Agenda

Canterbury Water Management Strategy Waimakariri Zone Committee

Monday 1 May 3.30pm

Council Chamber
215 High Street, Rangiora

Members:

Carolyne Latham (Chairperson)
Clair Aldhamland
Michael Blackwell
Kirk Blumers
John Cooke (Te Ngai Tūāhuriri Rūnanga) Tim Fulton (WDC Councillor)
Ruby Gill-Clifford (Youth Representative)
Erin Harvie
Martha Jolly
Claire McKay (ECan Councillor)
Arapata Reuben (Te Ngai Tūāhuriri Rūnanga)

WAIMAKARIRI DISTRICT COUNCIL

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Chairperson and Members
CWMS WAIMAKARIRI ZONE COMMITTEE

AGENDA FOR THE MEETING OF THE CANTERBURY WATER MANAGEMENT STRATEGY WAIMAKARIRI ZONE COMMITTEE TO BE HELD IN THE COUNCIL CHAMBER, 215 HIGH STREET, RANGIORA ON MONDAY 1 MAY 2023 COMMENCING AT 3:30PM.

Recommendations in reports are not to be construed as Council policy until adopted by the Council

BUSINESS

PAGES

KARAKIA

1. BUSINESS

1.1 **Apologies**

1.2 **Welcome and Introductions**

1.3 **Register of Interests**
Advice of any changes or updates. *5 - 7*

2. OPPORTUNITY FOR THE PUBLIC TO SPEAK

3. REPORTS

3.1 **Ashley Rakahuri Braided River Revival Draft Strategy – Murray Griffin (CWMS Facilitator, ECan)**
8 - 9

RECOMMENDATION

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** this update for its information taking into consideration the Committee's 2021/24 Acton Plan priorities in the Ashley / Rakahuri River catchment.

3.2 **CWMS Action Plan Budget Initiatives 2022/23 – Murray Griffin (CWMS Facilitator, ECan)**

10 - 44

RECOMMENDATION

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** the information provided on the proposed CWMS Action Plan Budget project initiatives for the 2022-23 financial year.

(b) **Approves** the support for these project initiatives based on the $50,000 CWMS Action Plan Budget allocated for each CWMS Water Zone for the 2022/23 financial year.

3.3 **Review of the CWMS Waimakariri Zone Committee Action Plan 2021-24 X – Murray Griffin (CWMS Facilitator, ECan)**

45 - 47

RECOMMENDATION

THAT the CWMS Waimakariri Zone Committee:

(a) **Confirms** any amendments to its CWMS Action Plan for 2021/24 for the 2023/24 financial year.

4. COMMITTEE UPDATES – M GRIFFIN (CWMS FACILITATOR, ECAN)

4.1 **Zone Committee Working Groups.**

4.2 **Hurunui Mahinga Kai and Biodiversity Workshop 2 – 15 March 2023.**

4.3 **Kaikoura Wetlands as Farm Assets Tour – 16 and 17 March 2023.**

4.4 **CWMS Committee Forums – Northern and Southern Hui on 27 and 31 March 2023.**

4.5 **ECan Water and Land Committee Meeting – 3 May 2023.**

4.6 **Where Next for Catchment Groups? – Cawthron Guidance Report Published.**

4.7 **How long will it take? – Environment Canterbury Science Summary information about nitrate time lags in Canterbury.**

4.8 **Further Information Links.**

4.9 **Action points from the previous Zone Committee meetings.**

RECOMMENDATION *48 - 95*

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** these updates for its information.

5. CONFIRMATION OF MINUTES

5.1 **Minutes of the Canterbury Water Management Strategy Waimakariri Zone Committee Meeting – 6 March 2023**

96 - 104

RECOMMENDATION

THAT the CWMS Waimakariri Zone Committee:

(a) **Confirms** the Minutes of the Canterbury Water Management Strategy Waimakariri Zone Committee meeting, held on 6 March 2023, as a true and accurate record.

6. GENERAL BUSINESS

KARAKIA

NEXT MEETING

The next meeting of the CWMS Waimakariri Water Zone Committee is scheduled for 3 July 2023 at 3:30pm.

AGENDA ITEM NO: 1.1	Register of Interests
Waimakariri Water Zone Committee	**MEETING DATE:** 1 May 2023

WAIMAKARIRI WATER ZONE COMMITTEE

Register of Interests – at 1 FEBRUARY 2023

Keeping a Zone Committee Members' declarations of interest register allows Zone Committees to identify and manage a conflict of interest when it arises.

The Office of the Auditor General notes a conflict of interest can arise when: "A member's or official's duties or responsibilities to a public entity could be affected by some other interest or duty that the member or official may have."[1]

If a member is in any doubt as to whether or not they have a conflict of interest, then the Member should seek guidance from General Counsel, Environment Canterbury, the Zone Facilitator, and/or refer to the following guidance: https://oag.parliament.nz/2020/lamia

Types of Interest to be documented in the register:

- Employment, trade or profession carried on by the Member or the Member's spouse for profit or gain
- Company, trust, partnership etc for which the Member or their spouse is a director, partner or trustee, or a shareholder of more than 10% shares
- Address of any land in which the Member has a beneficial interest and which is in the area of the Zone Committee
- The address of any land where the landlord is Environment Canterbury, Mackenzie District Council or Waitaki District Council and:
    - The Member or their spouse is a tenant; or
    - The land is tenanted by a firm in which the Member or spouse is a partner, a company of which the Member or spouse is a director, or a Trust of which the Member or spouse is a Trustee.
- Any other matters which the public might reasonably regard as likely to influence the Member's actions during the course of their duties as a Member.
- Any contracts held between the Member or the Member's spouse and Environment Canterbury, Mackenzie District Council or Waitaki District Council. Including contracts in which the Member or their spouse is a partner, a company of which the spouse is a director and/or holds more than 10% in shares, or a Trust of which the Member or their spouse is a trustee (noting that no committee member should be a party to a contract with Environment Canterbury or the relevant TLA if that value is more than $25,000 per annum)

Zone Committee members are to ensure that the information contained in this register is accurate and complete.

Name	Committee Member Interests
Claire Aldhamland	- Teacher – Rangiora High School
Michael Blackwell	- Director/ Shareholder – Blackwells Limited, Kaiapoi - 4Ha property, Tuahiwi

[1] Office of the Auditor General Good Practice Guide – Managing Conflicts of Interest: Guidance for public entities

Kirk Blumers	- To be confirmed.
John Cooke	- Director/Shareholder – Executive Limousines 2015 Limited - Director/Shareholder – Express Hire Limited - Director/Shareholder – Secure Property Management Limited - Director/Shareholder – Testpro Limited - Director/Shareholder – Acropolis Wedding and Event Hire Limited - Director/Shareholder – Pines Beach Store Limited - Director/Shareholder – Coastal Dream 2005 Limited – 4Ha property, Kaiapoi - Interim Trustee – Section 6 Survey Office Plan 465273 Ahu Whenua Trust
Cr Tim Fulton	- Waimakariri District Councillor - Freelance Writer in the agricultural business sector
Erin Harvie	- Shareholder – Bowden Consultancy Limited, trading as Bowden Environmental - Trustee – Waimakariri Landcare Trust - Co-ordinator - Waimakariri Landcare Trust - Member – NZ Hydrological Society - Member – NZ Institute of Primary Industry Management - Involvement with Cust River Water User Group
Martha Jolly	- Veterinary surgeon (Companion animal) - Student of Masters in Water Resource Management (2nd year) - Volunteer assistant the Styx Living Laboratory Trust - Volunteer educator Vets for Compassion - Volunteer clinician SPCA NZ - Member – Forest and Bird NZ
Carolyne Latham	- Farmer – Sheep, beef - Director – Latham Ag Ltd Consulting - Shareholder – Silver Fern Farms, Farmlands - Registered Member – New Zealand Institute of Primary Industry Management
Cr Claire McKay	- Canterbury Regional Councillor - Dairy Farming/Grazing - Ihenga Holdings – Partner (with spouse) - Woodfields Partnership – Partner (with spouse) - McKay Family Trust – Trustee (spouse also a Trustee) - Shareholder – Waimakariri Irrigation Limited, Ravensdown Ltd, Balance Agri-nutrients Ltd, Fonterra, and Farmlands

	- Member – Federated Farmers, Irrigation NZ - Water take and use consents CRC: 050222.1, 990908.1, 102890, 185900 - Effluent discharge consents CRC: 990910.4, 210035 - Domestic Wastewater discharge consents CRC: 102594, 122318, 144865
Arapata Reuben	- Trustee – Tuhono Trust - Member – National Kiwi Recovery Group - Rūnanga Rep – Christchurch/West Melton Water Zone Committee - Rūnanga Rep – Ashburton Water Zone Committee

AGENDA ITEM NO: 3.1	**SUBJECT MATTER:** Ashley/Rakahuri Braided River Revival Draft Strategy – update
REPORT TO: Waimakariri Water Zone Committee	**MEETING DATE:** 1 May 2023
REPORT BY: Murray Griffin, CWMS Facilitator, ECan	

PURPOSE

This agenda item provides the Zone Committee with an update on the Ashley/Rakahuri Braided River Revival draft strategy developed by Environment Canterbury and in advance of the community consultation for this draft strategy.

RECOMMENDATION

That the Zone Committee

Receive – this update for its information and with consideration to the committee's 2021-2024 Acton Plan priorities in the Rakahuri/Ashley River catchment.

BY WHO

This update will be led by:

- Sarah Worthington, Braided River Revival Advisor, ECan

BACKGROUND

The Braided River Revival programme established by Environment Canterbury has two overarching purposes:

1. To achieve improvements in the health of Canterbury's braided rivers by supporting the development and promotion to external partners, of a proposal for a landscape scale alignment of the agencies involved in braided river management.

2. Environment Canterbury, as a Council, has called for a step change in effort in the regeneration of freshwater, marine and terrestrial biodiversity and has recognised Braided Rivers as one of two priority ecosystems. Council's efforts to achieve the desired change are focused on strategic and work programme alignment, both internally and with external agencies and partners.

Alignment with the Waimakariri Water Zone Committee Action Plan 2021-2024

Action Plan Priority – Promoting the natural braided character and increased flow of the Ashley River/Rakahuri.

To protect the braided river values associated with the Ashley River/Rakahuri, ki uta ki tai, by:

- *Promoting an improved community understanding of land and water use impacts on braided river character and the lower catchment ecosystems,*
- *Working to make the Ashley River/Rakahuri safe for contact recreation, with improved river habitat, fish passage and customary use, and flows that support natural coastal processes.*

We will measure this by:

- *Encouraging the improved understanding of landowners and wider community of climate change impacts on the Ashley River/Rakahuri',*

- *Encouraging landowners and agencies to protect the landscape and indigenous biodiversity values in the upper catchment,*
- *Supporting weed control in the upper and middle sections of the catchment,*
- *Supporting an investigation into existing consents and water use in the Ashley River/Rakahuri catchment,*
- *Encouraging landowner and agency efforts to improve the habitat health of lowland spring-fed tributaries,*
- *Supporting investigations focused on understanding and improving the ecosystem health of Te Aka Aka/Ashley estuary.*

Alignment with the Waimakariri ZIP Addendum (2018)
The Braided River Revival programme aligns with the following ZIP Addendum recommendations focused on the Ashley/Rakahuri

Rec 1.22	That Environment Canterbury and the Waimakariri District Council recognise the Ashley River/Rakahuri for its important natural landscape values, braided river characteristics, and braided river bird (nesting and feeding) habitat.
Rec 1.23	That Environment Canterbury investigate funding for projects to address key environmental issues in consultation with LINZ and Department of Conservation for the Ashley River/Rakahuri, particularly the removal of woody weeds above the confluence with the Okuku River.
Rec 1.24	That Environment Canterbury and the Waimakariri District Council recognise the Upper Ashley River/Rakahuri catchment, including Lees Valley, for its high natural landscape and ecosystem values, and protect its waterways from degradation by: • Avoiding increased contaminant losses to waterways. • Preventing the removal or degradation of any existing wetlands. • Preventing the expansion of wilding pines.
Rec 2.1	The zone committee recommends that Environment Canterbury and the Waimakariri District Council work with Ngāi Tūāhuriri, landowners, agencies and stakeholders to integrate indigenous biodiversity in a whole of waterway, Ki Uta Ki Tai, approach to managing catchments in the Waimakariri Water Zone.

Alignment with other work programmes

- Work programmes developed under the Braided River Revival umbrella will mesh with other programmes particularly in relation to tree planting.
- Work on braided rivers may also deliver river protection functions outside of existing rating districts. For example, the current choked status of the Ashley Rakahuri between Ashley Gorge and the Okuku River may be addressed through Braided River Revival which will also have very beneficial effects for adjacent landowners concerned about lateral erosion.
- **Link** – For more information on the vegetation clearance being undertaken in the catchment:
  - Ashley River/Rakahuri vegetation clearance | Environment Canterbury (ecan.govt.nz)

AGENDA ITEM NO: 3.2	SUBJECT: CWMS Action Plan Budget Initiatives 2022/23 – for decision
REPORT TO: Waimakariri Water Zone Committee	DATE OF MEETING: 1 May 2023
REPORT BY: Murray Griffin, CWMS Facilitator – Waimakariri	

1. PURPOSE

The purpose of the agenda item is to enable the Waimakariri Water Zone Committee to confirm its support of projects using the Zone Committee's Canterbury Water Management Strategy (CWMS) Action Plan Budget for the 2022/23 financial year.

The committee has received information on the project initiatives to review in advance of this meeting to assist in confirming its final recommendations.

This year's initiatives for the committee's consideration are provided as agenda items: 3.2 – 1 to 3.2 – 5 in the meeting papers. They are:

3.2 – 1. Ashley Rakahuri Rivercare Group – Estuary Shorebird Monitoring	$ 9,000
3.2 – 2. Ashley Rakahuri Rivercare Group – Nesting Area Weed Clearing	$ 5,000
3.2 – 3. Waimakariri Biodiversity Trust – Wetland Restoration Daiken property	$20,000
3.2 – 4. Waimakariri Landcare Trust – Water Quality Gap Analysis	$28,050
3.2 – 5. Waimakariri Biodiversity Working Group – Environmental Awards	$ 3,000

2. RECOMMENDATIONS

That the Waimakariri Water Zone Committee:

1) **Receives** the information provided on the proposed CWMS Action Plan Budget project initiatives to support for the 2022-23 financial year.

2) **Approves** its support for these project initiatives based on the $50,000 CWMS Action Plan Budget allocated for each CWMS Water Zone for the 2022/23 financial year.

3. BACKGROUND

As part of their Long-Term Plan 2021-2031, Environment Canterbury established the Zone Committee Action Plan Budget and committed $50,000 per Water Zone for the 2021-22 financial year. Another $50,000 for each CWMS Water Zone was confirmed by Environment Canterbury it its 2022/23 Annual Plan.

The purpose of the budget is to support Zone Committees to focus on implementing their action plan and leverage other funding opportunities to achieve their Canterbury Water Management Strategy (CWMS) priorities.

CWMS Action Plan Budget Initiatives – Assessment

The Waimakariri Water Zone Committee has considered the above initiatives as options to support in this initial year of their 2021-24 Action Plan. In doing so, the committee has contributed to developing an assessment approach and template for the above and future Action Plan initiatives.

Assessment details for each initiative have been provided to the Zone Committee prior to the meeting to support its decision making.

Waimakariri Water Zone Committee

AGENDA ITEM NO: 3.2 – 1	**Application for funding – CWMS Action Plan Budget 2022/23:** Ashley Rakahuri Rivercare Group Inc
Waimakariri Water Zone Committee	**MEETING DATE:** 1 May 2023

Application for funding – CWMS Action Plan Budget 2022/23

Applicant details

Organisation (if applicable):	**Ashley Rakahuri Rivercare Group Inc (ARRG)**
Contact name:	
Contact email:	

About your project

The amount of information and detail we would like you to provide is in proportion to the amount of funding you are requesting. If it is smaller amount, then a simple description of your project, who's involved and what you will be doing, along with a simple budget is sufficient.

Project name:	*Ashley Rakahuri Estuary Shorebird Monitoring 2023/24*
CWMS zone where the activity will occur:	*Waimakariri in the Saltwater Creek and Ashley Rakahuri estuary areas.*
Provide a brief project summary:	
- *The project will continue monitoring the breeding of shorebirds around the Ashley-Rakahuri /Saltwater Creek estuary – the species, their nest locations and their breeding outcomes.* - *Such work has been undertaken by ARRG on the Rakahuri riverbed above the estuary for almost 20 years, but to our knowledge, has not been done before around the estuary itself.*	

Waimakariri Water Zone Committee

- *The main species monitored would be banded dotterel (turiwhatu), pied stilt (piako), black-fronted and white-fronted tern (tarapirohe and tara), S. Island pied oystercatcher (torea) and black-billed and black-backed gull (tarapuka and karoro).*
Describe the outcomes or impacts of this project: *Outcomes or impacts are what will change or who will benefit from this work, including enduring benefits. For example, fencing off springheads will improve biodiversity and improve stream health.*
Much improved knowledge of shorebird breeding attempts and success, plus knowledge of reasons for nesting failures
List the key outputs of the project: *An output describes what your group is proposing to do and is measurable. For example, install 250 m of fencing, or train 25 volunteers. Outputs are important and may be used as milestones in a funding agreement.*
A progress report by the end of December, 2023. *A final report by the end of March 2024 - following the end of the next shorebird breeding season.* *We wish to establish reasons for nesting failures of the previous season so steps can be taken to minimise factors that result in failure and thus attract threatened and vulnerable nesting shorebirds to successfully fledge chicks to increase species numbers. This is achieved in part through annual monitoring and bird counting in the selected area.*
Please state how the project aligns with the relevant Zone Committee's 2021-24 Action Plan: *All action plans can be found as a link at the bottom of the "What's happening in my zone" page on the Environment Canterbury website. (https://www.ecan.govt.nz/your-region/your-environment/water/whats-happening-in-my-water-zone/)*
- *This project aligns with the WWZC Action Plan Priorities:* - *(2) Increased indigenous biodiversity in the zone,*   - *To protect and improve the indigenous biodiversity, habitat or ecosystems in the Zone*
Tell us what activities you're intending to do and when you intend to have the project completed (timeline):
Visits to locate and monitor shorebird nesting in estuary at least weekly from Sept 2023 until end of February 2024 when fieldwork finishes. Final report completed by end of March, 2024.

Waimakariri Water Zone Committee

Tell us about the project management, including leadership and financial oversight:	
The MSc project will be undertaken by UoC MSc student, Eleanor Gunby, supervised by UoC Professor Jim Briskie. ARRG members, particularly Operations Manager, Grant Davey, will provide field guidance and assistance, with financial oversight from the UoC, and ARRG treasurer, Sue Mardon.	
List any other groups or organisations you are partnering with on this project, such as community groups, schools etc:	
The main partner is the UoC student.	
How will you engage the community on the project:	
ARRG is a North Canterbury (Rangiora) based community group with 185 members. Woodend is the nearest township to the estuary, and its community will be addressed on the project at its completion.	
Do you know of any cultural values associated with this site? **If yes, what engagement has occurred or is planned (if any) with local Papatipu Rūnanga about this project?**	**YES**
The estuary has always been important to Te Ngāi Tūāhuriri Rūnanga as a cultural site, particularly for mahinga kai. They are well aware of, and have supported, ARRG's shorebird activities since ARRG's formation in 1999.	
Please provide an accurate location with grid reference and/or map (if relevant to your project):	

***Map**: of the intended project area for Ashley Rakahuri Estuary Shorebird Monitoring by ARRG*

Who owns the land? *Attach evidence of permission from the landowner, or their representative.*

ECan.

Funding details

Please attach a budget to your application if one has been prepared. Your budget should include estimates of income and expenditure, including other funding and in-kind contributions. You should show clearly what you are planning to spend the Action Plan funds on if successful. We would like more detail if your application is for a larger amount e.g.$15,000. We have some example budgets for different types and sizes of projects in our resource pack. These will show you what we are expecting you to provide.

How much funding are you requesting?	**$9,000.00**

Waimakariri Water Zone Committee

If you are successful with this application, what components of your project will you spend the money on?*   *If you have a project budget, please attach it to your application.*
-Project admin costs *In-kind*   *-Monitoring co-ordinator, Eleanor Gunby* *$9,000*   *-Total project costs* *$9,000*   *-WWZC Action Plan request:* *$9,000*   *-Funding from other sources will be sourced as/if required.*   *Note: The increased funding application compared to last year's is due to Eleanor being paid to monitor from mid Nov to 6 Feb. Grant Davey monitored voluntarily from 7 Sep to mid Nov. Eleanor found $5,000 insufficient to cover her costs. UC covered some of her travel expenses. Therefore, ARRG is applying for sufficient funding to cover Eleanor Gunby to monitor the full nesting season 2023/24*

Have you applied to or received funding from other organisations for this project? **If yes, please provide details below or note if it is included in your attached budget.**	**YES**
ECan – CWMS Action Plan Budget support from the Waimakariri Zone Committee funded year 1 of the project in 2021/22 ($5,000 received 15 July 2022).	
Is the project receiving any other monetary or "in-kind" contributions from your organisation or others e.g. volunteer time, use of resources, facilities and equipment? **If yes, please provide details below:**	**YES**
Voluntary supervision by ARRG Operations Manager.	

Working with us and Environment Canterbury

In the last three years have you received funding or other support from Environment Canterbury for this, or any other project? **If yes, what was the funding/support for, and when did you receive it:**	**NO**

Waimakariri Water Zone Committee

Are you intending on applying to another Environment Canterbury fund this financial year for this, or any other project? **If yes, what fund are you applying to?**	**YES**
ECan – CWMS Action Plan Budget through the Waimakariri Zone Committee to support weed clearing in the Ashley Rakahuri River in 2022/23 ($5,000).	

Do you have supporting information you would like to provide (optional):

*Please attach any supporting information with your application***.**

Once completed, please send this application form to: Facilitator, Murray Griffin, email: murray.griffin@ecan.govt.nz

AGENDA ITEM NO: 3.2 – 2	**Application for funding – CWMS Action Plan Budget 2022/23:** Ashley Rakahuri Rivercare Group Inc
Waimakariri Water Zone Committee	**MEETING DATE:** 1 May 2023

Application for funding – CWMS Action Plan Budget 2022/23

Applicant details

Organisation (if applicable):	**Ashley Rakahuri Rivercare Group (ARRG)**
Contact name:	
Contact email:	

About your project

The amount of information and detail we would like you to provide is in proportion to the amount of funding you are requesting. If it is smaller amount, then a simple description of your project, who's involved and what you will be doing, along with a simple budget is sufficient.

