Discharge of Treated Wastewater from the Riversdale Wastewater Treatment Plant to Land and to Water

APPLICATION FOR RESOURCE CONSENT AND ASSESSMENT OF ENVIRONMENTAL EFFECTS
PREPARED FOR THE SOUTHLAND DISTRICT COUNCIL | June 2021

We design with community in mind

Stantec

Revision Schedule

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Form 9 of the Resource Management Act 1991

Application for Resource Consent under section 88 of the Resource Management Act 1991

To: Environment Southland
Private Bag 90116
Invercargill 9840

From: Southland District Council (District Assets)
15 Forth Street
P O Box 903
Invercargill 9840

1. The Applicant

Southland District Council (the applicant) applies for the following resource consent:

- A discharge permit to discharge treated wastewater to land and to water, for a term of five years.

2. The activity to which the application relates (the proposed activity) is as follows:

- To discharge treated wastewater and contaminants to water (the Meadow Burn) from the Riversdale Wastewater Treatment Plant; and
- To discharge treated wastewater and contaminants into land via the base of a soakage channel as part of the Riversdale Wastewater Treatment Plant.

The applicant holds discharge permit AUTH-20147220-01 which authorises the discharge of an average daily flow of up to 260 m^3 / day of treated wastewater and contaminants to land and to surface water from the Riversdale Wastewater Treatment Plant. The current permit expires 5 October 2021.

3. The site at which the proposed activity is to occur is as follows:

The Riverdale Wastewater Treatment Plant is located at the eastern end of Essex Street, Riversdale on land legally described as Part Lots 5 and 6 DP 92, Part Sec 509, Hokonui SD: Part Lot 3 DP 15122 Lot 7 DP 92, Lot 8 DP 92. The discharges are proposed to occur:

- From the existing Riversdale Wastewater Treatment Plant outfall located on the true right bank of the Meadow Burn at approximate map reference NZTM E1271094 N4907934; and
- Through the base of the existing soakage channel constructed immediately adjacent to the Riversdale Wastewater Treatment Plant oxidation pond at approximate map reference NZTM E1271081 N4908103.

4. The name and address of the owner and occupier of the site is:

i. Southland District Council, 15 Forth Street, Invercargill 9840 (Riversdale Wastewater Treatment Plant and soakage channel);
ii. The Crown, C/- Department of Conservation, P O Box 743, Invercargill 9840 (the Meadow Burn).

5. There are no other activities that are part of the proposal to which this application relates.

6. The following additional resource consents are needed for this proposal and are applied for in conjunction with this application:

An application to cancel and to vary specified conditions in associated permit AUTH-20147220-02 is made in association with, and in parallel to this application (see separate application form included in this application document).

7. **Attached is an assessment of the proposed activity's effect on the environment that —**
   a) includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and
   b) addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and
   c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

8. Attached is an assessment of the proposal against the matters set out in Part 2 of the Resource Management Act 1991; and

9. Attached is an assessment of the proposal against the relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act.

10. The value of the investment of the existing consent holder is approximately $3.16 Million based on the replacement value of the Riversdale wastewater network, with the value of the treatment plant and investment to date in the proposed RIB scheme in the order of $1.0 Million. A further $2.6 Million has been budgeted between 2021 and 2023 to implement the land discharge scheme in compliance with AUTH-20147220-02.

11. Attached is the following further information as required to be included in this application by the Southland Regional Effluent Land Application Plan, Southland Regional Water Plan, the proposed Southland Water and Land Plan, the Resource Management Act 1991, and any regulations made under that Act.

Dave Inwood

Asset Manager Wastewater: Southland District Council

Date: 2 June 2021

Address for service

Stantec New Zealand
PO Box 13-052
Christchurch 8141

Attention: Janan Dunning
Telephone: 03 341 4790
Email: janan.dunning@stantec.com

Form 10 of the Resource Management Act 1991

Application to Change or Cancel a Resource Consent Condition under section 127 of the Resource Management Act 1991

To: Environment Southland
Private Bag 90116
Invercargill 9840

From: Southland District Council (District Assets)
15 Forth Street
Invercargill 9810

1. The Applicant

The Southland District Council (the applicant) applies to cancel and to change specified conditions of discharge permit AUTH-20147220-02.

2. **The name and address of the owner and occupier of the site is:**

iii. Southland District Council, 15 Forth Street, Invercargill 9840 (Riversdale Wastewater Treatment Plant and soakage channel);
iv. The Crown, C/- Department of Conservation, P O Box 743, Invercargill 9840 (the Meadow Burn).

3. **This application relates to the following resource consent**:

AUTH-20147220-02 which authorises the consent holder *to discharge treated wastewater from the Riversdale oxidation pond to land via Rapid Infiltration Beds and a soakage channel and to water in the Meadow Burn via a soakage channel*.

4. **The application relates to the following conditions**:

Conditions 3, 4(a), 4(c), 4(d) and 5, and insertion of a proposed new condition.

5. The proposed changes to AUTH-20147220-02 are as follows:

i. Cancel Condition 3 in its entirety

ii. Amend Condition 4 as follows:

4. ~~If the Consent Holder determines that the proposed~~ Prior to using the Rapid Infiltration Basins ~~are to be constructed and used, then~~, the consent holder shall:
a) [Cancel Condition 4(a)]
b) [Retain Condition 4(b) as drafted, with incidental renumbering]
c) [Amend as follows:]
*construct and commission the Rapid Infiltration Basins ~~shall be constructed~~ and ensure they are operational by no later than 31 May ~~2021~~ **20XX**[1];*
d) [Cancel Condition 4(d)]. Replace with new condition 4A as follows:

4A. *This consent will lapse (as per s125 of the Resource Management Act 1991) if the Rapid Infiltration Basins are not built and operational by 31 May 20XX*[2].

[1] This date being five years from the date of issue.
[2] This date being the same as for condition 4(c)

5(b) ~~Te Ao Marama Inc. (ph (03) 931 1242)~~ *Hokonui Runanga (ph (03) 208 7954);*

14. The consent holder shall submit a report *to Environment Southland, Attn: Compliance Manager and to Hokonui Rūnanga* every two years from the date of granting this consent to the Consent Authority prior to 30 June.

6. The site that the change relates to is:

The Riversdale Wastewater Treatment Plant, Essex Street, Riversdale.
The Meadow Burn, Riversdale, Southland

7. The other activities that are part of this proposal to which this application relates:

An application to replace discharge permit AUTH-20147220-01 authorising the discharge of treated wastewater to land and water at the Riversdale WWTP is lodged concurrently with this application (see previous application form).

8. Attached is an assessment of the proposed change and cancelation of condition's effect on the environment that —

a) includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and

b) addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

9. Attached is an assessment of the proposed activity against:

the matters set out in Part 2 of the Resource Management Act 1991.

10. Attached is an assessment of the proposed activity against:

any relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act.

11. Attached is an assessment of effects of the proposed cancellation and change of conditions, and information as required to be included in this application by the Southland Regional Effluent Land Application Plan, Southland Regional Water Plan, the proposed Southland Water and Land Plan, the Resource Management Act 1991 including s127(3) of that Act, and any other regulations made under that Act. The information has been provided in sufficient detail to satisfy the purpose for which it is required.

Dave Inwood

Asset Manager Wastewater: Southland District Council

Date: 2 June 2021

Address for service

Stantec New Zealand
PO Box 13-052
Christchurch 8141

Attention: Janan Dunning
Telephone: 03 341 4790
Email: janan.dunning@stantec.com

Executive Summary

The Southland District Council (SDC) holds discharge permit AUTH-20147220-01 issued October 2016, authorising the discharge of treated wastewater from the Riversdale Wastewater Treatment Plant (WWTP) to land via a soakage channel, and to water (the Meadow Burn). The applicant also holds discharge permit AUTH-20147220-02, also issued 5 October 2016, which authorises the long-term (to 1 April 2037) discharge of treated wastewater to land via the soakage channel, to land utilising Rapid Infiltration Basins (RIB's), and to the Meadow Burn in emergency or extreme weather events.

Current discharges are authorised by AUTH-20147220-01 (the existing discharge permit) which expires 5 October 2021. The consent was issued for a five-year term which was considered adequate time to construct the RIB-based land disposal scheme authorised by AUTH-20147220-02. The applicant has made substantial progress toward the design of the RIBs and other changes associated with the RIB land disposal scheme, however construction of the RIBs has been prevented by delays in acquiring the necessary land area adjacent to the WWTP.

AUTH-20147220-02 includes milestone conditions which are intended to ensure the design and construction of the RIB scheme remains on track to be commissioned and operational before the existing discharge permit expires. To date, these milestones have been met, and the project was running to programme. However, with delays purchasing the land for the RIBs, it has become evident that the milestone dates in condition 4 of AUTH-20147220-02 for constructing the RIBs, and for land-based disposal to become operational will not be met.

In granting the existing discharge permit with a five-year term, no provision for significant programme delays was allowed for, as it was anticipated that there would be a timely transition from discharging wastewater to the soakage channel and the Meadow Burn, to the RIB scheme. Similarly, while AUTH-20147220-02 provides for the discharge of treated wastewater to land until April 2037, it is solely on the proviso that the discharge occurs via RIBs and the soakage channel, with discharges to the Meadow Burn limited to emergencies or extreme weather events. The consequence of the delayed land purchase therefore is that the current discharge permit will expire in October 2021 before the RIBS can be built, the milestone date for the construction of the RIBs will be missed, and the applicant will not have a consented discharge route for treated wastewater from the Riversdale WWTP until the RIBs are completed.

The applicant now seeks to replace the existing discharge permit with a new five-year permit to enable discharges to lawfully continue until land purchase can be completed, and the RIBs constructed and commissioned. The applicant considers that the five-year term will be adequate to complete and commission the RIB-based scheme. Application is also made to vary or cancel several conditions of AUTH-20147220-02 to align with the term of the replacement discharge permit while still holding the consent holder to account in respect of completing the scheme. Once the RIB scheme is operational, treated wastewater from the Riversdale WWTP will be discharged to land with operational discharges to the Meadow Burn permanently ceasing. The SDC remains committed to the RIB-based scheme and expects to commission it before the end of the term now applied for.

The discharges are described in Section 3.0 of this document. The nature and sensitivity of the receiving environment is described in Section 4.0, which notes the values of the Meadow Burn, including the cultural value placed on it by mana whenua and the community.

The assessment of environmental effects in Section 6.0 describes the scale and nature of the effects of the current discharge on both land and water receiving environments, including the positive effects of the discharge to the soakage channel in reducing the effect on the Meadow Burn. The applicant proposes to continue to discharge treated wastewater as provided for by the current permit and consent conditions and continue to focus on progressing the RIB scheme as quickly as possible. The conditions have required monitoring and reporting of the effects of the discharge on the quality of the receiving environments, and this information forms the basis of the effects assessment for this application.

The current discharge to land is classified as a discretionary activity under the rules of the Southland Regional Effluent Land Application Plan (RELAP) and the discharge to water is a non-complying activity under the rules of the Southland Regional Water Plan (RWP). The discharge to land is classified as a discretionary activity under the rules of the proposed Southland Water and Land Plan (pSWLP), while the discharge to water is a non-complying activity under the pSWLP. Overall, the discharges are not contrary to the objectives and policies of the relevant operative and proposed regional plans and are consistent with the purpose of the RMA, and there is no regulatory barrier to the new permit and the amendments to AUTH-20147220-02 being granted as applied for.

RESOURCE MANAGEMENT ACT SCHEDULE FOUR CHECKLIST

This application document has been completed as required by s88 and the Fourth Schedule of the RMA and is therefore complete and able to be accepted as lodged.

Information Required	Document Location
Description of the activity.	Section 3
Description of the site at which the activity is to occur.	Section 3 and 4
Full name and address of each owner or occupier of the site.	Refer to RMA Form 9 and 10 above
Description of any other activities that are part of the proposal to which the application relates.	All activities that are part of this proposal are described in Section 3 of this document.
Description of any resource consents required for the proposal to which the application relates.	Section 2 and Section 5
An assessment of the activity against the matters set out in Part 2.	Section 10
An assessment of the activity against any relevant provisions of a document referred to in Section 104(1)(b), including: a) Any relevant objectives, policies or rules in a document; and b) Any relevant requirements, conditions or permissions in any rules in a document; and c) Any other relevant requirements in a document (for example, in a national environmental standard or other regulations).	Section 10 addresses: • National Policy Statement for Freshwater Management 2020 • Southland Regional Policy Statement • Southland Regional Water Plan • Southland Regional Effluent Land Application Plan • Proposed Southland Water and Land Plan No national environmental standards apply.
If any permitted activity is part of the proposal to which the application relates, a description of the permitted activity that demonstrates that it complies with the requirements, conditions, and permissions for the permitted activity.	Not applicable
If the application is affected by Section 124 or 165ZH(1)(c) (which relate to existing resource consents), an assessment of the value of the investment of the existing consent holder (for the purposes of Section 104(2A).	Section 10.1.1.6
If the activity is to occur in an area within the scope of a planning document prepared by a customary marine title group under section 85 of the Marine and Coastal Area (Takutai Moana) Act 2011, an assessment of the activity against any resource management matters set out in that planning document (for the purpose of Section 104(2B)).	Not applicable
If it is likely that the activity will result in any significant adverse effects on the environment, a description of any possible alternative locations or methods for undertaking the activity.	Section 7 While no significant adverse effects are anticipated, the proposal involves the discharge of contaminants and

Information Required	Document Location
	therefore alternatives must be considered as required under s105(1) RMA.
An assessment of the actual or potential effect of the activity on the environment.	Section 6
If the activity includes the use of hazardous installations, an assessment of any risks to the environment that are likely to arise from such use.	The activity does not include the use of hazardous installations.
If the activity includes the discharge of any contaminant, a description of: i. The nature of the discharge and the sensitivity of the receiving environment to adverse effects; and ii. Any possible alternative methods of discharge, including discharge into any other receiving environment.	Sections 3, 4 and 7
A description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effects.	Section 9
Identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted.	Section 8
If the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved.	Section 9
If the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).	Not applicable
Any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects.	Section 6
Any physical effect on the locality, including any landscape and visual effects.	Section 6
Any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity.	Section 6
Any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations.	Section 6
Any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants.	Section 3, 4 and 6
Any risk to the neighbourhood, the wider community, or the environment through natural hazards or hazardous installations.	Section 6

1.0 INTRODUCTION

The Southland District Council (the applicant) provides for the safe and effective treatment and disposal of wastewater in Southland District as one of its core local government functions. The applicant achieves this for the Riversdale community through the Riversdale Wastewater Treatment Plant (WWTP). Riversdale is a small town on State Highway 94 between Gore and Lumsden, which has a normally resident population of approximately 420 people.

The applicant holds discharge permit AUTH-20147220-01 (**Appendix A**) which authorises treated wastewater from the Riversdale WWTP to be discharged to land via the base of a soakage channel at the WWTP site. Wastewater that does not soak to ground is discharged to the Meadow Burn at a defined maximum rate as prescribed in the conditions of that permit.

The applicant also holds permit AUTH-20147220-02 (also attached in Appendix A) which provides for Riversdale's wastewater to be discharged to land via Rapid Infiltration Beds (RIBs) which are yet to be built, and for discharges to the Meadow Burn only in emergency situations. The intention was for the latter permit to replace the first permit before it expired.

This document constitutes an application to:

- Replace discharge permit AUTH-20147220-01 to enable the discharge to land via the soakage channel, and to the Meadow Burn to lawfully continue for a further five years beyond the current expiry date; and
- Amend the conditions of AUTH-20147220-02 to reflect changes to milestone dates relating to the construction and commissioning of the RIB scheme, and other related incidental changes.

This application has been prepared in accordance with the requirements of s88 and the Fourth Schedule of the RMA. It includes a description of the activity and the nature of the discharges, an assessment of the actual and potential effects associated with the discharges on the environment, and the ways in which the adverse effects of the activity can be avoided, remedied or mitigated including through proposed consent conditions.

