event x3	
Guided walking	Clutha River/Mata-au Conservation Area/North Side
Sporting Event	
N/A	Mata-au Scientific Reserve
Sporting event	Lower Lindis Conservation Area
Easement	
N/A	Clutha River/Mata-au Conservation Area/South Lindis
Lake Dunstan	
Sporting event	Mahaka Katia Scientific Reserve
Clyde Dam to Lake Roxburgh	
Guided mountain biking x 1	Flat Top Hill Scenic Reserve & Flat Top Hill Conservation Area
Sporting Event	
Bike trail	
N/A	Clutha River/Mata-au Marginal Strip
Guided walking x3	Earnscleugh Dredge Tailings Historic Reserve
Guided walking x2	Lake Roxburgh Marginal Strip
Bike trail	
	Lake Roxburgh Outlet to the Sea
N/A	Clutha River/Mata-au Marginal Strip
N/A	Ettrick Conservation Area
N/A	Teviot Road Marginal Strip
Guided walking	Millers Flat Punt Site
Grazing	Clutha River/Island Block Conservation Area
N/A	Beaumont Conservation Area
N/A	Birch Island Conservation Area
Guided walking x4	Blue Mountains Conservation Area

Activity	Location
N/A	Tuapeka West Scenic Reserve – Conservation Area
N/A	Tuapeka Punt Site
N/A	Tuapeka Mouth Punt Site
N/A	Clutha River, Wharetoa Conservation Area
N/A	Clydevale/Clutha River/Mata-au Conservation Area
N/A	Gull Island (Clutha River) Conservation Area
Guided walking	Waiwera River Marginal Strip
Lake Wakatipu	
Rock climbing guiding	Te Kere Haka Scenic Reserve
Guided walking	
N/A	Taka Ra Haka Conservation Area
Guided walking	Wakatipu Tributary Conservation Area
Guided cycling	Lake Wakatipu Marginal Strip
Guided walking x 2	
Fishing guides	
Kayak guiding	
Guided walking x6	Seven Mile Recreation Reserve
Rock climbing guiding x3	
Guided mountain biking x4	
Kayak guiding	
Gold fossicking	
Guided walking x5	Wilsons Bay Recreation Reserve
Easement x1	
Guided mountain biking x2	
Guided mountain biking x3	Twelve Mile Delta Recreation Reserve
Guided walking x2	
4WD guiding	Bobs Cove Recreation Reserve
Gold fossicking	
Commercial dog walking	
Guided walking x13	
Guided mountain biking x3	

Activity	Location
N/A	Twenty-Five Mile Creek Recreation Reserve
Accommodation	Blanket Bay- Meiklejohns Bay Recreation Reserve
Horse trekking	
Guided walking	
Guided walking	Glenorchy Foreshore Conservation Area
Guided photography	
N/A	Kinloch Foreshore Reserve Conservation Area
Guided walking x3	Greenstone Road Recreation Reserve
Guided mountain biking x2	
Guided photography	
N/A	Von River Marginal Strip
N/A	Beach Bay Recreation Reserve (Walter Peak)
Kawarau River	
Rafting x2	Kawarau River Marginal Strip
Sporting event	
River surfing x2	
Fishing guides	
N/A	Kawarau River Conservation Area
4WD guiding 7	Arrow River Marginal Strip
Guided walking X18	
Fishing guides	
Trail licence X1	
Sporting event x1	
Mountain bike guiding x3	
River surfing x1	
N/A	Lepidium Kawarau Habitat Conservation Area
River surfing x2	Arrow Junction Conservation Area
N/A	Access to Kawarau River (Gibbston) Conservation Area
Guided walking x2	Kawarau Gorge Recreation Reserve
River surfing x1	
N/A	Whatatorere Historic Reserve
River surfing x 1	Roaring Meg Recreation Reserve

Activity	Location
N/A	Roaring Meg Conservation Area
N/A	Scrubby Stream Conservation Area
N/A	Ripponvale Conservation Area
Jet Boating	Kawarau Gorge Mining Centre
River surfing	
Tourist attraction	
N/A	Queenstown – Glenorchy Road Recreation Reserve

Appendix 2: 2004 Inventory of recreation opportunities on hydro settings

Source: Greenaway (2004). See section 4.15.

Activity	Location	Effect of scheme, significance	Image
Swimming (areas with specific facilities only – almost all parts of the area with access offer swimming sites)	Bannockburn, Lake Dunstan	Provided as part of scheme Regional	
	Cromwell foreshore, Lake Dunstan	Provided as part of scheme Regional	
	Lake Hāwea swimming area	Provided as part of scheme Regional	
	Lowburn Harbour, Lake Dunstan	Provided as part of scheme Regional	

Activity	Location	Effect of scheme, significance	Image
	Burton Creek, Lake Dunstan	Provided as part of scheme Regional	
	Mackenzie Beach, Lake Roxburgh	Provided as part of scheme Local	
Windsurfing	Northburn, Lake Dunstan (noting many other locations on the Clutha Arm are also suitable). Photo shows windsurfing information sign.	Provided as part of scheme Local	
Water skiing, biscuiting (formal ski lanes only - the activity occurs throughout the lakes)	McNulty's Inlet, Lake Dunstan	Provided as part of scheme Regional	
	Lowburn Harbour, Lake Dunstan	Provided as part of scheme Regional	

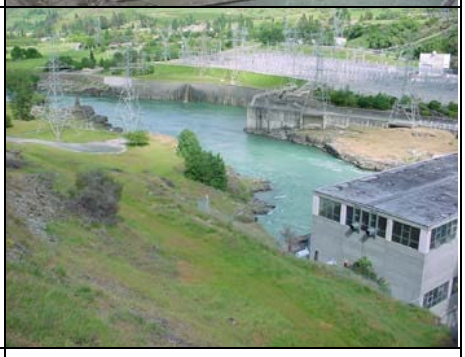
Activity	Location	Effect of scheme, significance	Image
	Northburn, Lake Dunstan	Provided as part of scheme Regional	
Boating (formal launching sites only).	Bannockburn ramp, Lake Dunstan	Provided as part of scheme Regional	
	Crippleton ramp, Lake Dunstan	Provided as part of scheme Regional	
	Cromwell boat ramp, Lake Dunstan	Provided as part of scheme Regional	
	Cromwell jetties, Lake Dunstan	Provided as part of scheme Regional	

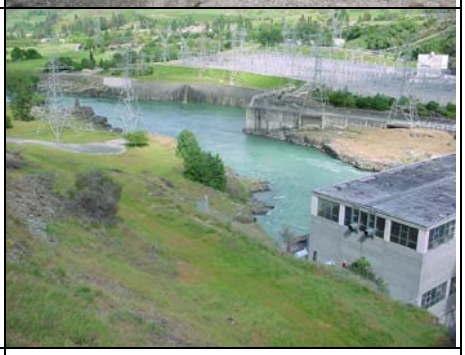
Activity	Location	Effect of scheme, significance	Image
	McNulty's Inlet ramp and jetties, Lake Dunstan	Provided as part of scheme Regional	
	Champagne Creek ramp, Lake Dunstan	Provided as part of scheme Regional	
	Lowburn Harbour ramp and jetties, Lake Dunstan	Provided as part of scheme Regional	
	Lowburn Inlet, Lake Dunstan	Provided as part of scheme Local	
	Northburn ramp, Lake Dunstan	Provided as part of scheme Regional	

Activity	Location	Effect of scheme, significance	Image
	Bendigo ramp, Lake Dunstan	Provided as part of scheme Regional	
	Burton Creek, Lake Dunstan ramp	Provided as part of scheme Regional	
	Burton Creek jetties, Lake Dunstan	Provided as part of scheme Regional	
	Dairy Creek, Lake Dunstan ramp	Provided as part of scheme Regional	
	Dairy Creek jetties, Lake Dunstan	Provided as part of scheme Regional	

Activity	Location	Effect of scheme, significance	Image
	Richards Bay, Lake Dunstan	Provided as part of scheme? Regional	
	Clutha River/Mata-au above Hāwea confluence	Unaffected Regional	
	Rotary Park, Alexandra	Modified Regional	
	Roxburgh Dam ramp	Provided as part of scheme Regional	
	Roxburgh Dam jetty	Provided as part of scheme Regional	

Activity	Location	Effect of scheme, significance	Image
Fishing (trout and salmon)	Lake Hāwea	Modified Regional	
	Hāwea River. Photo at Camp Hill Road bridge looking downstream.	Modified Regional	
	Upper Clutha River. Photo 300 metres above Hāwea confluence.	Modified Regional / National	
	Kawarau River	Modified (landlocked fish) Local / Regional	
	Lake Wānaka	Modified (landlocked fish) Regional / National	
	Lake Dunstan. Photo at Lions.	Provided as part of scheme Regional / National	

Activity	Location	Effect of scheme, significance	Image
	Lake Roxburgh	Provided as part of scheme Local / Regional	
	Clutha River/Mata-au below Roxburgh	Modified Regional	
White-baiting	Clutha River/Mata-au below Roxburgh	Possibly modified Regional	
Rafting	Clutha River/Mata-au below Hāwea Confluence. Photo at Fish and Game access site, Windemere.	Modified Regional / National	
	Kawarau River below Scrubby Stream	Modified Regional / National	
Rowing	Dunstan Arm Rowing Club (Burton Creek)	Provided as part of scheme Regional	
Kayaking	Sargoods Weir	Lost National	
	Cromwell Gap	Lost Regional / National	

Activity	Location	Effect of scheme, significance	Image
	Hāwea River. Image shows slalom course above Clutha confluence.	Modified Regional / National	
	Clutha Gorge	Lost Regional / National	
	Clutha River/Mata-au below Hāwea River. Photo at Fish and Game access site, Windemere.	Modified Regional	
	Lake Dunstan (flatwater). Photo at Cromwell foreshore.	Provided as part of scheme Regional	
	Clutha River/Mata-au below Roxburgh	Modified Regional	
	Kawarau River below Scrubby Stream	Modified National	
River boarding / sledging	Kawarau River below Scrubby Stream	Modified Regional / National	

Activity	Location	Effect of scheme, significance	Image
	Hāwea River. Photo above slalom course above Clutha confluence.	Modified Regional / National	
	Clutha River/Mata-au above lake Dunstan	Modified Regional / National	
Picnic, passive (formal managed sites only)	Bannockburn, Lake Dunstan	Provided as part of scheme Regional	
	Cromwell foreshore, Lake Dunstan	Provided as part of scheme Regional	
	Lions, Lake Dunstan	Provided as part of scheme Regional	

Activity	Location	Effect of scheme, significance	Image
	Northburn, Lake Dunstan	Provided as part of scheme Regional	
	Lowburn, Lake Dunstan	Provided as part of scheme Regional	
	Rocky Point, Lake Dunstan	Provided as part of scheme Regional	
	Bendigo, Lake Dunstan	Provided as part of scheme Regional	
	Dead Mans Point, Lake Dunstan	Provided as part of scheme Regional	

Activity	Location	Effect of scheme, significance	Image
	Crippletown, Lake Dunstan	Provided as part of scheme Regional	
	Dairy Creek, Lake Dunstan	Provided as part of scheme Regional	
	Lowburn, Lake Dunstan	Provided as part of scheme Regional	
	Burton Creek, Lake Dunstan	Provided as part of scheme Regional	
	Hāwea River (DoC reserve)	Modified Regional	

Activity	Location	Effect of scheme, significance	Image
	John Bulls, Lake Dunstan	Provided as part of scheme Regional	
	McNulty Inlet, Lake Dunstan	Provided as part of scheme Regional	
	Lake Hāwea, many sites	Modified Regional	
	Lake Roxburgh: McKenzies Beach, few other sites. Photo at Roxburgh Dam boat jetty.	Provided as part of scheme Local / Regional	
	Jacksons, Lake Dunstan	Provided as part of scheme Regional	

Activity	Location	Effect of scheme, significance	Image
Walking (major walkways only)	Riverside to Drs Point, Lake Roxburgh	Post scheme Local / Regional	
	Alexandra to Clyde	Post scheme Local / Regional	
	Cromwell to Bannockburn	Post scheme Local / Regional	
Cycling / mountain biking	Round Lake Dunstan	Post scheme Regional	
	Alex to Clyde (rail trail circuit)	Post scheme Regional	
	Doctors Point	Post scheme	
Jet boating (river)	Clutha River/Mata-au below Hāwea River	Modified Regional	
	Clutha River/Mata-au below Roxburgh	Modified Regional	
Education (formal structures only)	Cromwell College Education Centre, McNulty Inlet, Lake Dunstan	Post scheme Regional	

Boffa Miskell

Natural Character, Riverscape & Visual Amenity Assessments

Clutha/Mata-Au Water Quantity Plan Change – Stage 1
Prepared for Otago Regional Council

15 October 2018

Document Quality Assurance

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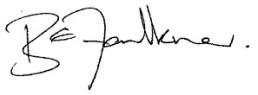
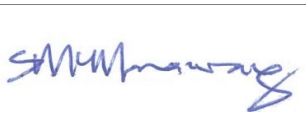
Prepared by:	Bron Faulkner Senior Principal/ Landscape Architect Boffa Miskell Limited	
	Sue McManaway Landscape Architect Landwriters	
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Contents

1.0 Introduction

Otago Regional Council (ORC) has commissioned a natural character, riverscape and visual amenity assessment to assist with the preparation of a proposed plan change to the Regional Plan: Water for Otago (Water Plan). The proposed plan change relates to:

Allocation limits and associated minimum flows for:

- The main stem of the Clutha River/Mata-Au between:
  - Lake Wanaka outlet and the head of Lake Dunstan;
  - Clyde Dam and the head of Lake Roxburgh;
  - Roxburgh Dam and the mouth of the Clutha River/Mata-Au;
- The main stem of the Kawarau River; and
- The main stem of the Hāwea River; Allocation limits and lake levels for;
- Lakes Dunstan and Roxburgh (Hydro lakes);
- Lakes Hāwea, Wakatipu and Wanaka (Source lakes).

This assessment is part of Stage 1 as a baseline study of the plan change process. Its purpose is to describe and analyse the current riverscapes, levels of natural character and visual amenity.

1.1 Project Scope

The project involves three separate but interrelated assessments; a riverscape description, a natural character assessment and a visual amenity assessment.

The study area for these assessments was identified by ORC and divided into 11 ‘reaches’ listed below; (refer **Figure 1**)

- Lake Hāwea
- Lake Wanaka
- Lake Wakatipu
- Lake Dunstan
- Lake Roxburgh
- Hāwea River
- Clutha Mata-Au between Lake Wanaka and Lake Dunstan
- Kawarau River
- Clutha Mata-Au between Lake Dunstan (Clyde Dam) and Lake Roxburgh
- Clutha Mata-Au between Lake Roxburgh (Roxburgh Dam) and Rongahere
- Clutha Mata-Au between Rongahere and river mouth

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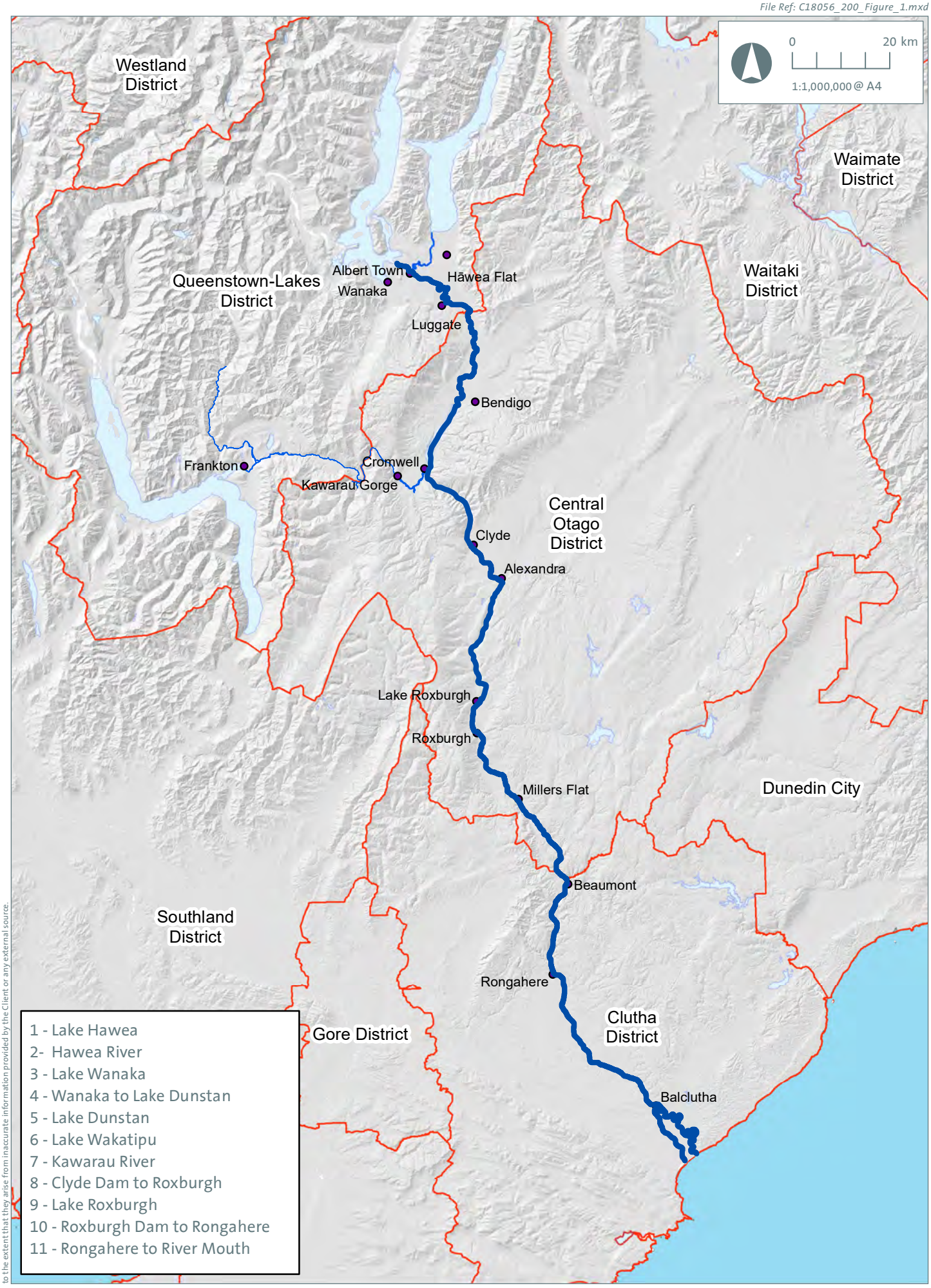

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Legend

Territorial Authorities

Data Sources:
Topographical map and data sourced from Land Information New Zealand. Crown Copyright Reserved 2018.

CLUTHA MATA-AU RIVER STUDY

Study Reaches: Figure 1

Date: 15 October 2018 | Revision: 1

Plan prepared for Otago Regional Council by Boffa Miskell Limited

Project Manager: **Yvonne.Pfluger@boffamiskell.co.nz** | *Drawn:* CMu | *Checked:* BFa

Assessment Limitations and Assumptions

Regional Scale Study

The study area for this project is extensive and essentially considers some of the largest waterbodies in the South Island. While the study area has been divided into 11 sub areas (or reaches), each of these typically encompass large geographical areas. At a regional scale each of the waterbodies can be considered to be relatively homogenous. However, if considered at a finer scale there would be obvious diversity of elements and qualities within each water body.