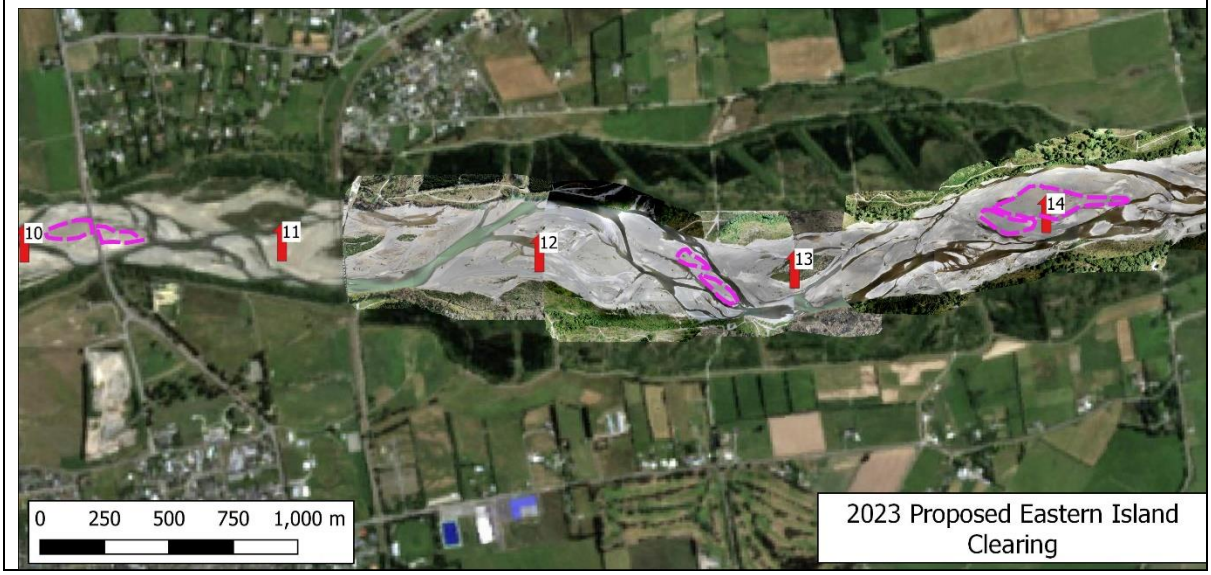
Project name:	*Ashley Rakahuri Nesting Area Weed Clearing, 2023*
CWMS zone where the activity will occur:	*Ashley*
Provide a brief project summary:	
Clearing weeds from braided river bird nesting areas in the Ashley.	
Describe the outcomes or impacts of this project: *Outcomes or impacts are what will change or who will benefit from this work, including enduring benefits. For example, fencing off springheads will improve biodiversity and improve stream health.*	

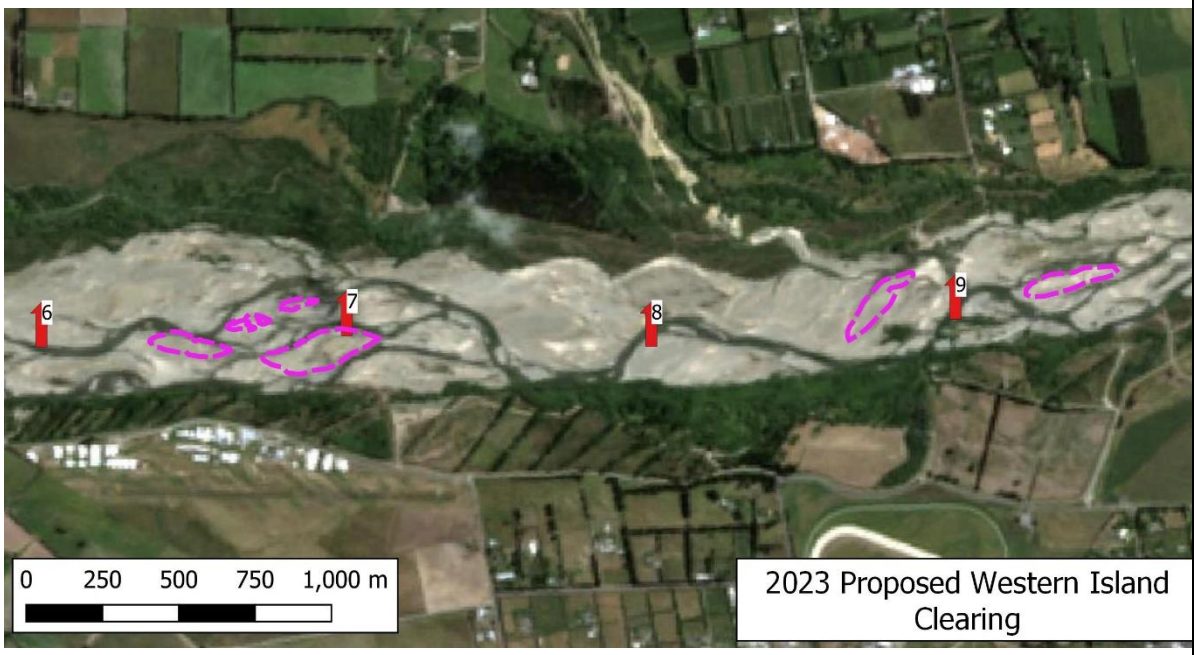
Waimakariri Water Zone Committee

Braided river birds require weed-free islands to nest on. These must be high enough to withstand moderate floods. Good water flow around the island will deter predators. Last nesting season 17 black-fronted terns fledged from 162 nests. Floods and predators were the cause of this poor success rate.
List the key outputs of the project: *An output describes what your group is proposing to do and is measurable. For example, install 250 m of fencing, or train 25 volunteers. Outputs are important and may be used as milestones in a funding agreement.*
14.6 ha of weed clearing is planned on 10 separate islands between 3km downstream from Rangiora and the airfield.
Please state how the project aligns with the relevant Zone Committee's 2021-24 Action Plan: *All action plans can be found as a link at the bottom of the "What's happening in my zone" page on the Environment Canterbury website. (https://www.ecan.govt.nz/your-region/your-environment/water/whats-happening-in-my-water-zone/)*
-This project aligns with the WWZC Action Plan Priorities: *(2) Increased indigenous biodiversity in the zone,* *- To protect and improve the indigenous biodiversity, habitat or ecosystems in the Zone.*
Tell us what activities you're intending to do and when you intend to have the project completed (timeline):
A large 4WD tractor equipped with a purpose designed and built machine which has a subsurface blade would be used. The group has successfully done this on several occasions in the past few years. A local contractor will be used. Timing of this work will be subject to flow around the islands, and contractor availability. However, we hope to get it done by early winter.
Tell us about the project management, including leadership and financial oversight:
Project Management will be supervised by ARRG Operations Manager, Grant Davey and team, financials will be undertaken by ARRG Treasurer, Sue Mardon.
List any other groups or organisations you are partnering with on this project, such as community groups, schools etc:
NIL
How will you engage the community on the project:

Waimakariri Water Zone Committee

Prior to the project start a public notice would be placed in the local Northern Outlook newspaper. *During tractor operating hours the public will be notified of site works by riverbed signage and with ARRG volunteers patrolling the working area, especially Area10 near the Cones Road Bridge. The expected time taken in this area would be a few hours of one day.*	
Do you know of any cultural values associated with this site? **If yes, what engagement has occurred or is planned (if any) with local Papatipu Rūnanga about this project?**	**NO**
Please provide an accurate location with grid reference and/or map (if relevant to your project):	
Please see attached maps of the Ashley Rakahuri River East (Areas 10-14) and West (Areas 6-9) of the Cones Road Bridge. *The intended areas to be cleared are within the purple dotted lines.* *Area 10 is mid-stream each side of Cones Road Bridge. Last season there was minimal human or vehicle disturbance in this area due to ARRG and ECan blocking vehicle access to the river and public education that is now being effective. Several bird species nested in this area but were unsuccessful due to last season's flooding and predation.*	





Who owns the land? *Attach evidence of permission from the landowner, or their representative.*
This land is owned by Environment Canterbury.

Funding details

Please attach a budget to your application if one has been prepared. Your budget should include estimates of income and expenditure, including other funding and in-kind contributions. You should show clearly what you are planning to spend the Action Plan funds on if successful. We would like more detail if your application is for a larger amount e.g.$15,000. We have some example budgets for different types and sizes of projects in our resource pack. These will show you what we are expecting you to provide.

How much funding are you requesting?	**$5,000**
If you are successful with this application, what components of your project will you spend the money on?*:	

Waimakariri Water Zone Committee

If you have a project budget, please attach it to your application.	
-Project admin and supervisory costs	*In-kind*
-14.6 ha - local contractor & tractor-pulled ripper @ $342.50/ha	*$5,000.00*
-Total project costs	*$5,000.00*
-WWZC Action Plan request:	*$5,000.00*
Funding from other sources will be sourced as/if required.	
Have you applied to or received funding from other organisations for this project? **If yes, please provide details below or note if it is included in your attached budget.**	**NO**
Is the project receiving any other monetary or "in-kind" contributions from your organisation or others e.g. volunteer time, use of resources, facilities and equipment? **If yes, please provide details below:**	**YES**
Some follow up hand pulling of weeds by volunteers may be done.	

Working with us and Environment Canterbury

In the last three years have you received funding or other support from Environment Canterbury for this, or any other project? **If yes, what was the funding/support for, and when did you receive it:**	**YES**
Ashley Rakahuri Estuary Shorebird Monitoring 2022/23, $5,000 received 15 July 2022 from CWMS Action Plan Budget	
Are you intending on applying to another Environment Canterbury fund this financial year for this, or any other project? **If yes, what fund are you applying to?**	**YES**
CWMS Action Plan Budget for further research of Estuary Shorebird Monitoring.	

Additional information

Do you have supporting information you would like to provide (optional):

*Please attach any supporting information with your application***.**

Once completed, please send this application form to: Facilitator, Murray Griffin, email: murray.griffin@ecan.govt.nz

AGENDA ITEM NO: 3.2 – 3	**Application for funding – CWMS Action Plan Budget 2022/23:** Waimakariri Biodiversity Trust
Waimakariri Water Zone Committee	**MEETING DATE:** 1 May 2023

Application for funding – CWMS Action Plan Budget 2022/23

Applicant details

Organisation (if applicable):	**Waimakariri Biodiversity Trust**
Contact name:	
Contact email:	

About your project

The amount of information and detail we would like you to provide is in proportion to the amount of funding you are requesting. If it is smaller amount, then a simple description of your project, who's involved and what you will be doing, along with a simple budget is sufficient.

Project name:	Wetland Restoration – Daiken property
CWMS zone where the activity will occur:	Waimakariri
Provide a brief project summary:	
Over a number of years, the Trust will work with Daiken New Zealand to restore a wetland associated with the headwaters of Saltwater Creek, Sefton. This funding application covers Stages 1 and 2 – investigations and planning. Currently Daiken NZ uses the site as part of its farm – some paddocks are irrigated by wastewater from the factory process and grass is cut and carried as hay or baleage. There is no stock on site. Springs, tile drains and drain channels cross the site; old aerial photographs show that there were meandering streams across the area. Water quality is good and tuna and other native fish have been recorded there.	

Overall, the project will investigate and manage the hydrology and planting to restore wetland function and indigenous biodiversity.

Daiken NZ will cover costs of planting and materials and will make a number of “in-kind” contributions. For example, staff will be involved in planning, any earthworks, planting and monitoring. The local community will be engaged in all stages including monitoring.

The Trust will take information and the experience gained through this major project to update its biodiversity and resources databases, web site and operating procedures. The Trust will develop a wetland restoration plan (WRP) template that will be repeatable for future opportunities in the District.

Describe the outcomes or impacts of this project:
Outcomes or impacts are what will change or who will benefit from this work, including enduring benefits. For example, fencing off springheads will improve biodiversity and improve stream health.

Overall:

- Headwaters of Saltwater Creek will be enhanced, with downstream benefits for the whole waterway from source to sea
- An area of wetland will be re-instated with hydrological and ecological benefits
- Indigenous biodiversity in Waimakariri will be enhanced
- Local communities will be engaged in biodiversity restoration
- Awareness of biodiversity and ecosystems will grow locally – public access may be possible to the completed project
- Publicity for the projects and the Trust will lead to future projects
- A local business (Daiken) will dedicate time, money and resource to a restoration project that can act as an example for other businesses to undertake similar projects that benefit the District

List the key outputs of the project:
An output describes what your group is proposing to do and is measurable. For example, install 250 m of fencing, or train 25 volunteers. Outputs are important and may be used as milestones in a funding agreement.

Stages One and Two:

- A detailed hydrology study will be conducted, and a set of recommendations and actions made to be integrated into the restoration action plan
- A site wetland restoration action plan will be prepared

Later stages:

Waimakariri Water Zone Committee

- An area of approximately 2 ha will be set aside from farming and converted to wetland – final area will depend on hydrological investigations
- That area will be planted with indigenous species.
- Aquatic habitat improvements may allow management of indigenous fish populations
- Members of the Ashley-Sefton community, including Daiken staff, will be involved in planting and monitoring

Please state how the project aligns with the relevant Zone Committee's 2021-24 Action Plan:
All action plans can be found as a link at the bottom of the "What's happening in my zone" page on the Environment Canterbury website. (https://www.ecan.govt.nz/your-region/your-environment/water/whats-happening-in-my-water-zone/)

The Waimakariri Biodiversity Trust's vision and purpose align with the following Waimakariri Zone Committee Action Plan Priorities:

1. **Improved monitoring of groundwater and surface water in the zone**

To encourage community understanding and awareness of monitoring and clarify future monitoring requirements in the zone by:

Facilitating collaboration to develop a wider monitoring network in the zone;
Encouraging more monitoring by catchment and landcare groups.

2. **Increased indigenous biodiversity in the zone**

To protect and improve the indigenous biodiversity, habitat or ecosystems in the zone through:

Managing and eliminating plant and animal pest species;
Assisting all landowners and managers to integrate indigenous biodiversity management into the wider aspects of land and water (catchment) management.

3. **Promoting the natural braided character and increased flow of the Ashley River/Rakahuri**

To protect the braided river values associated with the Ashley River/Rakahuri, ki uta ki tai, by:

Working to make the Ashley River/Rakahuri safe for contact recreation, with improved river habitat, fish passage and customary use, and flows that support natural coastal processes.

Tell us what activities you're intending to do and when you intend to have the project completed (timeline):

The Daiken wetland project will extend over a number of years. The stages are expected to be:

1. Investigations/baseline record – hydrology, ecology, cultural values, community engagement opportunities – including baseline records – what is there now? By end of 2023
2. Planning – preparation of a restoration action plan; identifying inputs required from Trust, Daiken and others. Early 2024
3. Physical works on site – getting the water back into the wetland – including engineering, earthworks, and diversions. Applying for consents if needed. 2024
4. Monitoring – how does the hydrology change in response to physical works? 2024-2025
5. Ecological plan preparation – a biodiversity plan for the new hydrological regime; and a management/maintenance plan. 2024-2025
6. Site preparation and planting – getting a range of people involved on site 2025-2026
7. Monitoring, management and maintenance. 2025 onwards.
8. A WRP template will be made publicly accessible; the Trust will use this to approach future projects

Tell us about the project management, including leadership and financial oversight:

- a dedicated project manager will be sought by the Trust
- project administrative over-sight will be done by WBT Co-ordinator until the project manager is appointed
- financial management through the WBT account, managed by WBT Treasurer
- outside professionals will be under contract to WBT

PDP have agreed to undertake hydrological work; Di Robertson has agreed to do ecological work. Other specialists will be approached as needed.

List any other groups or organisations you are partnering with on this project, such as community groups, schools etc:

- WDC and ECan ecologists will provide in-kind advice and support
- Sefton Saltwater Creek Catchment Group will be involved in site planning and monitoring
- Other partners may be sought for specific aspects of the project

How will you engage the community on the project:
• Daiken have indicated that they are comfortable with local news and web articles to publicise the project • Ashley School and Ashley township are approximately 3 km from the site and they will be approached for involvement • The Daiken wetland restoration project will be publicised as it progresses on the WBT website (under development, to be operating by Easter)

Do you know of any cultural values associated with this site? **If yes, what engagement has occurred or is planned (if any) with local Papatipu Rūnanga about this project?**	**YES**
All waterways are taonga and we recognise that Saltwater Creek is special in flowing into Te Aka Aka. Ngai Tūāhuriri will be kept informed of the project and invited to be involved when they wish. Arapata Reuben has agreed to provide advice on this aspect of the project. We will approach Zone Committee members, WDC staff and ECan staff for other information and engagement.	

Please provide an accurate location with grid reference and/or map (if relevant to your project):
Aerial photograph provided below in additional information.
Who owns the land? *Attach evidence of permission from the landowner, or their representative.*
Daiken NZ. A support email for this project from Federico Roura, Daiken NZ Technical Manager, has been provided for the committee, *please refer to the final page under additional information*.

Funding details

Please attach a budget to your application if one has been prepared. Your budget should include estimates of income and expenditure, including other funding and in-kind

contributions. You should show clearly what you are planning to spend the Action Plan funds on if successful. We would like more detail if your application is for a larger amount e.g.$15,000. We have some example budgets for different types and sizes of projects in our resource pack. These will show you what we are expecting you to provide.

How much funding are you requesting?	**$20,000**
If you are successful with this application, what components of your project will you spend the money on: *If you have a project budget, please attach it to your application.*	
Outline Budget attached to cover: • Hydrologist and Ecologist's contracts – fees and expenses • Project manager & co-ordinator – fees and expenses • Contingency to cover additional professional advice that may be needed • Plan printing, publicity and admin	
Have you applied to or received funding from other organisations for this project? **If yes, please provide details below or note if it is included in your attached budget.**	**NO**
Applications will be made to other organisations for later stages.	
Is the project receiving any other monetary or "in-kind" contributions from your organisation or others e.g. volunteer time, use of resources, facilities and equipment? **If yes, please provide details below:**	**YES**
Stages One and Two: • Project planning and management time, mapping and other resources: Daiken staff, Trustees and co-ordinator (paid by Trust) • Publicity of project: Trustees • Local ecological advice, mapping and other planning resources: Waimakariri District Council, Environment Canterbury	

• Voluntary assistance with baseline monitoring: Sefton Saltwater Creek Catchment Group. • On-site equipment/vehicles as needed: Daiken, volunteers

Working with us and Environment Canterbury

In the last three years have you received funding or other support from Environment Canterbury for this, or any other project? **If yes, what was the funding/support for, and when did you receive it:**	**YES**
Waimakariri Biodiversity Trust received $5,000 from Waimakariri Water Zone Committee in 2022 for assistance with establishment costs. This funding enabled the Trust to hold a Visioning Workshop on late 2022 to identify priority actions, then develop a website to promote, record and publicise these in 2023.	
Are you intending on applying to another Environment Canterbury fund this financial year for this, or any other project? **If yes, what fund are you applying to?**	**YES**
It is likely that the Trust will apply to the Waitaha Action to Impact Fund for this and other projects in 2023.	

Additional information

Do you have supporting information you would like to provide (optional):

*Please attach any supporting information with your application***.**

Once completed, please send this application form to: Facilitator, Murray Griffin, email: murray.griffin@ecan.govt.nz

Stages 1 and 2 Investigations and Planning Budget (all figures ex GST)

TOTAL Application for Stages 1 and 2: $20,000.

Contracted provider	***Stage 1,2 Inputs***	***$***
Hydrologist	• site visit; • review existing information and mapping; • scoping/information gap analysis; • liaison and reporting	**$7,000**
Ecologist	• site visits • liaison with hydrologist, Project Manager/co-ordinator and landowner, • reporting	**$7,000**
Project manager/Co-ordinator	Tasks beyond normal "administration" role if co-ordinator takes this role – e.g. project-specific cultural and community engagement, documenting process, reporting, register of technical support and suppliers, input to web-site	**$1,600**
Contingency	To cover any further investigations that may be needed as a result of early findings, to avoid having to wait for further funding rounds.	**$4,400**
In kind providers		
Daiken New Zealand	Initially will provide: site context and historical information; planning inputs; later - site works and plant purchase.	
Waimakariri Biodiversity Trust	Project planning and co-ordination of technical advice; reporting and documentation	
Waimakariri District Council	Ecological and hydrological advice; mapping and site information	
Environment Canterbury	Ecological and hydrological advice; mapping and site information	
Sefton Saltwater Creek Catchment Group	Local catchment advice; input to investigations	

Daiken wetland project – Lower Sefton Road Sefton.

Red line outlines approximate area to be investigated.

Dots indicate recorded springs.

(Photo supplied by WDC)

Email from Federico Roura, 20 February 2023

Good morning Judith

Definitely the idea of planting and improving the area of the Saltwater creek identified is supported by the Daiken New Zealand Lead Team. Based on an initial estimation of cost of plants to be about $7,000 per year for 3 years, we saw no difficulties in expensing this costs. The cost of machinery (tractor, digger, etc) or maintenance (weed control, etc) could be included in our routine operational costs. So no problems there. There should be no need for fencing or watering systems. But even if we have to, we may have some gear.

So in summary, Daiken New Zealand is committed to start the project and is willing to provide reasonable resources to sustain it.

Best Regards

Technical Manager

Email:

Web: http://www.customwood.co.nz

DAIKEN NEW ZEALAND LIMITED

AGENDA ITEM NO: 3.2 – 4	**Application for funding – CWMS Action Plan Budget 2022/23:** Waimakariri Landcare Trust
Waimakariri Water Zone Committee	**MEETING DATE:** 1 May 2023

Application for funding – Zone Committee Action Plan Budget 2022/23

Applicant details

Organisation (if applicable):	**Waimakariri Landcare Trust**
Contact name:	
Contact email:	

About your project

The amount of information and detail we would like you to provide is in proportion to the amount of funding you are requesting. If it is smaller amount, then a simple description of your project, who's involved and what you will be doing, along with a simple budget is sufficient.

Project name:	*Water Quality Gap Analysis – Waimakariri*
CWMS zone where the activity will occur:	*Waimakariri*
Provide a brief project summary:	
The Canterbury Regional Council undertakes state of the environment monitoring, as outlined in the story map: https://storymaps.arcgis.com/collections/84e3a967dc78433bb1b857c47c23f4d2 . However, Plan Change 7 highlighted several issues with the limited long-term monitoring data and how this was used within a groundwater model to inform regulation for nitrogen reduction was an area of contention and concern for the farming community. Significant time was invested during the hearing on Plan Change 7 on this topic, to avoid this in any future planning framework changes, the Waimakariri Landcare Trust wants to take	

proactive steps to be prepared and to have more confidence that the right data is being collected to gain a more complete understanding of the water quality within the Waimakariri District. It is also considered that connecting people with data is important for strengthening connections with the environment and being able to monitor progress and change over time; this will become more important once Freshwater Management Units and visions are defined for our catchment and with the introduction of National Bottom Lines and attribute targets for water quality.

The first step to achieving this outcome is to understand the existing monitoring already being undertaken by various stakeholders within the Waimakariri District and to determine where the spatial and temporal data gaps are in the monitoring programme and what additional monitoring needs to be undertaken. This is the phase of the project for which funding is being sought. For full disclosure, the Waimakariri Lnadcare Trust intends to undertake a second phase of our overall workstream for the project which will be focused on a review of the groundwater model used for Plan Change 7 and developing conclusions and identifying what further monitoring would be required to address any issues. The information provided in this application does not relate to this second stage.

In addition to the gap analysis, the Waimakariri Landcare Trust are also seeking to include the hire of GW Nitrate Sensor for a short period of time. The use of the sensor can be utilised thought 'drop-in testing day' as a way of introducing the project to the membership base and to increase the awareness of water quality to interested parties within the wider community. It is anticipated that these days will be supported by the Waimakariri Zone Committee and local and regional council. In addition to increasing awareness within the district, hiring a GW Nitrate Sensor is considered a more cost-effective way of identifying any challenges and risks associated with management and determining if this is a worthwhile tool to allocated future capital to purchase.

Describe the outcomes or impacts of this project:
Outcomes or impacts are what will change or who will benefit from this work, including enduring benefits. For example, fencing off springheads will improve biodiversity and improve stream health.

The Waimakariri Landcare Trust wants to work collaboratively with other stakeholders within the Waimakariri District to expand the freshwater quality monitoring. The outcomes sought from this project is to provide:

- A collective understanding of the water monitoring programmes currently being undertaken by stakeholders to avoid any duplication of efforts.
- Provide an understanding of data sharing, including data format and standards that need to be meet for different outcomes.
- Provide a gap analysis to form the basis of recommendations for further monitoring (spatial and temporal recommendations).

- Provide a recommendation of what data collection can be undertaken as citizen science and what needs to be undertaken to a national standard to ensure usability and reliability of any future data collected.

It is considered that the impact of the project will extend beyond just the outcomes listed, as the project is a first step in providing a baseline on monitoring and identify areas for improvement. This will become increasingly important for measuring progress towards meeting values and visions for Freshwater Management Units.

Additionally, by hiring a GW Nitrate Sensor, it will provide a chance for the Waimakariri Landcare Group to understand how the equipment works, identify any challenges and risks with the data collection and management phase, including data privacy. Knowledge sharing with the Waimakariri Water Zone Committee may assist the committee in any future aspirations of purchasing or hiring the equipment.

List the key outputs of the project:
An output describes what your group is proposing to do and is measurable. For example, install 250 m of fencing, or train 25 volunteers. Outputs are important and may be used as milestones in a funding agreement.

- Collective understanding of current monitoring undertaken by stakeholders.
- Recommendation of further monitoring both spatial and temporal required to be undertaken to supplement Environment Canterbury's current monitoring network.

Please state how the project aligns with the relevant Zone Committee's 2021-24 Action Plan:
All action plans can be found as a link at the bottom of the "What's happening in my zone" page on the Environment Canterbury website. (https://www.ecan.govt.nz/your-region/your-environment/water/whats-happening-in-my-water-zone/)

This project aligns with the action point: Improved monitoring of groundwater and surface water in the Zone.

To encourage community understanding and awareness of monitoring and clarify future monitoring requirements in the zone by:

- *Facilitating collaboration to develop a wider monitoring network in the zone;*
- *Encouraging more monitoring by catchment and landcare groups.*

Tell us what activities you're intending to do and when you intend to have the project completed (timeline):

- Project meetings with stakeholders to understand monitoring being undertaken by others (These meetings have started already and are expected to be completed by July)
- Analysis of existing monitoring with a focus on timing, location, and depths; Assessment of monitoring results to identify any issues; Identification of where gaps can be filled with existing wells. This work is expected completion date for this work in the1st August 2023
- Expand community knowledge of local water quality by holding community water testing day using a GW50 Nitrate Sensor hired from Hydrometrics. These days will be held prior to June 2024.

Tell us about the project management, including leadership and financial oversight:

- Project management lead is being undertaken by Charlotte Wright of Element Environmental.
- Project administrative oversight is the responsibility of the Waimakariri Lnadcare Trust's coordinator and project lead trustee Cameron Henderson.
- Financial oversight will be the responsibility of the Waimakariri Landcare Trusts coordinator and treasure along with any additional support from Waimakariri Lnadcare Trusts accountants Prosser Quirke if required.
- Science and technical lead will be the responsibility of Aqualinc.

List any other groups or organisations you are partnering with on this project, such as community groups, schools etc:

Several stakeholders who are either already undertaking water quality monitoring or are interested in water quality monitoring will be given the opportunity to contribute to the project to a level to which they are comfortable with.

- Canterbury Regional Council
- Ngāi Tūāhuriri
- Waimakariri Irrigation Limited
- Waimakariri District Council
- Christchurch City Council
- Ngāi Tahu Farming
- Dairy NZ (science/technical capacity)
- Other partners may be identified throughout the project.

How will you engage the community on the project:

- Liaising with key monitoring stakeholders within the Waimakariri District

• Keeping the Waimakariri Landcare Trust membership base informed of the project via direct communication and social media and inviting them to become more involved, if/as any opportunities arise in this stage of the project. • Holding water quality testing days using the GW Nitrate Sensor within the local communities, it is anticipated that the focus will be on areas with private drinking water supplies.	
Do you know of any cultural values associated with this site? **If yes, what engagement has occurred or is planned (if any) with local Papatipu Rūnanga about this project?**	**YES**
Ngāi Tūāhuriri Rūnanga will be informed of the project and will be invited to contribute their views as a stakeholder and be engaged to a level which they choose.	
Please provide an accurate location with grid reference and/or map (if relevant to your project):	
The geographical location is constrained to the Waimakariri District and extending to the south side of the Waimakariri River to incorporate possible monitoring requirements relating to the potential connection of water flow under the Waimakariri River towards the Christchurch drinking water supply area.	
Who owns the land? *Attach evidence of permission from the landowner, or their representative.*	
N/A for the first stage of the project.	

Funding details

Please attach a budget to your application if one has been prepared. Your budget should include estimates of income and expenditure, including other funding and in-kind contributions. You should show clearly what you are planning to spend the Action Plan funds on if successful. We would like more detail if your application is for a larger amount e.g.$15,000. We have some example budgets for different types and sizes of projects in our resource pack. These will show you what we are expecting you to provide.

Waimakariri Water Zone Committee

How much funding are you requesting?	**$28,050**
If you are successful with this application, what components of your project will you spend the money on?*: *If you have a project budget, please attach it to your application.*	
• Project management– fees and expense (approximately 30 hr) • Technical and Science - fees and expenses (approximately 95 hours) • Project administration - fees and expenses (such as room hire, printing and distribution as required). • Hire set up fee and one month hire of GW50 Nitrate Sensor $1,070 (refer to attached quote) • In kind contributions are anticipated to come from the Waimakariri Landcare Trust and key monitoring stakeholders within the Waimakariri District.	
Have you applied to or received funding from other organisations for this project? **If yes, please provide details below or note if it is included in your attached budget.**	**NO**
Is the project receiving any other monetary or "in-kind" contributions from your organisation or others e.g. volunteer time, use of resources, facilities and equipment? **If yes, please provide details below:**	**YES**
In kind contribution will be provided by key monitoring stakeholders attending workshops and meetings as required. In kind contributions will also be provided by the Waimakariri Landcare Trust for project administration and financial oversight.	