1.1 BACKGROUND

Wastewater in Riversdale is received at and treated in a single stage oxidation pond that was built and commissioned in 1974 when the town's sewerage scheme was built. From the outset, the oxidation pond treated the town's wastewater and discharged it to the Meadow Burn, immediately east of, and adjacent to the oxidation pond. Subsequent improvements were made to the scheme, ultimately including the addition of a soakage channel, which functions as a land-based infiltration system, discharging treated wastewater to land. The previous and current discharge permits allowed for the discharge of treated wastewater to the Meadow Burn when wastewater volumes exceeded the rate of infiltration through the base of the channel, due to high groundwater levels for example.

The Riversdale WWTP has been upgraded several times since it was built, to better facilitate effective treatment and land-based discharge, and to reduce the frequency of discharges to the Meadow Burn. In 2014 the Southland District Council (the applicant) applied for resource consent to build and operate a land-based disposal scheme using Rapid Infiltration Basins (RIBs), while still retaining the existing soakage channel and the ability to lawfully discharge treated wastewater to the Meadow Burn in emergency or extreme weather events. Resource consents AUTH-20147220-01 and 02 were issued in 2016 by Environment Southland and the applicant has been working to progress the RIB scheme since then. Both permits are described in more detail in the following sections.

1.1.1 Discharge Permit AUTH-20147220-01

In September 2014, the applicant lodged an application with Environment Southland for a five-year discharge permit to (essentially) continue the incumbent discharge of treated wastewater to the on-site soakage channel and to the Meadow Burn. The scheme involved continuing to treat influent in the single stage oxidation pond before discharging an annual average daily flow of 260 m^3/day to the soakage channel to discharge to land through the channel base.

The permit also anticipated the discharge of treated wastewater from the soakage channel to the Meadow Burn at a rate of <1 L/sec from December to March, and <2 L/sec from April to November where inflows exceeded the soakage rate. Discharges from the soakage channel to the Meadow Burn at rates greater than those specified above were authorised only when there was a risk of the channel or oxidation pond overflowing, such as could occur as a result of sustained heavy rainfall and / or high groundwater levels.

The short term of the permit was to allow for monitoring and site investigations to be undertaken in respect of the proposed RIB scheme. The longer-term consent for the RIB scheme was applied for in parallel and was to be subject to the scheme being proven as feasible during the term of AUTH-20147220-01. In the event that investigations concluded that the RIB scheme was not feasible in this location, the applicant would need to identify an alternative method of managing treated wastewater and secure any necessary consents prior to the expiry of AUTH-20147220-01.

Investigations and modelling undertaken since 2017 have confirmed that the RIB scheme is feasible on land adjacent to the WWTP site. The applicant now applies to replace AUTH-20147220-01 with a like-for-like discharge permit with a term of five years, to enable the RIB scheme to be completed and commissioned. Once it is operational, the RIB scheme will enable operational wastewater discharges to the Meadow Burn to permanently cease.

1.1.2 Discharge Permit AUTH-20147220-02

In parallel with the 2014 application above, a permit to discharge treated wastewater via the RIB scheme was also sought (AUTH-20147220-02). The RIB scheme consists of treated wastewater discharged to land via the soakage channel, to land via a series of RIBs to be constructed to the immediate west of the oxidation pond, and to the Meadow Burn from the soakage channel only in the event of an emergency caused by a natural disaster, or where inflows are excessive because of extreme weather. The permit was granted and expires in April 2037. The permit includes a series of milestones in condition a requiring the consent holder to:

(a) Assess and confirm by 31 May 2019 that the proposed RIBs can accept predicted wastewater flows

(b) Provide by 31 May 2020, detailed design and specifications of the RIBs to Environment Southland

(c) Build the RIBs by no later than 31 May 2021; and

(d) That if the RIBs are not operational by 31 May 2023, AUTH-20147220-02 will lapse.

The applicant has met milestones (a) and (b), however due to the delays to the project, cannot meet condition (c), and is consequentially unlikely to be able to meet condition (d). The applicant therefore seeks to vary or cancel several conditions as set out in Section 5.0 of this document, so AUTH-20147220-02 aligns with the term of the new discharge permit applied for to replace AUTH-20147220-01, to provide time to construct the RIBs and implement the land discharge scheme. An assessment of the effects of the proposed variations is included in Section 6.0 of this document.

2.0 PURPOSE OF THIS APPLICATION

When issuing AUTH-20147220-01, the five-year term of that permit was considered to provide adequate time to construct and commission the RIB scheme. Delays in developing the RIB scheme however has meant that while the scheme design and remaining site investigations have been progressed, the construction has not been able to occur. This delay was clearly not anticipated or allowed for in the five-year term sought for the existing discharge permit, and further time is required to:

- complete the land purchase
- complete the contractor tender process
- procure all necessary equipment and construction materials
- build the RIB scheme.

Following construction there will be a commissioning period where the RIBs will be brought online and the system sequentially and fully tested, evaluated and ultimately confirmed as operational.

The applicant needs to be able to lawfully discharge to the soakage channel and the Meadow Burn during the construction phase, and to the soakage channel, RIBs and Meadow Burn during the commissioning process while the scheme is being optimised and any operational issues resolved. Given the time needed to complete construction and commissioning, it is clear that the RIB scheme will not be complete before AUTH-20147220-01 expires on 5 October 2021, or by the milestone date in Condition (4)(c) and (4)(d) of AUTH-20147220-02. This application is required to enable discharges to lawfully continue until the RIB scheme can be built and becomes operational.

2.1 TERM

The applicant is applying for an interim discharge permit for five years, being the period necessary to complete the land purchase, construct, commission and test the scheme, and to allow a prudent amount of contingency to accommodate any further unanticipated delays such as:

- construction delays, including as a result of land access arrangements, seasonal and extreme weather events, and contractor and equipment availability and resourcing
- a commissioning period of up to six months, including allowing for seasonal constraints (e.g. avoiding initial testing during seasonal peak loads and periods of extreme weather, then subsequently testing under peak loads and extreme weather).

The applicant remains committed to land disposal via the proposed RIBs and ending operational discharges to the Meadow Burn as soon as possible, and the five-year term applied for is considered to be a prudent timeframe needed to achieve that goal. The key delay relates to land purchase – the applicant has advanced the design of the scheme and has prepared tender documents to let contracts for all remaining work, however this work is contingent on securing the land. While construction is yet to commence, it will advance with urgency once the land purchase is complete.

Table 2-1 sets out the applicant's current preferred programme and demonstrates its commitment to advancing land disposal as fast as possible. The table sets out an indicative programme based on circumstances at the time of this application.

Table 2-1: Indicative RIB Scheme Programme

Action	Anticipated Completion Date *
Land purchase	October 2024
Construction of the RIBs	April 2025
Commissioning of the RIBs and land disposal	August 2025
Targeted date for operational scheme	October 2025

* Note that these dates are indicative, based on a worst-case scenario involving Public Works Act and legal processes.

2.2 REGIONAL PLAN RULES

Under the rules of Southland's regional plans, discharges of treated wastewater to land and water cannot be lawfully undertaken without discharge permits being granted. The relevant rules are contained in the Southland Regional Effluent Land Application Plan (RELAP), the Southland Regional Water Plan (RWP), and the proposed Southland Water and Land Plan (pSWLP).

The RELAP and the RWP are the currently operative regional plans and are to be afforded full weight in determining this application. The pSWLP will ultimately replace the RELAP and RWP.

The rules of the pSWLP took immediate legal effect when the proposed plan was notified in 2016. Provisions amended as a result of the hearing process in 2017 took effect following the issuing of the hearing panel's decision in April 2018. Much of the pSWLP was appealed, and it is currently progressing through the Environment Court process. Both Rule 33 and Rule 33A, which apply to the discharges from the WWTP, have been appealed. Both rules have legal effect and must therefore be taken into account in determining the application, however the final

form and status of those rules is currently unresolved. Consequently, full weight cannot be placed on those rules until the Court's decision is issued, and the rules are beyond challenge.

The applicable regional rules are set out in Table 1-2, with grey shading indicating the currently operative rules.

Table 2-2: Regional Plan Rules Assessment

Regional Plan / Rule	Rule and Assessment	Status
Regional Effluent Land Application Plan (RELAP) **Rule 5.2.1**	The discharge of effluent **onto or into land** from a community sewage scheme is a discretionary activity	**Discretionary**
Proposed Southland Water and Land Plan (pSWLP) **Rule 33** (under appeal)	Discharges of effluent or biosolids **onto or into land** from a community sewerage scheme in circumstances where contaminants may enter water are discretionary activities subject to compliance with setbacks from waterbodies, places of assembly or dwellings, or authorised water abstraction points.	**Discretionary**
Regional Water Plan (RWP) **Rule 2**	Discharges of contaminants to **surface water** that do not reduce the quality of the receiving water below the water quality standards, after reasonable mixing, in Appendix F of the RWP are discretionary activities under Rule 1. Discharges which do cause water quality to fall below those standards are non-complying activities under Rule 2.	**Non-complying**
Proposed Southland Water and Land Plan (pSWLP) **Rule 33A** (under appeal)	The discharge of effluent or bio-solids from a community sewage scheme **into water in a river**, lake, artificial watercourse, modified watercourse or natural wetland is a non-complying activity.	**Non-complying**

Applications to vary the conditions of resource consents are to be addressed as discretionary activities as directed by s127 of the RMA.

In 'bundling' the applications, the proposed discharges require resource consent as **non-complying activities.** The 'gateway tests' of s104D of the RMA apply and are considered in detail in Section 10.1.1.7 of this application document.

3.0 DESCRIPTION OF THE ACTIVITY

3.1 WWTP LOCATION AND DESIGN

The Riversdale WWTP is located approximately 600 m to the east of the Riversdale urban area, and is reached via a private locked access (Figure 3-1). The WWTP consists of a single stage oxidation pond which discharges to an L-shaped soakage channel to the immediate west and south of the pond.

The oxidation pond was constructed in the late 1970's. It has a surface area of approximately 5,000 m^2 and approximate operating depth of 1.3 m (Stantec, 2019). The base of the pond has been constructed with a clay-liner, and the pond includes a wave band of cast in-situ concrete slabs. Wastewater is treated in the single stage oxidation pond and discharged into the adjacent L-shaped infiltration trench (Figure 3-2 and Figure 3-3).

Wastewater that does not infiltrate to land through the channel is released to the Meadow Burn at a controlled rate via a manually activated outfall. Discharges are limited to a maximum of 1 L/sec during summer, and a maximum of 2 L/sec in winter.

AUTH-20147220-01 provides for the discharge of treated wastewater from the oxidation pond to the adjacent L-shaped infiltration channel (Figure 3.1) at an annual average daily flow of 260 m^3/day.

The soakage channel is approximately 110 m long by 5 m wide, excavated into the underlying gravelly clay soils to facilitate soakage to land as the primary discharge pathway.

Figure 3-1: Location of the Riversdale WWTP and Soakage Channel

In 1999, Consent 98223 was granted for a 15-year period, authorising the discharge of treated wastewater from the pond to land via a soakage channel, and to the Meadow Burn from the channel as a contingency measure. The WWTP was upgraded in 2000 by adding the soakage channel to improve the efficiency of the discharge to land and to minimise the frequency of needing to manually discharge wastewater from the channel to the Meadow Burn. Initially, the first half of the channel comprised of a wetland with native plants; the second half consisted of a gravel infiltration trench. The infiltrative surface of the trench frequently blocked, resulting in manually controlled overflows to Meadow Burn Stream and die off of the wetland plants. To mitigate this, the entire wetland area (including vegetation) and internal berms were excavated in early 2010 to form a single, continuous 'L shaped' infiltration trench around the oxidation pond.

The channel is 135 m long by 5 m wide and was excavated into the underlying gravelly clay soils to facilitate the discharge to land as the primary discharge pathway. Despite subsequently rehabilitating the channel floor to try to further improve infiltration rates, the channel has not provided an effective land-based discharge solution and discharges to the Meadow Burn have continued.

Figure 3-2: Oxidation pond

Figure 3-3: Soakage channel and outlet

Figure 3-4: Soakage channel and discharge structure showing the Meadow Burn (on left)

Figure 3-5: Meadow Burn looking downstream

3.2 QUALITY AND QUANTITY OF WASTEWATER DISCHARGES

3.2.1 Existing Discharge Quantity

The applicant monitors influent volumes at the Riversdale WWTP. Data from September 2013 to March 2019 shows that influent wastewater ranged from 73 m^3/day to 429 m^3/day (Figure 3-6). The average daily flow over this period was 208 m^3/day, and the median was 193 m^3/day. On a daily basis, inflows regularly exceed an annual average of 260 m^3/day during winter. Data indicates a relatively stable base flow of wastewater in the order of 85 to 120 m^3/day. Inflows greater than 150 m^3/day are largely driven by infiltration into the wastewater network from rainfall and groundwater (Stantec, 2019). This means that the peaks in wastewater inflows are likely to be highly diluted.

Treated wastewater discharges to the Meadow Burn are not currently monitored but are inferred from the measured influent rates. Stantec has modelled the current discharge volumes based on site-specific climate data, actual wastewater inflows, predicted soakage and the manual discharge of up to 1 L/sec in summer and 2 L/sec in winter (Figure 3-7).

Modelled data indicates that up to approximately 35% of treated wastewater percolates to land through the base of the soakage channel (Stantec, 2019). The remainder is discharged to the Meadow Burn. Over the modelled period (2016 to 2019) between 52 m^3/day and 419 m^3/day of treated wastewater was discharged to the Meadow Burn.

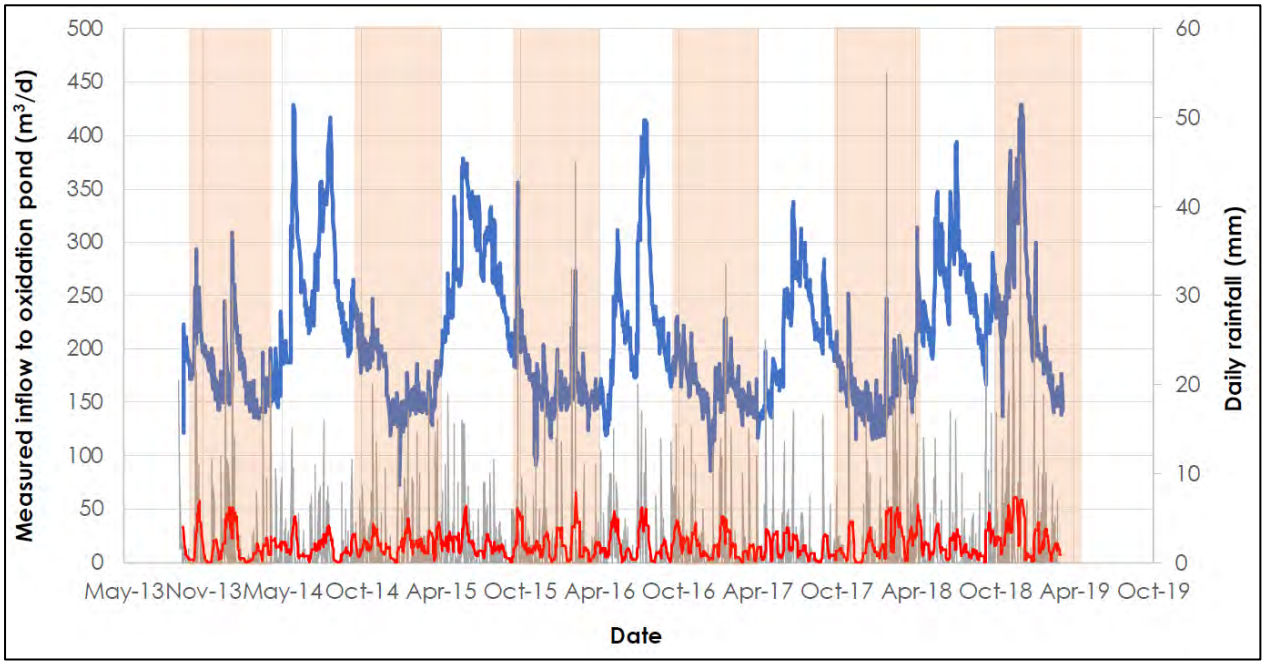


Figure 3-6: Wastewater inflow to the oxidation pond (blue) versus daily rainfall (grey) and moving average daily rainfall (red) (Stantec, 2019)