This assessment has been undertaken at a regional scale, inevitably resulting, to an extent, in an 'averaging' effect where very good or high value attributes can at times, balance out poorer or low value attributes. Notwithstanding this, the assessment has identified obvious differences in the attributes and qualities between the reaches.

Hydro Lakes - Lake Dunstan and Lake Roxburgh

Lakes Dunstan and Roxburgh are the flooded valleys of the Clutha River/Mata-Au where the river was dammed to develop the hydro power scheme in the 1950s and 1990s. For the purposes of this natural character assessment these lakes have been assessed as lakes rather than rivers, (albeit artificially created lakes). The lakes have been in place for some time, they have naturalised to lake systems to some degree and will remain as lakes for the foreseeable future. Consequently, in terms of on-going management decisions it is pragmatic to assess their naturalness in terms of lake elements, patterns and processes. The flow related attributes were however rated as very low given that they are managed for electricity generation.

Natural Character a Culmination of Many Factors

Natural character is essentially a measure of the naturalness (or modification) of the natural elements, patterns and processes that comprise a waterbody (refer to Section 2.2 for detailed description). The process to assess the level of natural character involves an understanding of the many systems and attributes that contribute to a waterbody including abiotic, biotic and experiential factors. Consequently, this requires input from a range of technical disciplines such as river hydrology and morphology, aquatic and terrestrial ecology, water quality and landscape architecture. This assessment is based on a desktop review of relevant available data, expert input and review by ORC staff and a site survey. The site survey was carried out over 2 days (13th and 14th June 2018) visiting 59 locations accessible from public roads.

1.2 Statutory Context

The Resource Management Act 1991 (RMA) requires regional councils to manage the taking and use of water and manage the quantity, level and flow of water bodies. The National Policy Statement for Freshwater Management 2017 (NPSFM) requires regional councils to set allocation limits and minimum water levels/flows for all freshwater management units and ensure efficient water use.

In order to meet the requirements of the NPSFM, the Otago Regional Council (ORC) is now preparing a series of changes to the provisions in the Regional Plan: Water for Otago (Water Plan). These plan changes seek to set allocation limits (primary and supplementary) and associated minimum flows for the surface water and connected groundwater resources of several Otago catchments.

Section 32 of the RMA directs regional councils to identify and assess the environmental, economic, social and cultural impacts (cost and benefits) of water quantity plan changes. Natural character, riverscape and visual amenity values together contribute to the economic, environmental and social and cultural wellbeing in the following ways:

- the quality of life experienced by New Zealanders.
- areas with high natural character often support high value biodiversity and ecosystems
- supporting tourism and film industries and can strengthen local economies by attracting residents and investment to an area, as well as tourists.

2.0 Riverscapes, Natural Character and Visual Amenity

Rivers and lakes are dynamic and complex features set within a broader landscape context. They are often a visual, ecological and recreational focus in a landscape as well as providing physical links throughout their catchments. Rivers and lakes and their margins have natural character, amenity and landscape values that require consideration in water allocation decisions particularly relating to how changing river flows and lake levels can affect those values.

Many aspects of riverscapes, natural character and visual amenity are inevitably interrelated and overlapping. The sections below describe each of the three assessments and the matters taken into consideration for each.

2.1 Riverscape Descriptions

The term riverscape refers to the particular landscape qualities associated with the features of a river and its margins and can be thought of as a subset of the wider landscape. It simply indicates that it is the river component of the landscape that is being considered, rather than the whole catchment context. For this project the riverscape section of the report also includes the descriptions of the lakes and their margins.

The riverscape is described for each of the identified reaches of this project in terms of the landform (river channel/ lakeshore morphology), land use (including recreation), and vegetation cover. The description provides the contextual landscape setting for each of the reaches/lakes.

2.2 Natural Character of Rivers Lakes and their Margins

The Resource Management Act (Section 6(a)) considers as a matter of national importance:

> *…the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.*

Natural character is a term used to describe the naturalness of an environment. The definition[1] used for this study is:

> Natural character is a term used to describe the naturalness of river/lake environments. The degree or level of natural character within an environment depends on:
>
> - The extent to which natural elements, patterns and processes occur

[1] A definition that has been widely adopted by landscape architects and other resource management practitioners.

- The nature and extent of modifications to the ecosystems and landscape/riverscape.
- The highest degree of natural character (greatest naturalness) occurs where there is least modification.
- The effect of different types of modification upon the natural character of an area varies with the context and may be perceived differently by different parts of the community.

The natural character of rivers and lakes may be affected by structural modifications (e.g. the construction of dams, water take structures groynes, stopbanks, bridges or boat ramps), changes in appearance resulting from particular flows or lake levels (in the most extreme case a dewatered river channel), or by longer term effects of river flow regime/lake level changes such as vegetation encroachment onto river beds, the loss of river braids, extent of lake margin etc. Dams, bridges, and infrastructure associated with water takes are examples of built modifications that may be in or close to the river/ lake bed. However, roads, structures and buildings occurring further from the river/ lake on adjacent land may also have effects on the natural character of a water body.

The methodology used for this natural character assessment is based on previously developed guidelines for river assessment[2] and the recent development of the natural character assessment methodology for the coastal environment.

2.2.1 Natural Character Assessment – Methodology

The key factors considered to assess the naturalness of the lakes and rivers relate to the degree of intactness of the natural elements, patterns, processes, and extent of any physical modifications to landforms or presence of built structures. It also includes the perceptual or experiential component of naturalness.

Natural elements incorporate all key river elements, such as the water, bed and banks, as well as particular attributes occurring within the river environment, such as geological formations, native vegetation and fauna. Exotic species also have natural characteristics that can positively contribute to natural character. However, their presence will reduce levels of natural character from 'pristine' because they have been introduced and displace indigenous vegetation.

Natural patterns take the channel and the riparian edge into account, as well as patterns created by humans on adjacent land, such as shelterbelts, land use boundaries, etc.

Natural processes include river/ lake dynamics, flows and currents, erosion, freshes and floods, and regeneration processes of riparian vegetation and ecological health.

Experiential/perceptual- relates to how we experience naturalness, the sense of untamed remoteness, the sounds and smells of a place and how natural it appears and feels.

[2] FRST 2009. Prepared by Boffa Miskell and NIWA *Riverscape and Flow Assessment Guidelines*

2.2.2 River and Lake Components

For the purposes of the natural character assessment the rivers and lake have been considered to comprise three components; Context, Margin, and Active bed.

Context

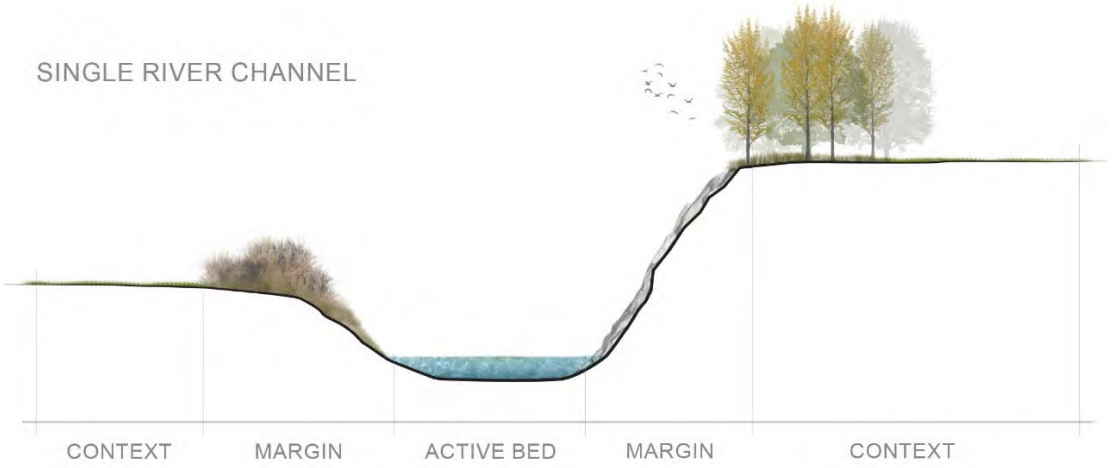
Refers to the wider landscape context of the catchment adjacent to the lake/river, and considers the land use, landform and vegetation cover that contributes to the overall character of the river/lake.

Margin

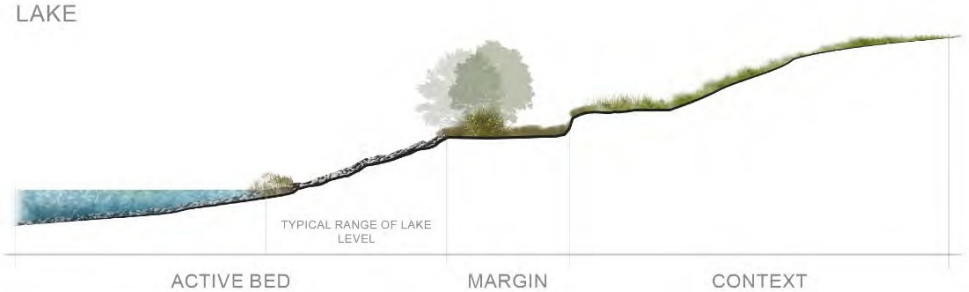
Refers to the strip of land between the active bed and the wider landscape context, including the banks. River processes, patterns and influences will be evident in the margin, such as occasional flooding, historic banks and channel patterns. From locations within the river/lake margin the active bed is the visually dominant feature. The margin is typically narrow and may incorporate terraces, banks, stopbanks, abandoned riverbed, floodplains, river and tributary confluences and built infrastructure. Generally topographic features define the extent of the margin as they extend between the top and base of banks or terraces. Vegetation type boundaries can also define the margin extent, such as where riparian scrub or planting meets grazed pasture in the landscape context.

Active Bed

- **River:** For single stem, incised rivers the active bed comprises the river channel. For wider riverbeds and those with a braided character the active river bed includes wetted areas/channels and may include dry margins, islands, banks, abandoned channels and bars of a braidplain that form part of the river's natural migration across the riverbed, as well as flood channels, and side channels.
- **Lakes**: Includes varying lake shore extents for the typical range of lake levels. The landward extent of the active zone is often delineated where permanent terrestrial vegetation meets the bare gravel/rock substrate.


SINGLE RIVER CHANNEL
CONTEXT
MARGIN
ACTIVE BED
MARGIN
CONTEXT


BRAIDED RIVER
FLOOD CHANNEL
ISLAND
CHANNEL
CONTEXT
MARGIN
ACTIVE BED
MARGIN
CONTEXT


LAKE
TYPICAL RANGE OF LAKE LEVEL
ACTIVE BED
MARGIN
CONTEXT

2.2.3 Structure of the Natural Character Assessment

Each component of the river or lake has been assessed separately using a set of attributes that incorporate the abiotic and biotic factors specific to river and lake systems as below. The experiential component of natural character has been considered for the complete river/lake rather than for each component separately.

Assessment Criteria Natural Character

River / lake Component	Attribute groupings	Lake/river Natural Character Attributes
Active bed	Abiotic	Flow regime characteristics and levels, managed or natural flows.
		River channel /lakebed substrate morphology including modifications/ structures e.g. boat ramps, dams, diversions
		Water Quality-if available indicator of ecological health
	Biotic	Aquatic ecology, flora/fauna, habitat, pest species
Margin	Abiotic	Modification and structures- buildings, quarries, stopbanks, bridges roads,
	Biotic	Terrestrial ecology, (also describe braided riverbeds) e.g. vegetation and bird habitat
Context	Abiotic and Biotic	Land modification/land use / vegetation. Urban, agriculture,
All (focus on active bed and margin)	Experiential	Views, sounds, sense of naturalness, wildness remoteness

A Five-Point scale was used to assign an overall level of natural character to each of the river/lake components.

Very High	**High**	**Moderate**	**Low**	**Very Low**
Very High levels of natural character due to Very Low or no levels of modification	High levels of natural character due to Low levels of modification	Moderate levels of natural character due to moderate levels of modification	Low levels of natural character due to High levels of modification	Very Low levels of natural character due to Very High levels of modification

2.3 Visual Amenity Assessment

Amenity values have been defined in the RMA as:

> *…those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.*

The focus as part of this report is on the visual aspect of amenity (recreational values of the water bodies are covered as part of a separate assessment).

Descriptions and evaluation of the visual amenity of the river reaches/lake will not be broken down into components as for natural character assessment as the river environment can only be experienced visually in its entirety.

Attributes that contribute to visual amenity (its pleasantness, and aesthetic coherence) are:

- **In river** - flow level, wetted surface/ dry channel, water clarity, water colour, water movement, light reflection
- **River margins** - vegetation, signs of human modification, litter, seasonal colour, exposed river/ lake margin (e.g. substrate of margin, algal proliferations)
- **Potential viewing audience** - visibility of the lake/river, popularity of the location, recreational uses, outlook for nearby residents or roads

3.0 Clutha Catchment Description

The Clutha River/Mata-Au flows for 338 kilometres (km) (Te Ara, Otago places - Clutha River/Mata-Au) southeast through Otago, making it the country's second longest river. It is also the largest volume river in New Zealand with a mean flow of 614 m^3/s, discharging 6% of the South Island's freshwater into the Pacific Ocean at Molyneux Bay (ORC, 2016). The power of the swift waters comes from the large scale of the catchment area, which at more than 21,000 km^2, represents two-thirds of the area of the Otago region.

The Clutha River/Mata-Au system is fed by three large lakes, Lakes Hāwea, Wakatipu and Wanaka, their headwaters deep in the Southern Alps. From this alpine-subalpine region, the river flows through Central Otago's block mountain landscapes with arid valleys and gorges and limited areas of fertile terraces and fans, to hard-rock downlands and out to the coastal plains and delta at the sea. The Kawarau River, draining Lake Wakatipu, is its largest tributary, joining the Clutha/Mata-Au at Cromwell.

There are three dams along the Clutha River/Mata-Au, at Roxburgh, Clyde, and Hāwea. The structures modify the local landscape character as well as artificially regulating lake levels and river flows and impacting on levels of sediment and its movement downstream. Gravel extraction occurs along the length of the river as well as in the Hawea and Kawarau rivers.

The waters above Balclutha are generally of a higher quality than below, where water quality deteriorates as a result of several high volume wastewater discharges.

Vegetation in the wider catchment is predominantly tall tussock, found on the higher elevation land and exotic grassland on the valley floors and the coastal plains. Small pockets of indigenous forest remnants and regenerating shrubland can be found, largely in the higher valleys but also along the lake and river margins in places. There are also regionally significant wetlands along the main stem of the Clutha River/Mata-Au. Exotic poplars and willows heavily dominate the river banks.

Twenty-three native fish species have been recorded from the wider Clutha catchment as well as koura/freshwater crayfish. Native fish include koaro, bully species, longfin and shortfin eels, common smelt, inanga, giant kokopu, torrentfish, and black flounder. Five sport fish species have been recorded within the Clutha catchment: brown and rainbow trout, Chinook salmon, brook char and perch (Unwin, 2016).

The catchment also provides diverse habitat for a wide variety of birds and other fauna, both exotic and indigenous.

There are many values associated with the river and catchment; as a source of food and gold, water for electricity and irrigation, as well as for its scenery, wildness and recreation opportunities. The Clutha/Mata-Au River is well recognised for its remarkable speed, colour and water clarity. The Upper Clutha between Lakes Wanaka and Dunstan in particular, rarely discolours with the rocky substrate often clearly visible under the water. In contrast, its tributary, the Kawarau River carries large levels of fine silt from the Shotover, influencing turbidity downstream.

The Clutha/Mata-Au River is also an area of Statutory Acknowledgement for Ngāi Tahu, including Lake Hāwea, Lake Wanaka, Te Wairere or Lake Dunstan, and Whakatipu-wai-Maori or Lake Wakatipu. The river and lakes were part of a mahika kai trail leading inland from the eastern coast and were also significant for the transportation of greenstone from the west.

Settlement of the Upper Clutha basin by Europeans began in the 1860s driven by gold mining and pastoralism. Historic mining sites on the edges of the river are still identifiable by the scouring caused by sluicing and by the location of stone tailings and cottage remnants.

Today land use varies along the river including protected conservation and crown land, grazing properties ranging from extensive sheep stations in a more natural landscape to more highly developed farms, orchard and vineyard areas. Central Otago produces around 45% of the nation's stonefruit, the river supporting a fruit and viticulture corridor.

There are a few built-up urban areas and many small settlements while state highways and local roads extending along much of the river corridor. has.

The predominant recent land use change in the catchment is the conversion of tall tussock grassland to high producing exotic grassland while new subdivisions and vineyards are also changing the immediate riverside landscape. Didymo is present throughout the catchment, and lake snow can be found in the headwater lakes. Lagarosiphon is also present in the catchment and is being managed in Lakes Wanaka, Dunstan, and Wakatipu and Kawarua River.

In 1984, the Clutha River/Mata-Au was included in a National Inventory of Wild Scenic Rivers, compiled to establish the scenic, recreational and other attributes for any river considered nationally important[3]. Today, the river continues to be appreciated for its recreational and scenic values. There are many public recreational areas taking in views of the river although close views from the water's edge are limited at times by riverside vegetation (predominantly willows) and by high banks.

The rivers and lakes in the catchment are widely used for recreation activities, particularly fishing, as well as swimming, and boating (largely in the lakes). Cycling along the river margins is also increasingly possible in many areas and growing in popularity.

The Kawarau River and its tributaries, including Lake Wakatipu, and the Shotover and Nevis Rivers, are the subject of a water conservation order, the Kawarau Water Conservation Order (KWCO), to maintain the rivers' wild and scenic, scientific and recreational values

[3] National Water and Soil Conservation Authority (1984) the inventory was never completed or given statutory recognition

4.0 Assessments - by Reach

4.0 Lake Hāwea

Lake Hāwea is a snow and glacier-fed lake at the head of the Clutha/Mata-Au catchment, located in a broadly north-south orientated glacial valley at an altitude of 348 metres (m). Fed primarily by the Hunter River, the broader catchment area extends some 1,340 km^2. At its southern end, the lake discharges into the Hāwea River, a short tributary of the Upper Clutha.

The lake forms a narrow, steep-walled basin approximately 35 km long, 384 m deep and covers an area of some 140 km^2. It is naturally dammed to the south by an ancient terminal moraine which was extended by an artificial dam across the lake outlet in the 1950s.

The lake and impressive glacially scoured slopes enclosing it contain high visual and scenic values and are highly legible in terms of past formative processes. The lake is identified in the Proposed Queenstown Lakes District Council (QLDC) District Plan as part of an Outstanding Natural Landscape (ONL).

The northern head of the lake is defined by the steep sided slopes of the Young and Huxley mountain ranges to the west and east and by the Hāwea River valley flats to the south. Other hills separate Lake Hāwea from Lake Wanaka to the west as well as the narrow ridge known as The Neck where the two lakes almost join. The Dingle Burn and Timaru River are key features, flowing into the lake from the east and are also surrounded by high peaks.