Working with us and Environment Canterbury

In the last three years have you received funding or other support from Environment Canterbury for this, or any other project? **If yes, what was the funding/support for, and when did you receive it:**	**YES**

Waimakariri Water Zone Committee

The Waimakariri Landcare Trust received $10,000 for contributions to the investigations for the Northbrook Trail, including weed control and planting in 2022 from the CWMS Action Plan Budget (ECan – Waimakariri Zone Committee) In addition, the Waimakariri Landcare Trust acted as an umbrella organisation and held funds for • Waimakariri Biodiversity Trust: $5,000 to assist with establishment; and • Sefton Saltwater Creek Catchment Group: $6,640 for water quality monitoring	
Are you intending on applying to another Environment Canterbury fund this financial year for this, or any other project? **If yes, what fund are you applying to?**	**NO**

Additional information

Do you have supporting information you would like to provide (optional):

GW50 Nitrate Sensor Hire Qoute from HydroMetrics

HydroMetrics™

Pricing list in New Zealand dollars

Code	Product	NZ retail price ($NZD)	Description
Hire-Setup	One off setup fee (for each hire period)	120.00	Setup of sensor and checking calibration pre use. Cleaning sensor post use.
Hire-Week	Hydrometrics GW50 Nitrate Sensor with 10m Cable	300.00	Weekly hire rate of GW50 sensor for short term deployment.
Hire-1 Month	Hydrometrics GW50 Nitrate Sensor with 10m Cable	950.00	Monthly hire rate of GW50 sensor for short term deployment.
Hire-3 Month	Hydrometrics GW50 Nitrate Sensor with 10m Cable	1,500.00	3 month hire rate of GW50 sensor for medium term deployment.
Hire-6 Month	Hydrometrics GW50 Nitrate Sensor with 10m Cable	2,500.00	6 month hire rate of GW50 sensor for medium term deployment.
Hire-Year	Hydrometrics GW50 Nitrate Sensor with 10m Cable	3,975.00	Yearly hire rate of GW50 sensor for long term deployment.

Notes:

- Pricing is for the sensor with 10 metres as standard. Longer cables are available at request.
- Pricing for GW50 model only. Pump clean and flow cell options are available on request.
- Consumables are to be on charged as required if used as a portable sensor (Manual Sampling).
- Comes with some cleaning brushes, and cleaning materials.
- Can be supplied with TruSense IoT telemetry.

Subject to HydroMetrics standard T&C's.

Nitrate Sensors for Research, Agriculture and Industry.

P +64 3 325 3700 / E info@hydrometrics.co.nz / W hydrometrics.co.nz
PO Box 69 133 / Lincoln / Christchurch 7674 / New Zealand

December 2020 pricing edition

Once completed, please send this application form to: Facilitator, Murray Griffin, email: murray.griffin@ecan.govt.nz

AGENDA ITEM NO: 3.2 – 5	**Application for funding – CWMS Action Plan Budget 2022/23:** Waimakariri Water Zone Committee & Waimakariri District Council
Waimakariri Water Zone Committee	**MEETING DATE:** 1 May 2023

Application for funding – Zone Committee Action Plan Budget 2022/23

Applicant details

Organisation (if applicable):	**Waimakariri Zone Committee – Biodiversity Working Group & Waimakariri District Council**
Contact name:	
Contact email:	

About your project

The amount of information and detail we would like you to provide is in proportion to the amount of funding you are requesting. If it is smaller amount, then a simple description of your project, who's involved and what you will be doing, along with a simple budget is sufficient.

Project name:	*Waimakariri Zone Committee Environmental Awards*
CWMS zone where the activity will occur:	*Waimakariri*
Provide a brief project summary:	
Following discussion at both Biodiversity Working Group and Zone Committee level we would like to set up environmental awards to highlight and celebrate individuals and organisations/businesses contributing to better environmental outcomes within our Zone. The inaugural awards will consist of three categories. 1) **Organisation or business**: can be a not-for-profit such as a catchment group or a business that has contributed significantly to environmental gains as aligned with the WZC Action Plan 2012-2024.	

2) **Individual**: someone who has driven educated or inspired environmental outcomes in the Zone. May be a member of an organisation or a landowner/private enterprise.
3) **Youth Award:** criteria are the same award for an organisation or individual, under 18.

An exceptional youth group or individual may also be eligible for awards 1) and 2).

The awards will be run in conjunction with WDC's annual Community Awards. A panel made up of ecologists, Working Group community members and iwi representatives will assess applications. All projects must align with at least one of the Zone Committee's Action Plan values (water monitoring, indigenous biodiversity, promotion of braided river character of the Ashley/Rakahuri, enhancement of recreation and improving mahinga kai values). Environmental projects with community benefit and/or cultural value are encouraged.

Describe the outcomes or impacts of this project:
Outcomes or impacts are what will change or who will benefit from this work, including enduring benefits. For example, fencing off springheads will improve biodiversity and improve stream health.

The awards give us a chance as a Zone Committee to commend positive environmental action occurring within the Zone. It will allow the community to connect with their Zone Committee and share the hard mahi they have been part of and be recognised for this. We hope that the awards will also encourage communication and discussion with the Committee, particularly important in the upcoming planning framework changes.

List the key outputs of the project:
An output describes what your group is proposing to do and is measurable. For example, install 250 m of fencing, or train 25 volunteers. Outputs are important and may be used as milestones in a funding agreement.

Three physical awards will be presented during the community awards. Each award will be accompanied by a living gift (such as native plant(s)) and remuneration to go back into the project presented (e.g. plant vouchers, trap material).

A comms campaign running through May/June will advertise the awards and allow applications to be completed either online or in hard copy. A local newspaper story may compliment this outreach. In this way we hope to increase community interest in environmental success within the Zone.

Please state how the project aligns with the relevant Zone Committee's 2021-24 Action Plan:
All action plans can be found as a link at the bottom of the "What's happening in my zone" page on the Environment Canterbury website. (https://www.ecan.govt.nz/your-region/your-environment/water/whats-happening-in-my-water-zone/)

The awards will be judged primarily on alignment with Action Plan values. • Monitoring • Biodiversity • Braided river character • Recreation • Mahinga kai Projects assessed for awards must align with at least one of these values but those that include more than one are encouraged.
Tell us what activities you're intending to do and when you intend to have the project completed (timeline):
May 2023: Funding confirmed. BWG planning meeting on 17 April June 2023: Working Group planning meeting. Award design finalised and ordered Judges appointed and criteria finalised. June 2023-July 2023: Comms campaign for awards across ECAN and WDC websites, community social media pages, newsletters, community groups etc. July 2023 : Applications open (4 weeks). July 2023: awards, gifts and vouchers purchased. August 2023: Panel judges applications and winners notified. September 2023: Awards ceremony with community awards night at WDC.
Tell us about the project management, including leadership and financial oversight:
This project will be managed by the Biodiversity Working Group and WDC. We ask that funding is paid directly to WDC for financial oversight (Contact Kate Steel, WDC ecologist).
List any other groups or organisations you are partnering with on this project, such as community groups, schools etc:
WDC as per above.
How will you engage the community on the project:
Through an extensive comms campaign and directly inviting to engage.

Do you know of any cultural values associated with this initiative? **If yes, what engagement has occurred or is planned (if any) with local Papatipu Rūnanga about this project?**	**YES**
It is possible that applications may align with cultural values. We will invite Rūnanga participation in assessing applications.	
Please provide an accurate location with grid reference and/or map (if relevant to your project):	
This proposal is open to projects Zone wide within the Waimakariri Zone.	
Who owns the land? *Attach evidence of permission from the landowner, or their representative.*	
N/A	

Funding details

Please attach a budget to your application if one has been prepared. Your budget should include estimates of income and expenditure, including other funding and in-kind contributions. You should show clearly what you are planning to spend the Action Plan funds on if successful. We would like more detail if your application is for a larger amount e.g.$15,000. We have some example budgets for different types and sizes of projects in our resource pack. These will show you what we are expecting you to provide.

How much funding are you requesting?	**$3000**
If you are successful with this application, what components of your project will you spend the money on?*: *If you have a project budget, please attach it to your application.*	
Awards made locally by Moller-young: 3 x $380 + GST (See Attached estimate); $1311. Per awardee $560 for living gift on the night and vouchers/credit towards furthering the chosen project or the group/organisation. Comms and Advertising: donated by ECAN and WDC.	

Have you applied to or received funding from other organisations for this project? **If yes, please provide details below or note if it is included in your attached budget.**	**NO**
Is the project receiving any other monetary or "in-kind" contributions from your organisation or others e.g. volunteer time, use of resources, facilities and equipment? **If yes, please provide details below:**	**YES**
WDC are supporting this application with floor time at the community awards, comms etc. They are also providing financial oversight.	

Working with us and Environment Canterbury

In the last three years have you received funding or other support from Environment Canterbury for this, or any other project? **If yes, what was the funding/support for, and when did you receive it:**	**NO**
Are you intending on applying to another Environment Canterbury fund this financial year for this, or any other project? **If yes, what fund are you applying to?**	**NO**

Additional information

Do you have supporting information you would like to provide (optional):

*Please attach any supporting information with your application***.**

Once completed, please send this application form to: Facilitator, Murray Griffin, email: murray.griffin@ecan.govt.nz

AGENDA ITEM NO: 3.3	**SUBJECT:** Review of the CWMS Waimakariri Zone Committee Action Plan 2021-24 X – for decision
REPORT TO: Waimakariri Water Zone Committee	**DATE OF MEETING:** 1 May 2023
REPORT BY: Murray Griffin, CWMS Facilitator – Waimakariri	

1. PURPOSE

The purpose of the agenda item is to provide the committee with an opportunity to review it 2021-2024 CWMS Action Plan and priorities. The committee will confirm any amendments to the current Action Plan that it considers will assist in implementing this Action Plan in the 2023/24 financial year.

A copy of the Waimakariri Zone Committee's CWMS Action Plan for 2021-24 is provided **as agenda item 3.3 – 1.**

2. RECOMMENDATION

That the Waimakariri Water Zone Committee:

1) **Confirms** any amendments to its CWMS Action Plan for 2021-24 for the 2023/24 financial year.

3. BACKGROUND

As part of their Long-Term Plan 2021-2031, Environment Canterbury established the Zone Committee Action Plans and a supporting budget for each water zone.

The confirmed purpose of the budget is to support CWMS Zone Committees to focus on implementing their action plan and leverage other funding opportunities to achieve their Canterbury Water Management Strategy (CWMS) priorities.


Image – Ashley River / Rakahuri

Waimakariri Water Zone Committee

Action Plan July 2021–June 2024

This summary highlights the key actions agreed by the zone committee for the next three years.

For more detail on the zone committee and plan, visit ecan.govt.nz/waimakariri-water-zone.

Our purpose:

To uphold the mana of the freshwater bodies within the Waimakariri Water Zone by facilitating enduring land and water management solutions that give effect to the Canterbury Water Management Strategy (CWMS) vision, principles and targets in our zone.

The CWMS aims to enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework.

Our functions:

Community engagement – continuing an active programme of engaging with communities on freshwater management matters and facilitating the provision of advice to councils (relevant territorial authorities and Environment Canterbury) and others (e.g. private sector) contributing to freshwater management.

Enhancing delivery capability and coalition of the willing – working with stakeholders across all sectors to extend the resources available to implement the CWMS, including securing additional resources and seeking opportunities to promote, support, leverage and expand catchment-based initiatives that advance CWMS implementation.

Progress reporting – annual progress reporting to councils on progress towards delivery of the zone-specific priorities and CWMS target areas identified in the Zone Committee Action Plan.

Our Councils' priorities for our zone committee are:

Waimakariri District Council

Ecosystem Health and Biodiversity

- To maintain or improve existing high-quality indigenous dryland ecosystems in intermontane basins and on the plains;
- Reduction of threatened or at-risk status of indigenous fish species compared with 2020;
- All coastal lagoons, hāpua and estuaries show improvement in key ecosystem health indicators compared with 2010.

Drinking Water

- Implementation programmes in place for each zone to achieve catchment load limits;
- Achieve nutrient efficiency targets for the zone on all new irrigated land and 80% of other land in major rural land uses (pasture, major arable, and major horticulture crops, and have 100% of rural properties working towards these targets (and for properties within urban boundaries that apply nutrients over significant areas).

Recreation and Amenity Opportunities

- Cyanobacterial risk for priority contact recreation sites in Canterbury rivers and lakes is understood and managed for public health;
- Manage water demand through meeting requirements under the Land & Water Regional Plan and continue regular community education/behaviour change campaigns on water use management and conservation.

Environment Canterbury

Kaitiakitanga Wāhi Taonga and mahinga kai targets

Grow support and resources to achieve the goal of five mahinga kai projects.

Ecosystem health and biodiversity targets

- Increased riparian management to protect aquatic ecosystems;
- Reducing the number of fish barriers;
- Protection and enhancement of wetlands.

Recreation and amenity targets

Achieving the 2025 target to restore priority freshwater recreation opportunities in each zone.

This taniko (woven pattern for clothing) Pātikitiki, represents lashing or binding together. The smaller diamonds represent pātiki (flounder). The Aramoana are white chevron shaped spaces representing the ocean waves. Together they represent the sustainment of our waters and the binding organisations that protect them. Pātiki is also the symbol for abundance.
– Ariki Creative

WAIMAKARIRI DISTRICT COUNCIL

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Waimakariri Water Zone Committee

Action Plan 2021–2024

Image – Burgess Stream, near Eyreton

Improved monitoring of groundwater and surface water in the zone

To encourage community understanding and awareness of monitoring and clarify future monitoring requirements in the zone by:

- Facilitating collaboration to develop a wider monitoring network in the zone;
- Encouraging more monitoring by catchment and landcare groups.

We will measure this by:

- Establishing a working group to bring together relevant organisations to review existing freshwater monitoring in the zone and address future monitoring requirements across the zone;
- Promoting the benefits of monitoring and establish options for the community to be involved in monitoring;
- Working with ECan and WDC to ensure monitoring results are accessible and understandable to the community;
- Facilitate catchment and landcare groups and the wider community working together with Councils to expand the freshwater monitoring in the Waimakariri and share information.

Increased indigenous biodiversity in the zone

To protect and improve the indigenous biodiversity, habitat or ecosystems in the zone through:

- Managing and eliminating plant and animal pest species;
- Assisting all landowners and managers to integrate indigenous biodiversity management into the wider aspects of land and water (catchment) management.

We will measure this by:

- Facilitating the establishment of a Waimakariri Biodiversity Trust and provide ongoing support to this Trust;
- Provide ongoing support and encouragement to groups in the zone advancing indigenous biodiversity values;
- Encourage catchment and landcare groups to protect, enhance and create more indigenous biodiversity habitat on properties;
- Promoting greater community understanding about biodiversity, and wetlands, and the benefits of their protection and enhancement.

Promoting the natural braided character and increased flow of the Ashley River/Rakahuri

To protect the braided river values associated with the Ashley River/Rakahuri, ki uta ki tai, by:

- Promoting an improved community understanding of land and water use impacts on braided river character and the lower catchment ecosystems;
- Working to make the Ashley River/Rakahuri safe for contact recreation, with improved river habitat, fish passage and customary use, and flows that support natural coastal processes.

We will measure this by:

- Encouraging the improved understanding of landowners and wider community of climate change impacts on the Ashley River/Rakahuri;
- Encouraging landowners and agencies to protect the landscape and indigenous biodiversity values in the upper catchment;
- Supporting weed control in the upper and middle sections of the catchment;
- Supporting an investigation into existing consents and water use in the Ashley River/ Rakahuri catchment;
- Encouraging landowner and agency efforts to improve the habitat health of lowland spring-fed tributaries;
- Supporting investigations focused on understanding and improving the ecosystem health of Te Aka Aka/Ashley estuary.

Protection and enhancement of recreation in the zone

To protect and manage the natural landscape and recreation resources in the Waimakariri Water Zone by:

- Facilitating the extension of recreation corridors and amenity space in the zone;
- Encouraging awareness of land use impacts on high value landscapes in the zone.

We will measure this by:

- Supporting the completion of the Silverstream loop;
- Supporting specific Arohatia te Awa marginal strip recreation works;
- Encouraging investigation into the causes of cyanobacteria blooms;
- Encouraging reductions in pollutants/contaminants to help reduce nuisance algal growths in waterways.

Improved Mahinga Kai within the Waimakariri Water Zone

To protect and enhance mahinga kai practices in waterways within the Waimakariri Water Zone, while also:

- Encouraging a wider understanding of mahinga kai practices in the community;
- Increasing Mahinga kai enhancement and access on the plains.

We will measure this by:

- Supporting the Ngāi Tūāhuriri mahinga kai enhancement projects on the plains and in lowland waterways;
- Encouraging catchment and landcare groups to protect and improve riparian habitat to support mahinga kai practices on the plains and lowland waterways;
- Supporting mahinga kai workshops across the zone.

Want to get involved?
Head to ecan.govt.nz/waimakariri-water-zone

Image courtesy of N Ledgard & G Davey

New committee member, Martha Jolly

E21/8463

AGENDA ITEM NO: 4	SUBJECT: Committee Updates
REPORT TO: Waimakariri Water Zone Committee	MEETING DATE: 1 May 2023
REPORT BY: Murray Griffin, CWMS Facilitator – Waimakariri, ECan	

PURPOSE

The purpose of the agenda item is to provide the committee with an overview of updates to be tabled.

RECOMMENDATION

That the Zone Committee:

Receives these updates for its information.

COMMITTEE UPDATES

The following updates will be addressed with the committee:

1. Zone Committee Working Groups

Biodiversity Working Group

Martha Jolly has provided the following update:

- The Working Group met on 17 April and discussed the hosting of the inaugural Waimakariri Water Zone Committee Environmental Awards in 2023. We hope to run the awards along with the WDC community awards later this year. A proposal to support this initiative from the CWMS Action Plan Budget for 2022/23 is provided as agenda item 3.2.5 in these meeting papers.

Lifestyle Block Working Group

Carolyne Latham had provided the following update:

- The Working Group has received positive and constructive feedback on the Top Ten Tips for Lifestyle/small block owners. With a final draft now imminent the focus is shifting to the distribution of this information and establishing the supporting website.

Monitoring Working Group

Erin Harvie provided the following update:

- The Working Group has been working with the Waimakariri Landcare Trust to confirm a project focused on analysis of the current freshwater monitoring within the zone. This project will build the understanding of the existing monitoring already being undertaken by various stakeholders within the Waimakariri District and to determine where the spatial and temporal data gaps are in the monitoring programme and what additional monitoring needs to be undertaken to meet the new freshwater management targets and outcomes. A proposal to support this initiative from the CWMS Action Plan Budget for 2022/23 is provided as agenda item 3.2.4 in these meeting papers.

2. Hurunui Mahinga Kai and Biodiversity Workshop 2 – 15 March 2023

Youth representative Ruby Gill-Clifford was able to attend this workshop hosted at Lockerbie Farm, Mouse Point, Culverden on Wednesday 15 March. She will provide the committee with an update on this workshop at the meeting.

3. Kaikōura Wetlands as Farm Assets Tour – 16 & 17 March 2023

Cr Tim Fulton was able to attend the second day of this Farm Tour in Kaikōura on Friday 17 March. He will provide the committee with an update on this day which included a farm visit to a Kaikōura Wetlands as Farm Assets site followed by a visit to Rakautara for a hands-on propagation session with the Wai Ora Trust Team.

4. CWMS Committees Forums – Northern and Southern Hui on 27 & 31 March 2023

Northern and Southern CWMS Zone Committee Forums were held at the end of March at Rāpaki and Waihao Marae respectively. The purpose of these Forums was to provide committees with an introduction to the partnership approach being developed by Environment Canterbury and Ngā Papatipu Rūnanga to support the required regional integrated planning framework. This will start with a review of the Canterbury Regional Policy Statement over the next 18 months with a view to notify in late 2024. Participants at both hui discussed the community engagement and consultation required for this review and how zone committees could support this engagement. They were also provided with a recap of the progress made by Zone Committees and the CWMS collaborative approach since 2009 and discussed some of the challenges and successes of freshwater management in Canterbury.

A summary of presentation content and key discussion points is being collated and will be provided to CWMS Zone Committee members.

5. ECan Water and Land Committee Meeting – 3 May 2023

Please find the link below to the upcoming meeting of the Environment Canterbury Water and Land Committee to be held on Wednesday 3 May. The agenda can be viewed and downloaded from this link:

- Link: Council and committee meetings: Current month | Environment Canterbury (ecan.govt.nz)

6. Where Next for Catchment Groups? – Cawthron guidance report published

Cawthron Institute of Research have recently published the guidance report, *Where to next for catchment groups – Lifting ambition and gearing up for the long game.*

The report is aimed at individuals or groups seeking to establish, work with or fund catchment groups, or those developing related policy. The report presents recommendations to help bridge the different perspectives of the groups involved and is intended to avoid or reduce misalignment.

To achieve this goal, both catchment groups and agencies need to reflect on what they are doing and why. Cawthron also highlight a significant opportunity for catchment groups, landowners and tangata whenua to work together on their shared goals.

A copy of the summary is provided as agenda Item 3.4 – 1 in these meeting papers.

A copy of the full report can be accessed via the link below:

- Link: **National Science Challenges – Our Land and Water webpage**

7. How long will it take? – Environment Canterbury Science Summary information about nitrate time lags in Canterbury

Environment Canterbury recently published a summary on the nitrate time lags being the time period between land use change and a resulting change in nitrate concentrations at a monitoring location (well, spring, stream, river, wetland or lake).

The key messages from the summary are:

- Many of our spring-fed streams and shallow wells in Canterbury showed some initial changes in nitrate concentrations within five years of when the land use intensified nearby. We monitor shallow groundwater across most of Canterbury. In these areas, if there are significant changes in farming practices, it shouldn't take long for us to see some changes in water quality.

- It can take much longer for the full effects from land use changes to emerge, especially at a catchment scale. It might be a decade or more for the changing nitrate concentrations to stabilise. It can also take longer for nitrate concentration trends to show up in deeper wells or streams and lakes far away from where the land use changes occurred.

- If the change in nitrate leaching is small, it is harder for us to see the changes quickly. For example, we may not easily see results from management changes within a farming system. We might need more than five years of data to be confident of any trend in nitrate concentrations beyond the natural year-to-year variation from different weather patterns.
-
- Some deeper groundwater below Christchurch, around Waipara and near the coast south of Timaru, was recharged a very long time ago. This older groundwater shows no land use impacts because it has been moving slowly through our aquifers for hundreds or thousands of years.

A copy of the summary is provided as agenda Item 3.4 – 2 in these meeting papers.

8. Further Information Links

- Link to the ECan updates on the **Essential Freshwater Package**:

Essential Freshwater package | Environment Canterbury (ecan.govt.nz)

- Link to the ECan updates on **Plan Change 7 & 2 to the Canterbury Land & Water Plan**

Plan Change 7 and Plan Change 2 - What you need to know | Environment Canterbury (ecan.govt.nz)

9. Action points from the previous zone committee meetings

Action points from the previous meetings:

- Information on the realignment of the North Brook tributary and water quality sampling at Tutaepatu Lagoon.
- Follow up on testing for pesticides in the Kaiapoi River.
- An update on the Kaiapoi River salinity logger data.
    - Updates on the above action points is being facilitated.

- Cr Fulton to convey feedback from the committee to Waimakariri District Council on the impact of the closure of stockwater races.

Fin.

Where next for catchment groups?

Lifting ambition and gearing up for the long game - a summary[1]

Jim Sinner, Christina Robb, Margaret Kilvington, Paratene Tane, Marc Tadaki, Edward Challies

Restoring health to freshwater bodies often requires sustained effort and coordinating the actions of individual land users. Catchment groups are increasingly seen, by the farming community and central and local government, as an important part of addressing freshwater challenges in Aotearoa New Zealand.

For the farming community, catchment groups can strengthen relationships within and beyond the catchment and build community resilience. For tangata whenua, working with catchment groups can be a way to exercise kaitiakitanga. For agencies, working with groups can be more effective and efficient than working with individuals.

The growing attention on catchment groups comes with increased pressure to improve freshwater outcomes.

There are many different expectations about what catchment groups can and should do. This creates a risk of misunderstanding and misalignment.

Agencies need to better understand catchment groups, so that policy and support packages will meet groups' needs. Equally, catchment groups' goals and activities need to be aligned with outcomes expected by agencies and communities to avoid disappointment. And both agencies and groups need to enable meaningful involvement by tangata whenua, lest a significant opportunity be missed.

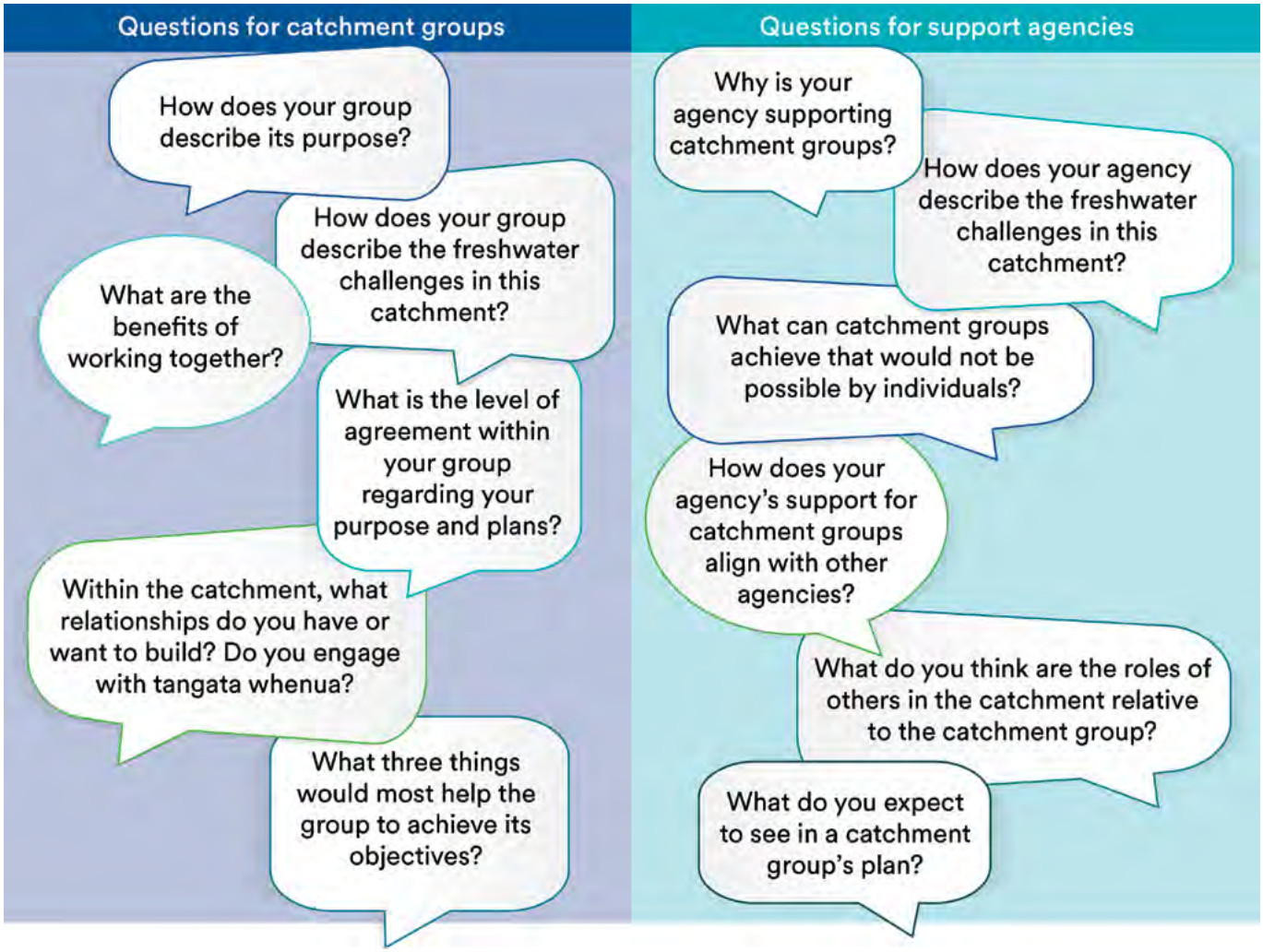
A failure to deliver expected improvements could lead to more regulation of specific farming practices.