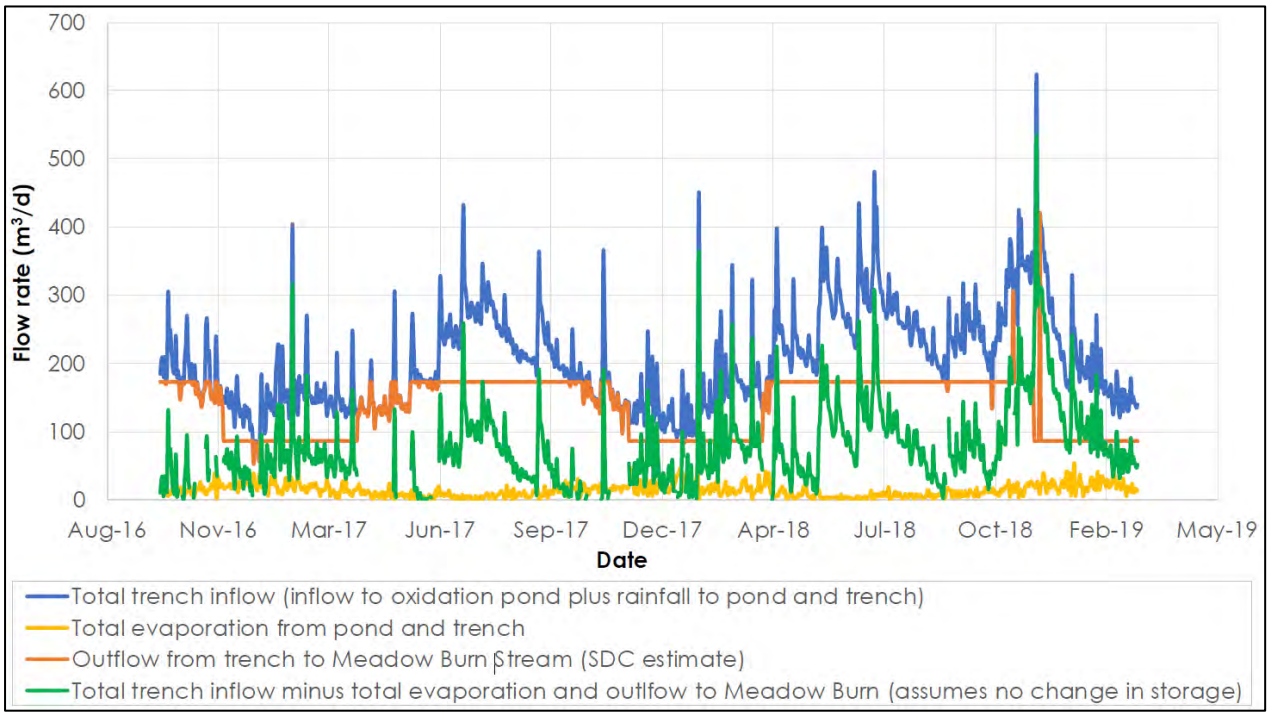


Figure 3-7: Modelled water balance for Riverdale WWTP (Stantec, 2019)

For the most part, wastewater discharge volumes over the term of the existing permit have complied with the limits set in condition 1(b) of AUTH-20147220-01 with discharges up to 1 L/sec in summer and 2 L/sec in winter. Two exceedances were identified, one on 6 December 2018 and one on 10 November 2018. These are likely to be due to high rainfall and/or groundwater conditions where storage capacity in the oxidation pond and the infiltration rate from the soakage channel were exceeded.

3.2.2 Existing Discharge Quality

Under discharge permit AUTH-20147220-01 the applicant is required to monitor the quality of treated wastewater at the end of the soakage channel prior to the discharge to the Meadow Burn. Samples are required to be collected and analysed quarterly in March, June, September, and December. The parameters to be monitored are identified in Table 3-1.

Table 3-1: Parameters to be monitored prior to discharge

Attribute	Parameter	Abbrev.	Trigger Value*	Units
Discharge volume	Rate of direct discharge from the pipe at the end of the soakage channel to the Meadow Burn	Discharge	1 (Dec-Mar) 2 (Apr-Nov)	L/sec
Physico-chemical	Temperature	Temp	-	°C
	pH	pH	-	pH units
	Electrical conductivity	EC	-	µS/cm
Sediment	Total suspended solids	TSS		g/m^3
Oxygen	Total 5-day carbonaceous biological oxygen demand	$CBOD_5$	50	g/m^3
Nutrients	Total nitrogen	TN	-	mg/L
	Total ammoniacal nitrogen	NH4	-	mg/L
	Soluble inorganic nitrogen (nitrate-nitrogen + nitrite-nitrogen + ammoniacal nitrogen)**	SIN	30	mg/L
	Total phosphorus	TP	-	mg/L
	Dissolved reactive phosphorus	DRP	10	mg/L
Bacteria	*Escherichia coli*	E. coli	-	cfu/100 ml
	Faecal coliforms	Coliforms	-	cfu/100 ml
Halogens	Fluoride	F	-	mg/L
	Chloride	Cl	-	mg/L
	Bromide	Br	-	mg/L

*Consent trigger value. There are triggers for other parameters but in surface water after mixing, not the discharge itself.
**TON instead of SIN is required to be monitored under consent AUTH-20147220-02.

A summary of discharge water quality from the last three years is provided in Table 3-2. All parameters complied with consent requirements except for $CBOD_5$. This exceeded the consent trigger value of 50 mg/L in March 2017, June 2020 and December 2020 (Figure 3-8).

Although no wastewater discharge standard for bacteria is defined in the existing consent conditions, the median and maximum levels for these parameters are expected for treated wastewater (>1,000 cfu/100 ml). Levels of suspended solids, nutrients and chlorine were also higher than typical levels during those sampling rounds.

Table 3-2: Summary of discharge water quality (Mar 2017 to Dec 2020)

Attribute	Abbrev.	Trigger Value	Units	Min	Med	Max
Discharge volume	Discharge	1 (Dec-Mar) 2 (Apr-Nov)	L/sec	No data		
Physico-chemical	Temp	-	°C	4.10	10.50	17.40
	pH	-	pH units	7.13	8.26	9.59
	EC	-	µS/cm	316	432	546
Sediment	TSS	-	g/m^3	5.8	65	130
Oxygen	$CBOD_5$	50	g/m^3	7.6	22.0	80.0
Nutrients	TN	-	mg/L	8.90	19.50	28.00
	NH4	-	mg/L	5.60	10.50	21.00
	SIN**	30	mg/L	No data		
	TON**	-	mg/L	0.07	0.38	2.00
	TP	-	mg/L	1.30	2.95	5.30
	DRP	10	mg/L	0.27	1.75	3.40
Bacteria	E. coli	-	cfu/100 ml	90	1850	68000
	Coliforms	-	cfu/100 ml	91	4500	71000
Halogens	F	-	mg/L	0.03	0.06	0.26
	Cl	-	mg/L	20.00	26.85	34.00
	Br	-	mg/L	0.04	0.07	0.08

**Total oxidized nitrogen (TON) is monitored, not SIN. TON is required to be monitored under consent AUTH-20147220-02.

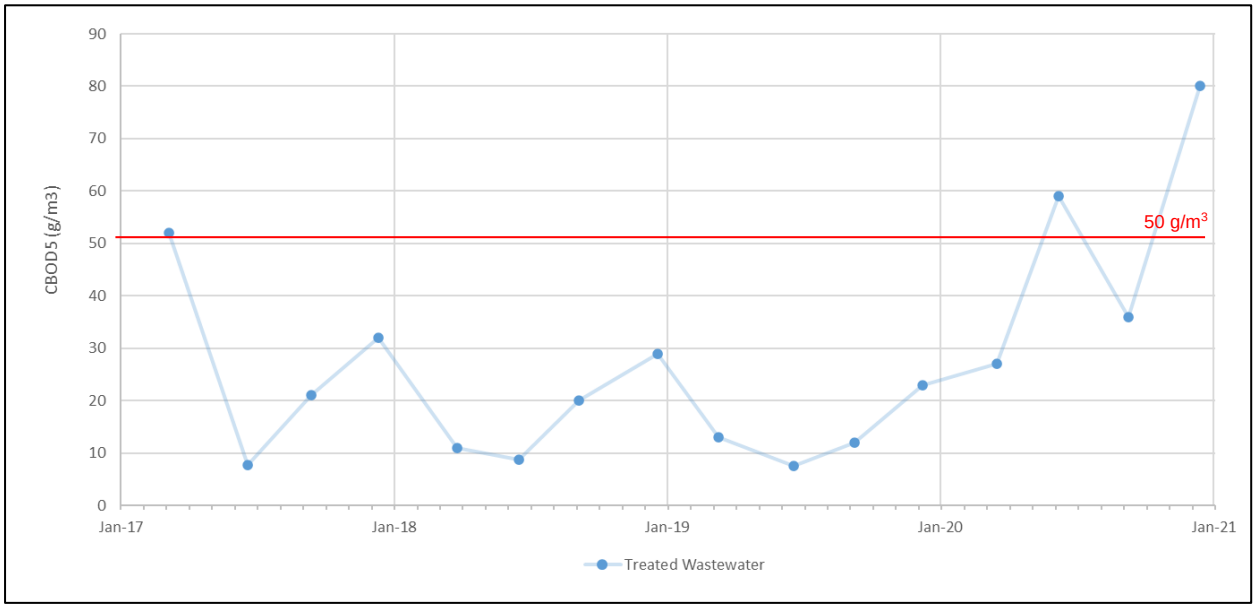


Figure 3-8: $CBOD_5$ concentrations in the discharge (Mar 2017 to Dec 2020)

3.2.3 Forecast Wastewater Quantity and Quality

No changes are expected to the quantity or quality of the wastewater discharged from the WWTP during the term of the consent applied for.

Riversdale has a usually resident population of approximately 420 people, that is considered to be stable and unlikely to significantly change over the next five years. Riversdale's wastewater is domestic in character with no significant commercial or industrial component, and no significant residential, commercial or industrial connections expected. There are also no changes planned to Riversdale's wastewater network over the next five years, such as extensions or upgrades to accommodate growth. A district-wide inflow and infiltration programme is currently under way, and Riversdale will be investigated within the next two years.

The quantity and quality of the influent wastewater is therefore expected to remain consistent with current conditions over the next five years, and therefore the quality of treated wastewater discharges is also expected to be substantially similar to current conditions.

3.2.4 Receiving Environment Monitoring

Under discharge permit (AUTH-20147220-01) the applicant is required to monitor the water quality within the Meadow Burn five metres upstream, 50 m downstream, and 800 m downstream of the WWTP discharge (Figure 4-6) in addition to monitoring the treated wastewater in the soakage channel (refer section 3.2.2).

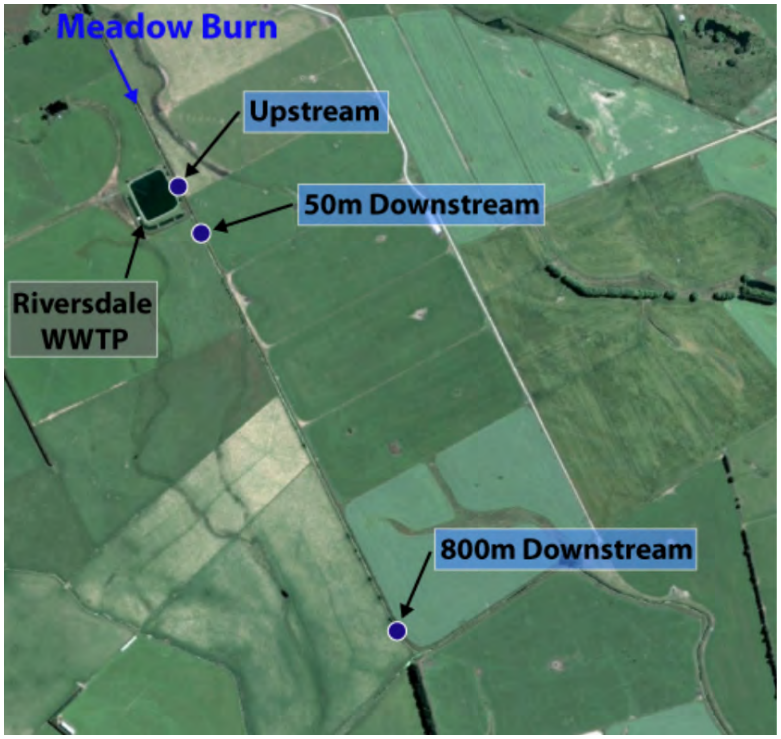


Figure 4-9: Meadow Burn sampling sites (Ryder Environmental, 2019)

The most recent accessible data on receiving water quality is included in the monitoring data captured by the applicant in undertaking the required monitoring programme, with samples upstream of the WWTP being taken at each sampling round to determine background water quality, and to enable the effect of the discharge to be determined.

Under the current conditions of AUTH-20147220-01, receiving environment samples are required to be collected and analysed quarterly in March, June, September, and December. The parameters to be monitored are summarised in Table 3-1. Most of these parameters are also monitored in the discharge.

For the purposes of this application, water quality for the Meadow Burn has been assessed against the consent trigger values, as well as the Water Quality Standards in Appendix G of the RWP and Appendix E of the pSWLP. It is noted that the Spring Fed standards set in the RWP and the pSWLP are the same. There are no default guideline values for fluoride, chloride or bromide in the Australia and New Zealand Standard (2018), although a trigger value for fluoride is in development. National Bottom Lines set at a catchment level through the National Policy Statement for Freshwater Management (2020) (NPSFM) are also referenced for comparison but do not form part of the applicable trigger values for the purposes of this permit application.

In addition to the parameters listed in Table 4-4, for the permit to be able to be granted, the discharge must not result in any of the following effects after reasonable mixing (i.e. at a point 50 m downstream of the discharge to the Meadow Burn[3]):

- The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
- Any conspicuous change in colour or visual clarity;
- Any emission of objectionable odour;
- The rendering of fresh water unsuitable for consumption by farm animals;
- Any change in the natural water temperature of more than 3 degrees Celsius;

[3] In accordance with s107(1) of the Resource Management Act 1991

- Any change in the pH outside of the range of 6.0 to 9.0, except when due to natural causes;
- A reduction in the oxygen content in solution to less than 6 milligrams per litre; or
- Any destruction of natural aquatic life as a result of a concentration of toxic substances.

The description of the activity in Section 3.0 and the assessment of effects in Section 6.0 of this document demonstrates that, for the parameters that have been measured the above effects have not been identified as a result from the WWTP discharge. Specifically, there is no conspicuous visual or odour effect resulting from the discharge, the suitability of the stream for stock water is not compromised, and the effect on temperature, pH, oxygen content and aquatic life is not statistically significant.

The reasonable mixing zone has been determined through the consent process for AUTH-20147220-01 as being 50 m downstream. This is proposed to be retained for the purposes of ongoing monitoring, and the ability to compare previous monitoring data with future WWTP performance and receiving environment effects. Monitoring and observation have not identified that the WWTP discharge results in the effects specified in above, beyond the mixing zone.

Table 3-3: Regional Plan Parameters to be monitored in the Meadow Burn

Attribute	Parameter	Abbrev.	Consent Trigger Value	Spring Fed Streams	NPSFM Bottom Line	Units
Physico-chemical	Temperature	Temp	-	≤21 all year ≤11 May-Sep ≤1or3 change	-	°C
	pH	pH	-	6.5-9	-	pH units
	Electrical conductivity	EC	-	-	-	µS/cm
Sediment	Turbidity	NTU		-	-	NTU
Oxygen	Dissolved oxygen (mg/L)	DO mg/L		-	4.0 min Nov to Apr	mg/L
	Dissolved oxygen (%)	DO %		>99	-	%
Nutrients	Total nitrogen	TN	-	-	-	mg/L
	Total ammoniacal nitrogen	NH4	0.9	-	0.40 max* 0.24 med*	mg/L
	Soluble inorganic nitrogen (nitrate-nitrogen + nitrite-nitrogen + ammoniacal nitrogen)**	SIN	-	-	-	mg/L
	Total phosphorus	TP	-	-	-	mg/L

	Dissolved reactive phosphorus	DRP	-	-	-	mg/L
Bacteria	*Escherichia coli*	E. coli	1,000	-	-	cfu/100 ml
	Faecal coliforms	Coliforms	-	1,000	-	cfu/100 ml
Halogens	Fluoride	F	-	-	-	mg/L
	Chloride	Cl	-	-	-	mg/L
	Bromide	Br	-	-	-	mg/L

*Based on pH of 8 and temperature of 20°C.
**TON not SIN is required to be monitored under consent AUTH-20147220-02.