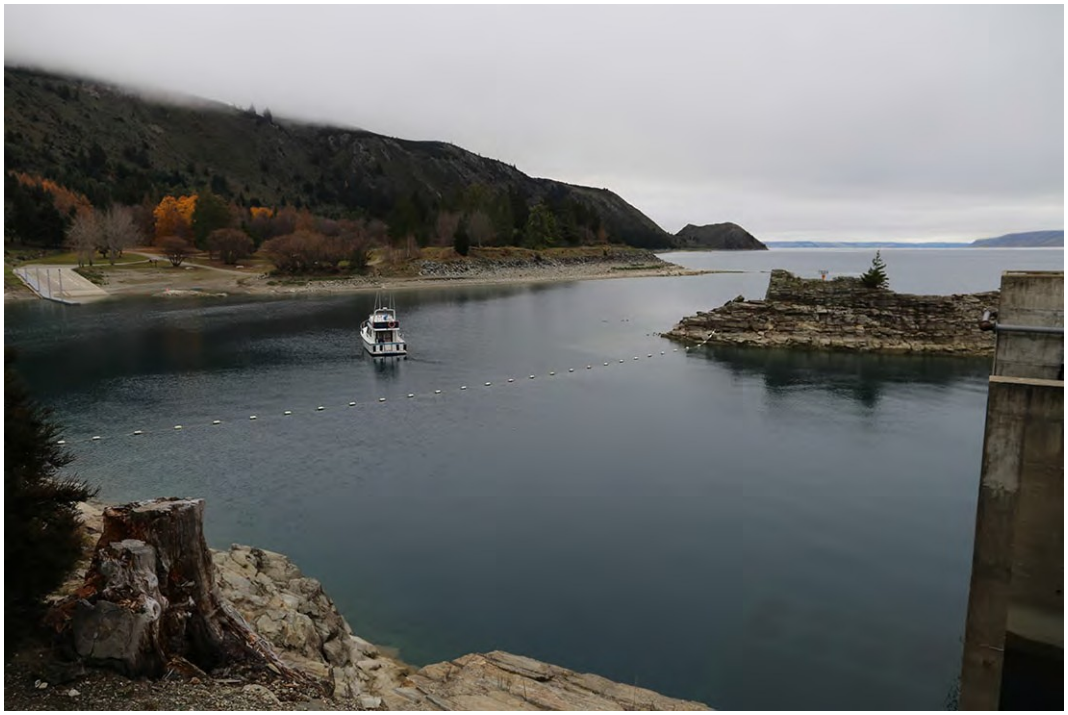
For Māori, the Wanaka and Hāwea area was a food gathering area and natural crossroads to access pounamu on the West Coast. Today, the small settlement of Hāwea, set back from the lake's southern shore is home to a growing population. Beyond the township, the foothills and ranges comprise a mix of extensive pastoral farming and conservation land with the northern arm of the lake surrounded by the Hāwea Conservation Park. Hāwea Flat to the south of the township is dominated by pastoral farming with more intensive use in irrigated areas.

The dominant vegetation cover on mid slopes and spurs surrounding the lake is tussock grassland with areas of beech forest and modified kanuka and grey shrubland. Gentler slopes between the ranges and the lake consist largely of pasture and mixed regenerating scrubland. The Hāwea flats in particular have seen a change to more intensively farmed paddocks and new dwellings. Farming has modified vegetation patterns but overall the Lake's context appears as a largely natural landscape. Overall the past glacial and fluvial processes remain highly legible, including the more recent tributary fans along the lake shore and the impressive braided delta of the Hunter River at the head of the lake.

The lake is well used, primarily in the summer, for fishing, boating (motor-boats and kayaking) and swimming. The surrounding landscape also offers a range of recreational activities including tramping, hunting and cross-country skiing.

While the northern end of the lake in particular has a strong sense of remoteness, wildness and a high level of naturalness, the flats at the southern end of the lake comprise the main area of modification. As well as containing the growing township of Hāwea, the southern end also contains the dam structure across the lake outflow, which artificially controls the lake's water levels. When the dam was first formed as part of the Roxburgh hydroelectric scheme, the lake was raised 20 m above natural storage levels. The lake level fluctuates within an 8 m operating range with an allowable minimum level of 338 m above the datum, providing storage for both Roxburgh and Clyde power stations.

The other key area of modification is State Highway (SH) 6 to Haast which follows the southwest margins of the lake. Farm access tracks encircle the lake on or near its margins.



Lake Hāwea control gate - Lake Hāwea levels can fluctuate by up to 8.0 m resulting in changing exposure of the shoreline

NATURAL CHARACTER – Lake Hāwea		**Degree of Natural Character**
Active bed	Outfall has been artificially controlled since 1958. The previous uncontrolled water level was 326.42 m. The original minimum controlled level was set at 328.87 m and a maximum of 345.32 m above datum. These levels have been adjusted to today's typical 8 m operating range between 338 m-346 m above datum but can be exceeded under the Flood Management Plan (Dam Water Permit, Consent No. 2001.384).	High
	• Inflows remain a natural process - Nor-westerly storms tend to provide the most significant inflows, particularly in spring and summer, when rapid snow melt can exacerbate flood flows. • One consented groundwater take at the lake. • Besides the water level and resulting artificial shoreline and the floating booms associated with the outfall, there are few other modifications. Overall the active bed is subject to legible, predominantly natural processes - alluvial and glacial – such as the obvious colluvial slopes and fans that extend into the lake. • Silver Island, located within the lake, is clad with regenerating indigenous vegetation and has a highly natural character. • The lake supports significant areas for development of juvenile trout and salmon, and significant presence of eel, trout, and salmon identified in Schedule 1A of the ORC Regional Plan: Water. Koaro have also been identified (NIWA Freshwater Fish map). • The dams obstruct migratory fish species. • No major threats from exotic pest plants. • A 1986 survey for the NZ Journal of Marine and Freshwater	

	Research (Clayton, Schwarz, Coffey, 1986) found the submerged vegetation was impoverished compared with that of Lake Wanaka. No vascular species were found - apparently associated with major water level fluctuations. • Scenic value of the notable colour of the water identified (ORC Regional Plan: Water). • The lake water quality is classified as 'Good' in the ORC State of the Environment (SOE) report card on water quality and ecosystem health, 2017.	
Margin	• The Lake Hāwea township is close but set back from the lake shore so the margin here continues to demonstrate the processes of interaction between water and land and is clearly associated with the lake. • The dam structure and boat ramps negatively impact on natural character but comprise a small proportion of the overall lake margin. • Controlling the lake levels artificially increases or decreases the extent of lake margin exposed around the shoreline and potential for dust. • Gentler slopes between the ranges and along the lake shore consist largely of pasture and indigenous fernland. • Conservation areas e.g. Hāwea Conservation Area and Lake Hāwea (Western Shore) Recreation Reserve extend down to the margins in places.	High
Context	• The small settlement of Hāwea at the lake's southern shore is home to a small but growing population. Beyond the township, the foothills and ranges comprise a mix of extensive pastoral farming and conservation land with the northern arm of the lake surrounded by the Hāwea Conservation Park and Hunter Conservation Area. • The dominant vegetation cover on mid slopes and spurs surrounding the lake is tussock grassland with areas of beech forest, particularly in the gullies, and modified kanuka and grey shrubland. • More intensive pastoral farming on Hāwea Flat with some irrigated land. • The margin of Dingle Lagoon (just over one km from lake) is identified as a Regionally Significant Wetland in Schedule 9 of the ORC Regional Plan: Water and the Hunter River	Very High
	Delta at the head of the lake is identified as a Significant Natural Area (SNA) in the Proposed QLDC District Plan. • The lake is part of the ONL identified in the Proposed QLDC District Plan, as is much of surrounding landscape - excluding the outfall structure, township and Hāwea Flats. Silver Island is an ONF in the Proposed QLDC District Plan. • SH 6 extends along the southern part of the western shore and the farm access track network encircles the lake. • Modifications are minor in proportion to the overall context of the lake.	
Experiential	• Highly scenic, remote, large scale open landscape with wide and distant vistas. • Unique aqua blue colour of the lake and sloping gravel beaches. • High winds and waves contribute to a dynamic environment on windy days. • Presence of dust from exposed lake shore during low lake levels. • With minimal levels of modification beyond the settlement of Hāwea, much of the lake and surrounding landscape is perceived to be of high natural character.	Very High

VISUAL AMENITY - Lake Hāwea		Degree of Visual Amenity
Nature of views, viewing audience	• Overall, beyond the village, the Lake Hāwea landscape has a very high level of visual coherence, largely uncluttered by human development. • The unusual clarity and colouring of the lake and impressive glacial slopes enclosing it contain high visual and scenic values and are highly legible in terms of past and present formative processes. • The lake is well used, primarily in the summer, for fishing, boating (motor-boats and kayaking) and swimming. The surrounding alpine landscape means tramping and skiing are popular activities nearby. When lake levels are low, more of the shoreline is exposed which is considered unsightly by some. • Popular tourist stop on SH6.	Very High

4.1 Lake Wanaka

Lake Wanaka is situated immediately west of Lake Hāwea at the head of the Clutha/Mata-Au catchment. As with much of this area, the landforms are dominantly those of glacial origin. The lake occupies a steep-sided trough, to a depth of 311 m. The lake is 279 m above sea level and has a catchment area of 2,590 km^2.

The major rivers feeding the lake system are the Makarora and Matukituki. The delta systems where they meet the lake are dynamic, adding to the legibility of alluvial as well as glacial processes. The outflow is to the south-east via the Clutha River/Mata- Au.

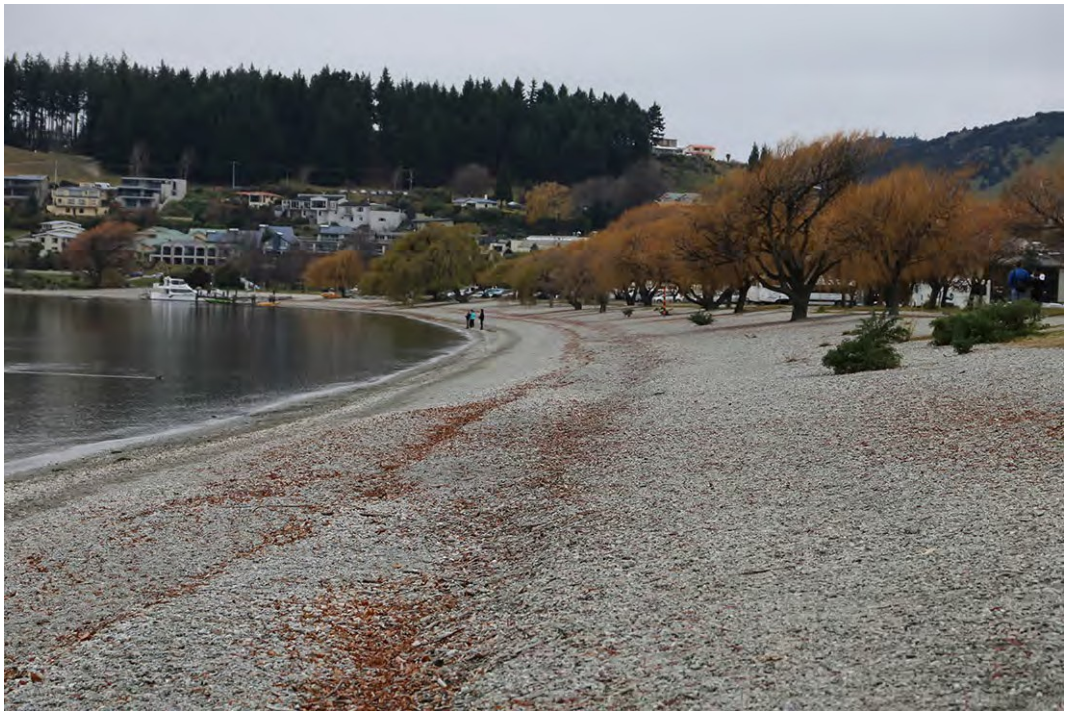
Lake Wanaka has natural lake levels as the outflow has not been modified or controlled. The lake is identified in the Proposed QLDC District Plan as part of an ONL. Large areas of land around the lake are also identified as District wide ONLs or Visual Amenity Landscapes (VAL).

The mountains particularly around the north end of the lake are rugged and high. Other prominent hills include Mount Iron, Mount Brown and the truncated spur formations of Roys Peninsula and around Glendhu Bay - their distinctive forms expressive of glacial erosion. Key features in the lake are the islands.

Land cover on the lower slopes and margins is dominated by unimproved pasture with improved pasture on some flatter land and large areas of regenerating indigenous fernland along the eastern lakeshore. Tussock cover dominates at higher altitudes. Poplars and willows are also characteristic along the shores of the more accessible beaches.

In addition to ongoing sheep farming, the lake is located adjacent to the popular resort town of Wanaka, and is much used in the summer for fishing, jet skiing, boating and swimming. The nearby mountains and fast-flowing rivers allow for adventure tourism year-round, with jetboating facilities located nearby. Residential development is largely limited to the southern shores, primarily Wanaka township and growing residential areas between Roys Bay and Beacon Point. SH 6 passes close to the lake along the northeast margin between The Neck and Makarora

The Lake Wanaka Preservation Act (1973) prevents the alteration of water levels in Lake Wanaka and the Upper Clutha River/Mata-Au (to the Hāwea River confluence) in addition to seeking to maintain or improve water quality in Lake Wanaka.



Wanaka township and residential areas provide an urban context to this part of the lake shore.

NATURAL CHARACTER - Lake Wanaka		**Degree of Natural Character**
Active bed	• The lake outlet is one of a few remaining on large lakes in the South Island which has not been modified and controlled. The quality of and natural range of water levels in Lake Wanaka are protected by the Lake Wanaka Preservation Act 1973. • Lake Wanaka is classified as being in an oligotrophic state and as having good water quality on Land Air Water Aotearoa's (LAWA) Trophic Level Indicator (TLI). The major inputs into Lake Wanaka are the Makarora and Matukituki Rivers, both of which have glacial origins and high water quality (LAWA). The immediate catchment is likely to contribute some nutrient input into the lake i.e. stormwater from the township of Wanaka and runoff from fertilised agricultural areas. • There are a small number of ground and surface water take consents around the southern shore and two lake intakes providing the town's water supply (Small percentage of the lake volume). • A marina, jetty and boat ramps at Wanaka modify the natural character of this part of the lake. • The lake occupies a legible, glacial-formed steep-sided deep valley. The delta systems where the Makarora and Matukituki Rivers meet the lake are dynamic, adding to the legibility of alluvial as well as glacial processes. The delta of the Makarora River is listed in the Geological Society's inventory of important geological sites and landforms. • Mou Waho, Mou Tapu and Te Peka Karara Islands all have a high natural character, being clad in regenerating indigenous forest and pest-free. Ruby Island has a somewhat modified character but is a readily identifiable and	Very High Low at developed waterfront area of jetty structures, moorings and boat ramps

	significant feature. • Schedule 1A of the ORC Regional Plan: Water identifies significant presence of eel, trout and salmon, significant indigenous aquatic vegetation and a rare association of aquatic plants, the presence of indigenous fish species and invertebrates threatened with extinction. Other fish identified in the lake include koaro and common bully (NIWA Freshwater Fish map). • The southern end of the lake including all the inlets south of Roys Peninsula is a lagarosiphon area under the ORC Regional Pest Management Plan and 'lake snow' also occurs here.	
Margin	• Development on the lake margins is largely limited to the southern shores, primarily Wanaka township e.g. boat ramps, paths, carparks and roads close to the lake shore at Roys Bay. • SH 6 passes close to the lake along the northeast margins. • In many places, particularly along the eastern margins, lake shore vegetation includes indigenous fernland with excellent examples of seral community vegetation (of shrublands towards forest). Poplars and willows are also characteristic. • Regionally Significant Wetlands listed in Schedule 9 of the ORC Regional Plan: Water include Makarora Flat Swamp Complex, Minaret Bay Swamp, The Neck Wetlands (between Lakes Wanaka and Hāwea). • Proposed QLDC District Plan SNAs near the lakeshore are Minaret Burn, Minaret Bay/Snag Bay, Albert Burn, Craigie Burn, East Wanaka Creek (Stevensons Arm).	High Low at urban/ residential development Wanaka / Beacon Point
Context	• Farming land use modifications have altered the vegetation with high and low producing pasture and vineyards now covering most of the lower slopes and basin landscape at the southern and northwest end of the lake with tussock succession cover at higher altitudes. • Hāwea Conservation Park down to lake shore at northeast head of lake. Other Protected areas on the lake margins include Matatiaho Conservation Area, Minaret Burn Mouth Conservation Area, and the Scenic Reserves on the two main islands. • In the Proposed QLDC District Plan, the lake is part of an ONL, the islands are ONFs, as is Roys Peninsula and much of surrounding landscape excluding Wanaka Basin/ Hāwea flats. • Urban residential settlement and infrastructure associated with Wanaka township wraps around the southern shores between Roys Bay and Beacon Point but is relatively contained along the lake, development focusing inland in the basin/flats area. Elsewhere around the lake, built form is very limited.	Very High Low at urban/residential development Wanaka / Beacon Point
Experiential	• The distinctive peaks and landforms are highly expressive of glacial erosion. • The grand scale of the lake and mountain landscape dwarfs people, inspiring a sense of awe. • The lake is a key element in the landscape and part of the identity of the district and region.	Very High

	• Beyond the modified township area, the lake is dominated by a very strong sense of remoteness with few man-made structures. • The clear waters of the lake change colour with the weather and provide scenic reflections.	

VISUAL AMENITY - Lake Wanaka		**Degree of Visual Amenity**
Nature of views, viewing audience	• Scenic values of the lake identified in Schedule 1A of the ORC's Regional Plan: Water include the unmodified lake level, water quality, and the colour of the water. • The lake is valued for providing a wide range of recreational opportunities.	Very High
	• In a recent community survey of Otago lakes (Catchment Otago, 2017) many respondents particularly noted that in addition to water activities they enjoyed looking at the lake, the view, and taking photos. • Overall, the lake and mountain landscape has a very high level of visual coherence, with minimal human modification, its scenery and accessibility drawing high numbers of tourists.	

4.2 Lake Wakatipu

Lake Wakatipu has a distinctive 'dog-leg' shape which gives the narrow glacial valley three main sections; the northern end from Glenorchy to White Point/Mt Nicholas, the middle section between White Point and Queenstown/Frankton, and the southern arm from Frankton to Kingston. The lake is New Zealand's longest, some 80 km in length and up to 5 km wide and covers an area of 289 km^2. It is drained by the Kawarau River from the eastern end of the Frankton Arm, which joins the Clutha River/Mata-Au below Lake Dunstan.

The lake is located 308 m above sea level at the southern end of the Southern Alps, between steep-walled ranges; between the Humboldt Mountains and Richardson Ranges at the lake's head, while The Remarkables and Tapuae - o - Uenuku Hector Mountains enclose the lake to the southwest. The main rivers to feed the lake are located on its western end, with the Rees and Dart Rivers providing the most significant inflows at their large braided delta areas. Other rivers and streams have created distinctive steep fans, such as the Greenstone and Von Rivers.