Our recommendations aim to bridge the different perspectives of the groups involved.

CAWTHRON

OUR LAND AND WATER | Toitū te Whenua, Toiora te Wai | National SCIENCE Challenges

Are you ready for the long game?



A more ambitious game plan

Catchment Groups:

- Develop a clear purpose and goals and communicate these to other parties (see above figure)
- Acknowledge other parties' perspectives, motivations, goals and constraints
- Seek a relationship with tangata whenua, recognising that this will take time
- Approach relationships with a willingness to learn about history and values
- Develop action plans that address RMA outcomes, tangata whenua goals, and the group's own objectives
- Plan for the long term, including succession
- Find meaningful indicators to track progress on environmental objectives, group development and key relationships
- Share progress reports regularly with tangata whenua and local community.

Agencies, including sector groups:

- Develop a clear purpose and goals and communicate these to other parties
- Acknowledge other parties' perspectives, motivations, goals and constraints
- Design freshwater policy to reward collective management
- Improve communication to catchment groups about RMA outcomes, agency roles and expectations, and long-term funding
- Support ongoing relationship work, e.g. fund catchment coordinators and kaitaiki and learning about Te Tiriti and local history
- Be realistic about what catchment groups can do and resource them appropriately
- Develop and track indicators based on actions, interim milestones and final goals
- Be open to using groups' own indicators.

Tangata whenua:

- Consider hosting a catchment group event at the marae
- Consider what shared outcomes could be achieved with the help of catchment groups.

1 For our full report, go to www.researchgate.net/publication/369366580
2 Learn more about these recommendations and other aspects of our research at ourlandandwater.nz/collectiveresponsibility

Indicative example of a catchment plan

Outcomes and Plans

Outcomes/key values	Mid-range objectives	Short-range objectives
Our waterways are healthy ecosystems *The community is connected and celebrates its waterways.*	*Mahinga kai (eel, flounder) is abundant and safe to eat* *It is safe to swim at the local swimming hole in summer*	*Improved passage of eels into spawning sites* *Reduced E. coli and sediment getting into waterways* *Good relationship with local marae; understanding Māori values in our catchment*

Relationships

Organisation, entity or person	Role with catchment group
XX marae	*Tangata whenua, long history in catchment, connection to taonga species*
XX Regional Council	*Land management advice, monitoring, planning rules*
XX school	*Classroom field trips, working bees, community support*
Department of Conservation	*Joint efforts to protect vulnerable native species*
XX Catchment Collective	*Assistance with group administration and funding*

Actions

Description	Rationale	Where / by whom	By when
Invite local marae representatives to AGM, and provide minutes	*Establish relationship with local marae*	*Committee chair*	*2023*
Fund and hire a catchment co-ordinator	*Improve internal and external communication*	*Committee*	*2024*
Prevent all stock access to tributaries upstream of swimming hole	*Address farming contribution to E. coli*	*Farmers in area with support from others*	*2025*
Riparian planting in strategic areas	*Stabilise banks; filter sediment, nutrients and bacteria; provide shade*	*North side of streams X and Y, all of stream Z; all landowners*	*8 km by 2025; done by 2030*
No forestry harvest within 10 m of permanent waterways	*Reduce sediment runoff*	*All forests in catchment*	*2028*

Support

- *Grant application $150k*
- *Member contributions $50k*
- *RC advice*
- *Two community planting days per year*

Tracking Progress

What and where	By whom	Frequency	Notes
Facebook engagement (likes, comments, etc)	*Catchment group coordinator*	*Quarterly*	*Reflects profile in community*
Connections with local marae	*Committee*	*Annually*	*Develop other indicators with marae*
MCI at Site A	*Catchment group*	*Monthly*	*Get training from X*
MCI, e. coli at site X	*Regional council*	*Monthly*	*RC monitoring site*
Eel abundance	*Tangata whenua*	*Quarterly*	*As agreed with X marae*

Post quarterly results on Facebook. Annual summary each March.

Overview of plan contents

A catchment action plan should have: key outcomes or values; important relationships; measurable objectives; actions to be taken by specific dates; and a plan for monitoring and reporting results. A map showing waterways and land use is also useful.

Outcomes and plans

Values and outcomes are often stated in RMA plans; the regional council can help identify relevant outcomes. Discuss goals with tangata whenua and other community members.

Outline the group's objectives to show how it will contribute to the outcomes, reflecting the group's goals and the outcomes that matter to the wider community. Targets in an RMA plan may include macroinvertebrate indices, nutrient concentrations and E. coli levels.

Mid-range objectives focus on what can be achieved in 5–10 years to significantly contribute to the outcomes. Short-range objectives can be achieved in less time, e.g. 1–3 years.

Actions

List specific actions that members will take to achieve the objectives, including who and by when.

Tracking Progress

A monitoring plan can be developed with help from council staff and tangata whenua, who may be interested in assessing mahinga kai or other cultural indicators. Results could be reported on the group's Facebook page, for example.

Outcomes and plans

Catchment groups should develop plans that address policy outcomes and local goals, and policy should reward collective efforts to achieve these goals.

Tracking Progress

Efforts to improve catchment health will be more successful if catchment groups and agencies adopt measurable objectives and report regularly on progress.

Farmers & Foresters

Tangata Whenua

Local Community

Government Agencies

RC

Local Councils

Sector Agencies

Relationships

Set relationship goals and priorities, then connect with a clear purpose and willingness to learn.

Support

Agencies should fund relationship work of groups, have clear objectives and be realistic about timeframes for achievement.

Date of publication: March 2023

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

“How long will it take?”
A summary of information about nitrate time lags in Canterbury

Environment Canterbury Science Summary: R23/02

“How long will it take?” A summary of information about nitrate time lags in Canterbury

Environment Canterbury Science Summary: R23/02

Lisa Scott, Marta Scott, Andrew Pearson, Ben Wilkins, Jennifer Tregurtha, Amber Kreleger

March 2023

Reviewed by:

Carl Hanson
Groundwater Science Section Manager

Helen Rutter
External reviewer, Aqualinc Ltd.

Fiona Shanhun
Chief Scientist

Key messages

- Many of our spring-fed streams and shallow wells in Canterbury showed some initial changes in nitrate concentrations within five years of when the land use intensified nearby. We monitor shallow groundwater across most of Canterbury. In these areas, if there are significant changes in farming practices, it shouldn't take long for us to see some changes in water quality.

- It can take much longer for the full effects from land use changes to emerge, especially at a catchment scale. It might be a decade or more for the changing nitrate concentrations to stabilise. It can also take longer for nitrate concentration trends to show up in deeper wells or streams and lakes far away from where the land use changes occurred.

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1 What is a nitrate time lag?

A nitrate time lag is a period between land use change and a resulting change in nitrate concentrations at a monitoring location (well, spring, stream, river, wetland or lake).

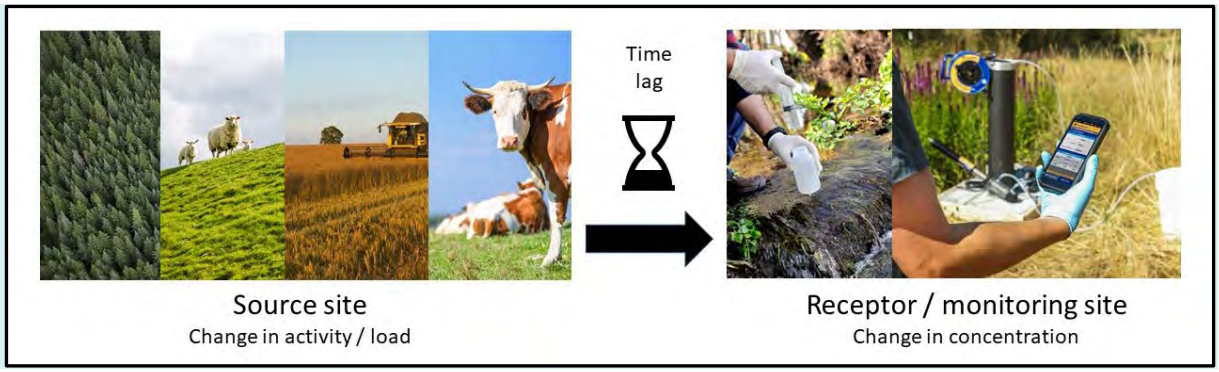


Figure 1-1: A nitrate time lag is a period between when a change occurs in the nitrogen load applied to land and when it is observed as a change in nitrate concentrations at a monitoring location

- Land use changes don't happen overnight. Once policies are changed or farming decisions are made, it takes time to implement a change in farm systems which changes the nitrogen inputs.
- The nitrogen balance in the soil changes when nutrients are applied to land (via fertiliser or effluent), grazing animals release urine, or land is cultivated. It takes time to break down the nitrogen-bearing compounds in the soil into forms of nitrogen that can easily be dissolved. Some of this soluble nitrogen is taken up by growing plants, but any excess of what the plants use becomes available for leaching, typically in the form of nitrate. Organic nitrogen in plants, soil organic matter or animal manure takes weeks or months to break down. Ammonium from fertiliser and urea can convert to nitrate in hours to days, depending on the soil conditions.
- It also takes time for water (rainfall or irrigation) to leach nitrate down through the soil and below the root zone. This time can be longer when we experience prolonged dry weather conditions, or faster when we experience wet conditions.
- Beneath the root zone, there is still more unsaturated material that the nitrate is carried through before it reaches the groundwater. The depth to the groundwater table and the type of material in this unsaturated zone will affect the time it takes nitrate to reach the groundwater.
- Finally, once nitrate reaches the groundwater, it takes time for the groundwater to transport the nitrate through the aquifer to the well, the stream or the lake where we might be monitoring. Some water and nitrate may travel faster due to quicker pathways in the aquifer (eg, through open gravels), or some more slowly due to slower pathways in the aquifer (eg, through finer grained sediments).
- A nitrate time lag is made up of the total of the time from its being applied to land to its observation at the monitoring location.

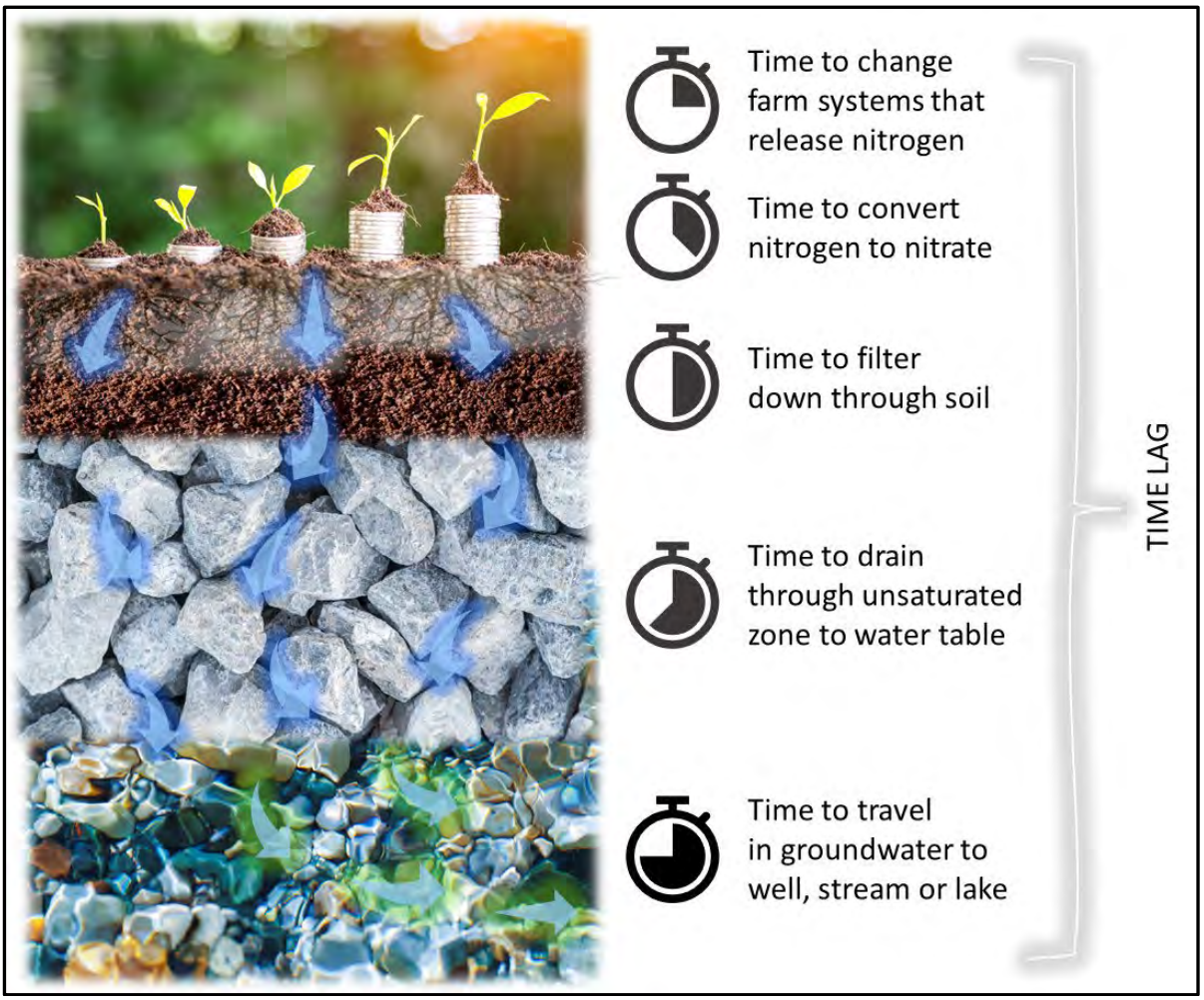


Figure 1-2: **There are several phases that make up a time lag between a change in land use and when the resulting change in nitrate concentrations can be measured in a receiving water body**

2 Time lag concepts

Nitrate transport is complex, but there are two important, simple concepts that can help us understand more about time lags when nitrate travels via groundwater:

1. Time lags increase with depth and distance from the source

There is no such thing as "the" nitrate time lag for a whole catchment or a receiving water body such as an aquifer. We can only consider a time lag between a location where land use changes and the location of our monitoring point. The closer the monitoring point is to the area of land use change, the sooner our monitoring will show the effects of the change.

The effects of land use change will appear relatively quickly in a nearby spring-fed stream, whereas it may take a long time for land use change at the top of the Canterbury Plains to affect springs tens of kilometres away near the coast.

Remember also that we are thinking about a three-dimensional system, so we must consider vertical distance as well as horizontal distance. Shallow groundwater is closer to the source than deeper groundwater, and it takes less time for land use change effects to become evident in shallow wells than it does in deeper wells drawing groundwater through well screens that are far below the water table.

2. Each water sample contains a mixture of water arriving after different travel times

There is no single travel time that defines a time lag for the nitrate reaching a monitoring location in water body such as a wetland, stream, lake or well. Science reports will refer to the groundwater "*travel time*" or "*age*", but this is really an average of the time it takes for water and nitrate from many different locations on the land surface to travel to the monitoring location.[1] When we use groundwater ages to describe the time lags, we need to remember that this 'age' is not the same as the age of a human individual, but more like the average age of a population.

Water and nitrate from different sources can also take many different paths to reach the monitoring point (Figure 2-1). The sample that we take from the well or waterbody will comprise water and nitrate from mixtures of sources that have taken different times to reach that monitoring location.

A portion of the water, which we think of as the younger fraction, travels faster through the most permeable parts of the aquifer (e.g., the porous gravels of former river channels). Relatively older water travels more slowly, especially through finer-grained, less permeable parts of the aquifer or through deeper parts of the system. For surface waterways there is an even quicker pathway via runoff, artificial drainage (e.g. tile drains) or near-surface interflow when conditions are wet. What we might observe when sampling a well or spring is a mixture of younger and older water that has arrived at the same time via different pathways.

The mixing of younger and older water (and all the travel time in between) blurs the effect of any specific source. If we are observing the nitrate concentrations at a monitoring point, we usually don't see a sudden step change in nitrate concentrations from one level to another. Instead, we tend to see a progressive rise or decrease in concentrations over time.

The first nitrate to arrive comes with the younger water travelling via quicker pathways, meaning we can sometimes see a change in nitrate concentrations at a nearby shallow monitoring point quite soon after a land use change. This is especially true at times and locations where a lot of the flow to the monitoring point is via quick and/or short pathways. But nitrate concentrations may not stabilise for some time, even if the land use has stopped changing, because more of the nitrate may be carried along with the older groundwater.

[1] For a full set of definitions related to time lags see Section 4.8.3, p 50 of Ausseil, O., Clapcott J.E., Etheridge Z., Hamilton D., Linke S., Matheson F., Ramsden M., Ruru I., Selbie D., Tanner C., Whitehead A., Bradley A. (2021). *Measuring the benefits of management actions: Mitigation effectiveness Monitoring Design, Proof of Concept development phase*. Our Land and Water National Science Challenge, New Zealand. https://ourlandandwater.nz/wp-content/uploads/2021/10/OLW_MonitoringDesign_Report_Final-reformat.pdf

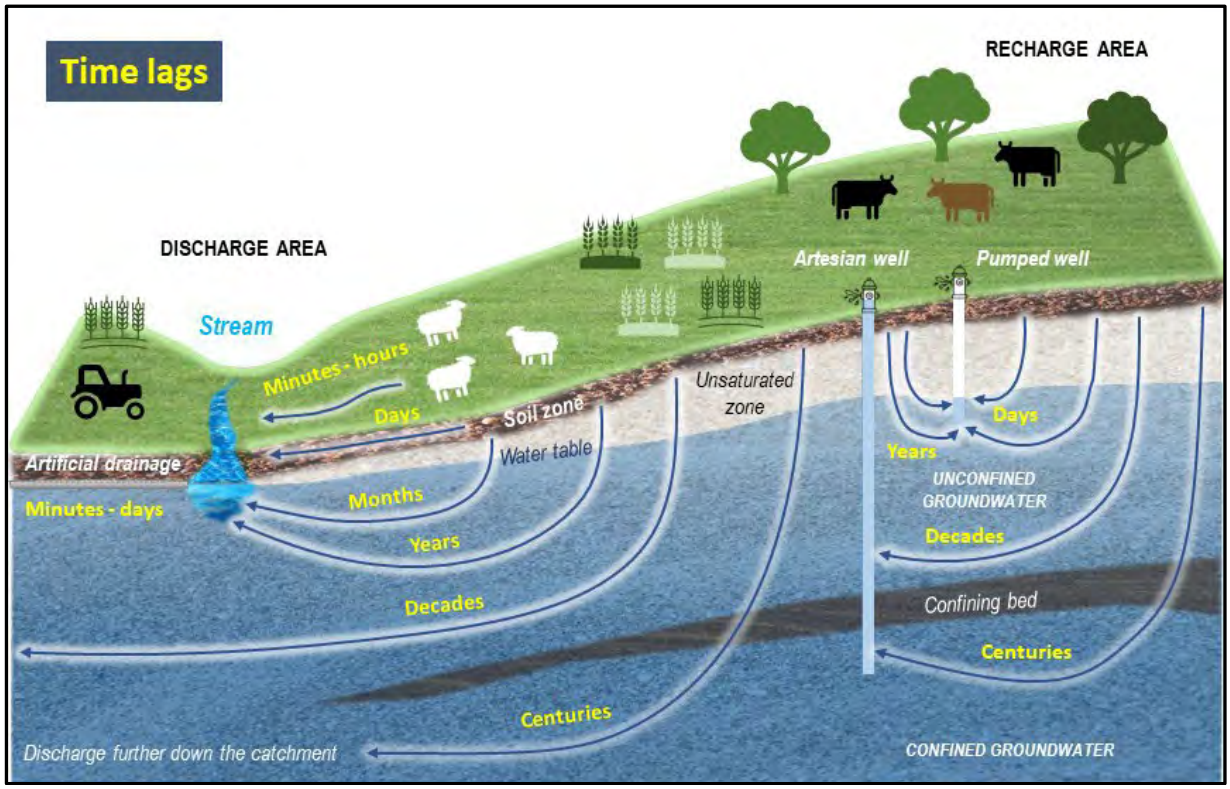


Figure 2-1: Groundwater flow paths vary greatly in length, depth, and travel time from points of recharge to points of discharge in the groundwater system

3 Why do we care about nitrate time lags?

When we think about nitrate time lags, we are usually trying to understand one, or both, of:

- the time after some management action is taken before we see a desired future outcome in receiving environments, usually some level of improvement in nitrate concentrations, or
- the legacy effects of past human activities on the nitrate concentrations we see now and what future impacts we might see from past and present land use that have not yet reached the receiving environment.

Some examples of the underlying questions around lag time are:

- How long after we make improvements to land management will it take before we can see the improvements in water quality in our wells, rivers or lakes?
- When will we know if our plans are working? When will we know whether the actions we take to improve water quality are having the desired effect?
- When can we expect nitrate concentrations to peak or level off? When will we reach our water quality targets?
- Is what we see today a reflection of land use years or even decades ago? If we decreased nitrate leaching now, would we still expect nitrate concentrations to increase from what was happening in the past?

In trying to answer these questions, it can help to be more specific about what we mean by the nitrate time lag. The term time lag can refer to several different ways we observe effects on nitrate concentrations or estimate the travel time of the water. Sometimes we talk about the legacy effects as the “load to come” or about nitrogen that is “still in the post”.

When we want to know how quickly we can see change, we are typically asking for the travel time of the *young fraction* – the water that arrives first. When we want to know how long until things reach a stable state, we also need to consider the longer travel time for all the rest of the water and nitrate to arrive having taken slower routes to the monitoring location.

4 Travel times through the unsaturated zone

Travel time through the soil and unsaturated zone (together called the *vadose zone*) is an important component of how long it takes to see changes in groundwater quality at the water table. Local studies have aimed to find out more about this phase of the travel time[2].

Tracer experiments (i.e., applying chemicals or micro-organisms to land and monitoring their arrival time and concentration in shallow wells) have shown that rapid transport of nitrate can occur through the unsaturated zone. Excess nitrate from land use travelling into shallow groundwater may be detected **within hours or days** when the soil becomes saturated, and particularly under flood irrigation (e.g., border dyke).

When there is a large rainfall recharge event, using continuous sensors monitoring nitrate concentrations we often see fast responses in shallow wells, sometimes **within days**. After large recharge events there is often a significant increase in nitrate in shallow groundwater. Analysis of many such events in Canterbury and nitrate concentrations in wells that we sample monthly has shown that nitrate concentrations usually peaked from a single rain event within **1 to 4 months after the event**. Over time, if land use becomes more intensive, more nitrogen builds up in the soil, the nitrate concentrations at their peak become higher after each rainfall event causing an increasing trend in groundwater nitrate concentrations.

Case Studies 1 to 4 at the end of this document provide evidence for how fast nitrate can reach the water table travelling through the unsaturated zone. The fastest responses usually happen when there is enough water applied (either with tracers, irrigation or rainfall) to saturate the soils. Under natural conditions travel times through the unsaturated zone will take longer as dry periods occur between the recharge events.

5 Travel times through the saturated zone

Saturated groundwater flow is faster than the flow of water under unsaturated conditions, but groundwater flow is still much slower than the flow rate in surface water streams or rivers. This has important implications for how long it takes to transport contaminants via groundwater.

The mathematics of groundwater flow and contaminant transport is beyond the scope of this report. Broadly speaking, groundwater seeps slowly through the tiny spaces (pores or factures) in the sediment or rocks driven by the hydraulic head (a pressure gradient). Groundwater velocity can be estimated in several ways, e.g. calculated from the hydraulic head (difference in water levels) and porosity of the aquifer using Darcy's law; derived from pumping test analysis or from tracer test observations.

Groundwater flowing through aquifers will typically move at a rate of only a few centimetres per day. However, some of Canterbury's alluvial gravel aquifers have been estimated to have very fast flow velocities (for groundwater) - in the order of tens to hundreds of metres per day.

Aquifer materials are heterogenous with different grain sizes, sorting and cementation in the sediments. This results in localised zones of higher and lower porosity and differing degrees of connectivity. Within a silty or sandy matrix, the flow may be only a few centimetres per day, but within a nearby open framework gravel channel the flow can be two orders of magnitude faster.[3]

As an example, Darcy velocity calculations for the Springston Formation on the Central Canterbury Plains ranged from two metres per month to 290 metres per day[4]. These estimates have a large range due to the heterogeneity of the aquifer. The bulk velocities of groundwater in an alluvial gravel aquifer

[2] Close, M. 2010. *Critical review of contaminant transport time through the vadose zone*, Environment Canterbury technical report R10/113 prepared by ESR, June 2020, Record number PU1C/7336, 46 p.

[3] Dann, R.L., Close, M.E., Pang, L., Flintoft, M.L. and Hector, R. P. 2008. Complementary use of tracer and pumping tests to characterize a heterogeneous channelized aquifer system in New Zealand, *Hydrogeology Journal*, 16, 1177-1191.