The NPSFM identifies national bottom lines required to be met for water quality and ecology parameters as well as attribute bands (A, B, C and D) to classify water based on these parameters. Attributes requiring limits on resource use, as per Appendix 2A of the NPSFM, and assessed in this AEE where appropriate are:

- Periphyton (trophic state)
- Ammonia (toxicity)
- Nitrate (toxicity)
- Dissolved oxygen (below point sources only)
- Suspended fine sediment
- Escherichia coli (E. coli); Human contact
- Cyanobacteria (planktonic); Human contact

Additional parameters that have been assessed in this application include those listed in Appendix 2B of the NPSFM 2020 as attributes requiring action plans:

- Macroinvertebrates
- Deposited fine sediment
- Dissolved reactive phosphorus

3.2.4.1 Results of Water Quality Monitoring

Discharge permit AUTH-20147220-01 was issued in October 2016 and water quality data has been collected quarterly commencing March 2017. As the proposed activity is simply to continue to undertake the activity as provided for by that permit until the discharge can be moved to the proposed RIB scheme, the monitoring results from March 2017 to date are considered to be an accurate reflection of the future operation of the WWTP for the term of the permit sought, as well as an indication of the effects of the activity on the receiving environment.

Table 4-6 presents a summary of water quality monitoring results from March 2017 to December 2020 for each quarter during that period. The parameters that have previously exceeded trigger values are identified.

Table 3-4: Summary of surface water quality data in the Meadow Burn (Mar 2017 to Dec 2020)

Attribute	Abbrev.	Trigger Value	Units	5 m Upstream			50 m downstream			800 m downstream		
				Min	Med	Max	Min	Med	Max	Min	Med	Max
Physico-chemical	Temp	≤21 all year ≤11 May-Sep ≤1or3 change	°C	7.90	11.45	15.50	8.40	11.10	14.10	7.40	11.00	14.60
	pH	6.5-9	pH units	6.68	6.84	7.06	6.69	6.92	7.21	6.67	7.03	7.55
	EC	-	µS/cm	155	163	174	159	171	208	158	169	186
Sediment	NTU	-	NTU	0.2	1.2	3.0	0.9	2.1	8.1	0.9	2.2	6.4
Oxygen	DO mg/L	4.0 min Nov to Apr	mg/L	5.80	8.85	11.10	1.40	8.40	10.90	0.80	8.85	13.20
	DO %	>99	%	No data								
Nutrients	TN	-	mg/L	4.10	4.65	6.00	4.10	4.95	6.30	1.80	4.85	5.80
	NH4	Consent: 0.9 NPS: 0.4	mg/L	0.01	0.02	0.38	0.03	0.33	1.20	0.03	0.17	0.38
	SIN*	-	mg/L	No data								
	TON*	-	mg/L	2.80	4.25	5.10	2.80	4.00	4.70	0.44	4.30	4.80
	TP	-	mg/L	0.01	0.01	0.29	0.01	0.09	0.51	0.03	0.08	0.20
	DRP	-	mg/L	0.01	0.01	0.06	0.01	0.07	0.28	0.01	0.05	0.12

Bacteria	E. coli	1,000	cfu/100 ml	10	60	2100	30	220	9200	10	295	2200
	Coliforms	1,000	cfu/100 ml	10	65	2300	30	295	10000	20	370	2600
Halogens	F	-	mg/L	0.04	0.05	0.08	0.04	0.05	0.06	0.04	0.05	0.14
	Cl	-	mg/L	7.29	8.08	8.50	7.90	8.58	11.00	7.40	8.51	9.90
	Br	-	mg/L	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03	0.04

*Total oxidized nitrogen is monitored, not SIN. TON is required to be monitored under consent AUTH-20147220-02.

The results set out in Table 4-6 show that ammoniacal nitrogen exceeded the limit condition 12 of AUTH-20147220-01 once since 2017. On 12 March 2019 levels of ammoniacal nitrogen peaked at 1.2 mg/L at the monitoring location 50 m downstream of the discharge (Figure 4-7). Data for all other monitoring events shows levels were well within the consent requirement of 0.9 mg/L. As this is a one-off exceedance and not a pattern of elevated ammoniacal nitrogen levels, it may be an anomalous result, although this cannot be confirmed.

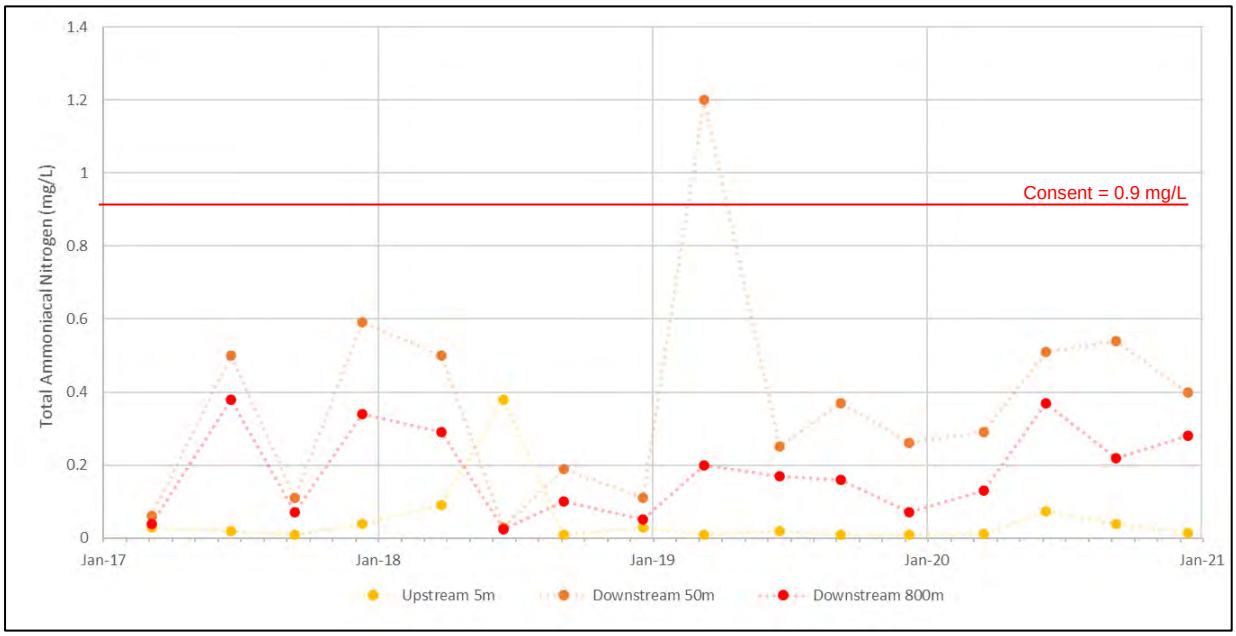


Figure 4-10: Total ammoniacal nitrogen concentrations in Meadow Burn 2017 - 2020

Table 3-5: Ammoniacal nitrogen results

Site	Year	NH_{4-} (mg/L) pH adjusted*	
		Annual median	Annual maximum
5 m Upstream	2017	0.01	0.02
	2018	0.02	0.15
	2019	0.004	0.01
	2020	0.01	0.03
	MAX	**0.02**	**0.15**
50 m downstream	2017	0.12	0.24
	2018	0.06	0.19
	2019	0.13	0.52
	2020	0.19	0.22
	MAX	**0.19**	**0.52**
800 m downstream	2017	0.08	0.16
	2018	0.04	0.11
	2019	0.07	0.08
	2020	0.12	0.16
	MAX	**0.12**	**0.16**

*As required under the NPSFM, NH_{4-} has been adjusted for pH.

Bacteria (*E. coli* and faecal coliforms) both exceeded the resource consent trigger value of 1,000 cfu/100 ml on four occasions: 19 Jun 2017, 11 December 2017, 09 February 2020 and 15 December 2020. Upstream exceedances are also evident, however. The highest recorded readings were 9,200 cfu/100 ml for *E. coli* and 10,000 cfu/100 ml

faecal coliforms at the site 50 m downstream of the WWTP on 11 December 2017. On three of the four occasions, levels were also elevated 800 m downstream, but with lower values. On most monitoring occasions, the levels at the upstream site were lower than those downstream, indicating an effect from the discharge from the WWTP.

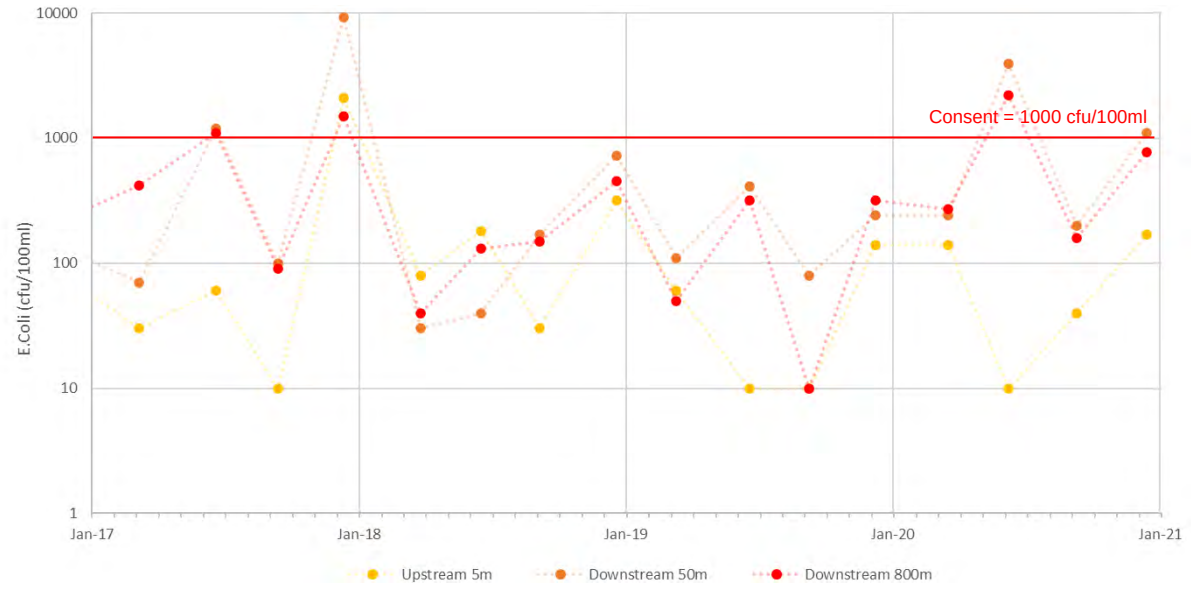


Figure 4-11: E.coli concentrations in Meadow Burn 2017-2020 (log scale)

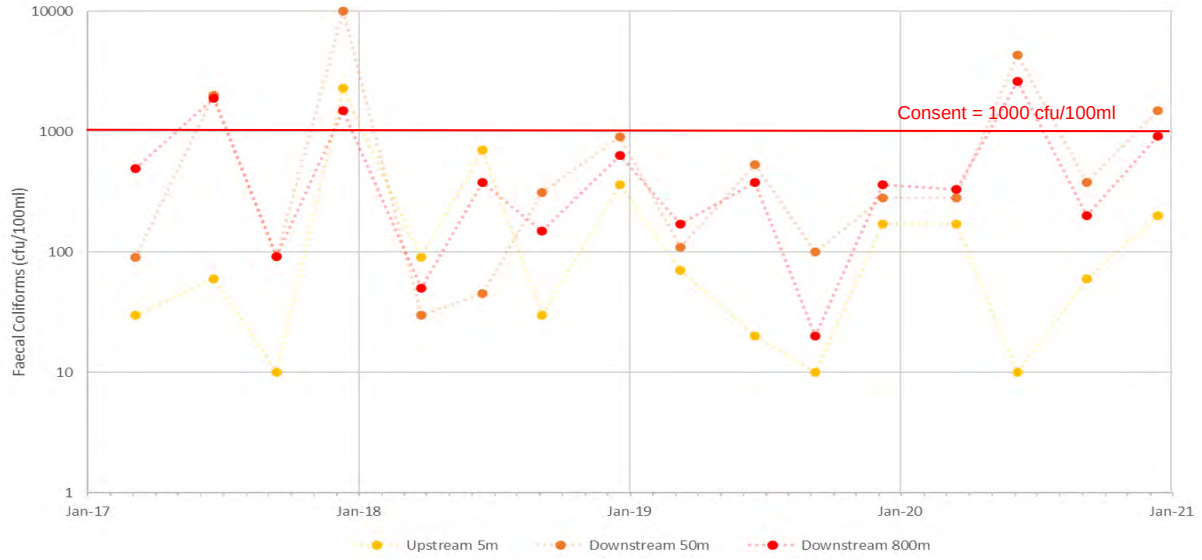


Figure 4-12: Faecal coliform concentrations in Meadow Burn 2017-2020 (log scale)

3.2.4.2 Aquatic Ecology Monitoring

Condition 13 of AUTH-20147220-01 requires an aquatic ecology survey to be undertaken within three years of the commencement of the consent, covering macroinvertebrates and periphyton. Sampling sites are to be the same as the water quality monitoring sites (Figure 4-6). The aquatic ecology survey was conducted in March 2019 by Ryder Environmental and is attached as **Appendix B**.

3.2.4.3 Macroinvertebrates

Three replicate samples were collected at each of the three water quality monitoring sites. A total of 39 different invertebrate taxa were identified from the three sites. Communities were numerically dominated by snails, ostracod shrimps, and chironomid midge larvae (e.g., *Corynoneura, Orthocladiinae, Tanytarsini*). Other taxa included amphipods, isopods (including Phreatoicids, which live in groundwater), *Xanthocnemis* damselfly larvae, and purse-cased caddisflies (*Hydroptilidae*). These taxa are all commonly found in low velocity waters and in areas with abundant plant growth.

Mayflies, stoneflies and caddisflies, known as EPT taxa (invertebrates typically indicative of higher water quality), were only represented by very low diversity of caddisflies. The species *Hydroptilidae* caddisflies were found at all three sites (*Hydroptilidae* are often excluded from EPT calculations as these taxa are considered indicative of lower quality conditions). The only other caddisflies in the Meadow Burn were *Hudsonema* and one *Hydrobiosidae* individual, which were only found at the upstream site.

Macroinvertebrate community health index (MCI and SQMCI) scores were similar at all three sites, with average scores at each site indicative of 'poor' quality condition. There were no statistically significant differences in MCI scores or SQMCI scores between the sites ($p>0.05$, Table 4-6). Therefore it was concluded that there was no impact of the WWTP discharge on macroinvertebrate communities (Ryder Environmental, 2019).

Table 3-6: Macroinvertebrate MCI and QMCI scores at Riversdale WWTP (Ryder Environmental, 2019)

Score/Classification	Upstream	50 m Downstream	800 m Downstream
Average MCI score	75	65	65
Average SQMCI score	3	3	3.6
Quality Class A Boothroyd and Stark (2000)	Probable severe pollution	Probable severe pollution	Probable severe pollution
Quality Class B Stark and Maxted (2007)	Poor	Poor	Poor

Average MCI and SQMCI scores at all three sites were lower than Environment Southland's standards for spring fed streams. Communities are largely composed of taxa insensitive to inorganic pollution/nutrient enrichment.

Table 3-7: Macroinvertebrate results compared to standards for spring fed streams

Parameter	Surface water bodies classified as 'Spring Fed'	Condition status
Macroinvertebrates	Macroinvertebrates MCI shall exceed 90 and SQMCI shall exceed 4.5.	Condition Not Met

3.2.4.4 Periphyton and Macrophytes

The Meadow Burn is abundant in macrophytes (aquatic plants), which is likely caused by a combination of surrounding land use, channel modification, lack of riparian shade, nutrient enrichment and low water velocities. Issues associated with heavy macrophyte cover include oxygen depletion, especially during summer low flows which can be further depressed during night-time when plant respiration occurs (Golder Associates, 2009).