These steep mountain slopes extend down to the lake shore, glaciers having carved the lake's narrow basin some 380 m deep. Glacial, tectonic and subsequent processes of weathering and erosion are evident in this landscape. Frankton is located on the former glacial moraine that contains the lake to the east and many prominent roche moutonnées, such as Peninsula Hill, are clear signs of the historic glacial processes in the area.

Much of the land at the lake edge on the eastern Queenstown to Glenorchy side of Lake Wakatipu is covered in regenerating shrubland and young forest with a high plant diversity. Tall tussock land remains dominant on the upper slopes while fernland and low producing grassland dominate the lower slopes with pockets of improved grassland on flatter land.

Settlements around the lake shore include Queenstown and Frankton and the villages of Kingston, Glenorchy and Kinloch. The focus of settlement and human modification around the

lake is on Queenstown and the Frankton Arm. This area has a character which is different to that of the rest of the lake, surrounded by urban development and areas of exotic forest.

Beyond the scenic settled landscape of the Wakatipu Basin, the foothills and ranges are rugged and comprise a mix of extensive pastoral farming and conservation land. The southern side of the lake is high country farmland that is difficult to access and very remote in character.

The lake is identified in the Proposed QLDC District Plan as part of an ONL and large areas of the land around the lake are identified as District Wide ONL or VAL. The Kawarau River Water Conservation Order also applies to Lake Wakatipu. Outstanding characteristics identified in the Water Conservation Order include the lake's fishery; scenic characteristics; scientific value, in particular water clarity and bryophyte (non-vascular plant) community; recreational purposes, in particular boating; as well as its significance in accordance with tikanga Maori.

The lake and wider area is also a popular venue for adventure tourism, with jet boating, skifields, paragliding, bungy jumping and tramping tracks within easy reach.

With the exception of the modified Frankton Arm and Queenstown urban area, Lake Wakatipu exhibits a high level of natural character.

NATURAL CHARACTER - Lake Wakatipu		**Degree of Natural Character**
Active bed	• Lake Wakatipu is considered to have very good water quality on the LAWA Trophic Level Indicator (TLI). It was rated 'Excellent' in the ORC's SOE report card, 2017. The Dart and Rees Rivers flow into the head of the lake, both of which have glacial origins and high water quality however the immediate catchment is likely to contribute some nutrient input into the lake, especially around the township of Queenstown. • There are two lake intakes providing Queenstown's water supply. • The Kawarau River Water Conservation Order also	Very High* * With the exception of the developed waterfront area of Queenstown/Frankton Arm with jetty structures, moorings and boat ramps

	applies to Lake Wakatipu to protect outstanding values, prohibit damming and maintain water quality standards. • The historic control gates at the outlet were built for mining purposes and are not in use, so management of the lake level is essentially a natural process.	which has a Low level of natural character.
	• There are large numbers of boat moorings, jetties, slipways, and boat sheds extending into the lake bed in the vicinity of Queenstown and the Frankton Arm. • Swimming, boating and fishing are all commonly enjoyed recreational activities on the lake. • Lake Wakatipu is New Zealand's longest lake. The narrow basin reflects the glacial, tectonic and subsequent weathering and water processes. The lake also has an unusual natural 'tide' or seiche which causes the water to regularly rise and fall about 10 centimetres. • Schedule 1A of the ORC Water Plan identifies values in the lake including absence of aquatic pest plants, juvenile development area for trout and salmon and significant presence of trout, salmon and eel, significant riparian vegetation, significant habitat for the indigenous koaro, and rare association of aquatic plants. The exotic lake weed Lagarosiphon is found in Frankton Arm, extending into the Kawarau River. Didymo (or lake snot) is also found in the wave wash zone.	
Margin	• Jetties, slipways, and boat sheds occupy the lake margins primarily in the vicinity of Queenstown and the Frankton Arm while the road to Glenorchy and SH6 and associated bridges follow the lake shore closely in places. • Pasture grassland occupies pockets of the lake margins around the middle reach and southeast arm however there are large stretches of indigenous fernland with regenerating shrubland and young indigenous forest elsewhere. • The southern shore of the lake in particular contains minimal development, apart from small nodes around the high country station buildings. The road to Glenorchy follows the northern shore all the way from Frankton.	High* *With the exception of the developed urban area of Queenstown/ Frankton Arm which has a low level of natural character .
Context	• There is a strong cultural overlay around Lake Wakatipu. The focus of settlement and human modification around the lake is on Queenstown and the Frankton Arm though there are smaller clusters of houses close to the lake in other areas such as pockets south of Queenstown along SH6, and at Kingston and Glenorchy. • Beyond these margins and the settled landscape of the Wakatipu Basin, the foothills and ranges generally comprise a mix of extensive pastoral farming and conservation land. • Tall tussock land remains dominant on the upper slopes while large areas of fernland, matagouri/grey scrub and low producing pasture are found on the lower slopes.	High on southern and western side Moderate to Low along Frankton Arm and at Kingston

	• Lake is ONL in Proposed QLDC District Plan excluding Frankton Arm and Queenstown Bay. Pig Island and Pigeon Island are ONFs. • The main SNAs bordering the lake shore include Halfway Bay Lakeshore, and 12 Mile Bush and lake face shrublands at Mt Creighton/ Bobs Cove. • Regionally Significant Wetlands identified in Schedule 9 of the ORC's Regional Plan: Water include Kinloch Wetland, Glenorchy Lagoon Wetland (less than one km from lake), and Mount Nicholas Lagoon (just over one km from lake).	
Experiential	• The significance of the mountains at the head of Lake Wakatipu, including Pikirakatahi (Mount Earnslaw), to Ngāi Tahu has been formally recognised by the Crown which has given this area the special status of 'topuni'. The area is also protected as conservation land. • The lake is a key element in the landscape and part of the identity of the district and region. • The grand scale of the lake and mountain landscape dwarfs people, inspiring a sense of awe. A recent community survey (Catchments Otago, 2017) found that among community uses of the lake, residents identified peace, quiet and communing with nature. • Beyond the modified Frankton Arm, the lake and landscape setting also convey a very strong sense of wildness and remoteness. • The clear waters of the lake change colour with the weather and provide scenic reflections.	Very High

VISUAL AMENITY - Lake Wakatipu		**Degree of Visual Amenity**
Nature of views, viewing audience	• The high scenic and aesthetic values of the lake and mountain landscape are well recognised and draw high tourist numbers. • There are many publicly accessible waterfront and elevated areas where views to the lake can be appreciated. The Catchments Otago Survey (2017) found that lakeside walking and cycling were the most common use, followed by sitting by the lake, and picnicking as well as a variety of other active watersports. • Scenic values associated with lake and noted in Schedule 1A of the ORC's Regional Plan: Water include the clear blue colour of the water, river deltas and beaches, and the particularly uncommon beach features between Rat Point and White Point. • The poplars and willows that frequently line the lake shore reduce the biotic natural character but contribute to changing colours of the seasons and the area's scenic values.	Very High

4.3 Lake Dunstan

Lake Dunstan (Te Waiwere) is a man-made lake on the Clutha River/Mata-Au. Located between Bendigo and the Clyde Dam, it was formed in 1992-94 as a result of the construction of the Clyde Dam and its hydro power station.

The shallow lake is enclosed by the steep rocky walls of the Dunstan Range along its eastern margin and the gentler slopes and terraces of the Pisa Range and Cairnmuir Mountains to the west.

While the main lake extends some 15 km from Bendigo to Cromwell, Lake Dunstan also includes the arm between Cromwell and the Clyde Dam through the Cromwell Gorge as well a smaller western arm where the Kawarau River joins the lake.

SH 8 follows most of the eastern lake shore, affording easy access, while SH 6 also follows part of the lake north of Cromwell.

Despite the close proximity of the road, the eastern margins north of the Cromwell bridge remain relatively undeveloped overall with the exception of some vineyards. The presence of extensive rock outcrops and naturalised and indigenous shrubland helps to maintain a sense of naturalness.

The landscape to the west is more modified and includes development such as intensive pastoral use, vineyards, orchards and lifestyle blocks, with houses close to the water margin, as well as a large gravel extraction area. The settlements of Pisa Moorings, Lowburn and Cromwell are located on these western banks and slopes. Much of the land between the highways and the lake where it is narrow or discontinuous has been developed or set aside for recreational use, including inlets, jetties, boat ramps, open grassed areas and amenity tree planting.

Below Cromwell the lake becomes very narrow, more like a river enclosed in a natural gorge. While the landscape was substantially drowned following the dam construction and retains some earthworks scars, modification of tributary confluences with the lake such as culverts under SH8. SH8 is cut into the east slope of the gorge close to the lake edge. There are few built structures and the gorge displays impressive rock formations.

Remnants of alluvial gold and quartz reef mining activity are present in places through the valley, most notably at Northburn (Quartz Reef) and Bendigo (Loganstown).

Outside the settled areas and the west side of the lake north of Cromwell, the dominant vegetation community is low producing grassland and exotic thyme shrubland. Remnant grey shrubland and sparse short tussock are located throughout the gorge as well as pockets of kanuka woodland.

Lake Dunstan provides water for irrigation for nearby stone fruit orchards and vineyards, and is a major recreational lake, with facilities for boating, waterskiing, fishing, parapenting, and rowing. A cycle trail is proposed on the west side of the gorge between Cromwell and Clyde and a number of walking/ biking tracks follow the western shore around Cromwell.

The lake is known for its exotic sports fish population of brown trout, rainbow trout, and Chinook salmon. Longfin eel, koaro, and bully have also been found here (NIWA Freshwater Fish Map).

The lake weed/ pest plant lagarosiphon creates a nuisance for recreational activities along parts of the lake shore and is being managed by ORC/Land Information New Zealand (LINZ).

Cromwell urban area at the confluence of the two major arms of Lake Dunstan, the flooded river valleys of the Kawarau River and Clutha River/Mata-Au.

NATURAL CHARACTER - Lake Dunstan		Degree of Natural Character
Active bed	• A man-made lake formed on the Clutha River/Mata-Au as a result of the construction of the Clyde Dam and hydro power station in 1992. Beyond Cromwell the lake continues but becomes very narrow, resembling more a river enclosed in a natural gorge. • 1 metre operating range - Lake levels are kept relatively stable with a normal operating range of between 193.5 m and 194.5 m above datum. • Several consented water takes on the lake, particularly along the main lake and Kawarau arm; fewer in the gorge. • Aggradation and formation of a delta is occurring in the Kawarau arm where the Kawarau River enters Lake Dunstan. Here, waters are shallow with moving sand bars. The large delta at the head of the lake is included in the Wanaka to Dunstan river reach. • The lake is considered oligotrophic, and the ecological health was rated 'Excellent' in the ORC's SOE report card on water quality and ecosystem health, 2017. • The lake has extensive beds of the invasive weed, lagarosiphon. • The presence of fish including longfin eel, galaxiid, common and upland bully, rainbow trout, perch, and koaro are identified on the NIWA Freshwater Fish map. • The lake provides an artificial koaro rearing habitat and may be boosting adult koaro populations upstream[4]. • Modifications to the active bed include booms and dam/power	Moderate - Low

[4] ORC ecologist comment on draft report , August 2018

	station infrastructure at the Clyde Dam, bridges, and the works to create the groynes, causeways and artificial 'harbours' and beaches on the margins.	
Margin	• The eastern lake shore remains relatively undeveloped overall with the western margins considerably more modified. • Bridge at Cromwell – Dead Mans Point, at Lowburn on SH8, and across Kawarau River arm (Bannockburn) • Tarras-Cromwell Road and SH8 follow close to margins of upper lake on both sides. Cromwell-Clyde road follows east bank of lower lake. • Cromwell town oxidation ponds are located next to the lake. • The presence of extensive rock outcrops and naturalised and indigenous shrubland in the gorge section help maintain a sense of naturalness through the lower lake. • The margins are dominated by low producing grassland, grey scrub and thyme and exotic vegetation, primarily pockets of willows.	Moderate
Context	• The particularly legible terraces near Lowburn, known as Sugarloaf, are identified by the Central Otago District Council (CODC) District Plan as an Outstanding Natural Feature (ONF) while the Cromwell Gorge is an ONL. • The landscape to the west of the northern arm is more modified and includes development such as intensive pastoral use, vineyards, orchards and residential blocks, with houses close to the water margin, as well as a large gravel extraction area. The settlements of Pisa Moorings, Lowburn and Cromwell are located on these western slopes. • While retaining some earthworks scars and the noticeable stabilization benching, there are few built structures beyond the dam. Infrastructure associated with the dam includes roading, a causeway and carparks. • Dominant vegetation community is low producing grassland and exotic thyme shrubland and remnant manuka/kanuka shrubland. • Displays impressive rock formations.	Moderate High
Experiential	• The Cromwell Gorge and the relatively unmodified northwestern shore at the foot of the Dunstan Mountains provide a sense of wildness. • Scenic experience of reflections of the ranges and autumn colours in the still lake. • Legibility of the old river terrace landforms is weakened in places by development. The modification of the lake shore north of Cromwell reduces the sense of naturalness in this area. • The close proximity of the road to the lake along most of the eastern shore introduces traffic noise which reduces the naturalness of the lake shore experience.	Moderate High

VISUAL AMENITY – Lake Dunstan		Degree of Visual Amenity
Nature of views, viewing audience	• The roads on either side of Lake Dunstan offer good viewing opportunities for travellers including access to many pullover areas and lakeside reserves. • The ranges surrounding the lake are dry, rolling and tor-studded, creating distinctive skylines and a rugged character, particularly noticeable through the Cromwell Gorge. • From Cromwell north, the west side of the lake has a relatively developed, disparate character including a large area of gravel extraction which reduces visual amenity. However, where the large scale of the distinctive outwash terraces and dry, rocky schist ranges dominate views, the level of aesthetic coherence and visual amenity remains high. • Some scenic value provided by autumn colours of exotic trees in the basin. • Where the pest plant lagarosiphon is visible, its presence reduces visual amenity.	High

4.4 Clutha River/Mata-Au Clyde Dam to Lake Roxburgh (Alexandra)

This short reach of approximately 12 km begins at the base of the Clyde Dam and flows towards Alexandra. There is no clear distinction between the end of the river and the head of the lake, but the confluence with the Manuherikia River past the Alexandra Bridge has been used as an arbitrary limit.

The flow of the Clutha River/Mata-Au in this section is controlled by discharges from the Clyde and Roxburgh Dams. The single thread river flows in a sinuous form lined with willows, poplars and other exotic species such as lupins. Vegetation in the wider landscape is dominated by pasture, shelterbelts and vineyards.

The reach is characterised by the modified land use and built form close to the margins, primarily associated with the towns of Clyde and Alexandra which spread towards one another on the east bank, as well as roads and quarries. The Earnscleugh Dredge Tailings are a historic reserve on the west bank, the exposed gravel mounds adding to the sense of modification in this landscape.

Flowing under the historic bridge at Clyde - river flows in this reach are regulated by the Clyde Dam upstream.

NATURAL CHARACTER – Clyde Dam to Lake Roxburgh (Alexandra)		Degree of Natural Character
Active bed	• The inflow is artificially regulated at the Clyde Dam. • A small number of water takes consented through this reach • The dam has an effect on the amount of sediment moving down the Clutha River/Mata-Au. Larger sediment becomes trapped behind the dams causing degradation issues downstream (NIWA, 2000). • While not identified on the NIWA Freshwater Fish Map, fish likely to be found in this reach will be the same species as those at Lake Roxburgh and include brown trout, longfin and shortfin eel, rainbow trout, koaro, perch, and salmon[5]. • Didymo has been found in the Clutha River/Mata-Au system, reducing the level of natural character due to potential impacts on indigenous habitat. • There are 2 gravel extraction points between Clyde and Alexandra, modifying the active bed.	Moderate
Margin	• The dam and associated industrial infrastructure are immense physical modifications to natural character at their location. • Other modifications in the river margins include bridges at Clyde and Alexandra, boat ramps, modified embankments/flood protection at Alexandra, a quarry area, and transmission pylons/poles. • Vegetation along the river margins is dominated by willows and frequent pockets of poplars.	Moderate High

[5] ORC ecologist comment on draft report , August 2018

Context	• Vegetation on the north side of the river in the wider landscape is dominated by high producing grassland and pines, and on the southern side, shelterbelts, vineyards and orchards. • Land use along this reach is modified, primarily associated with the urbanisation of Clyde and Alexandra, as well as roads and quarries. • There are a number of parks and reserves of different sizes providing access or views towards the river in Clyde and Alexandra. • A large block of pine trees at the northwest entrance to Alexandra was planted to keep the sandy soil in place. • The Earnscleugh Dredge Tailings are a historic reserve on the west bank displaying extensively disturbed ground.	Moderate
Experiential	• The dam infrastructure is visually dominant, particularly when experienced from below and cues to the artificial flow of the reach. • The sound of the powerful force of water when released through the dam. • The built up and modified nature of much of the context reduces the opportunities to experience a sense of wildness or remoteness along this reach. • When in close proximity to the river, the 'big river' presence of the Clutha/Mata-Au is inescapable. The combination of the river's immense water volume, power, currents, turbulence, unique clarity and colour and sometimes sounds inspire a sense of awe and respect.	Moderate High

VISUAL AMENITY - Clyde Dam to Lake Roxburgh (Alexandra)		**Degree of Visual Amenity**
Nature of views, viewing audience	• The disturbed ground and piles of gravel, both historic and current, visible adjacent to the river margins reduces the scenic qualities of the riverscape. • Greater visual amenity where the single thread river cuts through higher terraced embankments due to increased separation from the modified context. • Historic bridges at Clyde and Alexandra with stone piers adds to scenic qualities and visual interest. • Seasonal colours of the exotic riparian vegetation add to visual amenity. • Where didymo is seen it reduces visual amenity. • The dam and associated industrial infrastructure dominate the surrounding riverscape. Their industrial character diminishes the scenic qualities of the river and landscape however some viewers, such as those with an interest in hydro power may enjoy the view.	High

4.5 Lake Roxburgh

Lake Roxburgh is a man-made lake on the Clutha River/Mata-Au approximately 28 km in length between the Roxburgh Dam and Alexandra. The dam at Roxburgh is the lowest, and earliest of the three dams, constructed in the 1950s as part of the Clutha Power development. It also incorporates the second of the two hydro power stations on the river.

Much like lower Lake Dunstan, Lake Roxburgh is characterised by its shallow, narrow form and schist gorge landscape. Lake Roxburgh is even more tightly contained within steep rocky hillsides, typically little more than 200 m apart with occasional small shingle or gravel beaches/ fans at the mouth of creeks.

The primary vegetation around the Lake Roxburgh landscape is tall tussock land, thyme and briar scrubland, low producing grassland and indigenous grey scrub.

The lake is used as a sports fishery with brown trout, rainbow and occasional landlocked Chinook salmon usually present. Eel and koaro have also been found here (NIWA Freshwater Fish map).