[4] North Canterbury Catchment Board and Regional Water Board 1983. *Interim report on the Groundwater Resource of the Central Plains*. PU1C/3524.

measured at a test site in Burnham fall within the upper end of this range at 30 to 85 m/day[5]. These measurements were made using tracers under natural flow gradients (without pumping).

Linear flow velocities in the Canterbury Plains aquifers are typically higher in the upper plains (where the hydraulic gradient is steeper) and lower near the coast, especially between the Rakaia and Ashley/Rakahuri rivers (where the gradient is flatter and finer-grained sediment content of the aquifer increases).

These velocities apply to groundwater at the local site where they are measured (eg by pumping test or tracer test), but scaling them up is trickier and usually requires a groundwater flow model. Calculating catchment scale time lags is not a simple matter of multiplying a measured flow velocity by the linear distance between the source and receptor.

The travel time or age (time since recharge) of groundwater varies in different parts of the flow system (Figure 2-1). In shallow, local-scale flow systems the travel time from the land to the discharge area can be less than a day to a few decades. But in deep, regional flow systems with long flow paths (tens of kilometres), the travel times can reach thousands or tens of thousands of years[6].

6 When should we first be able to see a change in nitrate concentrations as a result of land use change?

If the change in nitrate leaching is large enough, we may not have to wait long to see nitrate concentrations start to respond. Some shallow wells in Canterbury have started to show changes in nitrate concentrations **within a few months or years** of a major land use change occurring nearby.

However, it might take decades or longer for the full effects of large-scale land use changes to come through, depending on how much flow reaches the monitoring location via deeper pathways.

There are few examples of groundwater quality response to land use changes in Canterbury which are suitable for estimating the time lag based on existing records. To estimate time lags, we needed to find existing information that met these requirements:

- Well-documented land use change that occurred in a defined location over a fairly short time. (Often land use change is not well quantified, or there has been incremental change occurring over a wide area for an extended time).
- Groundwater quality monitoring wells screened close to the water table and located downstream and very close to the area of land use change. In this way we can be more confident that changes in water quality in the wells are driven by changes in that area.
- Groundwater quality samples or measurements collected over the critical period to measure the change.

Case studies 5 to 7 at the end of this document give some examples where we have found enough information to make an informed estimate of the time lag after a specific change in land use.

The case studies show that:

- Once there is a change in the load of nitrate in the soil, nitrate concentrations near the water table can begin to change the next time any significant recharge occurs.
- Quicker responses occur where the soils are thin, and the water table is not very far below the ground.
- We can observe a response sooner if we are monitoring wells with screens near the water table and located close to the land where the change in nitrate leaching occurred.

[5] Pang, L., Close. M. and Noonan, M. 1998. Rhodamin WT and *Bacillus subtilis* transport through an alluvial gravel aquifer. *Ground Water* 36: 112-122.

[6] USGS groundwater fact sheet: https://pubs.usgs.gov/circ/circ1186/html/gen_facts.html

Determining nitrate time lag in groundwater is difficult because we are dealing with inputs from multiple sources over large areas that change gradually and not a single pulse of nitrate from one location and one event that can be monitored as it arrives.

- Land use changes are complex and generally occur incrementally – the changes happening on farms don't all happen at once and development can extend over a long time, especially on a catchment scale.
- Farm systems change progressively and there can be hidden changes even when the overall land use is stable (e.g., changing herd sizes, crop rotations, etc.)
- It can take a very long time for the whole system to reach a new equilibrium. In fact, we seldom see stable nitrate concentrations at any shallow monitoring location in agricultural areas because various components of farming systems usually keep changing.

Our ability to detect the change and determine a time lag depends on the scale of the land use change and where the change occurs relative to where we are observing the effects. It is harder to detect effects from land use change when the change in leaching is small, and/or the observation point is deep or a long way from the land use change.[7]

It can also take more time to be confident that we see a genuine change in nitrate concentration trends when we experience variable weather conditions and groundwater recharge is much higher or lower from one year or one season to the next. Nitrate time lags can change with changes in the drivers of water flow, such as changing recharge (from rain, irrigation or managed recharge) or with large scale changes in groundwater pumping.

Although the initial change can be rapid, it can take a very long time for the full effects from land use changes to emerge, especially at a catchment scale. It might be a **decade or more** before the changing nitrate concentrations in shallow wells stabilise.

7 How long does it take for effects to reach streams?

Rivers and streams in Canterbury are predominantly supported by surface runoff and shallow groundwater. Relatively high proportions of the total flow arrive through shallower, and therefore faster, flow pathways, so we expect to see changes relatively quickly.

Some estimates of nitrate time lags in rivers have recently been published for New Zealand[8]. The time lags were estimated using statistical methods to correlate land use and river load trends mainly for hill-fed and alpine river types. The time lag for land use changes to be seen in the nitrate concentrations in rivers and streams depended on the size and steepness of the catchment and the size of the change.

Time lag estimates for 43 catchments across the country ranged between one and twelve years, with an **average time lag of 4.5 years**. The authors of this study found an average **time lag of 4.0 years** between land use changes within the catchment and changes in the nitrate load arriving at a downstream monitoring point in the **Waimakariri River** (above the Old Highway Bridge)**.** The time lags between catchment land use changes and river load changes ranged from **0.5 to 7.5 years** for other river sites in Canterbury. More details of this study are given in Case Study 8 at the end of this document.

[7] For example, a change of less than 10% nitrate leaching losses requires far more monitoring data to measure an effect confidently than a 50% change in leaching. See Ausseil, O., Clapcott J.E., Etheridge Z., Hamilton D., Linke S., Matheson F., Ramsden M., Ruru I., Selbie D., Tanner C., Whitehead A., Bradley A. (2021). *Measuring the benefits of management actions: Mitigation effectiveness Monitoring Design, Proof of Concept development phase*. Our Land and Water National Science Challenge, New Zealand. https://ourlandandwater.nz/wp-content/uploads/2021/10/OLW_MonitoringDesign_Report_Final-reformat.pdf

[8] McDowell, RW, Simpson, ZP, Ausseil, AG, Etheridge Z and Law, R. 2021. The implications of lag times between nitrate leaching losses and riverine loads for water quality policy, *Nature: Scientific reports*, 11:16450. https://www.nature.com/articles/s41598-021-95302-1.

We also find similar or slightly longer estimates for the average travel time for water to reach springs and lowland spring-fed streams in Canterbury. We have collected age tracer samples from several spring and stream sites in the Waimakariri District and around Christchurch City during dry weather conditions. The age tracers for these lowland surface waters show that most of the water took less than 10 years to travel through the groundwater system and re-emerge in the streams. The **median 6-year travel time** shows that these spring-fed rivers are fed mostly by younger groundwater**.** Only artesian springs sourced from deep groundwater in eastern Christchurch have much older travel times. The age tracer data for our springs and streams is summarised in Case Study 9.

There is not a single number that can quantify the time lag for a stream. The estimates in Case Study 9 are expressed as averages (or sometimes ranges within a certain level of confidence), but these are derived from individual samples at specific sites. Travel times to streams also vary at different times due to varying stream flow conditions and water arriving from different pathways:

- at high flow, when conditions are wet, more water follows quick pathways (e.g., overland and through the soil or via artificial drainage) and
- in times of low flows, older groundwater arriving by longer, slow pathways makes up a greater proportion of the flow.[9,10]

Time lags also vary with location e.g., distance downstream. Many of our rivers and streams are supported by springs. Springs are the “pressure valves” of our groundwater systems where groundwater re-emerges to the surface.

- Springs near the headwaters of lowland streams skim off young shallow groundwater sourced from recharge occurring nearby.
- Further downstream, a greater amount of older, deep groundwater that is under pressure wells up flows into streams and coastal lakes, sometimes seen as bubbling springs (artesian vents).

Travel times have not been quantified using age tracers for the tributaries in the Te Waihora catchment. But we understand conceptually from nutrient concentrations, water chemistry and stable isotope tracers that relatively younger water feeds the springs around Lincoln and Leeston. Deeper groundwater, which is likely much older, upwells to seep into the lower reaches of the lowland streams and Te Waihora/Lake Ellesmere[11].

It can take **decades** for nitrate concentrations trends to stabilise in streams and lakes far away from where the land use changes occurred.

[9] Woodward, S, R Stenger and V Bidwell 2013. Dynamic analysis of stream flow and water chemistry to infer subsurface water and nitrate fluxes in a lowland dairying catchment. *Journal of Hydrology,* 505. 299-311.

[10] Stenger, R 2022. *Nitrogen lag review*, Lincoln Agritech Ltd. Report 1058-14-R1 prepared for Waikato Regional Council, June 2022.

[11] Scott, L and Hanson, C. 2017. *Nutrients from groundwater in two spring-fed tributaries of Te Waihora/Lake Ellesmere*, In: NZ Hydrological Society, Filling the Knowledge Reservoir - NZHS Conference Handbook 2017, 196 -197.

8 How long should it take for nitrate to reach deep wells?

It can also take **decades to centuries** for nitrate concentrations trends to appear in deeper wells, especially where the wells are several tens of kilometres from the area where the nitrate is coming from.

Most of the time lags so far in this report have been relatively short. The examples have all been from the shallower parts of our freshwater systems (surface water and near-surface groundwater). As we move deeper into aquifer systems the groundwater travel times increase.

Over 600 groundwater age tracer samples have been tested for Environment Canterbury over the years. From these samples, 85% of the modelled[12] mean travel times were greater than 10 years and more than half the samples had mean travel times of over 50 years. Many of the samples with older travel time were taken from deeper wells and/or confined aquifers.

While mean travel times are useful for estimating lag times, it is important not to over-interpret what these numbers mean. If the groundwater has a mean travel time of 50 years and has nitrate present, we might want to assume that all the nitrate in the groundwater came from what was happening on the land 50 years ago. But this is not necessarily the case.

As explained earlier, water samples contain water and nitrate from mixtures of sources that have taken different times to reach that monitoring location. An estimate of mean travel time is going to tell us more about when the peak effect will be observed, not when we might first see if there is a changing trend in concentrations.

Depending on the pathways by which water reaches the monitoring site, samples with the same mean travel time can have a very different distribution of travel times. An example is shown in Figure 8-1 where three different mixing models give the same mean travel time estimate of 50 years. The examples all have very different minimum travel times, ranging from 5 years to 40 years. The minimum travel time represents water arriving by faster pathways, (eg flowing overland or moving through the open framework gravels of former river channels), which can bring about changing nitrate concentrations long before the mean travel time has passed.

In some cases, nitrate can take decades, or longer, to arrive at a monitoring location. This usually occurs if:

- the nitrate source is very far away from the monitoring location, or
- we are monitoring deeper wells or
- the flow path for most of the water reaching the monitoring location is through aquitard materials with low permeabilities that have very slow groundwater flow velocities (e.g., the confining beds in Figure 2-1).

The effects coming from far away sources can either be cumulative (adding together nitrate from many different sources) or dampened (e.g. nitrate concentrations decreased by addition of more clean water from seepage from rivers), depending on what happens in the wider area.

Because some of the nitrate in groundwater travels via very slow pathways through the finer grained, less permeable parts of the aquifer, it can also take a very long time, longer than the mean travel time, for all the nitrate to be flushed out of the system when discharges reduce or cease.

[12] Groundwater age tracers cannot measure the time since recharge directly. We can only measure the concentration of a dissolved gas or isotope tracer in a sample and then we use mixing models to calculate the mean travel time that would give us that concentration. That means samples are likely to contain water that is both older and younger than the mean travel time.

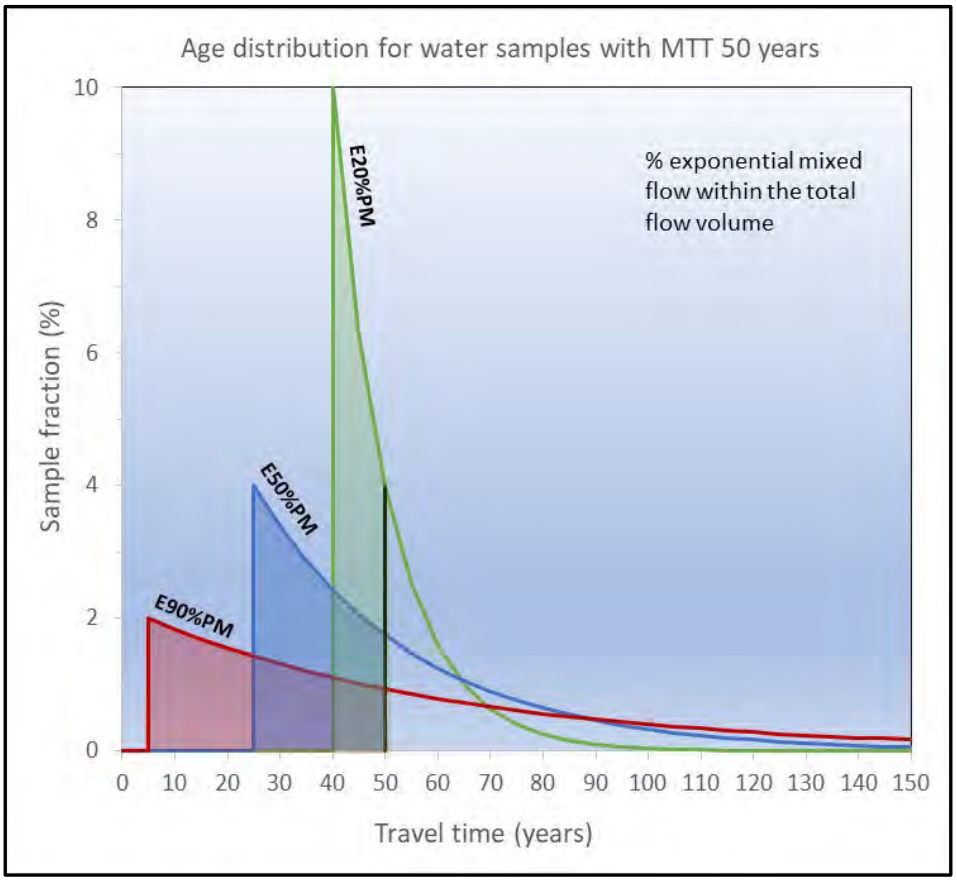


Figure 8-1: Age distribution plots for three different mixing scenarios that all give a mean travel time (MTT) of 50 years[13]. The sample with a small proportion of mixing (E20%PM, with 20% exponential mixed flow) has a range of ages closer to the 50-year mean. The highly mixed sample (E90%PM) has a wide distribution of travel times and substantial young flow component (shaded in red). In this situation, trends in nitrate concentrations could start appearing long before 50 years have passed

[13] Example taken from Stenger, R. 2022: Nitrogen lag review, prepared for Waikato Regional Council, Lincoln Agritech Report 1058-14-R1.

9 Are there places where we don't expect to see any nitrate from land use because the water is really old?

Some groundwater in Canterbury was recharged a really long time ago and has been moving slowly through our aquifers for hundreds or thousands of years. Because there is little or no young water component and there were no land uses that released high concentrations of nitrate before the 1880s, the nitrate concentrations in very old groundwater are always low[14].

Very old groundwater is usually found where it is difficult for water to either enter or exit the aquifer. This happens where the water-bearing layers have limited or no surface exposure for water to enter (e.g., deep, older sediment formations covered by fine-grained loess in South Canterbury or limestone in North Canterbury) or the aquifer outflow is restricted (e.g., where deep permeable gravels pinch out between fine-grained sediments offshore from Christchurch). Groundwater can also be very old where the water has travelled a long distance from the recharge area (where it enters the ground), such as via the longer flowpaths in Figure 2-1.

Carbon-14 dating of groundwater has shown us there is very old groundwater in deep wells in the following locations:

- aquifers in pre-Quaternary age gravels and sediments south of Timaru (e.g., Cannington Basin gravels and Taratu Formation)
- deep aquifers in the Waipara Basin, North Canterbury
- the deeper coastal confined aquifer system between the Ashley River/Rakahuri and the Rakaia River, notably beneath Kaiapoi, Christchurch and Kaitorete spit, south of Te Waihora

In the locations with very old groundwater, we don't expect to see any impacts of nitrate from past land use in deep groundwater. The time lag for nitrate leaching from present land use will also likely take decades or centuries before any effects show up. However, there are some things we still need to take note of:

- Even if the underlying deep groundwater is very old, there can still be shorter pathways for water to travel by overland runoff or through the shallower subsurface that can quickly take nitrate to shallow wells, springs and streams. For example, we might see effects of nitrate carried to streams by surface runoff in the downland areas and by tile drains in the coastal confined aquifer areas.
- The residence times of groundwater can change over time if pumping from deep wells draws in more and more water from further afield. Over decades of pumping to supply the city, there has been younger water being drawn into the western parts of the Christchurch aquifer system and additional older water being drawn upwards in the eastern parts.[15]
- Low nitrate is not always an indicator of very old groundwater. We also see low nitrate concentrations in groundwater in other locations in Canterbury, but this is usually related to low intensity land use, the dilution effects from alpine rivers or removal of nitrate by geochemical processes (denitrification), rather than the time lag for nitrate from land use to reach the wells.

[14] Morgenstern, U and CJ Daughney 2012. Groundwater age for identification of baseline groundwater quality and impacts of land-use intensification – The National Groundwater Monitoring Programme of New Zealand, *Journal of Hydrology,* 456–457, 79–93,

[15] Stewart, MK and RW van der Raaij, 2022. Response of the Christchurch groundwater system to exploitation: Carbon-14 and tritium study revisited. Science of the Total Environment, 817, 152730.

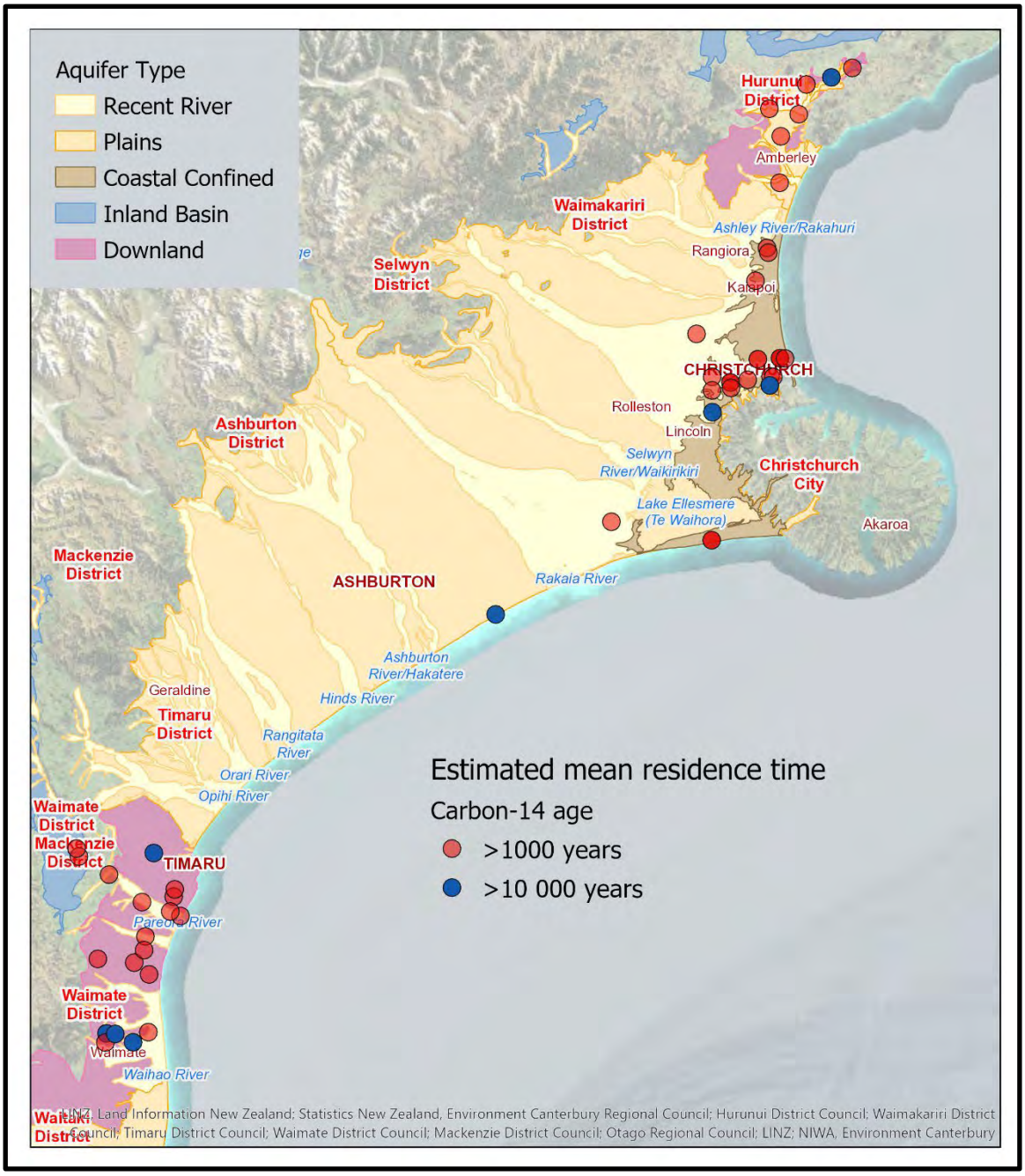


Figure 9-1: Locations where carbon dating of water samples from wells has shown that deep groundwater is very old and therefore unlikely to show impacts from recent land use

10 Case studies

The case studies provide additional evidence to support the conclusions in this document.

- Case studies 1 to 4 give examples of experiments, observations and modelling that illustrate how quickly (hours to months) water and nitrate can move down through the soil and unsaturated zone to reach the water table.
- Case studies 5 to 7 give examples where we observe changes in nitrate concentration trends in shallow groundwater within a few months to a few years after a significant change in land use has occurred.
- Case study 8 and 9 summarise time lags for rivers and streams from a published national research study and age tracer data collected for several investigations in Canterbury. They show that river nitrate loads would mostly lag land use changes by less than 6 years.

10.1 CASE STUDY 1: Fairton vertical tracer experiment

In the 1970s a tracer experiment was carried out at the Fairton meatworks near Ashburton to determine the maximum rate of vertical transport through an alluvial gravel unsaturated zone[16]. The groundwater already had high concentrations of chloride, sodium, and nitrate, so the experiment conducted was an inverse tracer test infiltrating river water with much lower levels of these contaminants. The river water was flooded continuously into a shallow excavation next to a shallow monitoring well.

The results showed that the river water took **22 hours to start arriving at the water table, 21 m below the ground**. This gives a transport rate of about 1 metre per hour.

However, there was a long tail to the effect. After 100 hours there was still a slow decline in the groundwater concentrations. This demonstrates that some of the water travels down through slower pathways, taking a longer time to continue diluting contaminants in the unsaturated zone. Not all the groundwater is displaced by the river water because contaminant concentrations still remain around ten times higher than what was injected.

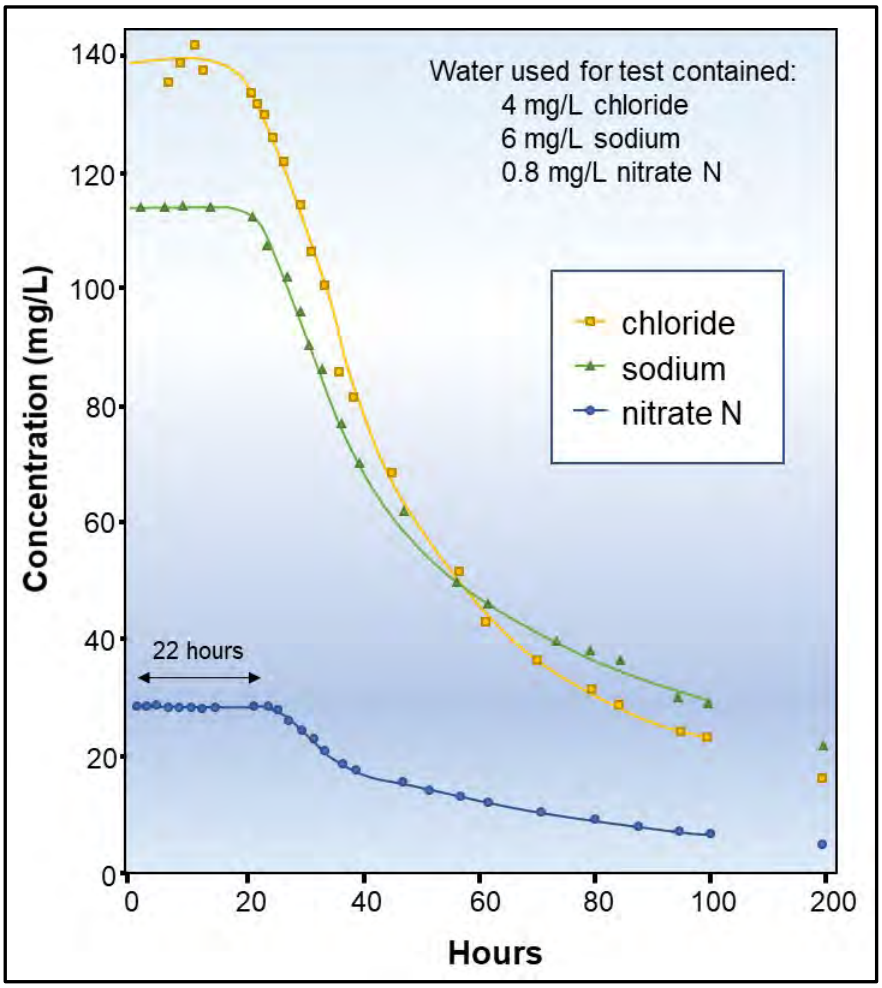


Figure 10-1: Concentrations of chloride, sodium and nitrate measured over time at a shallow well during the inverse tracer experiment at Fairton meatworks site (after Keeley & Quin, 1979)

[16] Keeley, GM and Quin, BF 1979. *The effects of irrigation with meatworks-fellmongery effluent on water quality in the unsaturated zone and shallow aquifer*. Progress in Water Technology 11:369 - 386.

10.2 CASE STUDY 2: Nitrate sensors respond to heavy rain in May 2021

Environment Canterbury have installed continuous nitrate sensors in some of our monitoring wells. The nitrate sensors take measurements every 15 minutes. Data collected after an extreme rainfall event from 29 to 31 May 2021 show us that nitrate concentrations can start increasing **within days of heavy rain**. We give three examples from Canterbury in the graph and table below.