A macrophyte assessment was undertaken in March 2019 using the macrophyte cover rapid assessment protocol (Collier et al. 2014). The Meadow Burn was dominated by the exotic watercress (*Nasturtium officinale*), with 100% of the channel covered at each of the survey sites. Channel clogginess was 100% at each site and the cover of native species was 0% (Ryder Environmental, 2019).

The Ryder Environmental survey could not complete a periphyton cover assessment at any of the survey sites due to the macrophytes that dominated the stream channel. Small patches of filamentous green algae were visible amongst macrophytes along the edge of the upstream site, but otherwise the only periphyton observed at each site was thin diatom films on cobbles and gravels that were scrubbed for biomass analysis.

Periphyton biomass (chlorophyll a) was assessed using Quantitative Method 1b (QM-1b). Average levels at each site were well below the spring fed limit of a monthly mean of 15 mg/m^2 (Table 4-10 and Figure 4-11). Concentrations of chlorophyll a were also well below the NPSFM National Bottom Line of 200 mg chl-a/m^3 and conformed to Attribute Band A reflecting negligible nutrient enrichment and/or alteration of the natural flow regime or habitat.

The Ryder Environmental survey also identified that there were no visible bacterial or fungal slime growths observed at any site, thereby meeting this standard required for 'Spring Fed' streams.

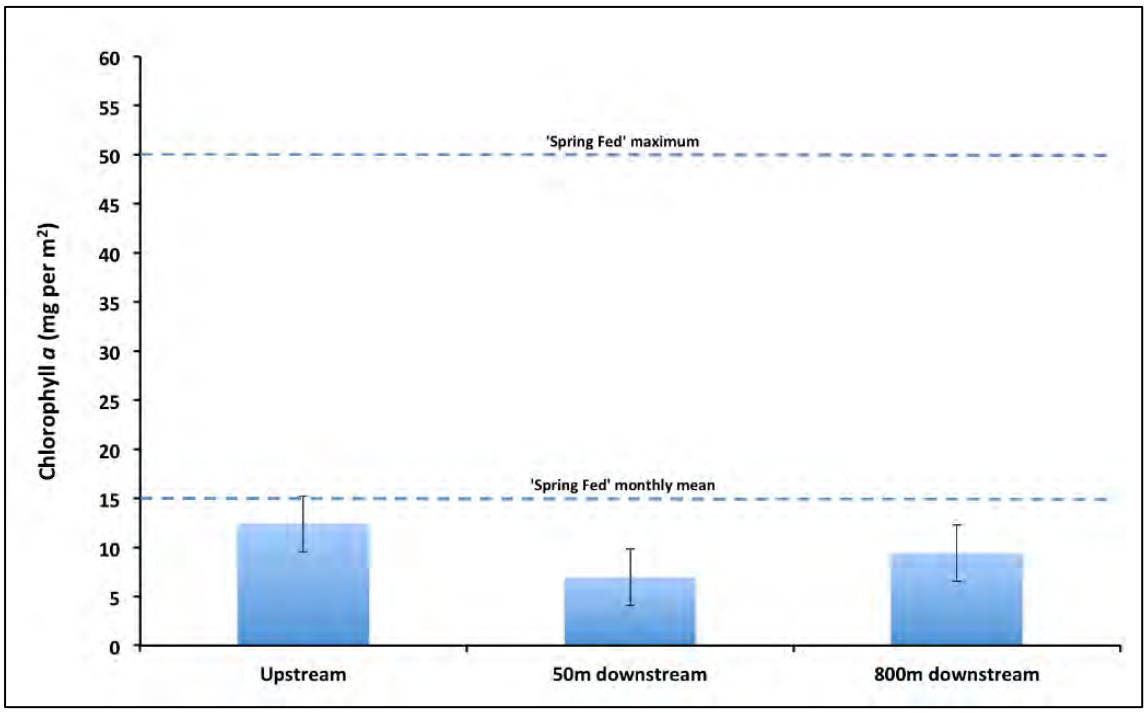


Figure 4-13: Periphyton biomass expressed as chlorophyll a in the Meadow Burn (Ryder Environmental, 2019)

Table 3-8: Periphyton standards for spring fed surface water bodies

Parameter	Surface water bodies classified as spring fed	Condition status
Bacterial or fungal slime growths	There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats. Note that this standard also applies to within the zone of reasonable mixing for a discharge	Condition Met
Periphyton	Chlorophyll a shall not exceed 50 milligrams per square metre at any time, or exceed a monthly mean of 15 milligrams per square metre for filamentous algae or diatoms and cyanobacteria (expressed in terms of reach biomass per unit of exposed strata (i.e., tops and sides of stones) averaged across the full width of the river).	Condition Met

3.2.4.5 Sediment

While no formal assessments of sediment cover were undertaken by Ryder Environmental in 2019, observations at each site identified only small patches of fine sediments associated with the macrophyte beds and no visible fine sediments on the stream bed. This indicates that sediment cover likely met the standard required for 'Spring Fed' streams of a change in sediment cover not exceeding 10% (Ryder Environmental 2019). This indicates that excessive sedimentation of the stream bed, and the associated adverse effects on habitat quality and turbidity in the water column impacting habitat quality is not occurring, including as a result of the WWTP discharge.

Turbidity has been recorded for four years, as shown in Figure 4-20. Records of turbidity show most results were below 4 NTU with the exception of March 2019 where a measurement of 8.1 NTU was recorded at the 50 m downstream site. Aside from elevated turbidity noted in March 2019 and June 2020 associated with high rainfall events, turbidity in the Meadow Burn in the vicinity of the WWTP is consistently low, and the WWTP discharge is not considered to result in conspicuous change in the visual clarity of the Meadow Burn as determined by turbiduty.

Table 3-9: Sediment standards for Spring Fed surface water bodies

Parameter	Surface water bodies classified as Spring Fed	Condition status
Sediment	The change in sediment cover must not exceed 10%.	Condition Met

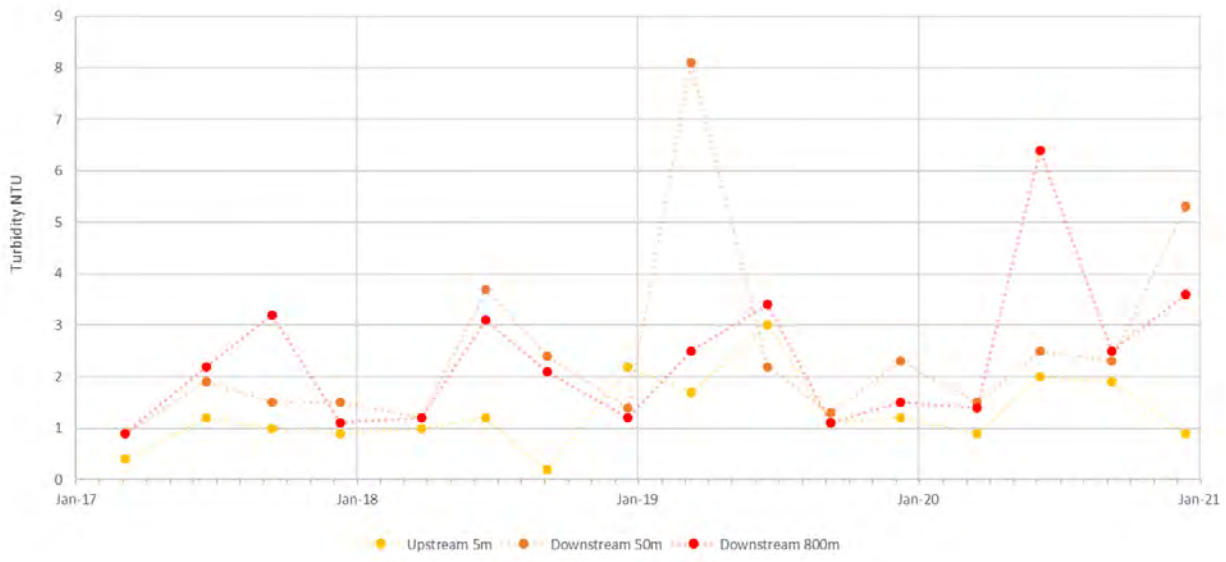


Figure 4-14: Turbidity concentrations in the Meadow Burn 2017- 2020

3.2.5 Summary of Receiving Environment Monitoring

Overall, based on the receiving environment monitoring undertaken by the applicant in association with exercising AUTH-20147220-01, the current WWTP discharges to the Meadow Burn are considered to result in a minor to moderately adverse effect on water quality and aquatic habitat. As the current operation of the WWTP is not proposed to change over the five-year term sought, the scale and significance of future effects is expected to be consistent with the findings of the monitoring.

4.0 DESCRIPTION OF RECEIVING ENVIRONMENT

4.1 CLIMATE

Riversdale has a temperate oceanic climate grading onto a continental climate more commonly found in Central Otago, with cold, wet winters and warm summers. The Riversdale region is one of the few areas in Southland prone to drought during the summer months.

The maximum daily (24 hour) rainfall recorded at NIWA's Gore Weather Station (AWS) was 64 mm recorded on 7 February 2011. Daily rainfalls exceeding 50 mm occurred on four days between 2001 and 2020 and rainfall exceeding 40 mm occurred on 10 days over that same period. Average daily rainfall was 2.5 mm.

Temperature extremes recorded at the Gore Weather Station included a highest recorded temperature of 32.3°C and a lowest recorded temperature of -6.0°C. The average temperature across this period was 17.4 °C.

Figure 4-1 shows that rainfall is consistent across the months on average, while temperature has a seasonal change being higher in summer and lower in winter.

The predominant wind directions are from the north-west (250° to 310°) and the north-east (15° to 60°). Wind speeds average 3 m/s with a maximum and minimum range between January 2001 and January 2013 being from 0 to 26.8 m/s. The Riversdale township is located west of the treatment scheme.

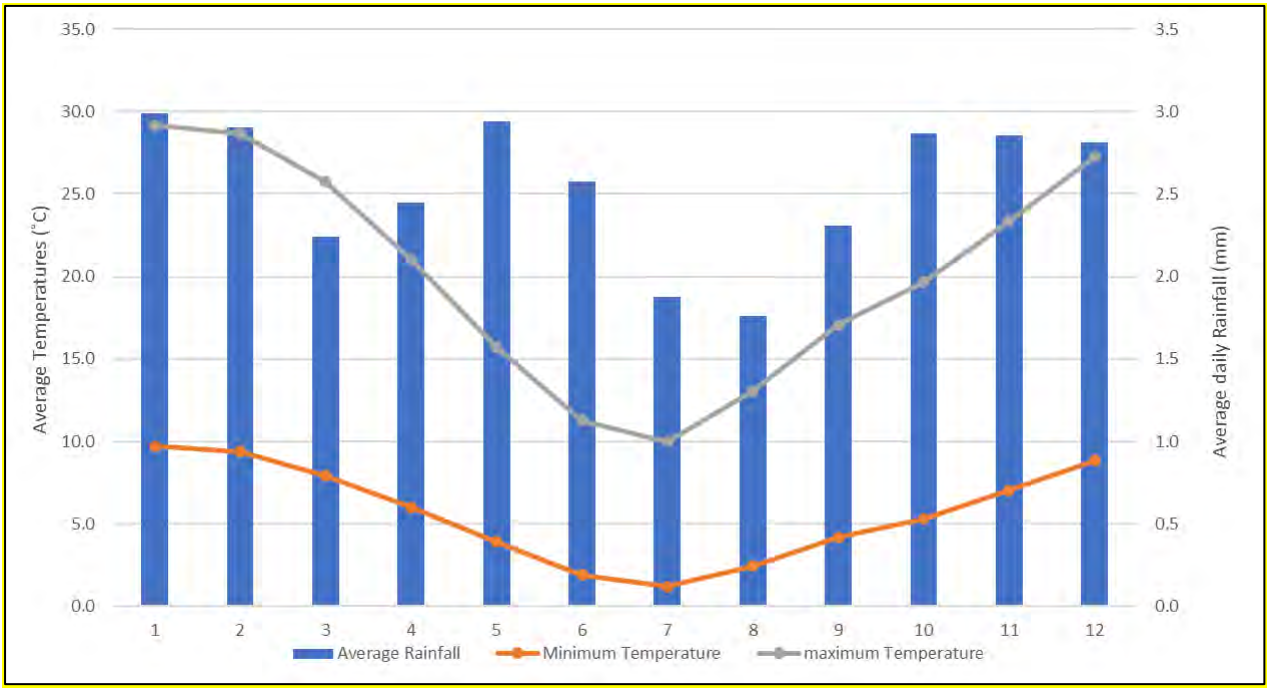


Figure 4-1: Climate Parameters for Gore Weather Station (AWS) between 2001 and 2020.

4.2 THE MEADOW BURN

4.2.1 Catchment and Land use

The Meadow Burn is classified in the RWP and in the pSWLP, as a 'Spring Fed' stream. The upper reaches consist of several highly modified pastural farming drains and ephemeral watercourses. The section of the stream adjacent to the WWTP has been channelised, with the historic, meandering, course of the stream visible in the adjacent pasture. The catchment area, to the point of discharge of the treated wastewater, is 1 km^2 showing that the Meadow Burn is a headwater stream with little upstream storage.

The Meadow Burn runs in a south-easterly direction for approximately 11 km to its confluence with the Mataura River. The entire catchment is heavily modified by agricultural activities.

The Meadow Burn has very little riparian vegetation apart from pasture grasses and occasional woody weed species such as broom and gorse, with some riparian vegetation near the confluence with the Mataura River (Figure 4-2). There are no known significant recreational or amenity values associated with this section of the Meadow Burn.

The River Environment Classification (REC) for the Meadow Burn is CD/L/Al/P/LO/LG[4], as described in Table 4-1, with a cool dry climate, low elevation, low gradient with a geology of Alluvium indicating a relatively high infiltration rate.

Figure 4-2: Meadow Burn 50 m downstream of discharge showing pastoral farming, and grass banks, aquatic macrophytes (March 2019).

Table 4-1: River Environment Classification (NIWA) for Meadow Burn

Category	Code	Description
Climate	CD | Cool-Dry	Mean annual temperature < 12°C and mean annual effective precipitation < 500mm
Topography	L | Low-Elevation	Very marked seasonal flow patterns: high in winter, low in summer. Low sediment supply. Stable, Low Gradient, entrenched channels with low flow velocity and silty sandy substrates. Flood flow velocities are low due to low channel slope.

[4] https://www.mfe.govt.nz/sites/default/files/environmental-reporting/about-environmental-reporting/classification-systems/rec-user-guide-2010.pdf

Category	Code	Description
Geology	Al | Alluvium	Rainfall infiltration is high which tends to reduce flood frequency. There tends to be a high degree of surface water and ground water interaction. Base flows may be sustained by seepage or springs or may reduce in the downstream direction as water flows into the groundwater system. Water chemistry reflects the nature of the parent material. Note that the source information on catchment geology, the LRI, does not discriminate the parent material for alluvium. This makes the geochemistry of the Alluvium category variable.
Land-Cover	P | Pastoral	Flood peaks tend to be higher and recede faster. Low flows are generally more extreme relative to catchments with natural land cover. Nutrient concentrations are high relative to natural Land-Cover categories. Erosion rates tend to be high, resulting in low water clarity and fine substrates (silts and mud) compared to natural land cover.
Network Position	LO | Low-Order	Headwater streams (Stream order 1 and 2) with little upstream storage. Fluxes of water and water borne constituent (e.g. sediment) move rapidly through with little attenuation.
Valley-Landform	LG |Low-Gradient	Low-Gradient channels. For given higher order classes, LG categories are characterised by relatively greater meandering, greater depth relative to width and lower water velocities.

4.2.2 Hydrology

The Meadow Burn has been regularly gauged since 2001. Efforts to establish a rated flow have been unsuccessful due to the impact of extensive macrophyte growth on the stage/discharge relationship (ES, 2011).