Aside from the water levels, modifications are minimal and the lack of road accessibility provides remote recreation opportunities. Lake Roxburgh Village lies below the dam. Built development on the lake margins is focused at the dam structure and around the township of Alexandra at the head of the lake, where the piers and abutments of the old and new bridges are situated in the river. Elsewhere the main modifications are very low scale and associated with historic mining activity and walking and cycling trails. Boat ramps are located at Alexandra and the Roxburgh Dam, used for accessing water based recreational activities including boating, swimming, water skiing, and fishing.

The long narrow form of Lake Roxburgh snakes its way through steep rocky and sparsely vegetated hill country.

NATURAL CHARACTER - Lake Roxburgh		Degree of Natural Character
Active bed	• A man-made lake with a dam and hydro power station operating since the 1950s (earliest on the river). Both inflow and outflow are managed. • The lake has a normal operating range of 2.45 m between 130.15 m and a maximum lake level of 132.6 m above datum. Consent allows the level to be reduced to 129 m in some conditions. • There are no consented water takes, ground or surface water. • Recorded fish species include brown trout, longfin and shortfin eel, rainbow trout, koaro, perch, salmon (NIWA Freshwater Fish map). However, as migratory fish including eel, lamprey, salmon and koaro, cannot get into Lake Roxburgh due to the dam, numbers are likely to be declining. Consent requires Contact Energy Limited to establish a system for downstream passage of adult eels past the Roxburgh Dam.	Moderate - High
Margin	• The dam and associated industrial infrastructure are immense, but localised physical modifications to natural character at their location. • There are few signs of human development along the margins other than boat ramps and the piers and abutments of the old and new bridges. • Elsewhere the main modifications are associated with historic mining activity and walking and cycling trails. • Vegetation along the lakeshore is predominantly modified with grassland and exotic scrubland and willows but also includes some indigenous grey scrubland e.g. matagouri.	Moderate-High
Context	• The lake is located within a schist gorge landscape. The township of Alexandra is located at its head but otherwise the area is extensively farmed or in conservation land - the large area along the western slopes is Flat Top Hill Conservation Area. • The primary vegetation around the Lake Roxburgh landscape is tall tussock land (particularly dominating the eastern slopes of the lake), and low producing grassland, and mixed grey scrubland.	High
Experiential	• Between Alexandra and the dam, the lake and gorge are essentially undeveloped other than through extensive farming and historic mining. Together with the very limited access, and gorge-like landform, the area offers those who do visit, a high degree of remoteness. • The vivid colour of the water is memorable. • Sense of river's history provided in visible reminders of mining left in the landscape. • The sound of motorised boats in the gorge reduces the sense of naturalness and remoteness however a jet boat enables cyclists and walkers to connect the two sections of the trail so some sound is likely to be experienced in a positive light.	High

VISUAL AMENITY – Lake Roxburgh		Degree of Visual Amenity
Nature of views, viewing audience	• With very limited road access other than at the ends of the reach and to McKenzies Beach on the east bank, the primary viewing audience is limited to cyclists and those on the water. • The scenic qualities of the lake are reduced at the dam by the surrounding development while visibility from public areas at Alexandra is limited by vegetation. • For those who do access the gorge, the steep high rocky bluffs, turquoise water, and the historic mining relics offer a very high level of aesthetic coherence and visual amenity. • The seasonal colours of the riparian willows add to scenic values along the gorge.	High

4.6 Hāwea River (Lake Hāwea to Clutha confluence)

The Hāwea River drains Lake Hāwea. The relatively short river flows some 9 km southeast through the Hāwea Flats to join the Clutha River/Mata-Au at Albert Town, just below Lake Wanaka.

Flows in the Hāwea River are controlled by Contact Energy Limited via the Hāwea Dam in order to generate hydroelectric power at the Clyde and Roxburgh Dams below. The mean annual flow at Camphill Bridge is 66 m^3/s however flows fluctuate frequently. Consents require a minimum discharge of 10 m^3/s below the Hāwea Dam at all times and a maximum discharge of 200 m^3/s, except during flood conditions.

The river terraces and level outwash plains introduce strong horizontal patterns to the wider glacial landscape, expressive of the force of the river in forming the landscape. The river is narrow at the Hāwea outlet and widens somewhat and takes on a more sinuous form towards its confluence with the Clutha/Mata-Au.

The river flows through a predominantly settled agricultural landscape with vegetation dominated by high producing grassland, irrigated land and some blocks of exotic pines. The ecology of the low-lying area has been significantly modified by pastoral farming, however significant areas of remnant and regenerating indigenous vegetation are present throughout the wider basin.

Willows and poplars are present along the margins for much of the river's length while the terraces and margins at the southern end are clad with regenerating scrub and have a higher natural character.

The river is popular for a variety of recreational activities including fishing and kayaking. A walking and cycling track follows alongside the river from Wanaka to Lake Hāwea.

Hāwea River - the river bed has been modified to create the standing wave at the whitewater park at Camphill Bridge.

NATURAL CHARACTER - Hāwea River		**Degree of Natural Character**
Active bed	• Flows are artificially controlled by Contact Energy Limited via the dam. • Consents require a minimum discharge of 10 m^3/s below the Hāwea Dam at all times and a maximum discharge of 200 m^3/s, except during flood conditions (must not exceed 800 m^3/s in the Clutha River/Mata-Au at the Cardrona Confluence). The flow regime means river levels can rise and fall quickly, the size and frequency of fluctuations reducing natural character. • The main physical modification to the river is the dam structure at Lake Hāwea. • Works at the Hāwea Whitewater park at Camphill Bridge have physically modified the river bed. 30 m^3/s of water are released under a regular regime to create a standing wave in the river for recreational users, such as kayakers. • Other physical modifications include two bridges (one a minor structure for walking/cycling only). • There are a few consented water takes on the river. • The river is narrow at the Hāwea outlet and takes on a more sinuous form towards its confluence with the Clutha/Mata-Au, with no artificial diversions. • Schedule 1A of the ORC's Regional Plan: Water identifies values in the river including a significant fish spawning area and for juvenile development, and significant presence of trout, salmon and eel. The Plan also notes the absence of aquatic pest plants, however didymo has been found here.	Moderate

	• Water quality in the river (Camphill Bridge) is rated excellent in the ORC's SOE report card on water quality and ecosystem health, 2017.	
Margin	• Disturbance to the river margins is limited and primarily comprises the dam and associated infrastructure, farm and recreational tracks as well as the relatively small scale bridge structures. Along the upper reaches near Hāwea Township a water race and tracks follow the true left bank. • Willows and poplars are present along the margins for much of the river's length while the terraces and margins at the southern end are clad with regenerating manuka/kanuka scrub and have a highly natural character. • Schedule 9 of the ORC's Regional Plan: Water lists Butterfield Wetland and Campbells Reserve Pond Margins as Regionally Significant Wetlands connected with this river.	Moderate High
Context	• The river flows through a predominantly settled agricultural landscape with some 'lifestyle' housing development close to the river margins (e.g. off Te Awa Road) and the Hāwea oxidation pond. (No deterioration in water quality has been attributed to the pond). • Vegetation is dominated by grassland - low producing closer to river margins, high producing beyond, some irrigated - and some blocks of exotic pines. • The river also flows through Albert Town Conservation Area and Recreation Reserve and a marginal strip (protected area) • SNA sites nearby at Te Awa Rd (QLDC District Plan) on the old river terrace represent good examples of native grassland community. • The ecology of the low-lying area has been significantly modified by pastoral farming, however significant areas of remnant and regenerating indigenous vegetation are present throughout the wider basin. • A walking and cycling track follows alongside the river from Wanaka to Lake Hāwea, part of the Te Araroa Trail.	Moderate High
Experiential	• Where the river loops, the terraces and level outwash plains are expressive of the force of the river in forming the landscape. • Aside from the Camphill Bridge, there is limited public road access to the central sections of the river, creating some opportunities for a sense of remoteness particularly where there are pockets of indigenous vegetation. • However, the irrigated farmland and more frequent appearance of dwellings very close to the margins, particularly at the northern end of the reach, reduces the natural character in places.	High

VISUAL AMENITY - Hāwea River		Degree of Visual Amenity
Nature of views, viewing audience	• A walking and cycling track follows alongside the river from Wanaka to Lake Hāwea, part of the Te Araroa Trail, enabling good views to the river for recreationalists that can be enjoyed away from busy public roads. • The relatively open, settled, rural landscape means that views incorporating the river and surroundings are more pleasantly scenic, including appreciation of the changing seasonal colours, rather than striking or impressive. • The dam structure reduces the visual amenity of the upper river near the Lake Hāwea outlet, although the grass cover and low level of associated infrastructure means it integrates more readily into the landscape than the larger dams further down the Clutha/Mata-Au. • Where visible, the presence of didymo reduces visual amenity.	High

4.7 Clutha River/Mata-Au between: Lake Wanaka outlet and Lake Dunstan

The Clutha River/Mata Au has its source in Lake Wanaka, a particularly significant outlet in that it is one of the few major lakes in the District which remains unmodified.

In these upper reaches between Lakes Wanaka and Dunstan, the Clutha River/Mata-Au flows southeast through the Wanaka/Hāwea basin before turning southwest to cut through the schist fault block mountains of the Pisa and Dunstan Ranges.

The river form is mostly narrow and single thread, contained between impressive, steep terrace faces with a rock and gravel substrate and occasional alluvial landforms of outwash and fan gravels, boulder deposits and side channels. Between Wanaka Airport and Luggate the river forms a series of distinctive loops. Downstream of the Lindis confluence, transitioning to the delta at the head of Lake Dunstan, the river channel widens to a braided meandering form. The extensive delta at the head of Lake Dunstan is identified as a Regionally Significant Wetland in the ORC's Regional Plan: Water (Bendigo Wetland). Sediment deposition and the gradual formation of the river delta have occurred since the lake was formed in the early 90s.

The river's well-defined terrace sequence forms are a distinct geological feature of the Upper Clutha valley, part of the peri glacial period when sedimentation from that time was eroded down by the Clutha River/Mata-Au.

The landscape context contains large-scale landforms and the high-lying terraces are open, dominated by pasture with vineyards, shelterbelts, and isolated areas of kanuka. Apart from farming modifications including tracks, fence lines and occasional buildings, built form is largely limited to the urban area around Albert Town. Roads are typically located at a distance from the margins, with only two bridges crossing the river. Open views are available and enable legible association between river landforms; terraces and their faces and the active river flood plain.

Vegetation along margins/ terraces faces comprises wilding pines and Douglas fir, kanuka shrubland, matagouri/briar shrubland, exotic grassland, and short tussock grassland. Willows line the river in many places, with occasional groups of Lombardy poplars. The shallow delta at the head of Lake Dunstan is favoured waterfowl habitat and is now a wildlife reserve.

The river on this reach is said to offer challenging big river fishing, with rainbow and brown trout the main species targeted by anglers, and the occasional Chinook salmon.

Clutha River/Mata-Au just above the Luggate bridge - with river margins dominated by exotic vegetation and kanuka prominent on the series of old river terraces.

NATURAL CHARACTER – Lake Wanaka to Lake Dunstan		**Degree of Natural Character**
Active bed	• This river reach is particularly significant in that the outlet at Lake Wanaka is the only one of the major lakes which remains unmodified and damming is prohibited. However, the flow is partially controlled below the Hāwea River confluence due to the management of lake levels at Lake Hāwea via the Hāwea River. • There are a high number of consented water takes along this reach. • The river retains its natural course with bends and loops with no artificial diversions. • Downstream of the Lindis confluence the narrow river channel widens to a braided meandering delta at the head of Lake Dunstan where no significant changes have been made to the shape of the	Very High
	river and its floodplain. Due to natural erosion and sedimentation the river migrates within the terraces (ORC, Oct 2014). The sediment deposition since construction of the lake has produced a slowly prograding delta. • The tributaries of the reach provide a significant habitat for Clutha flathead galaxiid (threatened indigenous fish species), as well as habitat for longfin eel, koaro and bully. The river also supports trout and salmon and significant trout and salmon spawning and juvenile development, riparian vegetation of significance to aquatic habitat, and a significant range of indigenous waterfowl (ORC Regional Plan: Water, and the NIWA Freshwater Fish map)	

	• Didymo has been found in the Upper Clutha/Mata-Au. • The shallow delta at the head of Lake Dunstan is favoured waterfowl habitat and is now identified in Schedule 9 of the ORC's Regional Plan: Water as a Regionally Significant Wetland (Bendigo wetland). The wetland has a high diversity of indigenous habitat types and flora and fauna, including nationally or internationally rare or threatened species.	
Margin	• Much of the river's margins in this reach lie within a narrow corridor of conservation land indicating that development will be limited and natural character values are likely to improve or be maintained over time. • Physical development within the margins is currently largely limited to two bridge crossings, pylons/overhead transmission lines, occasional pump stations and minor farm and recreational tracks. • Vegetation along margins is modified, however in addition to the exotic grassland and ubiquitous willows, poplars and wilding conifers, there are also areas of kanuka/ manuka shrubland, matagouri/briar shrubland and short tussock grassland, adding to the level of naturalness. • Between the Lindis confluence and the lake, willow cover along with broom and lupins is much more widespread.	High
Context	• The landscape context is dominated by pastoral land use (with some more intensively irrigated areas). SH 6 and SH 8A run through the valley. Apart from recreational tracks and farming modifications including tracks, fence lines and occasional buildings, development and particularly built form is sparse and largely limited to the urban area around Albert Town. However, there are a growing number of rural/lifestyle properties very close to the margins on old river terraces which could begin to impact on natural character e.g. subdivision near confluence with Lindis River. • Particularly impressive features in the landscape are the remnant older outwash surfaces between Bendigo and Tarras - Bendigo Terrace and The Bend Terrace where the former valley wide outwash surface has been eroded away, shaped and sculpted by river action into extremely well defined, large scale landforms. Along with Sugarloaf near Lowburn, they are considered to be the best examples in the country; described in the New Zealand Journal of Geology and Geophysics as "spectacular flights of terraces cut in glacial outwash gravels and tributary fans".	High
	• These dry outwash plains are critical habitats for a number of threatened plant species (such as the nearby Mata Au Scientific Reserve which supports a remnant of semi-arid ecosystem and of threatened plants and rare beetles). • They were also important breeding habitat for seasonally-migrating wading birds, such as banded dotterel. Recent more intensive agricultural practices have resulted in losses of some gravel habitat. As described, residential development has also occurred on some of these habitats. • Treated wastewater is discharged onto land at the Wanaka Airport near the river. Likelihood of groundwater contamination has been assessed as minimal. • The Clutha/Mata-Au is identified as an ONF in Proposed QLDC District Plan.	
Experiential	• Open views are available and enable legible association between	High

	river landforms; terraces, terrace faces and active river floodplain. • The proximity of the surrounding mountain ranges, the terrace formations, the presence of pockets of indigenous vegetation, and limited modification/dominant extensive (rather than intensive) pastoralism means there are some opportunities for wildness and remoteness. • However, the more frequent appearance of rural/lifestyle properties very close to the margins could begin to impact on the experience of natural character. • The unusual turquoise waters cue to the river's glacial source lakes. • The noise of the water flowing over low rapids cues to the river's speed and volume. • In close proximity to the river, the 'big river' presence of the Clutha River/Mata-Au is inescapable. The combination of the river's immense water volume, power, currents, turbulence, unique clarity and colour and sometimes sounds inspire a sense of awe and respect.	

VISUAL AMENITY - Lake Wanaka to Lake Dunstan		**Degree of Visual Amenity**
Nature of views, viewing audience	• The glacial colour of the waters, its unusual clarity and the contrast with the dominant colours of the surrounding landscape all add to visual amenity. • Seasonal colours of the exotic riparian vegetation contribute to the river's scenic values. • Impressive context of old river terraces enhances visual amenity of the wider riverscape. • Entrenched nature of the river channel limits visibility from public roads however openness of surrounding terraces provides occasional elevated views where the river's sinuosity, force, and colour can be appreciated, particularly from adjacent walking/cycling tracks. • The river is often experienced by boat, including kayaks and jet boats. • The areas of indigenous vegetation, particularly kanuka shrubland, matagouri/briar shrubland and short tussock grassland have high visual amenity. • The presence of didymo where visible reduces visual amenity.	High

4.8 Kawarau River (Lake Wakatipu to bottom of Kawarau Gorge/Lake Dunstan)

The Kawarau River is a major tributary in the Clutha River/Mata-Au catchment, draining Lake Wakatipu from the end of the Frankton Arm then flowing east to join the Clutha River/Mata-Au at Lake Dunstan.

Apart from alluvial and colluvial gravel river terraces through the Wakatipu Basin and Gibbston Valley, for much of its length (59 km) the river is characterised by the deeply entrenched narrow

rocky channel it flows through. Cutting through schist, the narrowest, steepest section is well known as the rugged Kawarau Gorge.

The river is joined by numerous tributaries contributing to a mean flow of 225 m^3/s. Many rapids and currents characterise the middle and lower reaches of the gorge in particular.

The Kawarau River and its tributaries, including the Shotover and Nevis Rivers are the subject of the Kawarau Water Conservation Order (KWCO) which has been applied to recognise and maintain the rivers' values. The upper part river is also identified in the Proposed QLDC District Plan as within an Outstanding Natural Landscape (ONL), as is the gorge in the CODC District Plan.

The KWCO recognises, among other things, the wild and scenic character of the Kawarau River gorge, scientific values (particularly associated with the return flow in the upper section when the Shotover River is in high flood) and the recreational values (in particular rafting, jetboating, and kayaking) are outstanding in the Kawarau River.

Historical characteristics of the Kawarau River include a natural feature known as 'the natural bridge', the Kawarau Suspension Bridge and the numerous relics of past goldmining era scattered along its banks.

SH 6 from Cromwell to Queenstown, part of the major tourist route, follows alongside the river so that it can be easily seen throughout its length.

Trout and salmon are found in the river, as are longfin eel, and it is a significant habitat for koaro.

Land use along the river corridor varies from roads and urban housing to farming, intensive viticulture, and subdivisions. Development is most noticeable around Frankton and the Gibbston Valley area with limited modifications (including historic goldmining activity) elsewhere.

Vegetation in the wider corridor is a combination improved, pasture and vineyards on valley terraces and unimproved pasture and exotic scrub on the hillslopes. The river margins are largely in grassland and introduced and regenerating shrubland communities.

The Kawarau River cuts through the dramatic steep sided rocky gorge. The cloudy water is a result of the Shotover River sediments.