From the results we noticed that nitrate concentrations respond most rapidly when:

- the source of nitrate is very close to the well
- soils are free-draining, thin and gravelly and
- the sensor measuring nitrate concentrations is close to the water table.

Table 10-1: Summary of responses observed with continuous nitrate sensors in groundwater wells during an extreme rain event from 29 May to 1 June 2021

Site location:	Balmoral, Hurunui	Pleasant Point, Timaru	Seadown, Timaru
Soil type and thickness	Well-drained, extremely gravelly, shallow stony silt loam 20 cm thick	Moderately well-drained silty loam, 20 to 45 cm thick	Poorly-drained silty loam, 1.2 m thick
Unsaturated zone material	Gravel with sand, silt and clay	Gravel and silt or clay	Clay-bound gravel
Depth to groundwater (m)	12 to 17.4 m	2.7 to 4.5 m	1.2 to 3.4 m
Well screen depth (m)	12 - 22 (at water table)	4.75* (1 to 2 m below water table)	6 - 11 (>3 m below water table)
Time to initial response (days)	**<1**	**2 – 3**	**7**
Time to peak concentration (days)	**4**	**15**	**>40**

* No screen information, total well depth given.

The Balmoral sensor is installed within a well on an irrigated beef farm with thin gravelly soils, and nitrate travels rapidly down to the water table when recharge occurs. It was only 22 hours after the peak of the May rainfall event (recorded at a rain gauge located next to the monitoring well) that the nitrate concentrations in groundwater started to rise (see the red line in the graph). The nitrate concentrations peaked within just 4 days. This was followed by another, even higher nitrate peak from more rain falling on already wet soils in mid to late June.

At Pleasant Point the nitrate sensor is at surface (water from the well is pumped through the sensor) and results are sometimes affected by temperature interference, but we could still see a sudden rise in nitrate concentrations starting 2 to 3 days after the heavy rain and peaking after 2 weeks. The well is located adjacent to an irrigated dairy farm.

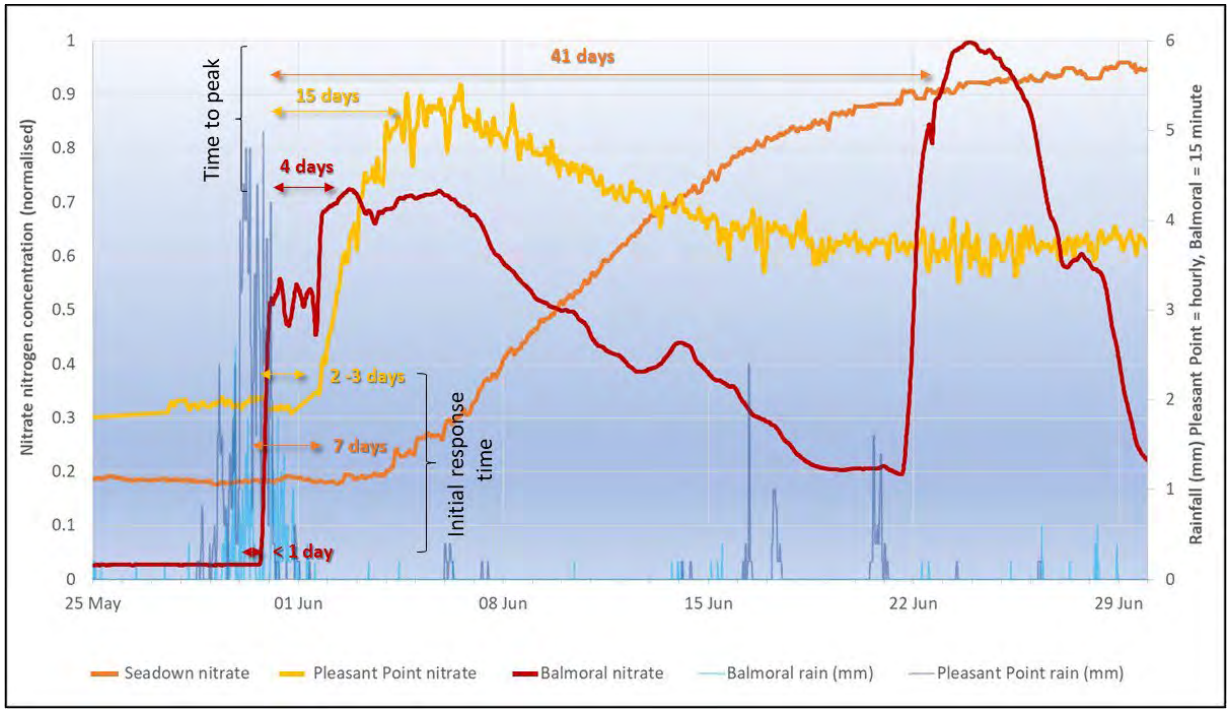


Figure 10-2: Rainfall and nitrate time series for three wells equipped with continuous nitrate sensors (nitrate data has been normalised to show time lags more clearly)

We saw a slightly slower response at our Seadown sensor where nitrate concentrations took about a week to start increasing after the May rainfall and were still rising slowly after 40 days. At this site the soils are thicker and less well drained than the other two locations. The well is located on dairy farming land and there is also a discharge of high nitrate stormwater from an industrial site that occurs one kilometre upgradient. Nitrate travelling through the aquifer from the upgradient discharge is likely to arrive later and add to the slowly increasing concentrations in comparison with the other two sites.

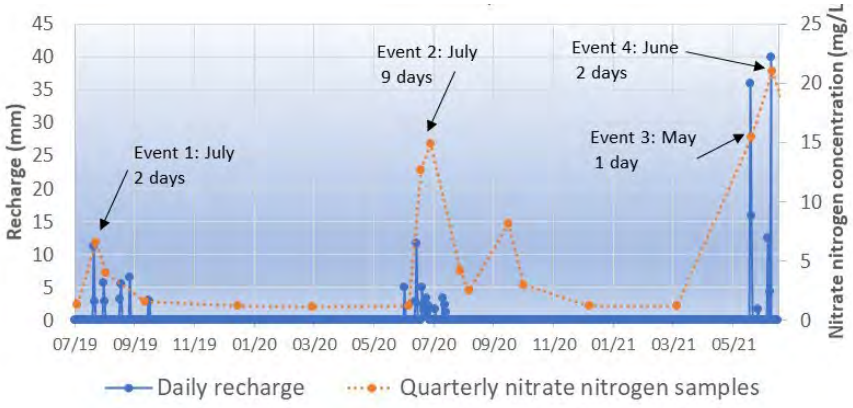
10.3 CASE STUDY 3: Recharge events and nitrate concentration peaks

The nitrate sensors in Case Study 2 give us very high-resolution data to observe how long it takes for nitrate concentrations in monitoring wells to respond to rainfall events. But we can also see similar patterns looking back at the nitrate concentrations in some shallow wells we sample monthly, or even quarterly.

In 2010, ESR[17] analysed the time lag between groundwater recharge and nitrate peaks in long-term monitoring wells. Groundwater recharge was derived from a soil water balance model used to calculate drainage based on rainfall and evaporation data from nearby climate stations. We have added to that analysis with 10 more years of data and a few more wells. The results show that **time lags of less than 1 month up to around 4 months through the unsaturated zone** after recharge events are common for us to see nitrate peaks in groundwater (drawn from a depth at or a few metres below the water table).

Remember that this time lag is only an indication of how long it takes for nitrate already in the soil and unsaturated zone to be driven down into the groundwater by rainfall. It does not include the time lag involved in applied nitrogen building up the nitrate in the soil and subsurface or the time lag for transport to a more distant location via the aquifer. The analysis is also limited by the frequency of sampling, so we can only approximate the lag to the nearest month (for monthly samples) or three months (for quarterly samples). The peak concentration of nitrate could easily have occurred sometime between samples.

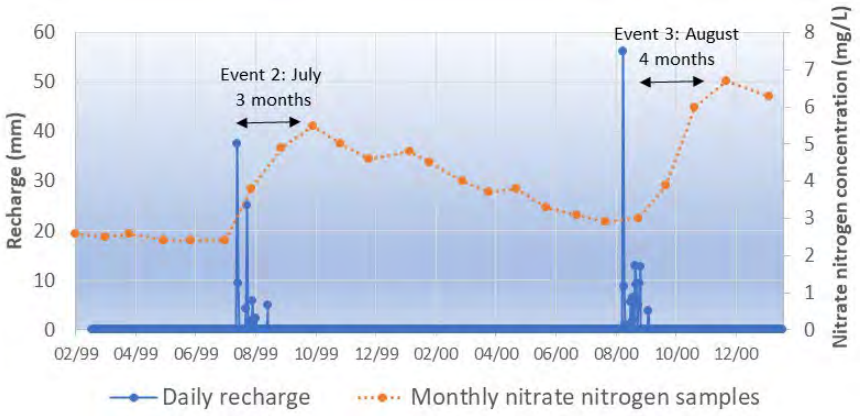
Table 10-2: Summary of time lags from recharge events to peak nitrate concentrations in shallow monitoring wells

Balmoral well BV24/0023		
Well screen depth (m)	12 – 24	Winter recharge 2019, 2020, 2021 
Water table depth (m)	12 – 17.4	
Analysis period	2019 to 2021	
Events analysed	4	
Median lag	**0 months**	

[17] Close, M. 2010. *Critical review of contaminant transport time through the vadose zone*, Environment Canterbury technical report R10/113 prepared by ESR, June 2020, Record number PU1C/7336, 46 p.

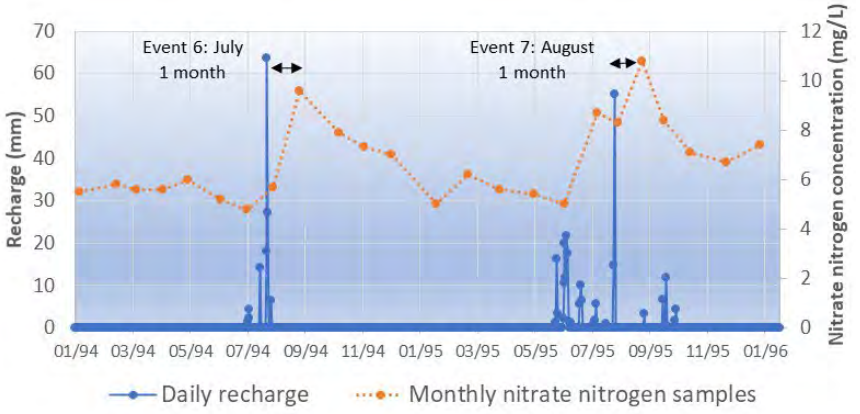
Swannanoa well M35/0132	
Well screen depth (m)	16 - 20
Water table depth (m)	1 – 9
Analysis period	1996 to 2021
Events analysed	14
Median lag	**3 months**

Example events: winter 1999 and 2000



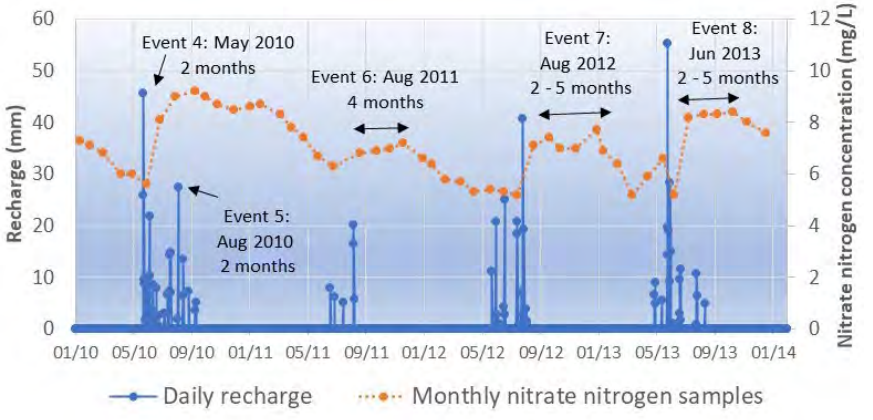
Yaldhurst well M35/1051	
Well screen depth (m)	27 - 33
Water table depth (m)	14 – 18
Analysis period	1986 to 2021
Events analysed	22
Median lag	**1 - 2 months**

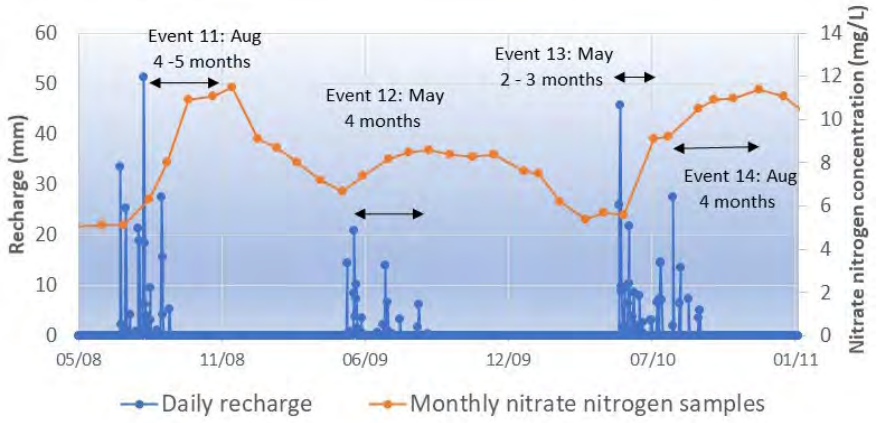
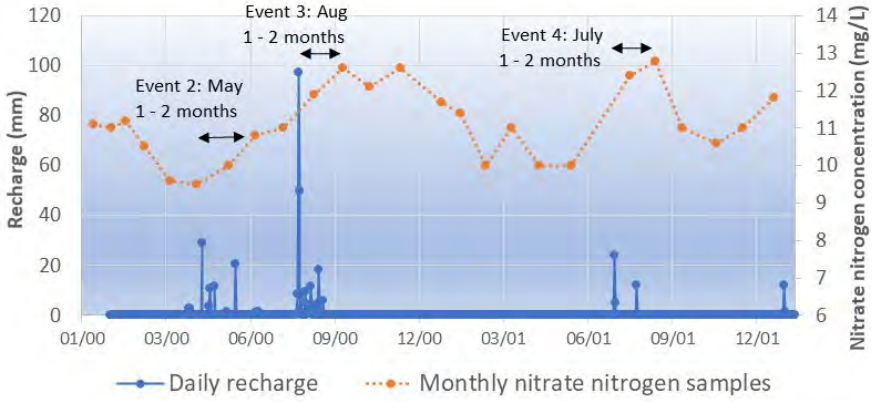
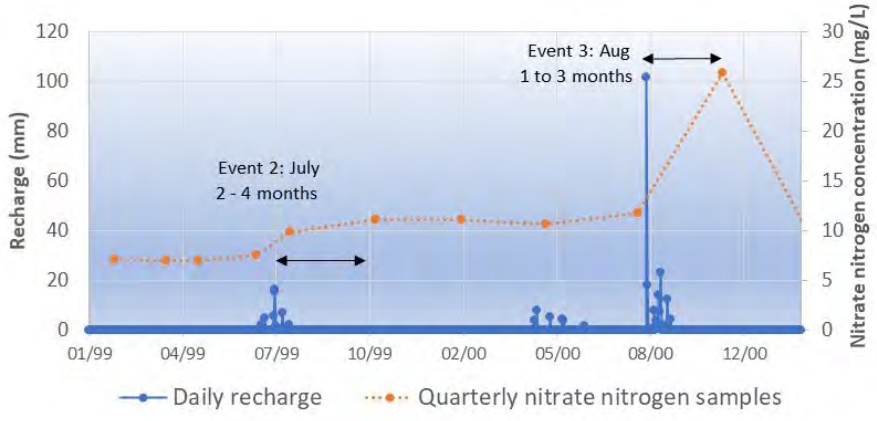
Example events: winter 1994 and 1995

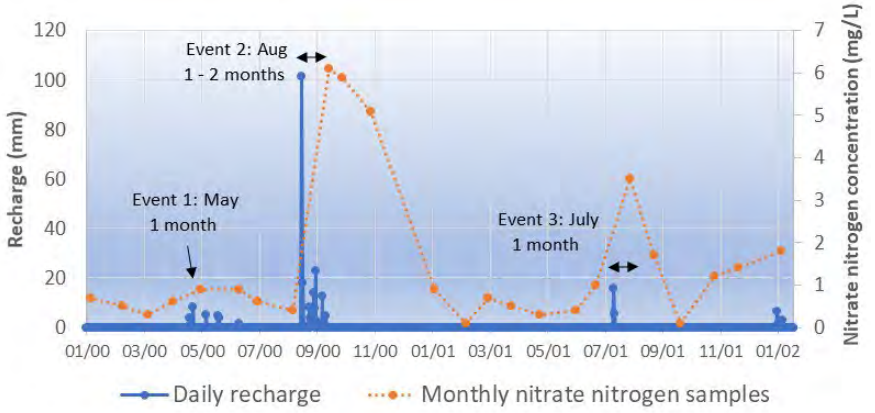


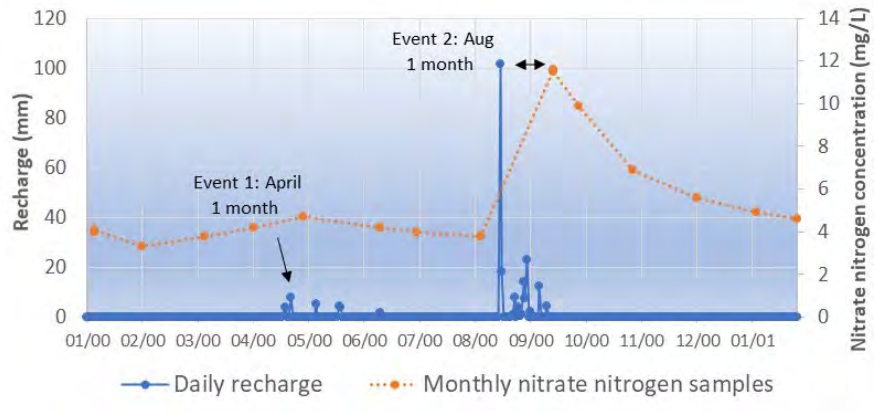
Rolleston well M36/4126	
Well screen depth (m)	33 - 34
Water table depth (m)	14 – 32
Analysis period	2006 to 2021
Events analysed	17
Median lag	**2 months**

Example events: 2010 to 2013



West Melton well M35/1003		
Well depth (m)	39.6	Example events: 2008 to 2010 
Water table depth (m)	15 – 33	
Analysis period	1989 to 2010	
Events analysed	14	
Median lag	**4 months**	
Dorie well L37/0415		
Well depth (m)	30	Example events: 2000 and 2001 
Water table depth (m)	16 to >30	
Analysis period	1999 to 2017	
Events analysed	16	
Median lag	**1 - 2 months**	
Seadown well K38/0430		
Well depth (m)	10	Example events: 1999 and 2000 
Water table depth (m)	**2 – 3**	
Analysis period	1995 to 2008	
Events analysed	6	
Median lag	**2 months**	

Pareora well J39/0135		
Well screen depth (m)	5 - 8	Example events: 2000 and 2001 
Water table depth (m)	4	
Analysis period	2000 to 2013	
Events analysed	16	
Median lag	**1 month**	

Ikawai well J40/0163		
Well depth (m)	4.6	Example events: 2000 
Water table depth (m)	1 – 3	
Analysis period	1996 to 2013	
Events analysed	14	
Median lag	**1 month**	

10.4 CASE STUDY 4: Vertical travel times for Southland and Waikato

Estimated vertical travel times have been mapped across the Southland and Waikato regions using climate, soil and unsaturated zone data fed into recharge and moisture balance models[18,19]. These models estimate how long it would take nitrate which is already in the soils to be carried vertically downwards by rainfall recharge and mixed in with the shallow groundwater. They do not count the time for a land use change to have effect nor the time for cumulative effects to travel over any horizontal distance to reach a water body.

Southland is characterised by small, self-contained basins containing well defined aquifer systems. The models estimated that over 80% of the Southland Region it would take **less than a year** for nitrate to travel through the unsaturated zone and 90% of the area would have a vertical travel time through the unsaturated zone of less than 2 years. Mixing of this vertical drainage with the shallow groundwater was expected to take a further 1.5 to 5 years, giving **total time lags of 3 to 5 years over most of the Southland Region** before local shallow groundwater would be expected to show responses to soil nitrate concentrations that have changed after land use changes (see the maps that follow).

When applying the model **in the Waikato Region**, the travel times were estimated to be longer, especially in elevated areas near Lake Taupo where groundwater is very deep. Time lags through the unsaturated zone were predicted to range from 6 to 77 years, with an **average of 27 years**. Most sites with lower elevations and shallower groundwater were expected to have time lags of less than 10 years.

The vertical time lags refer to the path from the land to the water table, but there are also shorter pathways via surface runoff and shallow subsurface flow in the unsaturated zone (interflow) and, in some places, artificial drainage. Not only in Waikato, but also in many other places, these quicker pathways contribute large volumes of water to the flow in streams.

In some parts of Canterbury we might expect to see shorter time lags through unsaturated zones, similar to what was predicted for Southland, since we have similar soils and alluvial sediments with better drainage than Waikato's volcanic deposits. However, we also have lower recharge rates on the Canterbury plains from lower annual rainfall and our large aquifer systems have relatively deep groundwater levels in many places in the upper Canterbury Plains, which would increase the travel time to reach the water table.

[18] Wilson, S, Chanut, P, Rissmann, C. and Ledgard, G. 2014. *Estimating Time Lags for Nitrate Response in Shallow Southland Groundwater*. Environment Southland technical report 2014-03, prepared by Lincoln Agritech, April 2014,

[19] Wilson, S and Shokri, A. 2015. *Estimation of lag time of water and nitrate flow through the Vadose Zone: Waikato and Waipa River Catchments*, Lincoln Agritech Ltd report 1059-9-R1, May 2015, 44 p.

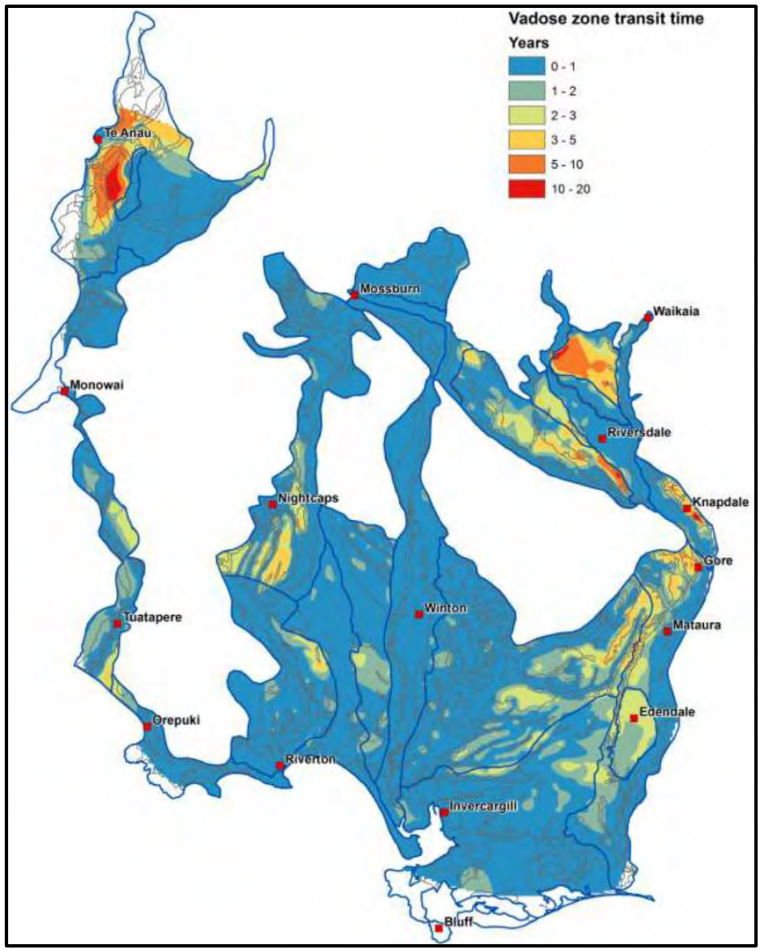


Figure 10-3: Travel times mapped by Wilson *et al.*, 2014 for vertical transport of nitrate through the unsaturated zone in Southland. Mean vadose (soil plus unsaturated) zone travel time estimates were estimated using the Van Genuchten model as described in the report

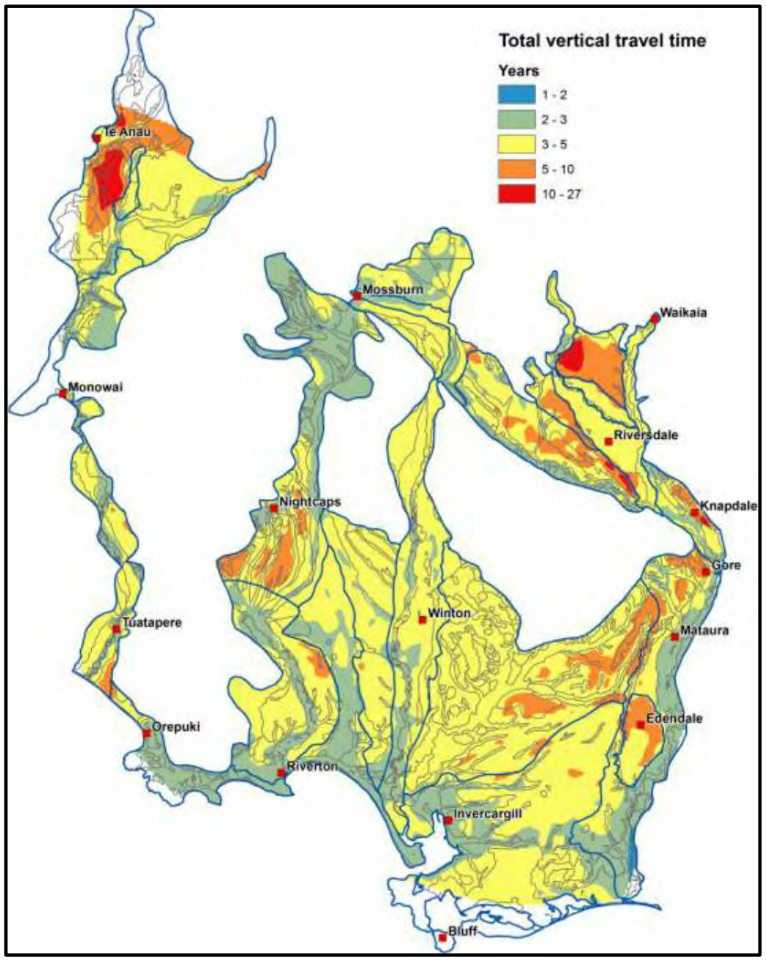


Figure 10-4: Wilson *et al.'s* (2014) map of total vertical travel time through the unsaturated zone and mixing into groundwater in the uppermost saturated zone for the Southland Region

10.5 CASE STUDY 5: Forest plantation to irrigated beef farming

Soil type and thickness	Depth to groundwater	Distance to monitoring location	Time lag to response
Well-drained, extremely gravelly, shallow stony silt loam, 20 cm thick	12 to 17.4 m below ground measured at monitoring well	Farming changes occurring from 5 metres to 5 km away from the well	**Approximately 3 years**

In July 2014 Environment Canterbury installed two wells to monitor the effects of a planned conversion of 3760 hectares of previously forested land to pastoral farming at Balmoral in the Culverden Basin. Samples were collected from the shallower monitoring well every three months to test the water quality. The well is screened across the water table.