York Road is the location most representative of the Meadow Burn in the vicinity of the WWTP discharge. Flow records at York Road from 2006 to 2013 are displayed in Figure 4-3. Flows over this period ranged from 6.0 to 98 L/sec. During summer low flows, the WWTP has a maximum allowable discharge of 1 L/sec, meaning that the wastewater would account for approximately 14% of the total flow in the Meadow Burn.

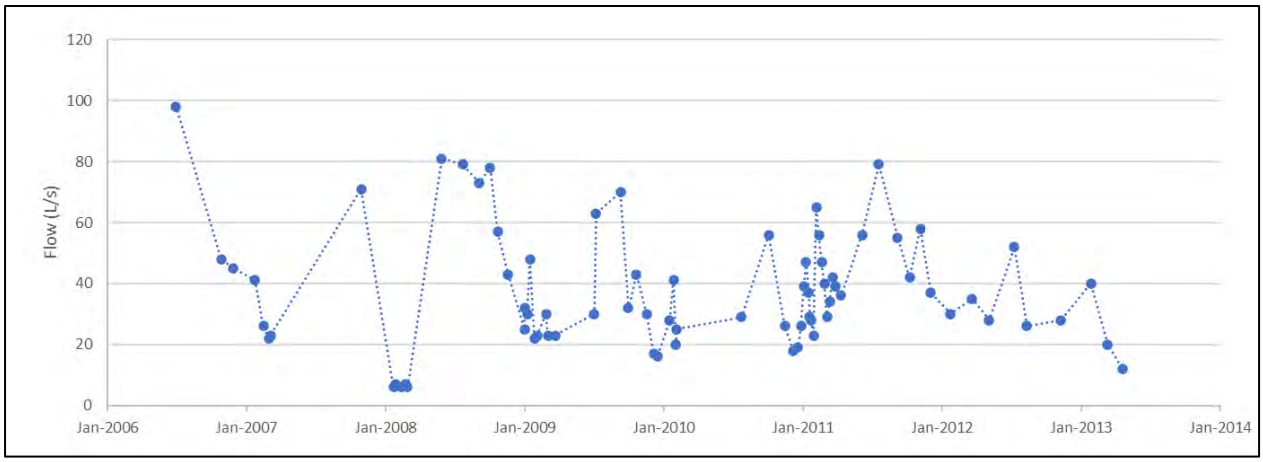


Figure 4-3: Flow gauging on Meadow Burn at York Road (2006-2013)

Flows in the Meadow Burn increase downstream due to inputs of groundwater. Flow gauging between 2006 and 2013 shows the median gauged flow increases from approximately 30 L/s in the headwaters at York Road to 200 L/s at Fingerpost-Pyramid Road (Table 4-2). The gauging results indicate greater groundwater inflow per unit length in the lower reaches of the Meadow Burn which likely reflects the increased hydraulic gradient in the downstream section of the Riversdale groundwater zone.

A longer-term, synthetic flow record has been created from a relationship between gauging at York Road and groundwater levels in Bore F44/0181 (Figure 4-4 and Figure 4-5). This indicates that flows may drop to at or near zero in very dry summers. This means that there would be no available dilution in the Meadow Burn. However, at these times wastewater discharges to the stream would also be minimal, and primarily to groundwater via the soakage channel.

Table 4-2: Recorded Flows of the Meadow Burn 2001 – 2013

Site	Record Period	Number of Gauging's	Min Gauged Flow (l/s)	Mean Gauged Flow (l/s)	Median Gauged Flow (l/s)	Max Gauged Flow (l/s)
York Road	2006 - 2013	40	6	37	30	98
Fingerpost Pyramid Rd	2001 - 2009	57	89	238	199	588

Source: Riversdale Groundwater Management Zone Technical Report (ES, 2011) with updated data to 2013 flow gauging's.

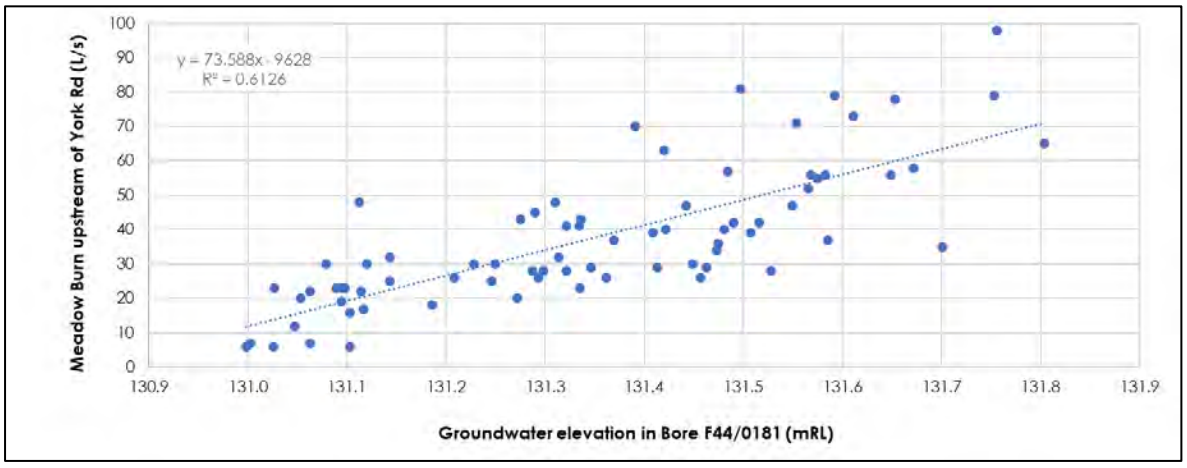


Figure 4-4: Relationship between flow gauging at York Road and groundwater levels in bore F44/0181R (2006-2013)

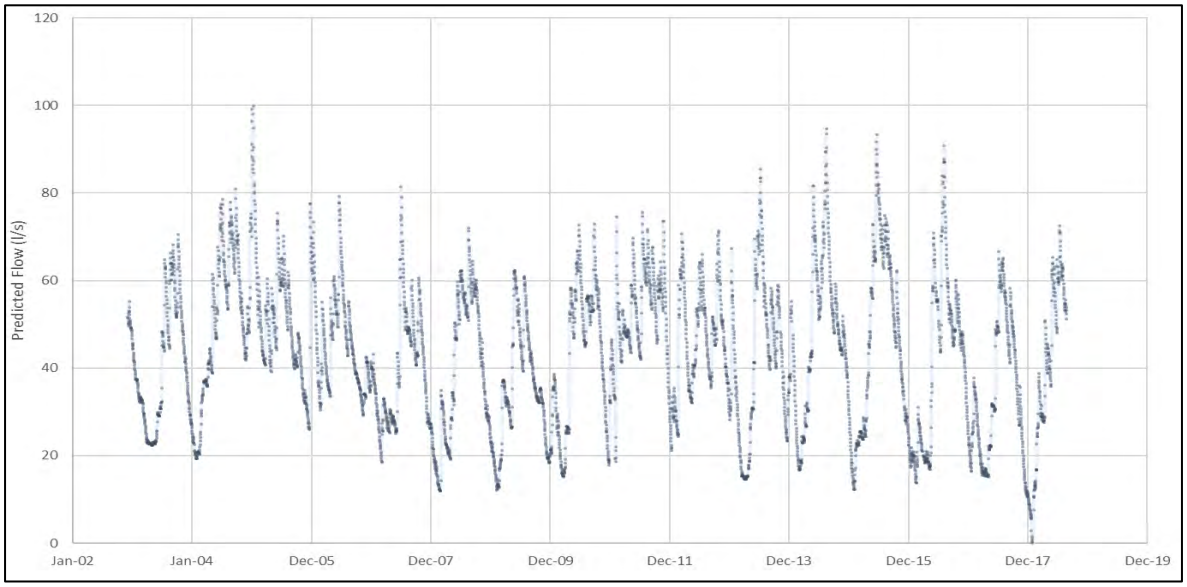


Figure 4-5: Predicted flow at 20 m downstream of York Road from the relationship between flow gauging at York Road and groundwater levels at Bore F44/0181.

Table 4-3: Predicted flow at 20 m downstream of York Road from the relationship between flow gauging at York Road and Bore F44/0181.

	Min Flow (l/s)	Median Flow (l/s)	Max Flow (l/s)	Maximum Discharge rate	Available dilution Min (1:X)	Available dilution median (1:X)	Available dilution Max (1:X)
Dec – Mar inclusive	0	29	100	1 l/s	0	30	101
Apr – Nov inclusive	15	50	95	2 l/s	8	26	48

4.2.3 Surface Water Quality

The Meadow Burn is a spring fed river, with its origin being a ‘depression spring’ where the land surface dips downwards and intersects the water table. On both occasions that the total discharges from all spring-fed streams was measured by Environment Southland (January 2003 and March 2010), the Meadow Burn accounted for up to 65 % of total spring discharge.

Environment Southland monitors the Meadow Burn at Round Hill Road as part of its State of the Environment monitoring programme. The integrated biological index (IBI) score for the Meadow Burn as a measure of stream health to support aquatic ecology was 36 and rated ‘good’ during the most recent survey undertaken in 2008/2009.

Water quality in the Meadow Burn is impacted by land use and abstraction rates, and is variable depending on rainfall, and groundwater levels, which impact flow volumes and contaminant dilution. Monitoring data associated with the implementation of AUTH-20147220-01 provides a useful indication of water quality in the stream upstream of the WWTP, as well as 50 m and 800 m downstream of the WWTP outfall to the Meadow Burn. Monitoring results are set out in detail in Section 3.0 of this document.

4.2.4 Aquatic Ecology

The Meadow Burn is recognised as ecologically significant (ES 2011). It supports populations of two threatened or at-risk fish species: the longfin eel (*Anguilla dieffenbachii*) and Gollum galaxias (*Galaxias gollumoides*) and provides a refugee for adult brown trout (*Salmo trutta*) during times of high flow in the Mataura River (ibid.). However, ecologists have agreed that aquatic life in the Meadow Burn is stressed for a variety of reasons including impacts from land use and abstractions (ibid.). However, well oxygenated water, low water temperatures and lack of flooding still contributes to the lower Meadow Burn being an important tributary for brown trout spawning as part of the Mataura River catchment.

4.2.4.1 Freshwater Fish

The New Zealand Freshwater Fish Database (NZFFD) has several records for the Meadow Burn, including sites in close vicinity to and upstream of the WWTP (Figure 4-10). Three native species of fish have been recorded: longfin eel, Gollum galaxias, and upland bully, in addition to exotic brown trout (*Salmo trutta*) (Table 4-4).

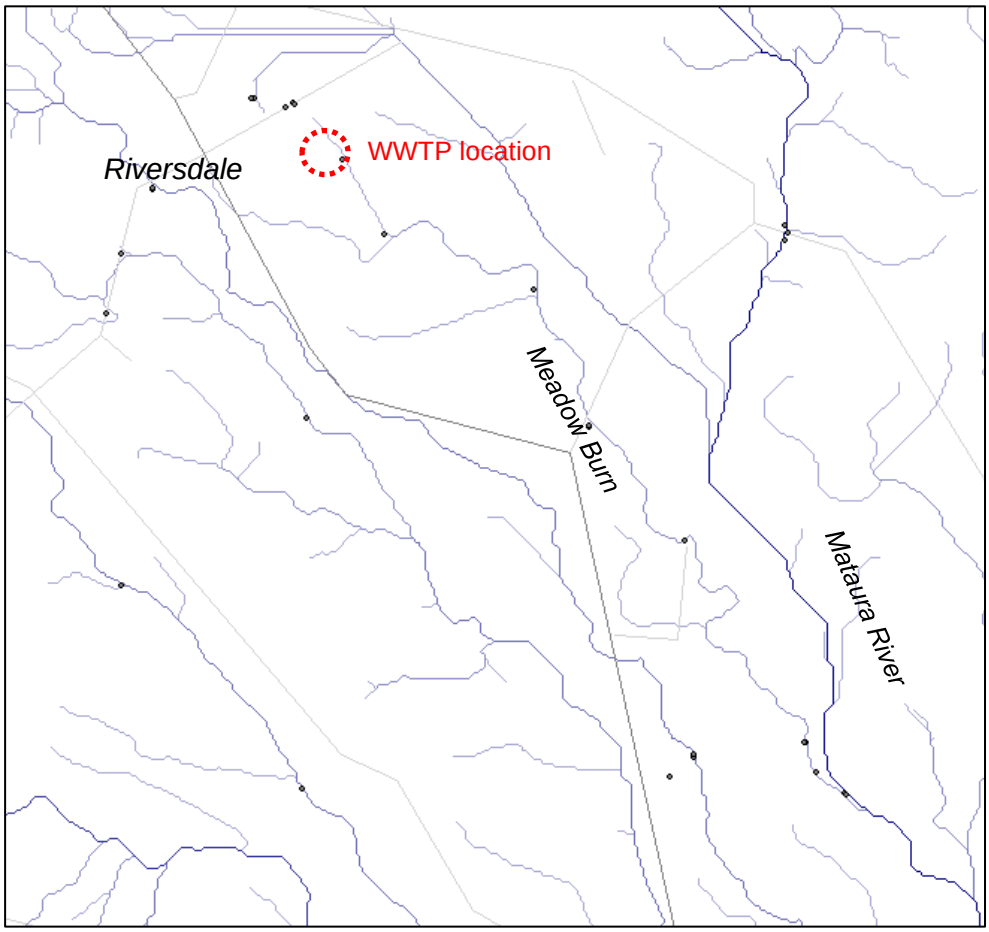


Figure 4-6: NZFFD Records for Meadow Burn and surrounds (NZFFD, 23/022021)

Gollum galaxias are classified as Threatened: National Vulnerable. Their main threats are due to habitat loss from land development and water abstraction and being eaten by introduced fish species such as trout (DOC, 2013). Longfin eels are classified as At Risk: Declining. Longfin eels face threats including degradation of habitat, especially in lowland areas, and on-going issues with fish passage, declines in water quality, as well as commercial harvesting (DOC, 2017).

Fish species diversity increases downstream of the WWTP, but both Gollum galaxias and upland bully have been found in the vicinity of the plant and upstream (latest records in 2009 and 2011 respectively). The absence of trout in the upstream reaches indicates a barrier to fish passage may be present somewhere downstream of the WWTP. As trout are a key predator of Gollum galaxias, this provides protection to the population.

Table 4-4: Fish and macroinvertebrate species in the Meadow Burn (NZFFD, 23/022021)

Scientific Name	Common Name	Threat Status (DOC, 2013 & 2017)
Anguilla dieffenbachii	Longfin eel	At Risk: Declining
Galaxias gollumoides	Gollum galaxias	Threatened: Nationally vulnerable
Gobiomorphus breviceps	Upland bully	Not Threatened
Hyridella menziesi	Freshwater mussel	At Risk: Declining
Paranephrops zealandicus	Koura	At Risk: Declining
Paratya curvirostris	Freshwater shrimp	Not Threatened
Salmo trutta	Brown trout	Introduced

A detailed description of the fish populations in the Meadow Burn is documented by Golder Associates (2009):

- **Gollum galaxias:** Gollum galaxias (*Galaxias gollumoides*) are endemic to the southern South Island and Stewart Island. The Gollum galaxias is one of 12 known non-migratory galaxiid species. The Department of Conservation has classified the Gollum galaxias as Nationally Vulnerable with a moderate, stable population (DOC, 2013). Intensification of land use is thought to be the primary threat to this species, with populations in areas of poor water and habitat quality showing declines in fish density and length. The Freshwater fish database shows that Gollum galaxias were noted in 2007, 2009, 2010 and 2011.

  In 2009, the distribution of Gollum galaxias was patchy, with a low abundance within the lower reaches of the Meadow Burn. Population profiles available indicated that populations in both the upper and lower reaches of the Meadow Burn are stressed while the upstream habitat was utilised for spawning. The upstream reaches of the Meadow Burn near Riversdale were considered to be a key habitat for this species (Golder Associates, 2009).

- **Longfin eels:** The New Zealand Freshwater Fish Database and Dungey (2004) record longfin eel at four sites along the Meadow Burn, additionally the survey undertaken by Golder Associates in 2009 recorded several eels at an upstream site at Riversdale Pyramid Road and a single eel in the lower reaches.