NATURAL CHARACTER - Kawarau River		Degree of Natural Character
Active bed	• The river is the subject of the Kawarau Water Conservation Order (KWCO) to protect its outstanding values including by prohibiting damming. • Identified values include natural and scientific values particularly associated with the return flow in the upper section of the Kawarau when the Shotover River is in high flood. • Flows through a deeply entrenched narrow channel of schist - the narrowest, steepest section is well known as the rugged Kawarau Gorge which has a wild and scenic character. • Many rapids and currents characterise the middle and lower reaches of the gorge in particular. The most notable rapids are the Chinese Dog Leg rapid near Gibbston, and the Nevis Bluff rapids. • The river has a significant presence of trout, salmon, eel, significant habitat for koaro. While didymo has been found here, the ORC Regional Plan: Water notes the river is free of aquatic pest plants upstream of Lake Dunstan. • Water quality is rated 'Good' in the ORC's SOE report card on water quality and ecosystem health, 2017 - the river's turbidity influenced by the Shotover catchment. The Kawarau is one of the main sources of sediment for the Clutha/Mata-Au, primarily from the Shotover. Evidence suggests that the Shotover River sediment is increasingly obstructing the flow of the Kawarau River (Strong and Davies).	Very High
Margin	• The margins are steep slopes and rock bluffs with a low level of modification. • Physical modifications in the margins are limited largely to occasional transmission pylons, road and suspension bridges, pipework associated with the Roaring Meg Power Station, historic mining activities which are small in scale, and tourism related amenities, primarily the Goldfields Mining Centre. • The river margins comprise areas dominated by bare rock, grassland, areas of introduced shrubland communities, poplars and willow. They also include areas of regeneration, extending into the wider context, where the shrubland is heavily dominated by matagouri and sweet briar but also includes *Coprosma propinqua* and to a lesser degree *Olearia odorata*. • The Shotover Confluence River Swamp, located on a terrace at the historic confluence of the Shotover and Kawarau Rivers, is listed as a Regionally Significant Wetland in Schedule 9 of the ORC's Regional Plan Water. • The regenerating Kawarau Faces are identified as an SNA in the Proposed QLDC District Plan.	High
Context	• Land use along the river corridor is largely extensive farming, particularly in the wider landscape. However, the elevated river terraces through Gibbston Valley to Frankton and Lake Wakatipu comprise a variety of development from urban housing to intensive viticulture, subdivisions and some conservation land. • Infrastructure associated with the Roaring Meg Power Station can be seen from the road as part of the Kawarau River valley landscape. • Vegetation in the wider corridor is predominantly in improved pasture and vineyards on valley terraces and unimproved pasture and exotic scrub on the hillslopes.	High

	• The Pisa Conservation Area extends down to the river margins and meets the Arrow Junction Conservation Area at the Kawarau Bridge, and Lepidium Kawarau Habitat Conservation Area on the south bank. • The river is identified within a larger ONL in the Proposed QLDC District Plan and in the CODC District Plan.	
Experiential	• Despite its murkiness, the turquoise colour of the water is highly memorable and contrasts with the dark surrounding rock. • The sound and legibility of the force of the water increases the sense of naturalness. • Sense of river's history provided in visible reminders of mining left in the landscape. • Despite the proximity of the road in places, and sounds of jetboats in the lower gorge, the enclosing landform and movement of the river are so dominant that human modifications are experienced as relatively insignificant, particularly through the gorge - the river is experienced as an impressive wild feature.	Very High

VISUAL AMENITY - Kawarau River		**Degree of Visual Amenity**
Nature of views, viewing audience	• SH 6 follows alongside the river. Together with occasional lookout areas with interpretation and pedestrian suspension bridges, this accessibility enables good opportunities for travellers to view and appreciate the river. • The narrow valley and incised river highlight its force while the schist river walls are distinctive and together with the rapids and currents in the river add to the impressiveness and expressiveness of the scene. • The high enclosing ranges make the river and terraces the central focus in a scenic valley landscape. The scale and lack of modification across the mountains increases the sense of naturalness in spite of development on the terraces between.	Very High

4.9 Clutha River/Mata-Au between: Roxburgh dam to

4.1 Rongahere

The reach between Roxburgh Dam and Rongahere is a distance of some 60 km in which the river remains confined to a single channel, typically less than 150 m wide between the elevated Old Man and Lammerlaw schist ranges. The wider river corridor is characterised by a narrow, clearly defined valley, with occasional alluvial flats.

Land use along the corridor is dominated by hill country pastoral farming with the flats in more intensive use, orchards and vineyards. However, the Rongahere Gorge provides a notable contrast to this, incorporating a considerable area of beech forest. The length of the river is lined with willows and dotted regularly with small settlements including the largest built up area of Roxburgh.

There are bridges at Roxburgh, Millers Flat, Horseshoe Bend and Beaumont, two of which are registered historic places. SH 8 meets sections of the reach while the Clutha Gold Cycle Trail utilises a minor gravel road alongside the east bank between Beaumont and Millers Flat. Otherwise, aside from the large concrete dam, structures on the margins and in-river modifications for most of the reach are very limited.

From Roxburgh to the Teviot-Ettrick flats, the river flows southeast through a mix of hill country and pockets of older flat valley fill deposits. Island Block is a distinctive topographic feature where the river swings east but the low-lying valley to the west appears to have also been a former channel.

South of Island Block, the valley tightens again and at Beaumont the river turns to wind south through the Rongahere Gorge, another section of steep hill country, clad mostly in a mix of exotic plantation forestry and remnant beech-podocarp forest. Lower pastoral hill country dominates the landscape to the east. Beech forested Birch Island/Moanui is a feature in the river as are the rock gardens – an intriguing pattern of rock outcrops in the river.

The Beaumont and Rongahere gorges are identified as outstanding natural features and represent the last major river flat and gorge of the schist peneplain or block mountain system of the Central Otago highlands.

The flow in this reach is controlled by the Roxburgh Dam and the water level may vary by up to 1.5 m under normal conditions. The formation of the Roxburgh Dam is also associated with bed level degradation immediately downstream of the dam.

At Beaumont the river cuts through the hill country, flowing between rocky banks.

NATURAL CHARACTER – Roxburgh Dam to Rongahere		Degree of Natural Character
Active bed	• The flow in this reach is controlled by the Roxburgh Dam and the water level may vary by up to 1.5 m. • Several consented water takes between the dam and Island Block, • Confined to a single channel, typically less than 150 m wide cut through schist with occasional alluvial flats. • The volume of sediment transported through these reaches is likely to be reducing significantly due to the Roxburgh dam. • The channel bed below Roxburgh Dam has degraded by 6 m between 1948 and 2016 (ORC, 2017). Presumably due to starvation of sediment because of the Roxburgh Dam.	Moderate
	• There are 4 current and historic gravel extraction points in this reach. • The distinctive pattern of rock gardens/outcrops, including the larger Birch Island/Moanui, in the river add to the natural character of the reach. • The river in this reach maintains an excellent water quality according to both LAWA and the ORC's 2017 SOE report card on water quality and ecosystem health. • The river supports a significant range of indigenous fish species, including some threatened with extinction, and significant areas for fish spawning and development of juvenile fish. • Fish recorded here include eel, trout, salmon and lamprey. • The river also supports indigenous waterfowl, a significant remnant indigenous ecosystem at Birch Island/Moanui, and a rare association of aquatic plants above the confluence with Tuapeka (ORC Regional Plan: Water, Schedule 1A).	
Margin	• The dam and associated industrial infrastructure are immense physical modifications to natural character at their location. • Elsewhere, structures on the margins and in-river modifications are largely limited to a small number of bridges and occasional pylons/poles. Roads come close to the river margins in places. • Even outside the gorges, the river banks are often steep, high and incorporate rocky outcrops and populated with willows as well as pockets of poplars, broom, gorse and wilding conifers. • Birch Island/Moanui, and the bush of the gorge itself, has a covering of a mixed podocarp forest that includes sphagnum moss, mountain and silver beech as well as totara and matai. Both the gorge and the island are home to rare and nearly extinct insect species.	Moderate
Context	• Land use along the corridor is dominated by pastoral farming with high producing exotic grassland as well as intensive orchards and vineyards on the flats. • Regular small settlements occur along the river including the largest built up area of Roxburgh. There is a large area of conservation land in the gorges (Blue Mountains Forest Conservation Area). • The Beaumont/ Rongahere Gorges are clad mostly in a mix of exotic plantation forestry and large area of remnant beech-podocarp forest. • The gorges are identified as outstanding natural features.	High

Experiential	• The riffles and sounds indicate where the fast flowing water partially breaks over the rocky outcrops. • The narrow, steep walled, and at times densely vegetated gorge sections provide a sense of remoteness. • The dam infrastructure is dominant in the localised area, particularly when experienced from below. The complex industrial elements and character are experienced as a sharp contrast to the simple patterns and elements present along much of the wider river in this reach. • The Clutha/Mata-Au has a sense of a powerful 'big river', which is inescapable when close by. The combination of the river's immense water volume, power, currents, turbulence, unique clarity and colour and sometimes sounds inspire a sense of awe and respect. This is further enhanced where the river encounters rapids and the 'rock garden' features.	High

VISUAL AMENITY - Roxburgh Dam to Rongahere		**Degree of Visual Amenity**
Nature of views, viewing audience	• Clear views to the water from SH 8 are limited, often screened by high banks, vegetation or due to distance. However, the steep faces and presence of close vegetation through the gorge and glimpses of the river offer very high amenity and a distinctive contrast to much of the Clutha/Mata-Au riverscape. • Some viewing opportunities are available from the Teviot Road and there is good visibility for cyclists along much of the Clutha Gold Trail, particularly between Millers Flat and Beaumont. • The schist outcrops that begin to appear more frequently throughout this landscape add to the visual amenity of the riverscape, from occasional islands to rock embedded in the margins and the steep hillsides and rocky bluffs above. • The clarity of the water also adds to visual amenity. • Seasonal colours of the exotic riparian vegetation are enjoyed. • The dam, power station and associated infrastructure, including substation, transmission lines and pylons and artificial embankments dominate the riverscape at this location. Their industrial character diminishes the scenic qualities of the river and landscape however some viewers, such as those with an interest in hydro power may enjoy the view.	High

4.10 Clutha River/Mata-Au: Rongahere to Molyneux Bay

The lower Clutha/Mata-Au remains predominantly a single thread river upstream of Balclutha. As it flows to the sea at Molyneux Bay however, the reachbelow Balclutha has a less stable channel alignment with gravel bars and islands becoming a feature as well as visible tidal effects. Stopbanks line the lower sections of the river from Barnego downstream to prevent flooding of the adjacent land, including Balclutha Township. The surrounding landscape changes markedly, decreasing in altitude and relief.

At Tuapeka Mouth the river enters a noticeably more open low, rolling downlands landscape, often entrenched in alluvial terraces.

The landscape has a sparsely settled rural character with farmhouses and small villages scattered alongside the river, connected via a number of local roads, some of which closely

follow the river margins in places. Pastoral farming is the dominant land use with vegetation cover comprising high producing grassland, occasional shelterbelts and scrub in gullies and on terraces and hill slopes. A feature of the lower part of this section are remnant totara trees, near Totara Island.

Balclutha is the largest settlement on this reach, the township extending across both sides of the river, the bridge and stopbanks locally modifying its margins. Here, the character of the river changes markedly to become a low-lying landscape that comprises the historic floodplain of the river. Downstream of the last bridge, the river divides into two branches, the Koau Branch which flows on the southern side of the delta and the smaller, meandering Matau Branch.

The river branches wind across a flat fertile coastal plain of coastal and river alluvium Between them they enclose a large, ‘island’ called Inch Clutha comprising farmed paddocks divided by shelterbelts and minor roads and occasional dwellings. High, continuous stopbanks have been built along either side of the channels as flood protection and willow typically defines the river banks.

The lower Clutha River/Mata-Au provides diverse habitat from coastal shoreline, estuarine, brackish lagoon, gravel beds, swamps, riparian willow and pasture, supporting many fish species, marine gull species as well as wading and some inland bird species (ORC, 2017).

Matau Branch of the river at Stirling bridge - the lower reaches of the river flow across flat land and old floodplains, largely contained by stopbanks and lined with willow.

NATURAL CHARACTER - Rongahere to Molyneaux Bay		Degree of Natural Character
Active bed	• Flows still controlled by Roxburgh Dam though the fluctuations are less evident in this lower reach. • A number of consents for surface and groundwater takes between Clydevale area and the coast. • Remains predominantly a single thread river as it flows to the sea at Molyneux Bay however gravel bars, braided beds and islands becoming a feature, often entrenched in alluvial terraces. This low-lying, flat land located between Balclutha and the Pacific Ocean is known as the Clutha Delta formed by a combination of natural processes, most recently characterised by the interaction of estuarine and fluvial processes (ORC, Natural Hazards, 2016). • The volume of sediment transported through these reaches is likely to be reducing significantly as the effects of the Roxburgh Dam sediment starvation are expressed. The dams contribute to channel stability problems in the lower alluvial reaches through reduced sediment input and an unnatural flow regime (NIWA, 2000). • Several gravel extraction sites. • From Balclutha, downstream of the last bridge, the river divides into two branches Koau and Matau, enclosing a large 'island' called Inch Clutha. • Aerial photography shows changes in river morphology of this reach such as fewer areas of gravel and more backwater areas (ORC, 2017) • Schedule 1A of the ORC's regional Plan: Water identifies the reach below Balclutha as a significant fish spawning area (including inanga) and development area for juvenile trout and salmon, the significant presence of eel, trout and salmon, a significant range of indigenous fish species and regionally significant presence of gamebirds. • Other fish identified on the NIWA Freshwater Fish map include common bully, lamprey, giant bully, inanga, common smelt, and black flounder. • River provides diverse habitat from coastal shoreline, estuarine, brackish lagoon, gravel beds, swamps, riparian willow and pasture, supporting many fish species, marine gull species as well as wading and some inland bird species (ORC, 2017). • The river measured at Balclutha maintains an excellent water quality according to LAWA and the ORC's 2017 SOE report card. However, the Clutha District Council (CDC) District Plan notes that quality deteriorates below Balclutha due to several wastewater discharges. • Below Balclutha, modification of the delta began in the late 1800s with ad-hoc drainage and flood protection infrastructure. Current flood protection system includes engineering works in the form of pump stations, outfall structures, training lines and floodbanks, built along either side of the Koau and Matau channels, modifying the active bed and margins. • Apart from flood protection works below Balclutha, physical structures in the river are largely limited to occasional bridge piers and pylons/poles. • Some channel diversions have been undertaken (at Shaws Island, Willowmead) but generally the natural meandering channels are unmodified.	Moderate
Margin	• From 4 km upstream of Balclutha, the engineered stopbanks, pump stations etc and bridges (at Balcutha and along the Matau branch) modify the river margins.	Moderate

	• Between Rongahere and Balclutha physical modification in the margins is minimal, primarily limited to the bridge and boat ramp at Clydevale, the Tuapeka Mouth ferry structures and occasional pylons/poles. • The tidal area of the reach is also valued for whitebaiting and associated fishing structures can be found in places. • Willows and pasture line the river margins throughout this reach, grazing often close to the river's edge including on the grassed stopbanks. • Regionally significant wetlands listed in Schedule 9 of the ORC's Regional Plan: Water include Rigney Pond Margins, Culcairn Oxbow Marsh, Finegand Lagoon Marsh, Clutha/Mata-Au Wetlands, Clutha River/Mata-Au Mouth Lagoon, Molyneux Bay Swamp	
Context	• The landscape has a sparsely settled rural character with farmhouses and small villages scattered alongside the river however these are limited and typically well set back from the margins. • Pastoral farming is the dominant land use. Vegetation cover comprises high producing grassland, occasional shelterbelts and scrub in gullies and on terraces and hill slopes. A feature of the lower part of this section are remnant totara trees, near Totara Island. • At the time of European arrival, the Clutha Delta was covered in dense swamp vegetation, such as flax and rush, only broken by the narrow strips of forest and scrub on the margins. • Some local roads closely follow the river margins adding a low level of development to the river context. • Land use on the delta includes rural, residential, commercial and industrial activities with associated roads and buildings. The predominant land use is agriculture. Balclutha is the largest settlement on this reach. The more northern Matau branch passes through the townships of Stirling and Kaitangata. • Balclutha extends across both sides of the river, the built form and infrastructure locally modifying the riverscape.	Moderate
Experiential	• High stopbanks and the high arch of the bridge at Kaitangata increases awareness of the landscape as a river delta/flood plain. • The experience of natural character gradually reduces from north to south as the extent of obvious modification increases. • The visible proximity of stock and grazed pasture on the river and coastal edge reduces the sense of naturalness. • The visible tidal effects and occasional views of islands add to the sense of naturalness and legibility of the river's geomorphology and proximity to the coast. • At Balclutha and approaching the coast, the degree of human intervention becomes most noticeable with the urban setting and continuous channelisation. Despite the visible sand dunes, the rural working landscape right to the edge of the dunes and the flood protection works reduce the sense of remoteness often anticipated in the coastal environment. • The 'big river' presence of the Clutha/Mata-Au is inescapable when viewing it from close by. The combination of the river's immense water volume, power, currents, turbulence, unique clarity and colour and sometimes sounds inspire a sense of awe and respect.	Moderate

VISUAL AMENITY - Rongahere to Molyneaux Bay		Degree of Visual Amenity
Nature of views, viewing audience	• Some roads closely follow the river margins enabling river views (particularly from bridges and occasional laybys) however the presence of willows and high stopbanks limits also visibility for long sections. • The presence of engineered channels reduces the river's visual amenity in these sections. • The occasional island and the pocket of totara and distinctive rock outcrops in the upper section of the reach add to the riverscape diversity and visual amenity. • While contributing less to natural character, the predominantly exotic riverside trees and shrubs add to visual amenity including through the changing seasonal colours of the exotic willows and poplars within an overwhelmingly green, cultivated grassland landscape. • The river's size and swiftness means that where visible, it forms a prominent natural, powerful and at times scenic feature within a working rural setting – this sense of the river's prominence typically increases travelling south to north as the river valley narrows.	Moderate High

5.0 Conclusions

The Clutha River/Mata-au and its lakes and tributaries not only play an important role in commercial and recreational activity in the region, they support a range of significant values. These values and the extent to which they contribute to natural character and visual amenity vary throughout the catchment.

Some general trends can be observed when comparing the natural character and visual amenity ratings between reaches reach:

- The level of natural character is generally higher towards the top of the catchment. This means it is Lakes Hāwea, Wanaka, and Wakatipu, the uppermost reach of the Clutha River/Mata-Au between Wanaka and Lake Dunstan, and the Kawarau River, that tend to achieve the highest natural character ratings.

  These source lakes are large, the mountains higher and more rugged and predominantly characterised by a strong sense of remoteness, wildness and high levels of naturalness. While there are large areas of modification such as the townships on the lake shores, they are currently subservient to the scale of the waterbodies and surrounding natural landscape.

  The extent to which flows/levels are managed generally has a considerable impact on natural character. With the exception of Lake Hāwea and the Hāwea River, flows and lake levels at the upper end of the catchment are essentially natural. The dam at Hāwea reduces the natural character rating for the active bed of both the lake and the river.

- As the waters flow from lake to river and south to the sea, alpine landscapes change to more intimate river corridors that have a legible history of intensive agricultural land use and infrastructure. While much of the land use is rural, the river valleys are typically dominated by pastoral farming with high producing exotic grassland as well as orchards and vineyards; modifications that reduce natural character.

  Although settlements tend to be small, the nature of the topography means roads have been developed alongside much of the river corridor which also impact on natural character. However, roading infrastructure also allows travelers to appreciate the visual amenity of the river in places.