Initially concentrations of nitrate (shown as blue bars in the time series graph below) were low and stable, around one milligram per litre in groundwater under the clearcut forest. The concentrations rose slightly in the winter of 2018 to three milligrams per litre, two years after the farm was converted to dryland beef farming in late 2016. However, this single sample is not enough to confirm there has been a significant change.

A continuous nitrate sensor was installed in the well in August 2018, shortly after approximately 770 hectares of irrigated beef farming began on the adjacent land.

The sensor recorded very high nitrate concentrations reaching groundwater within a few hours of rainfall events over the winters of 2019, 2020 and 2021, and suggested that increased nitrate leaching from the intensified pastoral land uses was reaching the monitoring well.

The time lag between when beef grazing began and when we first saw a significant increase in nitrate concentrations at the monitoring well was around **three years**. This is not the total time lag to reach a new equilibrium, because more nitrate is still moving through the slower pathways in the system and nitrate concentrations are still trending upwards. But is does answer the question of how long the time lag is between when a change in leaching from land use and when we can first measure some effect or response in the groundwater at the water table.

A deeper monitoring well in the same location, screened 85 metres below the groundwater table, has also been sampled each year, but has shown no response to the land use changes 5 years later (shown with yellow symbols in the maps and time series graphs).

This case study also demonstrates some of the challenges of quantifying nitrate time lags over incremental land use changes, even when we have reliable land use records and high sample frequency. Without such data, itis much harder to analyse the data.

Table 10-3: Land use changes and groundwater nitrate response from 2014 to 2021

Total Nitrogen leaching loss (t/yr) *	2014 - 2015	2015 - 2016	2016 - 2017	2017 - 2018	2018 - 2019	2019 - 2020	2020 – 2021
Irrigated beef	0	0	0	39	39	39	38
Irrigated dairy support	0	0	0	0	0	0	1.5
Dryland beef	No data		27	2.0	2.0	2.0	2.0
Trees/cutover	No data		0.01	0.03	0.03	0.03	0.03
Apples	0	0	0	0	0	0.03	0.03
TOTAL	**No data**		**27**	**41**	**41**	**41**	**42**
Annual average nitrate N in shallow well (mg/L)	**0.8**	**1.1**	**1.3**	**1.0**	**3.2**	**5.5**	**6.7**
Annual average nitrate N in deeper well (mg/L)	**0.21**	**0.20**	**0.20**	**0.21**	**0.20**	**0.19**	**0.23**

* Nitrogen leaching estimated from lookup tables for each type of land use in tonnes per year for the converted area east of SH7.

Information sources:

- Aerial images – Google Earth
- Farming land use and estimated nitrogen leaching calculated for sub-area from *Ngāi Tahu Balmoral: Annual Reports* prepared by Pattle Delamore Partners Ltd for Ngāi Tahu Farming Limited 2017 to 2021
- Shallow well nitrate concentrations and nitrate sensor maximum concentrations – Environment Canterbury monitoring data from well BV24/0023.
- Drinking water maximum acceptable values – Ministry of Health Drinking-Water Standards for New Zealand 2018

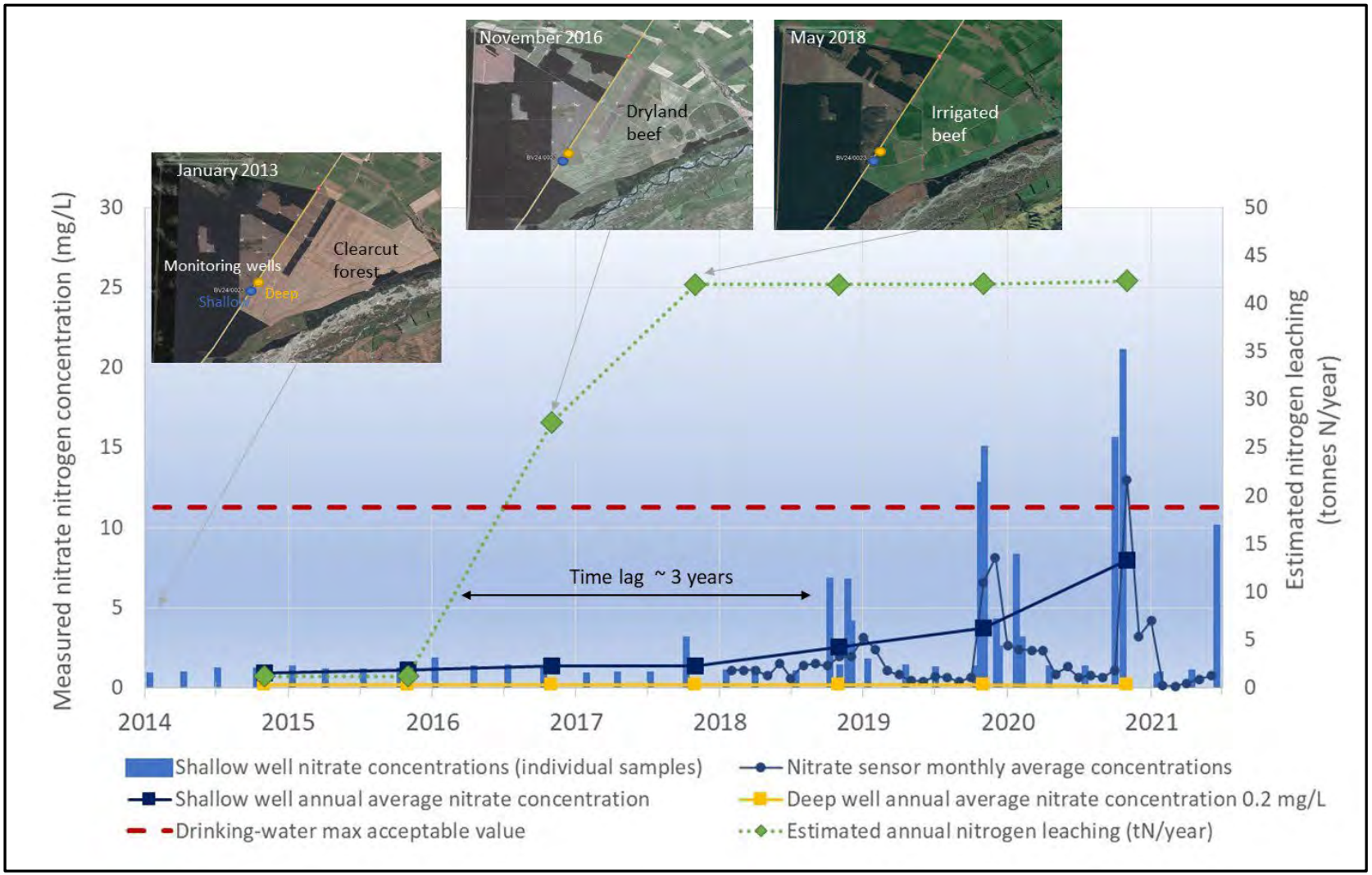


Figure 10-5: Aerial photos of land use changes and time series of annual nitrate leaching loads and groundwater nitrate concentrations for a forest-farm conversion

10.6 CASE STUDY 6: Catchment scale irrigation and land use changes

Soil type and thickness	Depth to groundwater	Distance to monitoring location	Time lag to response
Well-drained, very stony silt loam < 20 to 45 cm thick	2 to 15 m below ground measured at monitoring wells	Farming changes occurring across wider district all around wells	**Less than 5 years**

Long-term state of the environment monitoring in the Hekaeo-Hinds plains area of mid-Canterbury has shown nitrate concentrations in groundwater respond to land use changes over the years.

1990

- When monitoring began in the early 1990s, nitrate concentrations in groundwater were elevated and slowly trending upwards. Irrigated areas, stock numbers and fertiliser inputs were increasing gradually across the plains between the Ashburton/Hakatere and Rangitata rivers.

1995 ↓ 2000

- The late 1990s and early 2000s were a period of rapid changes in farm systems and irrigation methods:
  - Border dyke irrigation was replaced by overhead spray systems “freeing up” water and allowing infilling of areas that weren’t previously irrigated
  - Increasing large scale dairy farming occurred
  - Increasing irrigated cash cropping and crop rotations occurred
  - Groundwater takes increased to irrigate areas outside of surface water schemes and supplement irrigation scheme water.

2005

- By 2005 nitrate concentration trends had begun to rise sharply in many of the shallow monitoring wells and those with well screens close to the water table.
  - It took a few more years of monitoring data for the steeper increasing trends in nitrate concentrations to become apparent
  - Similar patterns of increasing rate of nitrate concentrations were seen right across the upper and middle plains area.

Below (top left) is an aerial snapshot from February 2001 where the characteristic green/brown stripes of border dyke irrigation dominate the area. By October 2004 when the next aerial survey was flown, the stripes are disappearing as spray irrigation came online and circular patterns in the fields show where centre pivot systems were appearing.

The time series graph shows how nitrate concentrations in two shallow wells (light and dark blue symbols) near the spray-irrigated area started increasing rapidly **within a few years** from the conversion to spray irrigation (dark blue arrow) and the land use changes that accompanied the change in irrigation systems. With more frequent monitoring after 2005, we saw more variable nitrate concentrations, responding to wetter and drier periods, but the overall trend in concentrations is still increasing.

The graph also shows how the nitrate concentrations in another shallow well (green symbols) continued increasing at a slower rate until nearly a decade later and then they show a sudden rise. This well is an area mapped in 2013/2014 as one of the last remaining border dyke irrigated properties in the catchment. Shortly afterwards, centre pivot irrigators were installed and **within about a year** of the associated land use changes the nitrate concentration trend steepened there too.

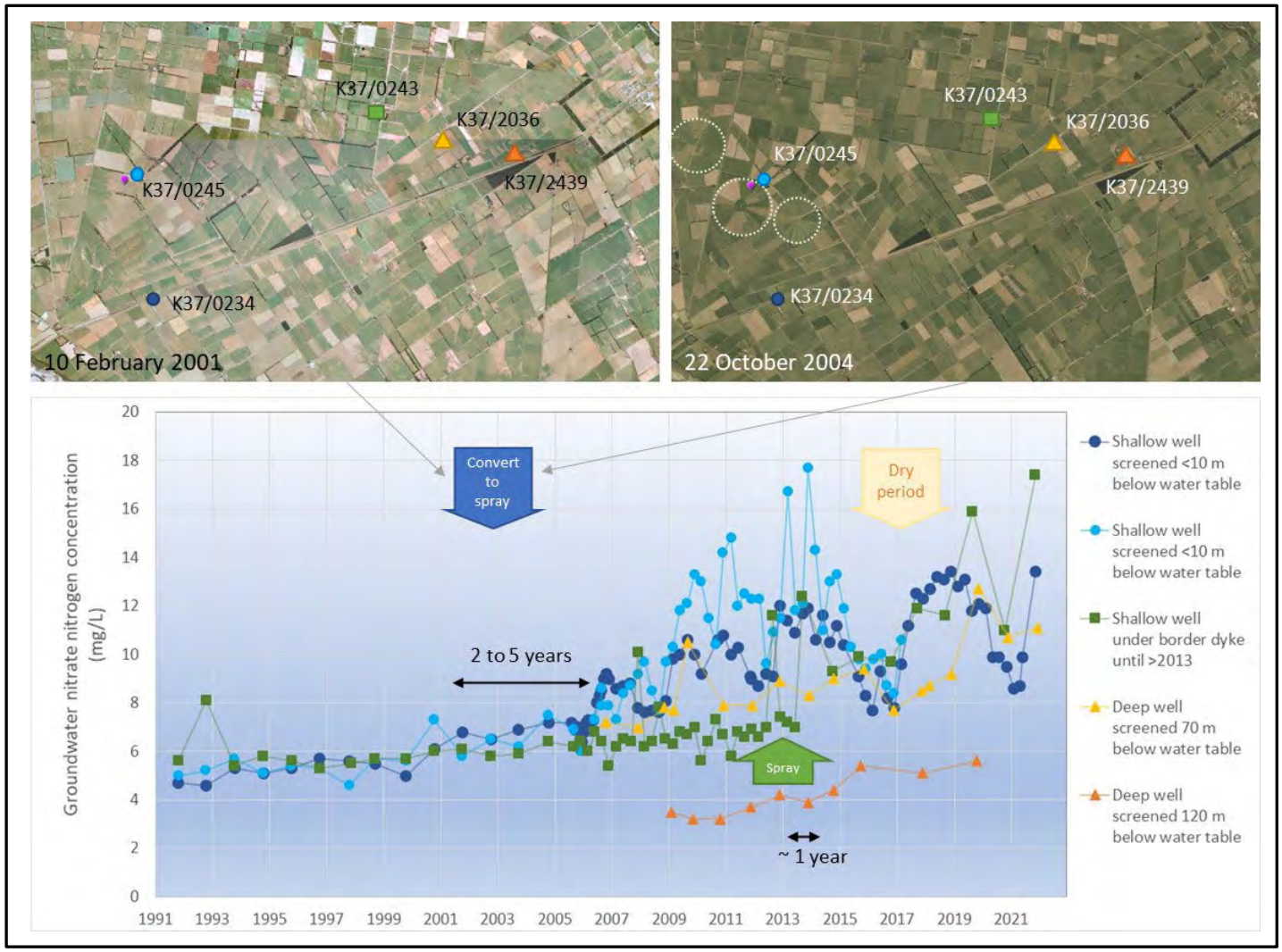


Figure 10-6: Aerial photos of land use changes and time series of nitrate concentrations in groundwater for a catchment undergoing large scale farming changes

10.7 CASE STUDY 7: Efficient irrigation and effluent discharges

Soil type and thickness	Depth to groundwater	Distance to monitoring location	Time lag to response
Well-drained, very stony silty loam, <20 cm thick	6 to 17 m below ground (measured at monitoring well)	Irrigation and discharges 100 – 200 m from well	**Less than 3 years**

For the past 18 years, we have sampled a 41 m deep well in an alluvial gravel aquifer in South Canterbury, usually once a year in October, for water quality monitoring. We noticed that the concentrations of nitrate in the groundwater increased significantly in 2016 and we have been looking at recent land use changes around the well to try to find the cause.

The increase in nitrate leaching rates was unlikely to be a response to converting the land use to dairy farming. The area is located near a milk factory and has been used for dairy land use for many years. Consents for dairy effluent discharges were issued in the early 1990s, at least 10 years before the first groundwater sample was taken and dairy cows may have been present long before that.

Factors that could have affected nitrogen leaching were documented shortly before the observed groundwater nitrate concentration response:

- A large block of farmland was converted from border dyke to centre pivot irrigation. Aerial images from Environment Canterbury and Google Earth show the change took place between November 2013 and March 2015
- Compliance officers noted ponding from dairy effluent discharge applied by travelling irrigator on the property to north in March 2015 and March 2016. Ponding could indicate high irrigation rates to wet or low permeability soils.

There are large intervals (months to years) between observations both for the land use activities or events and the annual groundwater sampling, so it is not possible to pinpoint the exact **time lag** between the land use events and the initial response in groundwater.

Both the irrigation conversion and effluent ponding events took place within a period of **less than three years**, potentially as little as one year before the first elevated groundwater nitrate concentration was measured in October 2016. Despite subsequent compliance visits (2017 to 2022) showing improvement in the management of effluent irrigation, nitrate concentrations in the well remain elevated from the additional nutrient loading to the land.

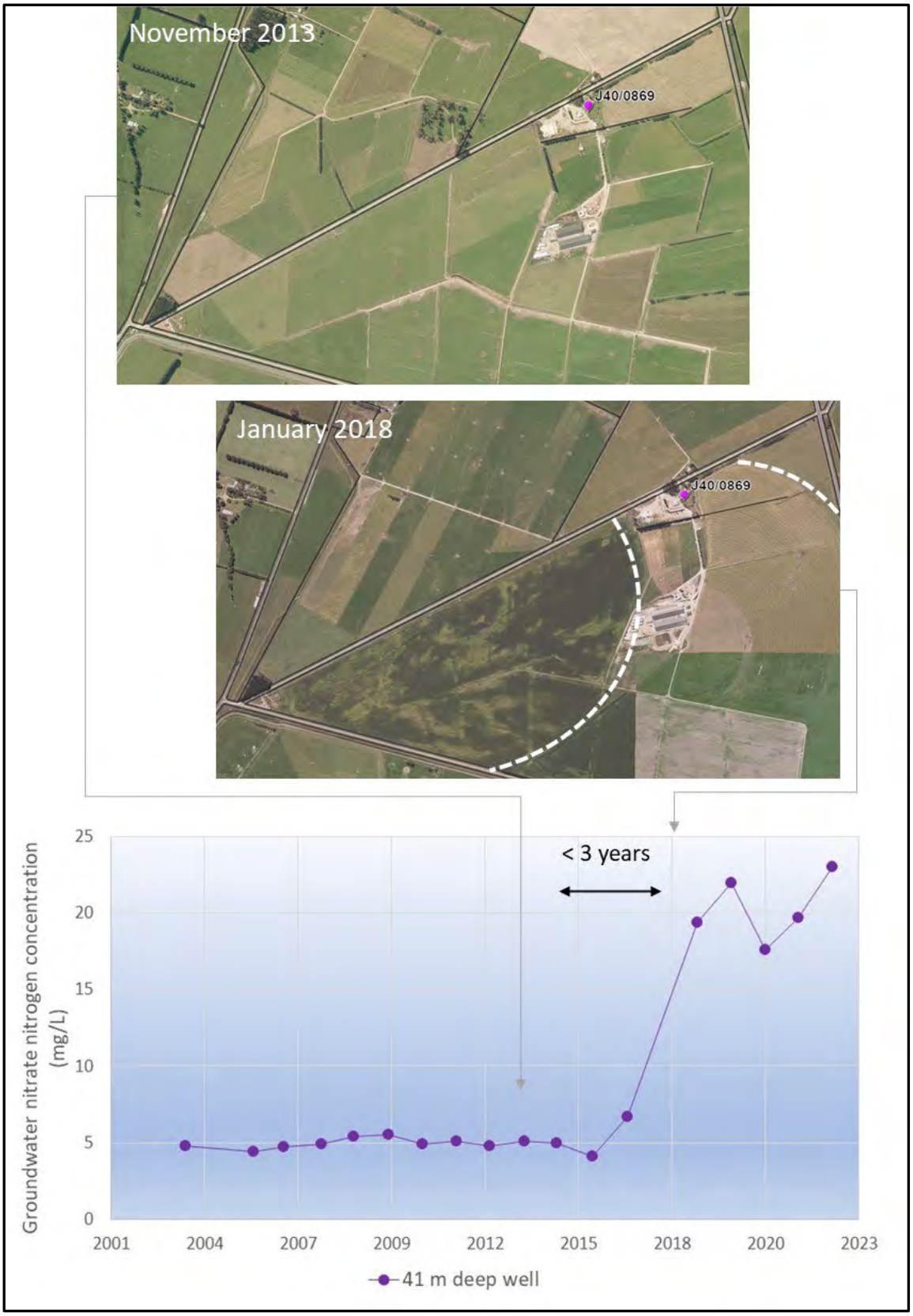


Figure 10-7: Aerial photos of irrigation system changes and the nitrate concentrations in a monitoring well (dashed white lines highlight the extent of the pivot irrigators in 2018)

10.8 CASE STUDY 8: Nitrate time lags for New Zealand river sites

Some estimates of nitrate time lags in rivers have recently been published for New Zealand[20]. The authors estimated time lags using two different statistical techniques which compared annual rates of nitrate nitrogen leaching in catchments and annual loads of nitrate nitrogen in rivers from 1990 to 2018.

Nitrate leaching rates were derived from previous work by Manaaki Whenua compiling a nitrate leaching map for New Zealand[21]. The river loads were calculated from monitoring data collected by NIWA from the National Rivers Monitoring network[22]. For catchments where estimates of mean travel times were available from models or age tracers, they found these compared well with the estimates from their statistical correlations.

The method doesn't work for all catchments, mainly because there needed to be a significant change in leaching rates and nitrate loads for the two to be correlated. In catchments with minimal land use change over the period of analysis this was not possible. But time lag estimates were possible for 43 catchments across the country, ranging between one and twelve years, with an **average time lag of 4.5 years**.

The example below illustrates how the river nitrate load for the **Waimakariri River** in Canterbury (solid grey line) lags behind the sum of leaching losses from farming (solid black line). Analysis of the time series (the authors used a cumulative Generalised Additive Model) gave an average **time lag of 4 years** between land use changes and changes in the nitrate load arriving in the river.

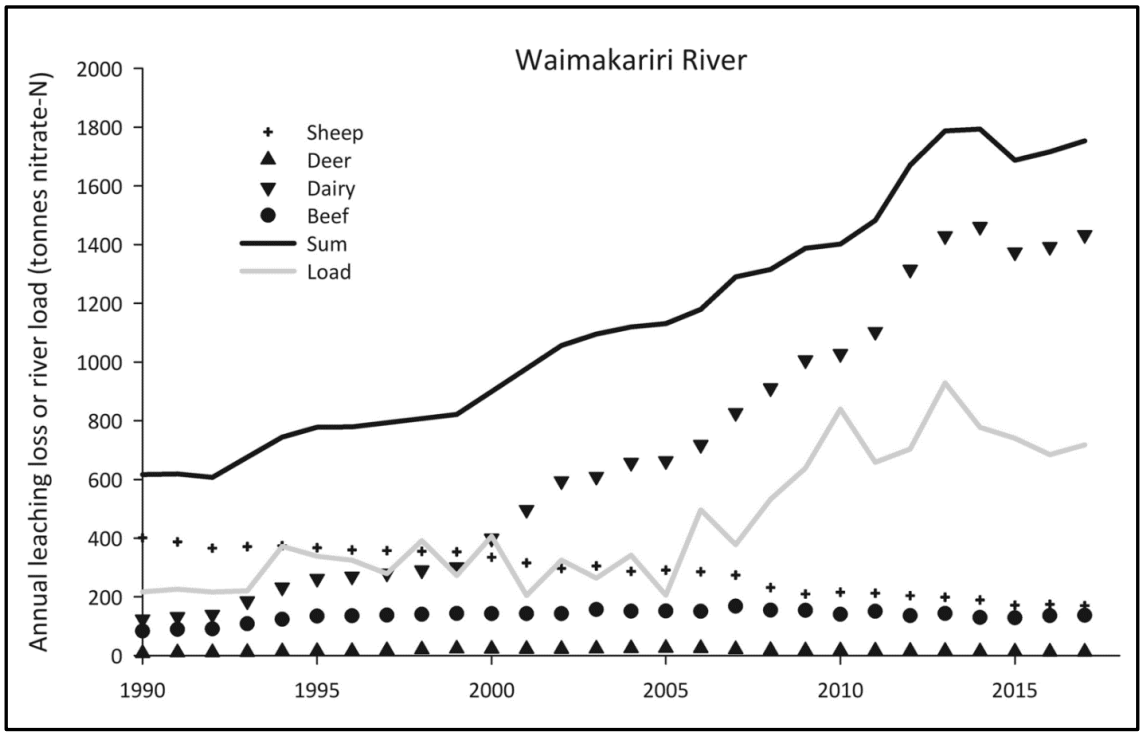


Figure 10-8: Annual leaching loss of nitrate–N (tonnes) over 1990–2018 for each livestock class, the sum of livestock classes and the load in the river for old HW bridge site on the Waimakariri River, Canterbury. Note that the increase in load occurs after the increase in nitrate–N leaching losses. After McDowell *et al.* (2021)

[20] McDowell, RW, Simpson, ZP, Ausseil, AG, Etheridge Z and Law, R. 2021. The implications of lag times between nitrate leaching losses and riverine loads for water quality policy, *Nature: Scientific reports*, 11:16450. https://www.nature.com/articles/s41598-021-95302-1.

[21] https://www.stats.govt.nz/indicators/nitrate-leaching-from-livestock

[22] https://niwa.co.nz/freshwater/water-quality-monitoring-and-advice/national-river-water-quality-network-nrwqn

The results for all the river monitoring locations in Canterbury from this study are summarised in Table 10-5.

Table 10-4: Time lags between nitrogen leaching from land use and measured riverine nitrate loads for Canterbury Rivers. Results from McDowell *et al.* (2021)

River and monitoring location	Catch-ment area (km^2)	Mean leaching loss (kg N/ha/yr)	Lag CCM method (years)	Lag Cumu-lative GAM method (years)	Filtered mean of CCM and GAM (years)*	Mean travel time from age tracer data (years)
Opihi at Rockwood	411	7.9 ± 0.2	**0.5**	**3**	**1.8**	-
Opuha at Skipton Br.	456	3.5 ± 0.1	**1.5**	**6.5**	**4.0**	-
Hakataramea above MH Br.	898	15.1 ± 0.4	**-**	**-**	**-**	-
Hurunui at Mandamus	1059	0.9 ± 0.1	**(5.8)**	**-**	**MDC**	-
Opihi at Grassy Banks	2370	7 ± 0.2	**6.5**	**7.5**	**7.0**	-
Waimakariri at Gorge	2384	1.2 ± 0.1	**-**	**-**	**MDC**	-
Hurunui at SH1 Br.	2519	5.6 ± 0.2	**3.5**	**5**	**4.3**	-
Waimakariri above old HW Br.	3014	3.9 ± 0.3	**-**	**4**	**4.0**	3.7
Waitaki at Kurow	9744	1.1 ± 0.1	**-**	**(4)**	**MDC**	-
Waitaki at SH1 Br.	11882	2 ± 0.1	**5.6**	**-**	**5.6**	-

* Mean of results from two correlation methods after filtering out results for impacted or recently disturbed sites and those with no significant land use changes.