  Longfin eel (*Anguilla dieffenbachia*) have been classified as Declining with very large population and low to high ongoing or predicted decline (predicted decline 10–70%) (DOC, 2013). Longfin eels are expected to be widespread throughout the Meadow Burn although it is likely that additional pressure from fishing in the lower reaches will restrict numbers (Golder Associates, 2009).

- **Upland Bullies:** Upland bullies were recorded in the middle and lower reaches of the Meadow Burn in 2003. The species is more common south of McMath Road, approximately 2 km downstream of the WWTP, with a sizeable permanent population present at Fingerpost Pyramid Road. Upland bullies are not threatened.

- **Brown Trout:** The lower reaches of the Meadow Burn, downstream of Fingerpost Pyramid Road is a known spawning area for brown trout (Golder Associates, 2009). Fish and Game Southland have been recording trout spawning in the Meadow Burn for the last decade and note that this stream is an important

Brown trout habitat. Trout use the Meadow Burn to avoid flooding in the Mataura River and as a source of cooler temperatures in summer due to groundwater upwelling (Golder Associates, 2009).

4.2.4.2 Macroinvertebrates

The NZFFD has records of freshwater mussels / kākahi, koura and shrimps in the Meadow Burn (Table 4-7). All three have been found upstream and downstream of the WWTP, although there are no records in the immediate vicinity. Both freshwater mussels and koura are classified as At Risk: Declining.

Freshwater mussels are threatened due to habitat loss and degradation including clearance of riparian vegetation, piping or modification of streams, river regulation and abstraction, eutrophication, siltation, as well as loss of host fish species. It is noted that the larval stage of the mussel attaches to host fish, most commonly koaro, which are not present in the Meadow Burn.

Koura are similarly threatened by habitat loss in streams and declines in water quality, as well as predation by introduced species (trout).

Golder Associates (2009) conducted macroinvertebrate sampling at four sites on the Meadow Burn, although the specific locations were not reported. Macroinvertebrate fauna present in the Meadow Burn were predominantly pollution-tolerant taxa with a distinct lack of more sensitive species. The dominant taxa collected at all sites were amphipods and *Potamopyrgus* snails, indicating poor water and/or habitat quality. A single mayfly species was present at the downstream site near Fingerpost Pyramid Road, and up to five pollutant tolerant caddisfly taxa were present at the sample sites, but no stoneflies.

4.3 LAND AND GROUNDWATER

4.3.1 Terrestrial Ecosystems

The terrestrial environment in proximity to and surrounding the Riversdale WWTP and the Meadow Burn catchment is highly modified and consists of productive farmland dominated by introduced grass species, shelter trees and woody weeds such as gorse and broom. Several drainage depressions thought to be old channels of the Meadow Burn are evident in the vicinity of the WWTP and are a common feature in the wider landscape. These depressions are typically dominated by pasture grasses, however some lower in the catchment support emerging wetland species.

The margins of the Meadow Burn are lined with rank grasses and in places, woody weed species. No specific conservation values are identified in regional or district planning documents for either bank of the Meadow Burn in the vicinity of the WWTP or immediately downstream. Farming is the dominant land use in the wider area. Consequently, there are limited terrestrial ecology values of note in the vicinity of the WWTP.

4.3.2 Soils

The soils and geology of the Riversdale area are described in detail in section 2.3.2 of the technical Groundwater Report attached as **Appendix C** to this document. Soils in the general area are identified as generally alluvial, shallow and well-drained. They consist of relatively heterogenous alluvial gravels with moderately to poorly sorted gravels, clay-bound gravels, sand and silts up to 30 m deep.

The geology underlying the WWTP site was confirmed through field work completed following the issuing of AUTH-20147220-01 in relation to proving that the RIB scheme is feasible at the WWTP site.

The soakage channel was excavated into clayey gravels and backfilled with evenly graded gravels. The material underlying the channel is significantly permeable with minimal clay and silt content.

4.3.3 Groundwater

The WWTP is located within the Riversdale Groundwater Management Zone (GMZ), a riparian aquifer within an alluvial terrace of the Mataura Catchment. Groundwater recharge occurs primarily through rainfall and irrigation, and via the Mataura River in the upper aquifer. The lower aquifer largely discharges to the Mataura River south of Gore.

Groundwater quality in the GMZ is generally good, although there are areas showing moderate to very high contaminant levels resulting from land use, primarily productive farming.

Investigations[5] at the WWTP site concluded that groundwater at that location moves in a generally southeastern direction, discharging to the Meadow Burn which is a spring-fed stream with its source approximately 1.4 km to the north of the WWTP site. Groundwater depths range between 1 m to 3 m below ground level across the Riversdale GMZ and reflect variations in seasonal rainfall. The natural groundwater levels beneath the WWTP site vary between 0 and 1.5 m below ground level, subject to rainfall, and groundwater generally discharges to the Meadow Burn downstream of the WWTP.

4.4 CULTURAL AND HERITAGE VALUES

The Meadow Burn is not subject to a statutory acknowledgement however its connection with the Mataura River, and the river's cultural significance is acknowledged. The cultural and spiritual values afforded to water and waterbodies in general by Ngāi Tahu as tangata whenua are acknowledged, as is the cultural value afforded to waterbodies by the wider community.

A review of the Heritage New Zealand Pouhere Taonga's register, and information held by the NZ Archaeological Association (NZAA) has not indicated any historic sites in proximity to the Riversdale WWTP, or the Meadow Burn in the wider vicinity of Riversdale. Similarly, the Southland District Plan Planning Maps do not show any recorded archaeological sites, silent files or heritage sites in the vicinity of the WWTP.

4.5 RECREATIONAL VALUES

Given the scale and nature of the Meadow Burn in this location, limitations on public access to the waterbody, and the dominance of productive farming in the vicinity, the upper Meadow Burn does not offer notable recreational opportunities. There are no known angling values in the upper stream, and there are no sites along the stream identified as a Popular Bathing Site as listed in Appendix K of the RWP.

The upper reaches of the waterbody and its surrounds do not hold high amenity values, noting that the Meadow Burn has been heavily modified and holds little natural character until its lower reaches, immediately upstream of its confluence with the Mataura River approximately 11 kilometres downstream.

4.6 SENSITIVITY OF RECEIVING ENVIRONMENT

The sensitivity of the Meadow Burn as the receiving environment for surface water discharges from the Riversdale WWTP is considered to be moderate, given the aquatic ecology values present. According to Golder Associates (2009) the upstream reaches of the Meadow Burn near Riversdale support a local population of Gollum galaxias and are a spawning site for this species. The upper reaches of the Meadow Burn are considered to be a key habitat for Gollum galaxias, however populations in both the upper and lower reaches of the Meadow Burn are stressed. Further downstream, the Meadow Burn is an important habitat and spawning ground for brown trout (ibid.). Note that the physical habitat of the Meadow Burn is degraded, with channelisation, no riparian shade, and low water velocities. This results in dense macrophyte growths and poor macroinvertebrate communities.

The sensitivity of the land and groundwater environment into which the soakage channel discharges is considered to be low, taking into account the use of the land for wastewater treatment and disposal for some time, and the predominant use of land in the vicinity for grazing.

5.0 PROPOSED CHANGES TO CONDITIONS

The applicant proposes several changes to the conditions of AUTH-20147220-02 under s127 of the RMA to address conditions that apply to activities that have been completed already, or which contain dates that have passed. The proposed changes are set out below and in full in the conditions attached in **Appendix D**:

[5] Refer to the Groundwater Technical Report in Appendix C

- **Cancel Condition 3:** This condition relates to proving whether the RIB scheme will work at the Riversdale WWTP site, which has already been achieved. The applicant has since moved into the design phase of this project, and hence this condition is no longer relevant.
- **Amend Condition 4:** The applicant proposes to amend the chapeau of Condition 4 to better reflect the work previously completed in confirming the RIB scheme is viable, and to better reflect the client's commitment to the scheme.
- **Cancel Condition 4(a):** This condition refers to submitting the specifications of the RIBs to Environment Southland by 31 May 2020 – this condition was met and is no longer relevant.
- **Amend Condition 4(c):** This condition currently requires the RIBs to be operational by 31 May 2021. Given the substantial delays to the programme, the applicant proposes to amend this condition to provide time for the RIBs to be constructed and commissioned.
- **Cancel and replace Condition 4(d):** The applicant proposes to cancel this condition to improve clarity, and to replace it with a new and separate condition (Condition 4A) with an amended lapse date. The proposed new date aligns with the expiry date of the replacement permit (for AUTH-20147220-01) of mid-late 2026 if the application is approved this year.

  The proposed replacement of condition 4(d) will ensure that if the RIB scheme is not given effect within the term of the replacement permit, it will expire and AUTH-20147220-02 will lapse. The proposed date applied for will provide adequate time to complete the land purchase process, construct and commission the RIBs, and ensure they are operational within the term of the replacement permit. Condition 4A, to replace condition 4(d) is proposed as:

  4A. *This consent will lapse (as per s125 of the Resource Management Act 1991) if the Rapid Infiltration Basins are not built and operational by 31 May* 20XX[6].

- **Amend Condition 5:** This constitutes a correction of the listed contact from Te Ao Marama Inc to Hokonui Rūnanga.
- **Amend Condition 14:** Hokonui Rūnanga requested in pre-application discussions that they be copied in to monitoring outcomes at the same time as the Consent Authority. Amending this condition as proposed will achieve that outcome.

The applicant seeks to retain (roll over) most of the consent conditions in AUTH-20147220-01 for the replacement discharge permit. This is because the conditions for the existing permit already reflect the current operation of the WWTP and that operation is not proposed to change over the five-year term sought, and there is no change proposed to the intended RIB scheme. While most of the conditions from AUTH-20147220-01 are proposed to be 'rolled-over' to the replacement permit, the applicant proposes several changes. These are set out in full in the proposed conditions in Appendix D, and mostly consist of removing conditions requiring actions that have already been completed, and better aligning with the conditions in AUTH-20147220-02.

6.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS

6.1 POSITIVE EFFECTS

The primary positive effect of the proposal will be enabling the Riversdale WWTP and associated discharges to lawfully continue to the soakage channel and Meadow Burn until the RIB scheme can be built and commissioned, and all operational discharges to surface water can cease. The community has invested in Riversdale's wastewater network and treatment plant which safeguards community health by collecting and treating Riversdale's wastewater to a standard that is safe to discharge. Centralising wastewater management in this way ensures wastewater is processed and treated, and that process is supervised, monitored, reported and the consent holder is accountable. Granting these applications will allow the community's investment in the network and WWTP and the associated community benefits to continue to be realised. Being able to lawfully continue the discharges as sought will enable the wastewater scheme to continue to safeguard the health and wellbeing of the community by

[6] Being five years from the year of issue.

providing an effective, efficient and affordable means of managing the environmental and public health risks associated with wastewater treatment and disposal.

The community has also invested in investigations, approvals and designs for a RIB scheme as a more socially, environmentally and culturally acceptable solution to wastewater management. Removing operational discharges from the Meadow Burn will lead to positive environmental, social and cultural effects by helping to improve surface water quality.

The most significant positive effects from the RIB scheme (and granting consent to the short-term discharge so that the RIB scheme can be constructed) will be:

- Helping to improve the water quality of the lower Meadow Burn, and as a tributary of the Mataura River. This will help to reduce risks to aquatic ecology and ecosystems
- Reducing risk to public health from contact with the river
- Reducing the nutrient load to the stream
- Reducing adverse effects on cultural and spiritual values associated with water or waterbodies, as affected by the WWTP discharges.

The applicant is committed to the RIB scheme and currently has no other feasible or practicable alternatives to the discharge to the Meadow Burn until that scheme is operational. Enabling the discharges to lawfully continue for a maximum five-year term will mean the applicant can focus attention and resources on building the RIB scheme and enable operational discharges to water to permanently cease.

6.2 EFFECTS OF TREATED WASTEWATER DISCHARGE TO THE MEADOW BURN

This section addresses the actual and potential effects of the existing treated wastewater discharge to the Meadow Burn. This assessment is based on the assessment of the current effect of the discharges authorised by AUTH-20147220-01 as indicated by wastewater monitoring and receiving environment monitoring undertaken by the applicant, as assessed and described in Section 3.0 of this document. For the avoidance of doubt, this assessment excludes the effects of wastewater discharges to land via the RIB scheme, or discharges to the Meadow Burn during emergency or extreme weather events which are already consented under AUTH-20147220-02.

6.2.1 Methods for Assessing Environmental Effects

The assessment of effects methodology is broadly consistent with the 'Ecological Impact Assessment Guidelines' described by EIANZ (2015 and 2018). EIANZ provides a framework which allows a consistent and transparent approach to the assessment of effects. It includes the following steps:

1. Assign ecological value to habitats potentially impacted by the project
2. Determine the magnitude of ecological effect from the proposed activity on the environment
3. Ascertain the overall level of effect, and
4. Determine effects management response

Step 1 in the process comprises assignment of ecological value. Although a wide range of metrics and measures are used in the assessment of freshwaters there is no unifying set of attributes used to assign value of significance. Table 6-1 uses a series of commonly used habitat and species values to identify 'Negligible' 'Low', 'Moderate', 'High' or 'Very High' values. This approach is broadly consistent with that detailed in EIANZ (2018).

Table 6-1: Assigning value to species and habitats for assessment purposes (adapted from EIANZ 2018)

Value	Habitat values	Species values
Very high	A reference quality watercourse at or near its pre-human condition with the expected assemblages of flora and fauna and no contributions of contaminants from human induced activities. Negligible degradation e.g. stream within a native forest catchment.	Benthic invertebrate community: Has high diversity, species richness and abundance. Contains many taxa that are sensitive to organic enrichment and settled sediments. Has no single dominant species or group of species. Has MCI scores typically 120 or greater. Has high EPT richness and proportion of overall benthic invertebrate community. Fish community is diverse and abundant. Riparian vegetation typically with a well-established closed canopy. No pest or invasive fish (excluding trout and salmon) species present. Stream channel with natural morphology and limited erosion. Habitat natural and unmodified.
High	A watercourse with high ecological or conservation value but is no longer reference quality. It has been modified through loss of riparian vegetation, fish barriers, and/or stock access. Slight to moderate degradation e.g. exotic forest or mixed forest/agriculture catchment.	Benthic invertebrate community: Has high diversity, species richness and abundance. Contains many taxa that are sensitive to organic enrichment and settled sediments. Has no single dominant species or group of species. Has MCI scores typically 80-100 or greater. Has moderate to high EPT richness and proportion of overall benthic invertebrate community. Fish communities typically diverse and abundant. Riparian vegetation with a well-established closed canopy. No pest or invasive fish (excluding trout and salmon) species present. Stream channel with morphology natural and limited bank erosion. Habitat largely unmodified.
Moderate	A watercourse which contains fragments of its former values but has a high proportion of tolerant fauna, obvious water quality issues and/or sedimentation issues.	Benthic invertebrate community: Has low diversity, species richness and abundance. Is dominated by taxa that are not sensitive to organic enrichment and settled sediments. Is dominated by species or group of species Has MCI scores typically 40-80.

	Moderate to high degradation e.g. high-intensity agriculture catchment.	Has low EPT richness and proportion of overall benthic invertebrate community. Fish communities typically moderate diversity of only 3-4 species. Pest or invasive fish species (excluding trout and salmon) may be present. Stream channel and morphology modified (e.g., channelised) Stream banks may be modified or managed and may be highly engineered and/or evidence of significant erosion. Riparian vegetation may have a well-established closed canopy. Habitat modified.
Low	A highly modified watercourse with poor diversity and abundance of aquatic fauna and significant water quality issues. Very high degradation e.g. modified urban stream.	Benthic invertebrate community: Has low diversity, species richness and abundance. Is dominated by taxa that are not sensitive to organic enrichment and settled sediments. Is dominated by species or group of species. Has MCI scores typically 60 or lower. EPT richness and proportion of overall benthic invertebrate community typically low or zero. Fish communities are low diversity, only 1-2 species. Pest or invasive fish species (excluding trout and salmon) present. Stream channel and morphology modified (e.g., channelised). Stream banks often highly modified or managed and maybe highly engineered and/or evidence of significant erosion. Riparian vegetation typically without a well-established closed canopy. Habitat highly modified.
Negligible	Not Threatened Nationally, common locally, poor habitat with few species.	Nationally or locally common with a negligible contribution to local ecosystem services.