- The dam structures at Roxburgh, Clyde, and Hāwea physically modify the active bed, margins and context, reducing natural character and visual amenity at a local scale. They also impact the naturalness of the wider riverscape through artificially controlling lake levels and flows as well as levels of sediment and its movement.
- The natural character ratings for the river and lake margins throughout the catchment tend to be lower than the ratings for the active bed and context. This is a reflection of the extent to which the margins are already modified due particularly to the dominance of willow and other exotic species.
- When compared to other reaches, Lake Dunstan has the lowest natural character rating for its active bed. While the lake has excellent water quality, provides valued recreational fishing opportunities and retains a high level of visual amenity, natural patterns and processes within the active bed are reduced considerably due to its artificial construction, flow regulation, and infrastructure along the shoreline.
- The river reach between Clyde and Lake Roxburgh at Alexandra is considered to have the lowest natural character rating for its context due to extent of development close to the margins. Modification is primarily associated with the towns of Clyde and Alexandra which spread towards one another on the east bank, as well as roads and quarries.
- While the catchment overall is appreciated for its recreational and scenic values and generally achieves high visual amenity ratings, it is the upper end that attracts most visitors where the glacial, alpine landscape is impressive and highly legible.

The table below summarises the ratings for natural character and visual amenity for each reach.

Summary Table

	Active Bed	Margin	Context	Experiential	Visual amenity
Lake Hawea	H	H	VH	VH	VH
Lake Wanaka	VH Low at developed waterfront area of jetty structures, moorings and boatramps which has a Low level of natural character	H Low urban/residential development Wanaka Beacon Point	VH Low at urban/residential development Wanaka / Beacon Point	VH	VH
Lake Wakatipu	VH With the exception of the developed waterfront area of Queenstown/Frankton Arm with jetty structures, moorings and boat ramps which has a Low level of natural character.	H With the exception of the developed urban area of Queenstown/ Frankton Arm which has a Low level of natural character.	H on southern and western side Moderate to Low along Frankton Arm and at Kingston	VH	VH
Lake Dunstan	**ML**	**M**	**MH**	**MH**	**H**
Clutha (Clyde Dam to Lake Roxburgh/Alexandra)	M	MH	M	MH	H
Lake Roxburgh	MH	MH	H	H	H
Hawea River	M	MH	MH	H	H
Clutha (Wanaka to Dunstan)	VH	H	H	H	H
Kawarau River	VH	H	H	VH	VH
Clutha River (Roxburgh Dam to Rongahere)	M	M	H	H	H
Clutha River (Rongahere to Molyneux Bay)	M	M	M	M	MH

6.0 How Changing Flows Can Affect Natural Character and Visual Amenity Values

Natural character is a combination of the natural elements, patterns, and processes of a river system. When changes occur to elements (e.g. extraction of gravel), effects on natural character can be localised so that natural patterns and processes are able to essentially continue. When changes begin to affect natural processes (such as water flow), natural character is likely to decrease more markedly.

A reduction in flow or lake level can induce change in rivers and lakes that primarily has the potential to be reflected in the ecological integrity and quality of river ecosystems. The experiential aspects of natural character may also be impacted however often (though not always), effects would have to be greater before a reduction in flow or lake level would result in an adverse 'natural' experience.

River flow affects a range of habitat factors including current, water depth, wetted area, substrate, dissolved oxygen levels and water temperature. Indicators of impacts can be a very shallow water depth, a reduction in the wetted area or reduced water movement compared with what might be expected or for longer durations than might be expected. Changes such as these tend to be more noticeable in shallow, braided rivers than in single thread, incised rivers like the Clutha River/Mata-Au.

In order to evaluate the effect on natural character of changing flows/lake levels, the effects needs to be considered separately for each of the river/lake components, (i.e. active bed, margin, context) as change flows/levels affect these components in very different way and by varying degrees.

Active Bed

When considering the active river bed in particular, a reduction in flow and especially the loss of flood flows, can reduce natural fluvial processes. This includes the movement and deposition of sediments and gravels that lead to the formation of river braids, bars, and islands.

Similarly, lowering lake levels is likely to increase the size of beaches/ exposed shoreline and sediment deposition

In addition to lower flows, rapid, frequent, or large changes to flows (for example, the flow regime at Hāwea River) are not conducive to supporting fish habitat, frequently dewatering the slower/shallower margins of the reach. These flows may also adversely affect benthic invertebrates, contributing to reduced food source availability for fish and birds[6].

Conversely, invertebrate and fish taxa habitat quality and quantity all increase as flow declines, in the range between 80 m^3/s to 370 m^3/s, indicating that low flows can have a positive effect on some ecological aspects of natural character[7].

[6] 2018. Ecological Flow Regime Assessment for The Upper Clutha River/Mata-Au: Complementing Hydraulic-Habitat Modelling With Drift-Feeding Trout Net Energy Intake Modelling. [1]Cawthron Institute and [2]National Institute of Water and Atmospheric Research. Prepared for Otago Regional Council

[7] ibid

Physical habitat quality for cyanobacteria and algae, such as didymo are also predicted to improve with flow reduction, increasingly so at flows below 200 m^3/s and especially below 100 m^3/s.[6] This would lead to adverse effects relating to the presence of these nuisance algae.

Margins

With regards to the margins, flow changes are important for abiotic features, such as gravel substrate banks as flood flows clear exotic weeds. These high flows that cover the margins are essential to maintain the quality of the gravel surface habitat for birds.

Values relating to terrestrial ecology in the riparian margins, eg vegetation and bird habitat, may be impacted by changes to flow or lake levels when the extent to which these communities are within or out of the water changes so that their ability to adapt and survive is affected.

Vegetation on the margins of most reaches on the Clutha River/Mata-Au is already modified so that effects of reducing flows on natural character are unlikely to be significant and would result in further colonisation of dry river margin areas.

Lowering or fluctuating lake levels can alter the hydrology of connected wetlands. An increased frequency or prolonged drying of the lake shore will detrimentally alter the wetland habitat

Context

Effects of reducing flows are unlikely to impact on the natural character of the wider riverscape or lake landscape context, other than through experiential attributes. For similar reasons, low flows may reduce the visual amenity of a river or lake, for example by resulting in large areas of exposed shoreline or river margins covered with dry sediment or algae. In such an instance, people's appreciation of that river's pleasantness, aesthetic coherence and even its cultural or recreational attributes could be reduced.

However, much of the Clutha/Mata-Au is a single braid, highly entrenched river, the steep banks and depth of substrate well below the water ensuring that any reduction in flow is likely to be difficult to notice. Those areas most sensitive to a change in flow regime are likely to be sections where the river takes on a shallower, more braided morphology, such as sections of the Hāwea River.

Visual Amenity

The effects of flow/level change on visual amenity values is very closely linked to recreation values. The effects will be greatest at the most frequented locations where people come into contact with river and lake margins. In particular low levels expose greater extents of bare margin which can be less attractive due the presence of sediments or algae. The effects will also be greatest in areas of high natural character/low modification where large exposed shores/river margins can appear incongruent with the typical patterns and processes where waterline adjoin vegetation.

Other factors

Many factors play a role in maintaining, improving or reducing natural character, including flows and lake levels. In addition to changing flows, the natural character of many of the reaches on the Clutha/Mata Au will also be susceptible to factors such as surrounding land use change (e.g. due to irrigation), particularly by additional structural modifications to the river, its margins or adjacent context.

For example, a new house on the river terrace is likely to be more noticeable in many instances than a change in appearance resulting from particular flows (unless reductions are extreme).

However, longer term effects of flow reduction such as vegetation encroachment onto the river or lake bed, will be more prominent and lead to effects on the natural patterns and processes of the river.

For these reasons, it is understanding the ecological impacts of reduced flows together with consideration of the maintenance flushing flows/floods and seasonal base flows that are most important in considering effects of flow thresholds on the natural character of the Clutha/Mata-Au catchment

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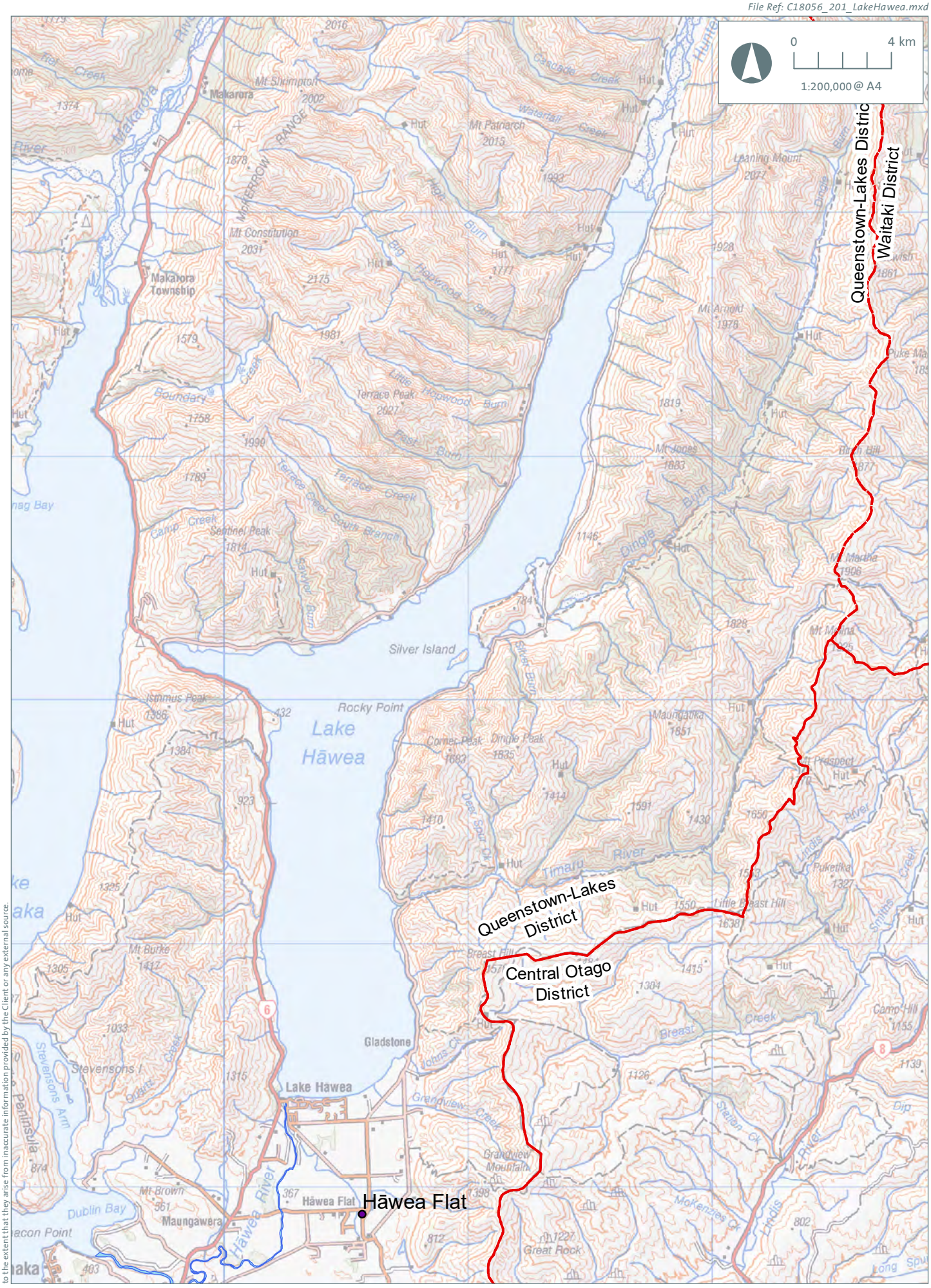

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CLUTHA MATA-AU RIVER STUDY

Lake Hawea

Date: 15 October 2018 | Revision: 1

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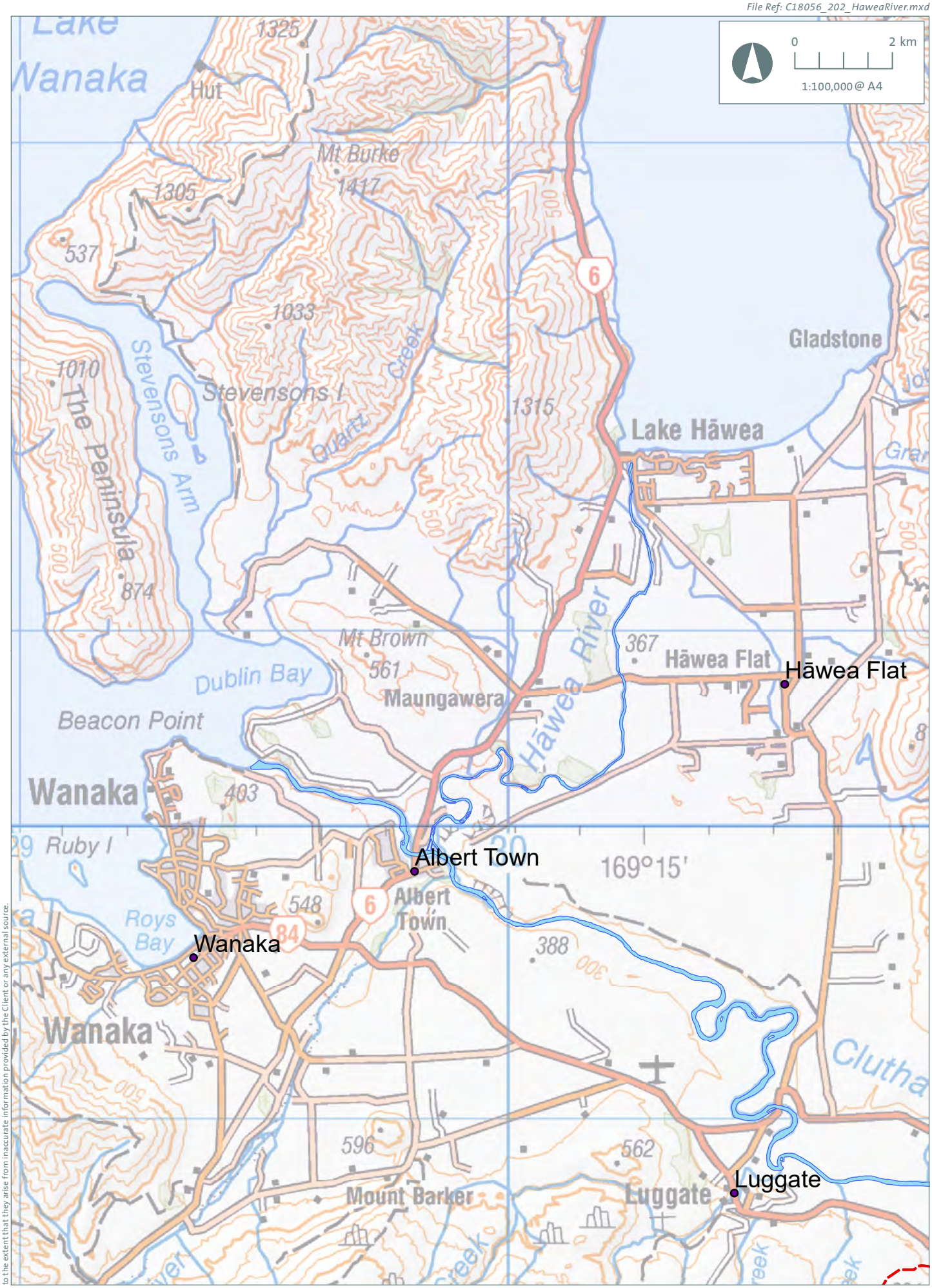

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Hawea River

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Lake Wanaka

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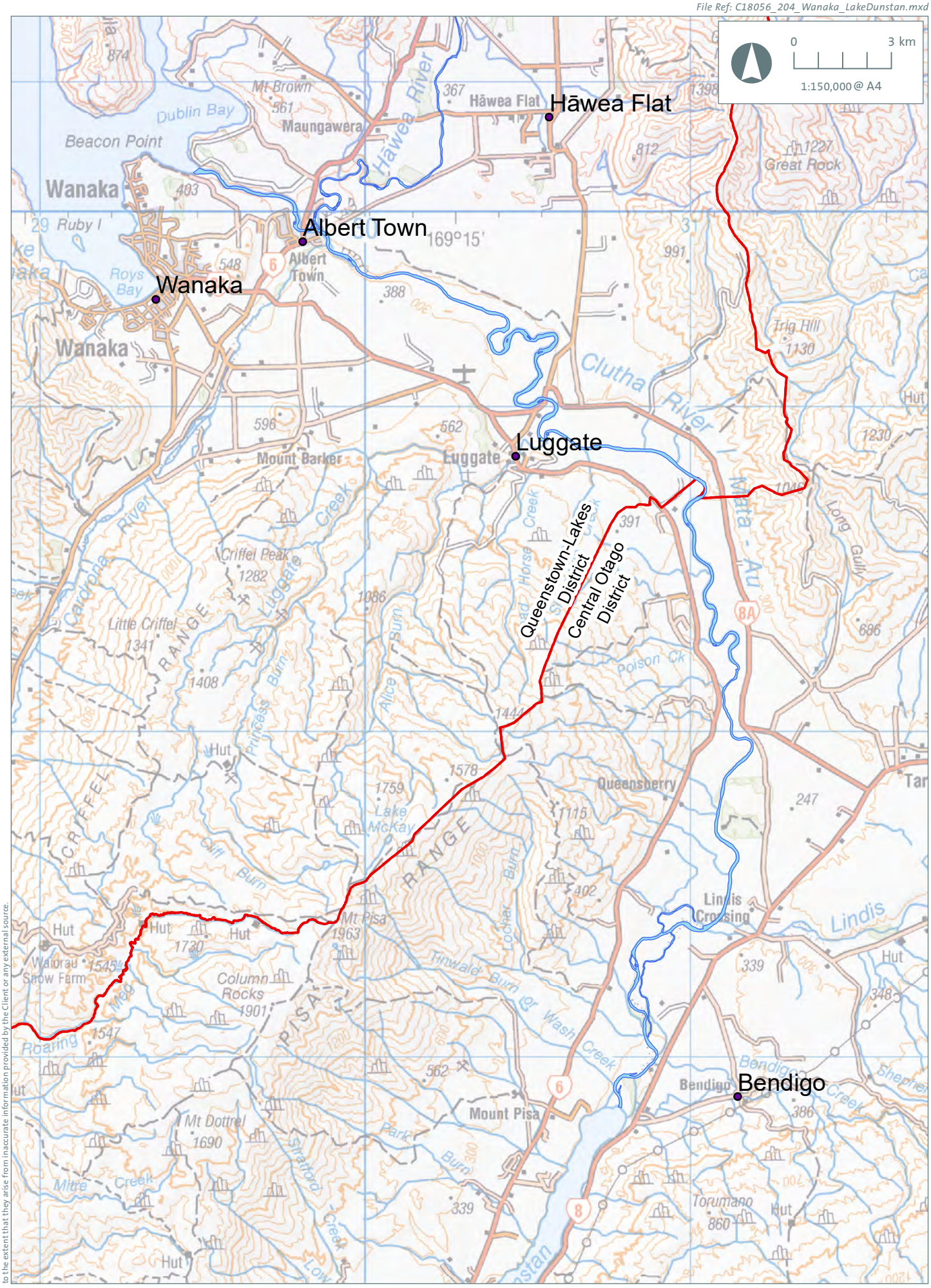