CCM = cross correlation model, GAM = generalised additive model, MDC = minimally disturbed conditions >90% native bush, mountain or scrub i.e. no land use trend for correlation.

Lag times in parentheses were for sites that were either impacted (e.g. by hydroelectric schemes) or under MDC and excluded from further analysis.

Six of the ten river sites had **time lags** which could be calculated by one or both correlation methods and one site also had a previous modelled mean travel time from age tracers. The time lags between land use changes and river load changes ranged from **0.5 to 7.5 years**.

Three sites were downstream of high-country catchments where there was minimal land use change so could not be correlated with water quality. One site yielded no correlation using either method.

10.9 CASE STUDY 9: Age tracer travel times for springs and streams

Age tracers[23] tell us about hydrological water travel times, or how long water takes to travel from the land surface through the groundwater to reach a well, spring or river sampling site. Unlike the other methods used in our case studies, age tracers are about the water itself and do not rely on knowing anything about when land use changes happen or about the concentrations of nitrate. However, because nitrate is highly water soluble and does not "stick" to aquifer materials, the nitrate travels along with the water in the aquifer. This means water age tracers can also give a good estimate of how long an **average time lag** might be expected before nitrate arrives at the sampling site.

Over the years, Environment Canterbury has engaged GNS Science to analyse age tracer concentrations and estimate travel times for groundwater samples across the Canterbury Region. In some areas, mostly Waimakariri District and Christchurch city, we have also investigated travel times for springs, streams and drains using a tritium tracer. The results from these studies are summarised in Table 10-6.

The water travel times for most of the springs and streams we looked at in Canterbury are similar to the time lags McDowell and others found for rivers in the previous example, with a median travel time of **6 years** for all but the final two springs in Table 10-6. The SB and WR springs are exceptions. These springs in eastern Christchurch are fed by artesian water flowing to surface after travel times of more than a century through the coastal confined aquifer system. The sandbar spring was later discovered to be one of a group of deep artesian wells within the Christchurch estuary that were drilled in the early 1900s, so it is not surprising that the water would be very old.

[23] Age tracers are components found in very small quantities in natural waters that preserve a record of when the water was last in equilibrium with the earth's atmosphere. Age tracers can be either dissolved man-made gases whose concentrations in the atmosphere have changed over time, or very small amounts of radioactive isotopes of hydrogen or carbon that decay with known half-lives. Tritium, an unstable isotope of hydrogen, is considered the most reliable tracer for younger water samples (less than 100 years old). Using long-term records of atmospheric concentrations of the tracer, and the measured concentration of the tracer in the sample, scientists can use models to estimate time ranges for how long it takes the water to reach the sampling point.

Table 10-5: Mean hydrological travel times modelled from tritium isotope measurements for lowland streams, springs and tile drains under base flow conditions. (Where the mean travel time is shown as a range, this is the 95% confidence interval from the modelled estimate)

Site ID	Monitoring location description	Date of sampling	Mean travel time (years)	Ref.
SQ30332	Kaiapoi River at Island Rd	16/03/2016	5 - 7	1
SQ30340	Kaiapoi River at Heywards Rd	16/03/2016	4.5 - 6.5	1
SQ30400	Cust River at Skewbridge Rd	16/03/2016	8 -10	1
SQ30426	Ohoka River at Island Rd	16/03/2016	5 - 7	1
SQ30428	Ohoka River at Jacksons Rd	16/03/2016	8.5 - 11	1
SQ32943	Silverstream at Harpers Rd	16/03/2016	4.5 - 6.5	1
SQ35040	Eyre Main Drain	16/03/2016	7 - 9	1
BW24/0023	Clarkville spring	04/02/2012	7 - 8	2
BW24/0023	Clarkville spring	19/07/2012	6 - 8	2
M35/7450	Tile drain – summer	04/02/2012	0 - 2	2
M35/7450	Tile drain - winter	19/07/2012	1 – 3	2
M35/7493	Spring	04/02/2012	1 - 3	2
M35/7493	Spring	19/07/2012	1 - 3	2
M35/7494	Ohoka Stream tile drain - Dalleys Weir	4/02/2012	1 - 5	2
M35/7494	Ohoka Stream tile drain - Dalleys Weir	19/07/2012	1 - 4	2
M35/7494	Ohoka Stream tile drain - Dalleys Weir	16/03/2016	3.5 - 5.5	1
M35/7500	Ohoka River tile drain	4/02/2012	6 - 7	2
M35/7500	Ohoka River tile drain	19/07/2012	6 - 9	2
M35/7500	Ohoka River tile drain	16/03/2016	6 - 9	1
N34/0165	Omihi Stream spring Mt Cass Rd	20/05/2008	7	3
SX	Styx River at Redwood Spring Rail Br.	08/12/2017	3	4
SX1	Styx River trib. at Aquatic Centre Foot Br.	08/12/2017	2	4
RW	Redwood Springs	08/12/2017	9	4
AH	Avonhead Spring M35/8006 Group 10	08/12/2017	8	4
KR	Knights Reserve M36/5396 Group 16	09/12/2017	14	4
SB	Sandbar Spring Avon-Heathcote Estuary	09/12/2017	>180	4
WR	Wetland Reserve Spring Group 14	10/12/2017	150	4

References for Table 9-6:

1. Van der Raaij, RW 2016: Tritium results and residence time interpretations for spring-fed streams in the Waimakariri Water Management Zone, GNS Science Letter report CR2016/99 LR, 14 July 2016.
2. Van der Raaij, RW 2013: Groundwater age interpretation for Ashley-Waimakariri springs, GNS Science Letter report CR2013/96 LR, 19 April 2013.
3. Dodson, M 2009. *Active tectonics, geomorphology and groundwater recharge to the Waipara Kowai zone*, North Canterbury, MSc Engineering Geology thesis, University of Canterbury.
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MINUTES OF THE MEETING OF THE CANTERBURY WATER MANAGEMENT STRATEGY WAIMAKARIRI ZONE COMMITTEE HELD IN THE KAIKANUI MEETING ROOM, RUATANIWHA KAIAPOI CIVIC CENTRE, 176 WILLIAMS STREET, KAIAPOI, ON MONDAY 6 MARCH 2023 AT 3.40PM.

PRESENT

C Latham (Chairperson), C Aldhamland, E Harvie (remotely from 4.15pm), M Blackwell (remotely from 4.15pm), A Rueben (Te Ngāi Tūāhuriri Rūnanga), Councillor T Fulton (WDC Councillor) and Councillor C McKay (ECan Councillor), R Gill-Clifford (Youth Representative)

IN ATTENDANCE

M Bate (Kaiapoi Resident), J Roper-Lindsay (Waimakariri Biodiversity Trust), M Griffin (ECan CWMS Facilitation Team Leader), A Burton (WDC Water Environment Advisor), S Kidner (ECan Northern Engineer Rivers Team), J Ensor (Mandeville Residents Association), A Arps (ECan Northern Zone Delivery Manager), N Theinhardt (ECan Zone Delivery Lead Waimakariri), J Irvine (ECan Planning Advisor Rivers Team), S Stewart, B Walton (Waimakariri Irrigation Ltd), J Benn (Department of Conservation), Councillor P Redmond (WDC), G Davey (Ashley-Rakahuri Rivercare Group) and A Smith (WDC Governance Coordinator).

KARAKIA

R Gill-Clifford opened the meeting with a karakia.

1. BUSINESS

Apologies

Moved C Latham Seconded C McKay

THAT an apology for absence be received and sustained from committee member M Jolly, and apologies for lateness from committee members A Reuben and J Cooke.

CARRIED

Welcome and Introductions

C Latham welcomed everyone present to the meeting and requested members and those in the public gallery to introduce themselves.

Register of Interests

There were no updates to the Register of Interest.

2. OPPORTUNITY FOR THE PUBLIC TO SPEAK

Michael Bate

M Bate expressed his concerns regarding information in a recent newspaper article advising that birds and fish life were flourishing. M Bate believed this was incorrect information and not true.

M Bate referred to the report on this agenda on Council spraying and chemical usage – Waterways and Roading spraying information, which provided a summary of chemical spraying

practices in the Waimakariri District. It looks at the types of chemicals used, and approximate quantities of chemicals used. M Bate questioned the information in the report on the type of glyphosate that was used by the Council and whether chemicals were sprayed directly into the water or not. There were approximately 250 drains, creeks and streams that were allowed to be sprayed in Waimakariri and 900kms of water races. M Bate suggested the report should state that it was the Council's intention to reduce the chemicals sprayed on waterways, to help the environment. According to M Bate, there was no aquatic plant life at all in the bottom half of Taranaki Stream.

3. REPORTS

3.1 Waimakariri Irrigation Limited – update – Murray Griffin (ECan, CWMS Facilitator) and Brent Walton (CEO, Waimakariri Irrigation Limited)

B Walton was present for this report, providing an update on recent activities of Waimakariri Irrigation Limited (WIL). The report on the agenda provided a background about WIL noting the storage of water was crucial to the future of the cooperative and farming on the plains. The WIL scheme operates and manages a water take from the Waimakariri River and delivers water to 200 shareholders and irrigates 23,000 ha within a 44,000ha area between the Waimakariri and Ashley Rivers. The report also provided background on the Wrights Road property purchased in 2007 by WIL, and subsequent building and resource consents granted to construct an 8.2million m3 water storage facility. This stored water supply will augment the river water supply and lift reliability of the water from a relatively low 75% to a relatively high 92% level.

The water storage scheme was one of the big projects of WIL and B Walton advised that this scheme requires a 75% approval of shareholders. There will be shareholder engagement over the next five to six weeks and a vote to be undertaken by the end of April. This had been an ongoing project since first purchasing the property in 2007. He noted the cost of building a facility would never get any cheaper. Shareholders are being asked to make this decision, but the true benefits will be for the next generation of farmers. Having this water source provides options for different choices of land use in future.

B Walton also noted it would be a challenge to get consent approved for another storage facility and there was no Plan B for storage, and this was key for the Plan Change 7 solutions package for the Waimakariri district. He also noted on-farm reductions are a challenge particularly for those shareholders in the nutrient red zones.

One of the other initiatives of WIL has been a big push on biodiversity, with momentum growing and it was pleasing that farmers were approaching WIL with biodiversity options in their farm plans. B Walton confirmed there were four nurseries installed in local schools in the district, with the intention of the seedlings being grown with farmers then sourcing these seedlings for plantings on their properties.

The WIL discharge consent expires in 2025 and is a current priority. B Walton noted there was a poor understanding of what was in local waterways, with work being done to improve this understanding. Any opportunities to enhance and protect what may be living in them was encouraged. Existing fish screens won't be compliant under the new regulations. B Walton talked of a new technique which can achieve more sampling over a much greater area to establish what fish life was currently in the waterways.

Regarding the on-farm actions, WIL is assisting to get farm environment plans on a GIS platform and those going into the new consenting regime now have a much better understanding than previously. WIL shareholders are aware of what will be required for the new consent and working towards meeting the requirements of that. Currently the shareholders are up to 93% A and B audits, two C audits, and one D audit on a small dairy farm. WIL was working actively with that shareholder to get that property from a D to a B audit. This was required to be reported on annually.

Councillor Fulton mentioned a recent article about the number of expiring farm consents and the life of the dairy sheds coming to an end and was this something that WIL were considering. B Walton responded that on most of the WIL shareholder dairy farms the infrastructure was quite new, as these properties had not been dairy farms prior to the irrigation scheme's existence. It was pointed out that the current D audit property was an older dairy shed and this was a challenge. With the audit process, this gives some forewarning of any improvements that may be required in future.

Regarding the data recorded on groundwater, C Latham asked was this information being shared. B Walton advised that PDP would be continuing with this data collection. There would be extra monitoring in some areas, which was a requirement of ECan, and there was debate whether they should be paying for this. Different interest groups may use this data, but it was still to be determined how it could be shared with these different groups, given they would use the data differently..

Councillor C McKay queried about the updated Freshwater Farm Plans and if these plans were being incorporated into the GIS process. B Walton confirmed this was the case, and endeavouring to capture essential data was important going forward when applying for the consent renewal. He added there are on-farm success stories included on the WIL website, and there had been several positive interactions following this.

Through the Chairperson, J Ensor commended the work of Brent Walton and WIL, noting the importance of irrigation to the area. Having been a long-time user of irrigation on his own property, J Ensor believed this was a great step forward.

Moved Councillor Fulton Seconded Councillor McKay

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** this update for its information taking into consideration the Committee's 2021-2024 Acton Plan priorities.

CARRIED

3.2 **Waimakariri District Council Spraying and Chemical Usage – Waterways and Roading Spraying Information – Angela Burton (WDC, Water Environment Advisor)**

A Burton presented this report, which provided a summary of chemical spraying practices in the Waimakariri District. The report summarised the types of chemicals used, and approximate quantities of chemicals used last season and the spraying management practices of the Council. Other non-chemical forms of weed control were used before any spraying was undertaken, which was the last resort for control work. This was the case, for example, when mechanical forms of control cannot access an area.

For roadside maintenance, anyone who is undertaking spraying work must hold an Introductory Gro-Safe Certificate.

A Burton highlighted the Council had a No Spray Register which members of the public can add their properties to. Having this register added on to the Council website was currently being investigated.

CORDE was the Council roadside spraying contractor for rural drainage and DELTA is the WDC contractor for urban drainage. The information in the report on the quantities of herbicides used was provided by these two contractors. When spraying is undertaken it is to assist native plants to flourish, whereas they may otherwise fail. Glyphosate is used in riparian areas and as plants increase in size, the need for spraying decreases. Hand weeding methods and trimming is also used for weed control.

A Burton provided information on what types of sprays were used on different plants or trees

and how these were applied, either sprayed, or injected as a paste in willow trees.

Council contractors can spray dry drains to control rank grass, however, that can only be undertaken once a year and is done to ensure that flood management is effective. A resource consent held by the Waimakariri District Council covered spraying wet drains, but this was used at discretion, if the work couldn't be undertaken manually.

The Discharge of Herbicide in Drains and Waterways Notices are issued annually to specific parties prior to the commencement of the spray season, and it was proposed that these would now also be circulated to the Zone Committee.

The Council are investigating potential development of a chemical register and looking into the spraying undertaken by contractors.

R Gill-Clifford asked if there had been any research or survey information on the impact of AMPA (aminomethylphosphonic acid) in water. A Burton was not aware of any research or surveys undertaken by the Council previously on this matter but agreed to undertake some research into any information that might be available on this and would provide information back to committee members.

C Latham commented, and it was agreed, that it would be important to have testing done on sediment as well as the waterways. It was noted this had been done previously on the Kaiapoi River.

Cr P Redmond asked when it was necessary to spray into water and was there criteria to be met. A Burton responded that it would be when there was no opportunity for machinery to access waterways. It was planned to have criteria to provided to contractors before spraying was commenced.

Cr P Redmond referred to a study which stated the use of glyphosate did not have effects on fish or vertebrate. A Burton advised she was not able to comment on the results of the study (Carex University of Canterbury study), noting that this was a one-off small study providing a snapshot. The findings were quite limited from this study, and A Burton was not aware of any other studies. It was confirmed that this report would be circulated to the Council's Utilities and Roading Committee.

A Reuben asked if there would be any further studies done by Carex, suggesting that just five sites would not give a thorough picture and, consequently, would be inconclusive. It was suggested that there be some follow up to get further data and more conclusive answers. A Reuben suggested that John Harding be invited to speak to the committee on this matter.

A Rueben asked if contractors keep logbooks of spraying that was undertaken around waterways. A Burton said this was part of the resource consent requirements with Environment Canterbury and would be provided when requested by Council.

C Latham asked if there was ever any feedback received from the organisations that the Council was required to send the spraying programme information to. A Burton was unsure of any previous feedback received and would follow up to clarify.

J Ensor commented on the manner used for spraying on crop farms, which was a combination of spraying first, and then mechanically clearing the drains. He suggested there was no one solution that fits all situations. He also noted the long-term effect of Tordon on trees, as this stayed in the ground for a long time, possibly up to 25 years.

The Chairperson noted the valuable information contained in the report and that the questions that had been raised could be followed up on and improvements continued to be made.

Moved C Aldhamland Seconded Councillor C McKay

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** Report No. 230110001807.

(b) **Notes** that herbicides used for Council operations are only used where deemed necessary by Council staff and contractors, and other (non-chemical) weed control options are used where they are deemed more appropriate.

(c) **Notes** that the budgets in the Long Term Plan have been based on continuing to use herbicides, including glyphosate, for weed control, where deemed necessary by Council staff and contractors.

(d) **Notes** that the Waimakariri Zone Committee will be included in future notifications of annual spraying programmes.

(e) **Notes** that Diquat is not used in any Council spraying programme.

(f) **Notes** that the Waimakariri District Council will continue to work toward keeping better records on chemical spraying within the district and will investigate the potential development of a chemical register and spraying decision parameters for contractors and staff.

(g) **Circulates** this report to the Utilities and Roadings Committee and all Community Boards.

CARRIED

3.3 **Environment Canterbury Weed Control Programme – Update – Murray Griffin (ECan, CWMS Facilitator) and Sam Kidner (ECan, (Northern Engineer, River Team)**

S Kidner was present to speak to this report on the ECan spraying programme proposed for North Canterbury in 2023/24, assisted by a PowerPoint presentation.

S Kidner explained ECan managed rivers throughout Canterbury from the Lower Waitaki through to Kaikoura. Spraying of braided rivers was important to enhance natural vegetation and keep the riverbeds free to allow flowing water, and also protection from flooding. Build up of vegetation in the gravel part of riverbeds can create “islands” of vegetation and threaten biodiversity. A clearer fairway was a much better habitat for birds as well as native plants.

He noted the key areas that are sprayed are the berms, which are the vegetated areas between the stop banks and the fairway in the gravel part of the river. There were flood protection zones on the side of rivers that required the control of willows. Ivy and Old Man’s Beard was sprayed in the berms. Stop banks are also sprayed to prevent trees from growing on them, as this can compromise the strength of the stop banks.

There was also weed control in the drainage schemes, and S Kidner confirmed there was only one drain in Waimakariri district that was spot sprayed.

The use of herbicides use was strictly controlled through the conditions of the Council’s resource consent. Operators also follow best practice guidelines and there was a handbook used by operators.

S Kidner noted spraying invasive vegetation allows a river to flow in a more direct route, and reduces the likelihood of water getting pushed out to the side channels and onto neighbouring properties. The removal of vegetation in the fairways allows a river to flow more naturally and avoid erosion.

In response to a question from Cr McKay, S Kidner clarified there was also mechanical removal of larger trees on the fairways as well as spraying in the fairways. He noted some of these larger trees had been allowed to grow and were now up to five metres tall, which is currently the situation at the Okuku/Ashley River confluence. Staff were now endeavouring to keep closer control of these and remove them before they get this big.

S Stewart asked if this presentation could be made available to the Waimakariri District

Council and all the Community Boards. It was agreed that this would be made available to these groups.

C Latham asked how it was decided where or when spraying was undertaken. S Kidner advised that if there was an issue with some flooding then the spraying and mechanical work was undertaken for weed clearance. He noted there was always a focus on finding an efficient way for the work to be done. Removal of bigger trees, such as willows, by a matter of scale need to be removed. Even lupins, broom and gorse can cause issues in riverbeds, but lupins were a lower priority.

R Gill-Clifford asked what the end goal of the spraying was. S Kidner responded that it was hoped native plants would re-establish in the riverbeds, but the main driver for keeping the river fairways clean was public safety. He added the programme was ongoing because of the continued spread of seeds from invasive weeds across riverbeds. Despite the Check Clean Dry Programme, often these seeds were spread via four wheel drive vehicles.

Regarding the recording of chemical volumes and usage, S Kidner advised that all ECan vehicles are fitted with GPS to monitor their movements and locations when operating. Staff keep a spray diary which tracks when, where and how much chemical was used and which species are targeted. This information was reviewed by the ECan Rivers Team. This information has been recorded for the past ten years and the information is collated annually. It was hoped to have this data available digitally soon.

Moved Councillor C McKay Seconded Councillor T Fulton

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** this update for its information taking into consideration to the Committee's 2021-2024 Acton Plan priorities.

CARRIED

3.4 **Rakahuri Estuary Shorebird Monitoring – Update – Murray Griffin (ECan, CWMS Facilitator) and Grant Davey (Volunteer, Ashley Rakahuri Rivercare Group)**

G Davey from the Ashley Rakahuri Rivercare Group noted the special place the Ashley estuary was with a significant number of rare birds nesting in the area. A PowerPoint presentation was shown of the birdlife at the Ashley Rakahuri Estuary.

G Davey spoke about the GPS system used for finding nests, mapping them, and then returning to these nests and checking on progress. He advised of the problem with the large number of Black Backed Gulls, and the issue these gulls have in predating the Banded Dotterels from the sand dunes at Waikuku Beach between the two outlets of the river. This year there were no Banded Dotterel nests in this area. Black Backed Gulls had also taken out a large colony of White Fronted Terns. In researching Black Backed Gulls, G Davey confirmed this was what they naturally do. G Davey advised there needs to be something done to control the numbers of Black Backed Gulls and this was a matter of priority. On the southern sand dunes there was also an issue with disturbance to bird nesting sites. Where the river meets the estuary there were vehicles, people walking dogs, and little notice was taken by the public of the signs, or respect shown for the sensitivity of this environment. The ECan Rangers do a good job but they can't be there all the time. This situation was beyond the scope of the Rivercare Group who were now looking for some assistance.

Councillor Fulton commented on the possibility of the nesting area being a "no-go" zone for people and G Davey referred to the Northern Pegasus Bay Bylaw which was operative and covered a significant area where no vehicles or dogs were allowed. If there were any wildlife killed, the Wildlife Act can be invoked, but this was a difficult situation. This area was an environmental jewel in the crown in this district and G Davey suggested it was not being looked after. He also noted there is a partnership between agencies involved for any work to

fund the removal of some of the Black Backed Gull population. This matter needed to be brought to the public's attention and it was pointed out that this matter had already been reported in the local newspapers. The Rivercare Group has considered running a public meeting at Waikuku Beach to advise the community of the issues. It was noted that there were members of the local community who enjoy the freedom of using the beach and estuary. J Roper-Lindsay suggested that this matter could be one of the topics for the Waimakariri Biodiversity Trust's winter series discussion and she would follow up on this.

Moved Councillor Fulton Seconded C. Aldhamland

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** this update for its information taking into consideration to the Committee's 2021-2024 Acton Plan priorities.

CARRIED

3.5 **Waimakariri Biodiversity Trust – Update – Murray Griffin (ECan, CWMS Facilitator) and Judith Roper-Lindsay (Chair, Waimakariri Biodiversity Trust)**

J Roper-Lindsay was present to provide an update on the work of the Trust and the actions that were developed from a recent workshop.

Matters being prioritised are setting up a website and biodiversity mapping. She noted a teacher at Rangiora High School,and WBT Trustee Peter Courtney, had some cultural mapping and intends to include a biodiversity layer to this. WDC was also undertaking some biodiversity mapping and it was hoped to coordinate these two systems.

Referred to the Zone Committee's Action Plan Budget, J Roper-Lindsay suggested there could be a closing date on the application forms. C Latham advised that the Committee would be considering applications in April and these would come to the May committee meeting for a decision on funding.

J Roper-Lindsay confirmed the Trust was planning another Winter Series of talks around the district. These could be more in the form of discussions, rather than lectures.

Moved Cr C McKay Seconded C Aldhamland

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** this update for its information taking into consideration to the committee's 2021-2024 Acton Plan priorities.

CARRIED

4. COMMITTEE UPDATES – M GRIFFIN (CWMS FACILITATOR, ECAN)

4.1 Zone Committee Working Groups.

These Working Group updates were taken as read.

J Ensor suggested that there should be further information provided to the lifestyle block owners in Mandeville area, as had been done in the Oxford area. C Latham referred to the Ten Top Tips information brochure that was currently being produced. Once this was available, this would provide useful information to landowners.

There were no questions.

4.2 Environment Canterbury Water and Land Committee Meeting – 22 February 2023

Cr McKay provided update on the decision of the committee on information to private well owners. It was decided that ECan would invite other agencies to work with them to develop an education campaign for private well owners, alongside well water testing. It was up to the other agencies whether they wanted to be involved.

Cr Fulton suggested that these initiatives could be taken back to the Council Community Boards to ensure they are aware and supporting this campaign in the future. Cr Fulton would follow up with this.

4.3 **Further Information Links.**

Updated links on the ECan Freshwater Package.

Plan Change 7, down to one appeal which is going to a Court case at the end of March.

4.4 **Action points from the previous Zone Committee meetings.**

Moved Councillor T Fulton Seconded R Gill-Clifford

THAT the CWMS Waimakariri Zone Committee:

(a) **Receives** these updates for its information.

CARRIED

5. CONFIRMATION OF MINUTES

5.1 **Minutes of the Canterbury Water Management Strategy Waimakariri Zone Committee Meeting – 30 January 2023**

Moved R Gill-Clifford Seconded A Reuben

THAT the CWMS Waimakariri Zone Committee:

a) **Confirms** the Minutes of the Canterbury Water Management Strategy Waimakariri Zone Committee meeting, held on 30 January 2023, as a true and accurate record.

CARRIED

6. GENERAL BUSINESS

There is a mahinga kai and biodiversity workshop to be held 15th March from 11am to 1pm that members of the Zone Committee were invited to. M Griffin would provide details to members on the location of this workshop in the Hurunui.

M Blackwell spoke on the shareholders not having good understanding of land use discharge by the shareholders of Waimakariri Irrigation Ltd. E Harvie noted she believed the organisation was working on this matter.

M Bate shared his video of Kaiapoi Lakes, that had been discussed at the previous zone committee meeting. This video highlighted improvements in the lakes water quality and habitat, which M Bate said was the result of the stopping of use of chemical spraying in the water for the past three years.

KARAKIA

R Gill-Clifford provided a karakia to close the meeting.

NEXT MEETING

The next meeting of the CWMS Waimakariri Water Zone Committee is scheduled for 1 May 2023 at 3:30pm, in the Waimakariri District Council Chambers, 215 High Street, Rangiora.

There being no further business, the meeting closed at 6.03pm.

CONFIRMED

_____
Chairperson
Carolyn Latham

_____
Date