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Wanaka to Lake Dunstan

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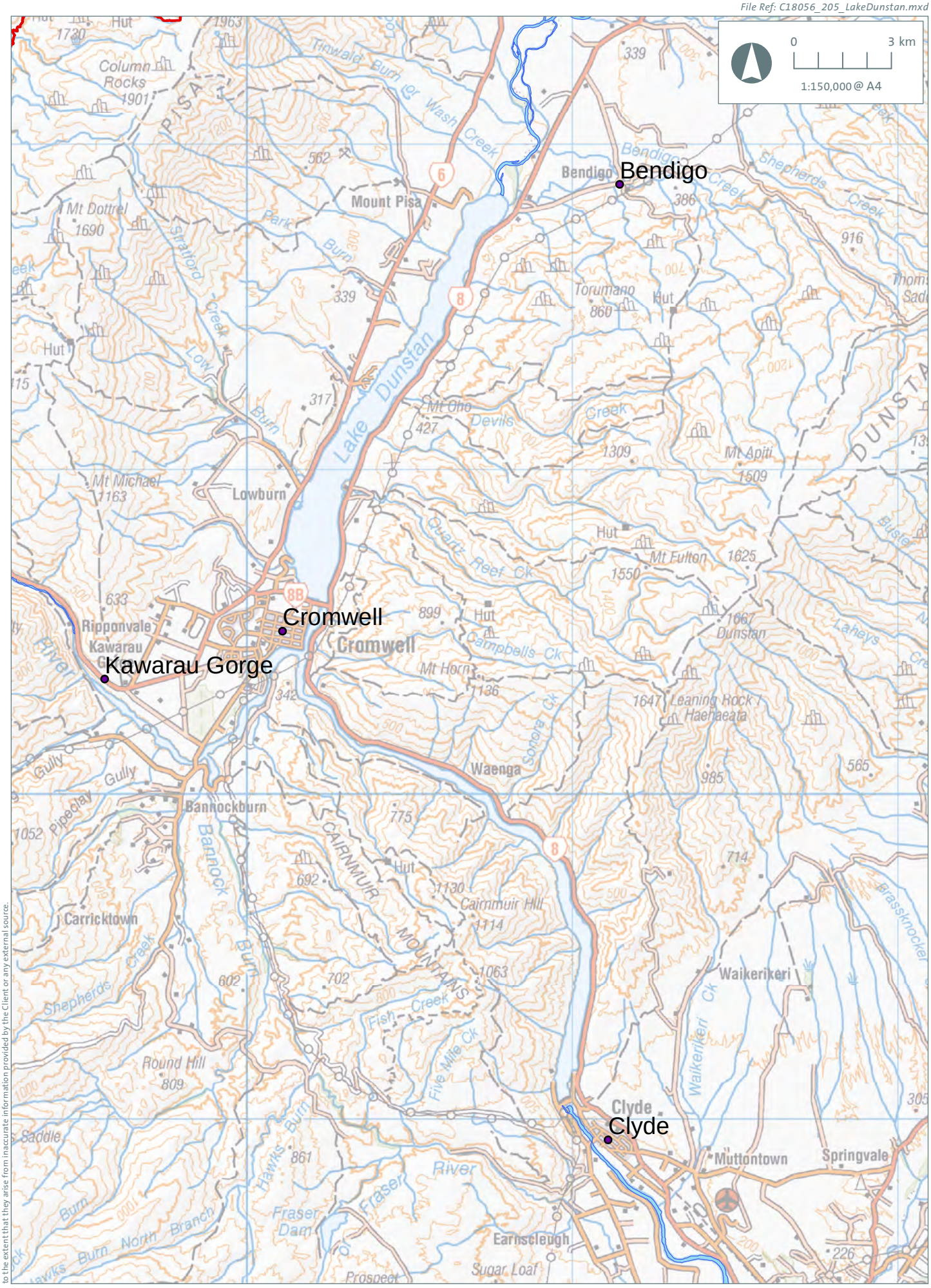

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Lake Dunstan

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Lake Wakatipu

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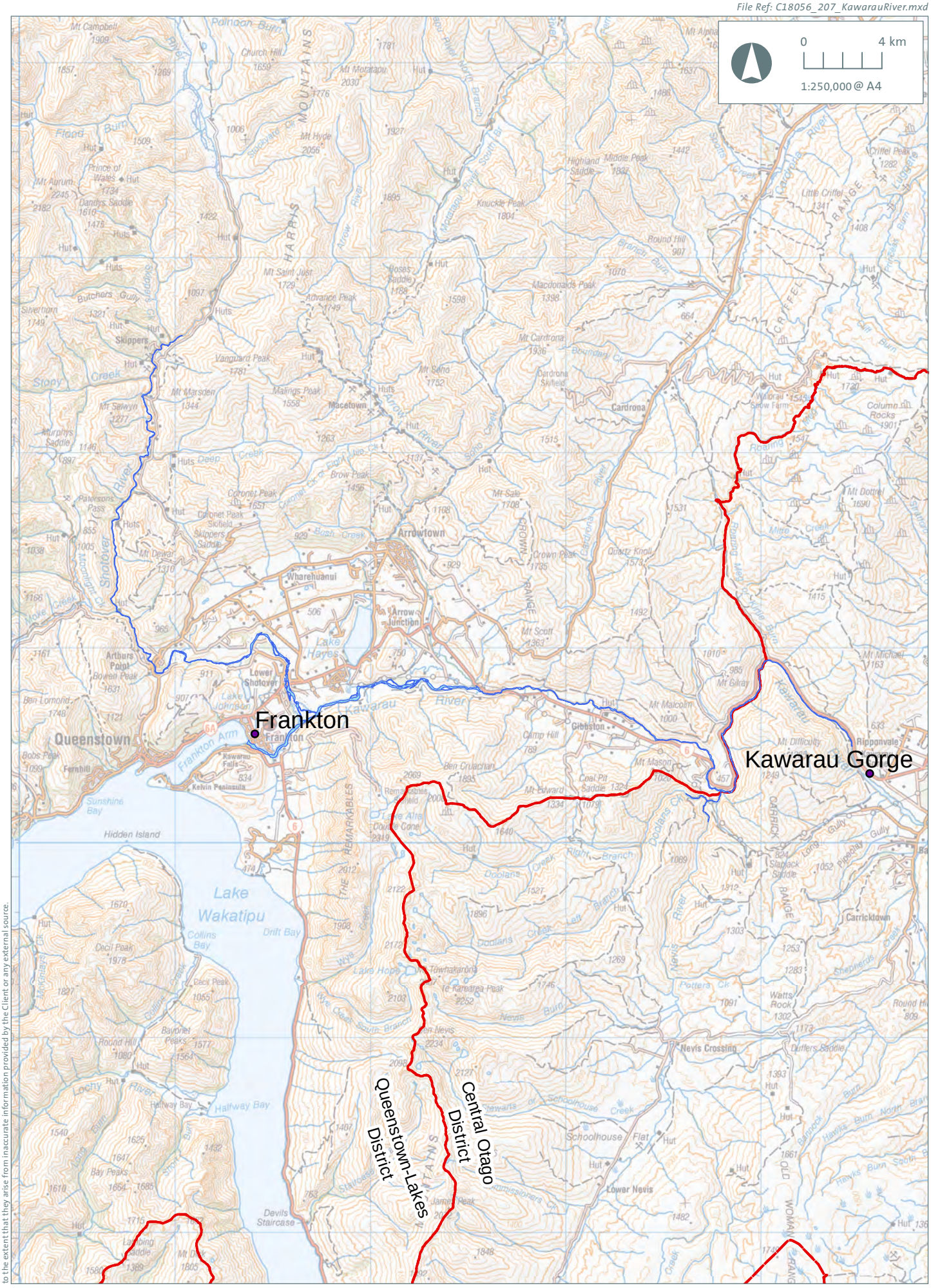

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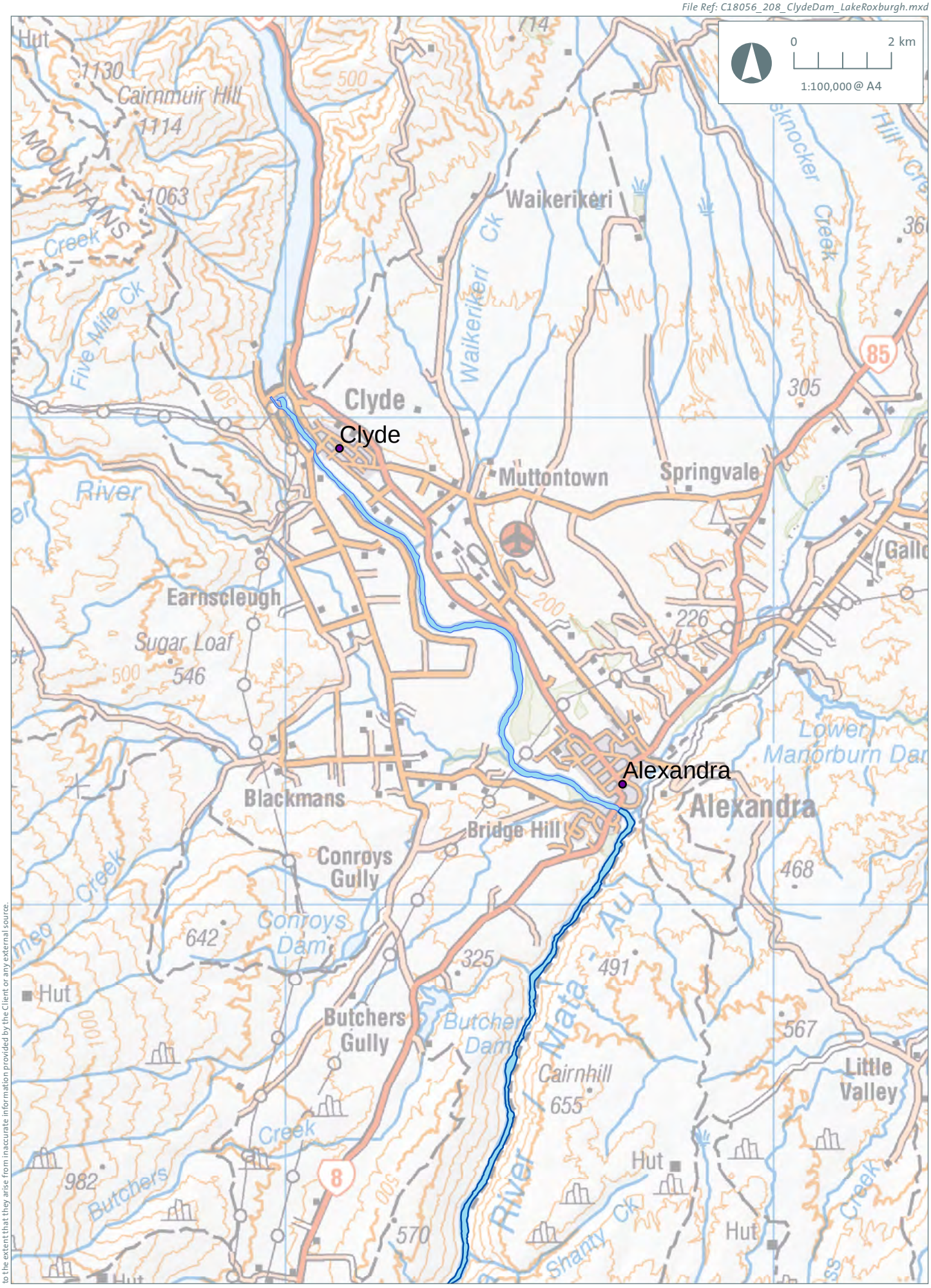

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Clyde Dam to Roxburgh

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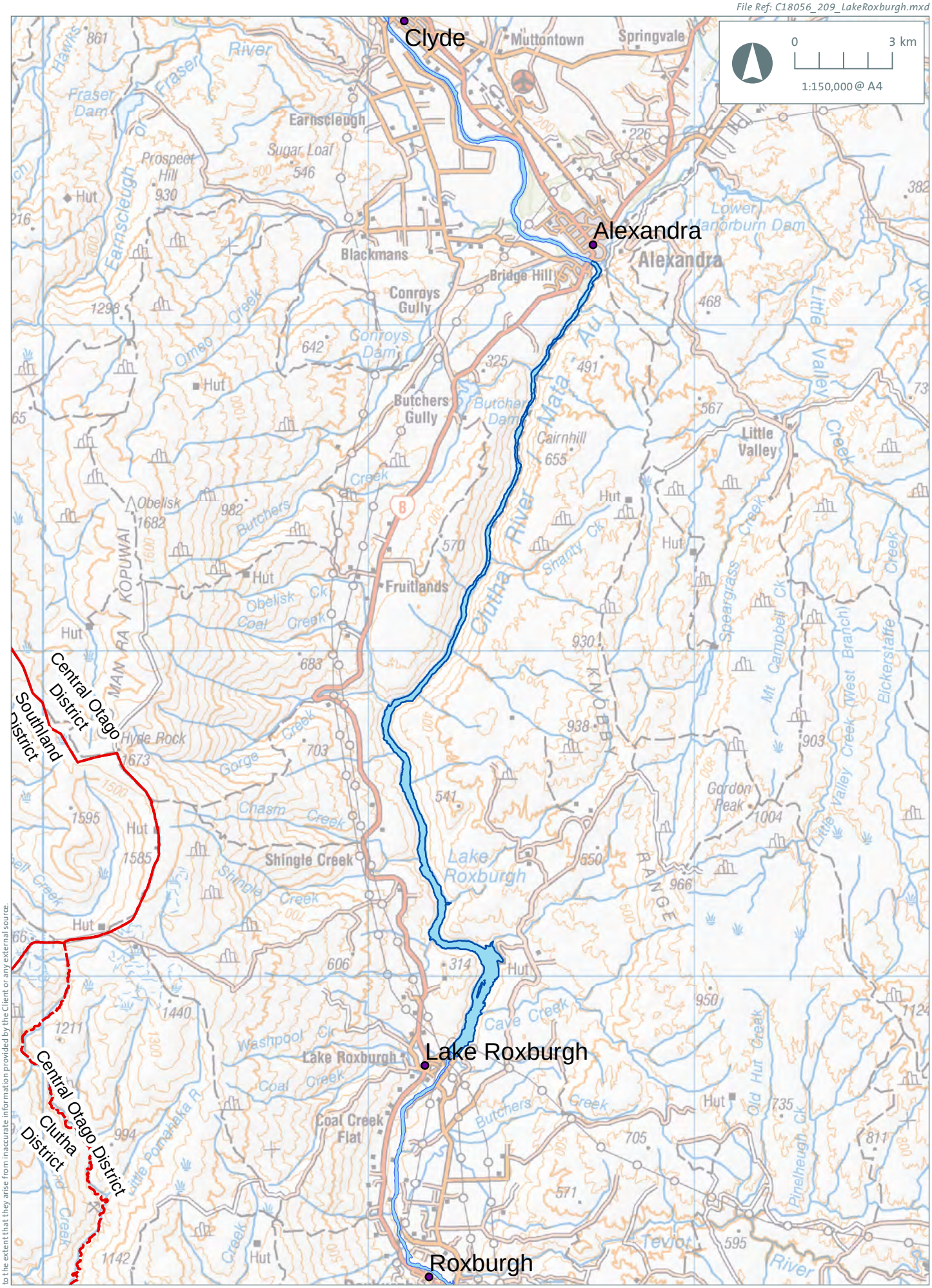

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Lake Roxburgh

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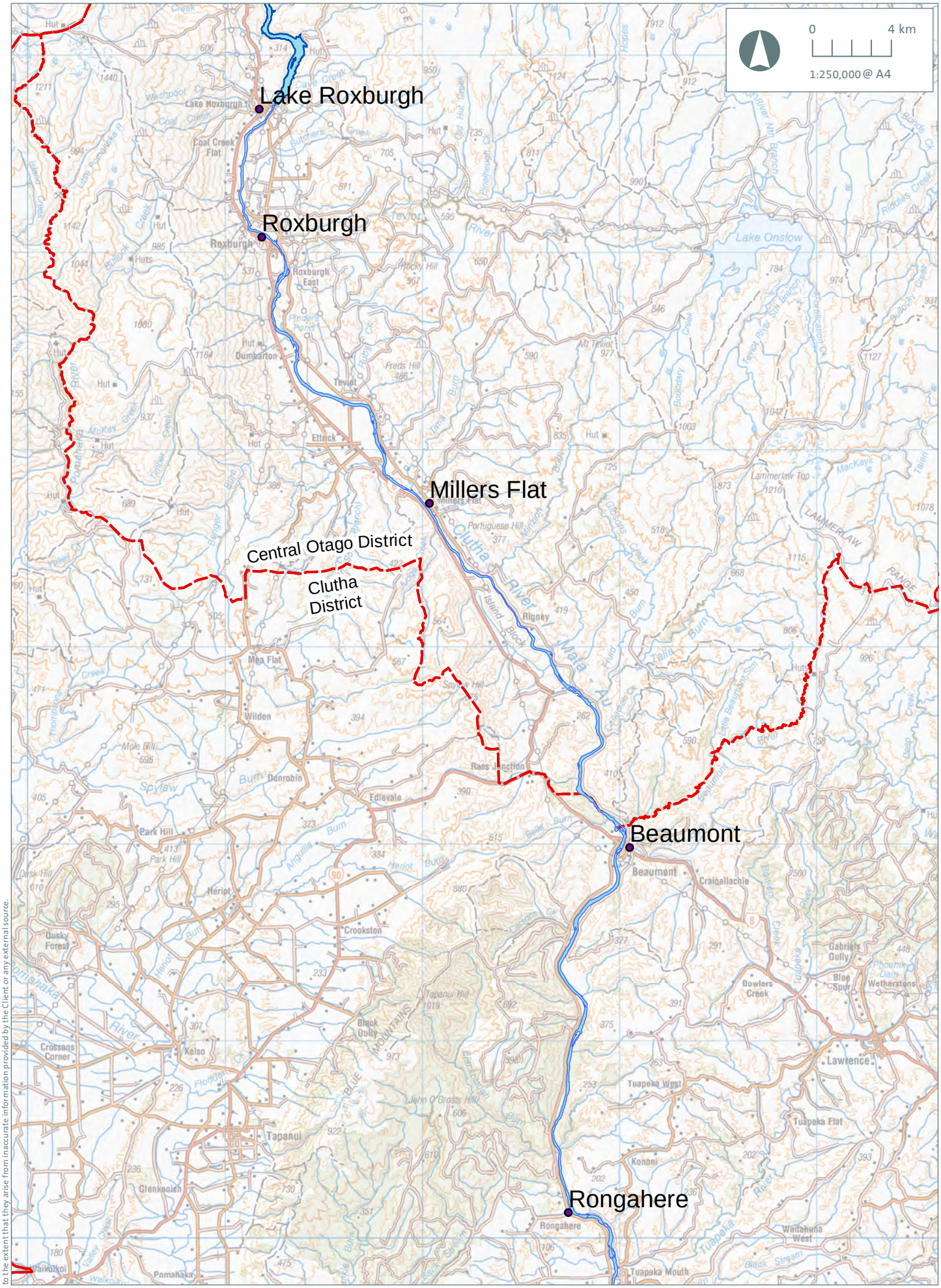

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Roxburgh Dam to Rongahere

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Rongahere to River Mouth

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