Step 2 requires an evaluation of the magnitude of effects on local ecological values based on footprint size, intensity and duration. The unmitigated 'Magnitude of the Effect' that the activity is expected to have on species found in the Project area is evaluated as being either 'Negligible', 'Low', 'Moderate', 'High' or 'Very High', (Table 6-2) and is assessed in terms of:

- Level of confidence in understanding the expected effect
- Spatial scale of the effect
- Duration and timescale of the effect

- The relative permanence of the effect, and
- Timing of the effect in respect of key ecological factors

Table 6-2: Evaluation of magnitude of effects for assessment purposes (EIANZ 2018)

Magnitude	Determining factors
Very high	Total loss of, or very major alteration to, key elements/features/ of the existing baseline condition, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Step 3 requires the overall level of effect to be determined using a matrix that is based on the ecological values and the magnitude of effects on these values. Table 5-3 shows the EIANZ (2018) matrix outlining criteria to describe the overall level of ecological effects. We have used the overall level of ecological effect to determine if effects management is required. Effects assessed as being Moderate, High or Very High in Table 6-3 warrant efforts to avoid, remedy or mitigate.

Table 6-3: Criteria for determining overall levels of ecological effects (EIANZ 2018)

Magnitude of effect	Ecological Value				
	Very high	High	Moderate	Low	Negligible
Very high	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very Low	Very low
Negligible	Low	Very Low	Very Low	Very Low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Step 4 implementation of the effects management hierarchy to avoid, remedy or mitigate potential impacts.

The available data has been assessed following this methodology in detail in **Appendix E** of this application, and is summarised as follows:

6.2.2 Effect of the Discharge Volume

No automated monitoring of the discharge volume is undertaken. Modelling of the discharge indicates general compliance with the consent requirements of AUTH-20147220-01 over the term of the preceding consent, with volumes limited to 1 L/sec in summer and 2 L/sec in winter. The exceptions were during periods of sustained heavy rain when discharged wastewater would be diluted with rainfall and/or elevated stream flow and groundwater.

During summer the flow in the Meadow Burn is very low. Flows may drop to at or near zero in very dry summers. This means that there would be little to no available dilution in the Meadow Burn. It is not known if the soakage channel would discharge during these conditions. If it does, this could place considerable stress on the instream biota.

The applicant proposes to retain the discharge volume limits of 1 L/sec in summer and 2 L/sec in winter as at present. Having assessed the effects of the discharges over the course of exercising AUTH-20147220-01 from 2017 to the present on the basis of the monitoring data assessed in Section 3.0 of this document, the effect of the volume of the discharge on the Meadow Burn for the term sought is considered to be minimal.

6.2.3 Effects on Water Quality

A summary of the water quality data collected between 2017 and 2020 is presented in Table 3-4 with an assessment of NPSFM attribute bands provided in Table 6-4.

The Meadow Burn is a spring fed stream. The upper reaches in the vicinity of the WWTP consist of a highly modified and channelised drain with no riparian vegetation and adjacent pastural farming.

Water quality monitoring results assessed in Section 3.0 of this document indicate that water quality in the Meadow Burn in general is impacted by habitat modification and runoff from surrounding land use, with the upstream monitoring site demonstrating periods of elevated bacteria and nutrients, and low dissolved oxygen levels. It is noted that there is typically a discernible decline in water quality from upstream of the WWTP to the 50 m downstream site in respect of bacteria, nutrients and dissolved oxygen. In the case of ammoniacal nitrogen, *E. coli* and faecal coliforms, the recorded levels also exceeded consent limits on occasion. These results indicate periods of cumulative adverse effect on instream ecology and water quality from time to time, and are considered further below.

6.2.3.1 Bacteria

As the Meadow Burn in not classified as a popular bathing site, the NPSFM limits for *Escherichia coli* do not apply.

On four occasions faecal coliforms exceeded the spring fed surface water standard 50 m downstream, three times at 800 m downstream, and once upstream. *E.coli* concentrations mirrored faecal coliform concentrations with Consent condition 12 trigger (1000 cfu/100 ml) being exceeded on four occasions 50 m downstream, three times 800 m downstream, and once upstream.

Concentrations varied between very high and concentrations close to the guideline levels on these few occasions. Spatial variability showed that where exceedances were occurring concentrations 800 m downstream were also high, although concentrations were less than at the 50 m downstream site showing additional dilution from the incoming groundwater zone.

A paired t-test of faecal coliform (and E. coli) concentrations between 5 m upstream and 50 m downstream and between 5 m upstream and 800 m downstream resulted in there being no significant statistical difference ($p>0.05$) between upstream and both downstream sites. This indicates that there is no discernible change in bacterial concentrations in the Meadow Burn upstream and downstream of the WWTP over the last three years.

Given the absence of opportunities for recreational activity or other circumstances where people may come into primary contact with water in the stream, the effect of exceedance of bacteria limits is minimal.

6.2.3.2 Nutrients

Nutrients values that were recorded below the NPSFM national bottom line include Ammoniacal-N, Nitrate-N (assessed from TON) and dissolved reactive phosphorus (band D for DRP). Total nitrogen and total oxidised nitrogen (Nitrate-N + Nitrite-N) t-tests were not statistically different however between upstream and downstream sites indicating wider nutrient impacts on the land in the area.

Concentrations of ammoniacal-N, however, have previously exceeded the RWP and pSWLP limits for spring fed streams of 0.32 mg/l at 50 m downstream and 800 m downstream of discharge point, but only once upstream. The consent condition trigger of 0.9 mg/l at the Meadow Burn 50 m downstream of the discharge point was exceeded once with a concentration of 1.2 mg/l. This was nearly an order of magnitude higher when compared to upstream and 800 m downstream.

Total ammoniacal nitrogen concentrations were higher downstream of the discharge point compared to upstream with t-tests showing a statistical difference between 5 m upstream and 50 m downstream and between 5 m upstream and 800 m downstream.

Dissolved reactive phosphorus and total phosphorus were higher downstream than upstream with t-tests showing a statistical difference between 5 m upstream and both the 50 m downstream and 800 m downstream. Median concentrations upstream were < 0.010 while downstream were > 0.018 mg/L.

The monitoring indicates that the spatial scale of effect is moderate for nutrients more than 50 m downstream of the WWTP, and the concentration effect is low-moderate. The discharge is currently contributing to nutrient enrichment of the Meadow Burn, with associated effects such as macrophyte proliferation. Removing operational discharges by implementing the RIB scheme is expected to measurably improve downstream water quality in respect of nutrient enrichment.

6.2.3.3 Physiochemical parameters

Surface water results for water temperature, dissolved oxygen and pH from monitoring data recorded between 2017 and 2020 are summarised in Table 6-4, and compared to the Spring Fed guidelines in the RWP and pSWLP. All parameters apart from visual clarity were measured, with visual clarity not able to be assessed due to the amount of aquatic vegetation present.

Table 6-4: Summary of Physiochemical Monitoring 2017 - 2020

Spring Fed Waterbody Standard	2017-2020 data	Condition Status
Water Temperature shall not exceed 21˚C	No temperatures were above 21˚C	Complies
Water Temperature shall not exceed 11˚C between May to September	No temperatures exceeded 11°C between September 2017 and December 2020 at 50 m downstream of the WWTP discharge. One exceedance of 11.2 ˚C occurred at 800 m downstream in June 2020.	Complies
Daily Maximum ambient Water temperature shall not increase by more the 3˚C when natural (upstream) temperature is 16˚C or below as a result of discharge, or if natural (upstream) temperature is above 16˚C, then no greater than a 1˚C increase.	Temperature was below 16˚C at all monitoring sites between September 2017 and December 2020. Temperatures did not increase more than 3˚C between upstream and downstream (both 50 m and 800 m) sites.	Complies
pH shall be within the range of 6.5 and 9	All concentrations upstream and downstream within range.	Complies
Visual Clarity shall be >3.0 metres (Secchi depth)	No data.	Not able to be assessed

The concentration of dissolved oxygen in water shall exceed 99% of saturation concentration	Concentrations based on mg/l, however, minimum concentrations at all sites are well below 8.18 mg/L which equates to 99% dissolved oxygen. Median values for all sites are ≥8.1 mg/L.	Not met upstream or downstream of the WWTP discharge

The monitoring undertaken by the applicant shows temperature of the receiving water was almost always within the standards for 'Spring Fed' surface water bodies, except once where natural (upstream) temperature was above 16˚C, and a greater than a 1˚C increase in temperature occurred in June 2019 (1.3˚C). This effect only occurred once during the monitoring period, with a small increase above consent standards. All other measurements of temperature complied with the standard.

Monitoring also showed that dissolved oxygen fluctuates seasonally, with summer lows (all March samples) well below guideline limits. Dissolved oxygen was below the NPSFM national bottom line and regularly did not meet the RWP and pSWLP limits for spring fed streams. While median values for all sites are ≥8.1 mg/L, minimum concentrations at all sites are well below 8.18 mg/L which equates to 99% dissolved oxygen.

Oxygen concentrations in the monitoring data for March 2019 went below the limit in consent Condition 2 of 6 mg/l at both 50 m downstream and 800 m downstream and once below this limit at the upstream site. Concentrations upstream dropped each summer to some degree, however, t-tests showed there was no statistical difference between upstream and either of the downstream sites indicating pressures from regional impacts such as lack of riparian planting and shade as well as limited mixing of water from a spring fed system. Consequently, the discharge is resulting in a minimal adverse effect on physiochemical parameters overall.

6.2.3.4 Conclusion

The assessment of monitoring data described in section 3.0 of this document, and the evaluation above demonstrates that there is minimal difference between up and downstream sites in the parameters assessed. This shows that the WWTP discharge to the stream is not resulting in a significant change to the quality of the stream, noting however that upstream water quality is already considered to be degraded. The effect of the discharge on water quality when considered in the context of the receiving water quality, and the 'spring fed' standards, is considered to range from minor to moderate.

6.2.4 Effects on Aquatic Ecology

The effects of the discharge over the five-year term sought will be similar to those experienced between 2017 and the present, as identified in the assessment of monitoring results and the 2019 Ryder Consulting report addressed in Section 3.0 of this document.

The Meadow Burn is recognised as ecologically significant (ES, 2011). It supports populations of Threatened Gollum galaxias, and At Risk longfin eels, freshwater mussels and koura. The upper reaches near Riversdale support a permanent population of Gollum galaxias, including a spawning site, and are considered to be a key habitat for this species (Golder Associates, 2009), noting that the up and downstream populations are identified as stressed. Further downstream, the Meadow Burn is recognised an important habitat and spawning site for brown trout (ibid). Maintenance of instream flows is critical to maintaining instream habitat for fish (Golders, 2009).

Macroinvertebrate communities in the Meadow Burn are poor at all sampling sites, understood to be the product of degraded in-stream habitat, with a straightened channel, no riparian shade, abundant macrophyte growth, and degraded water quality resulting from influences such as upstream and surrounding agricultural land use, possibly exacerbated by water abstraction as well as contaminant discharges. With the exception of freshwater mussels and koura, no other sensitive macroinvertebrate taxa are present.

The operation of the WWTP results in localised impacts on water quality with various degrees of effect on aquatic habitat in relation to species-specific sensitivity to the contaminants present in the stream, both from upstream, and as a result of the WWTP discharge. The assessment of the previous monitoring data and the Ryder Report concluded that the contribution of the WWTP discharge to adverse effects on aquatic ecology downstream of the WWTP was moderate and that upstream water quality is already degraded and impacts aquatic habitat quality. However the change in ecological communities between up and downstream of the WWTP discharge is minimal. As noted in the 2019 Ryder Environmental biological survey of the Meadow Burn, despite 'subtle differences'

between the three sites assessed, no evidence was found to indicate that the discharges from the Riversdale WWTP are causing any adverse effect on aquatic ecology in the upper reach of the Meadow Burn. This is despite the impact on water quality noted in the applicant's receiving environment monitoring.

The nature and significance of the adverse effect of the WWTP discharge on aquatic ecology is not expected to change over the term of the permit applied for while the applicant focusses attention and resources on implementing AUTH-20147220-02 to remove operational discharges from the stream. On that basis, the proposed discharge is not considered to result in an adverse effect on aquatic habitat that will be more than minor.

As is noted in Section 3.0 of this document and the assessment above, the Ryder Environmental survey in 2019 did not find significant differences in macroinvertebrate and periphyton communities or deposited fine sediment between upstream and downstream sites. This suggests that while the WWTP discharges are shown to have a minor to moderate adverse effect on water quality in the Meadow Burn, they are currently having minimal adverse effect on ecological indicators that could be affected by water quality. The nature and significance of the effect of ongoing discharges on water quality are not expected to change over the term of the permit sought, given that there are no changes sought to the WWTP operation ahead of the move to the RIB scheme.

6.2.5 Public Health

A safe reticulated sanitary wastewater system is necessary to protect the public health of any community. The Riversdale WWTP provides a significant public health benefit to the community. The positive effects of such a system include:

- Provision of a safe and reliable public health sanitation system
- Improved physical environment particularly in terms of lower potential contamination in the town.

It is noted that the Meadow Burn is not classified as a Popular Bathing Site in the RWP. No contact recreation is known to occur in the vicinity or immediately downstream of the WWTP.

Given that access to the Meadow Burn is very restricted, and recreational opportunities are extremely limited, the potential impact of the discharge on public health from contact is minimal.

6.2.6 Summary of Effects on Surface Water

The Meadow Burn is subject to degradation from channelisation, lack of riparian shade, rural land use, diffuse pollution and treated wastewater discharges. Upstream water quality has been shown through the monitoring undertaken over the term of AUTH-20147220-01 to be degraded, noting that the WWTP discharge has a discernible effect on several water quality parameters as noted in Section 3.0 of this application. On the basis that the volume, frequency and quality of the WWTP discharge will remain the same over the term of the permit applied for, the adverse effect on water quality is considered to be moderate, and minor on related aquatic ecology. Overall, the effect of the discharge on the Meadow Burn is conservatively assessed as moderate (i.e. more than minor).

The five-year permit applied for will enable the completion of the RIB scheme, at which time all operational discharges to the Meadow Burn will cease. The contribution of the WWTP discharge to the cumulative effects of land use, abstraction, and point and diffuse discharges to the Meadow Burn will then be removed, resulting in an improvement in surface water quality, and a positive overall effect.

6.3 EFFECTS OF THE WASTEWATER DISCHARGE TO THE SOAKAGE CHANNEL

The application to replace AUTH-20147220-01 includes approval to continue to discharge treated wastewater to land via the existing soakage channel. The effects of discharging wastewater to land at the site, where it will enter groundwater are addressed in the technical report entitled *'Riversdale Wastewater Treatment Plant Resource Consent Application: Groundwater Technical Report'*[7] attached as Appendix C. Further, the discharge from the

[7] Lovett, A.; April 2021 – for Stantec New Zealand.

soakage channel is also authorised until 2037 by AUTH-20147220-02, albeit in association with the discharge via the RIB scheme.

6.3.1 Effects on Groundwater Quality

The assessment of the effects on groundwater quality is set out in section 4.4 of the groundwater technical report. The assessment concludes that the discharge to the channel results in a very localised and limited effect on groundwater quality, particularly from bacteria and nutrients. The quality of the groundwater as affected by the discharge improves rapidly through dilution and dispersion as observed in the samples taken from the applicant's monitoring bores downstream. The effect of continuing the discharge via the soakage channel, on groundwater quality is therefore less than minor.

6.3.2 Mounding and Surface Flooding Effects

Discharging treated wastewater to land can potentially result in mounding of groundwater in the vicinity of the discharge. Mounding can result in effects on natural groundwater flow direction, surface flooding, particularly in nearby drainage depressions and old river channels, and in extreme cases, above-ground breakout of effluent discharges.

The assessment in the Groundwater Report concluded that rainfall is the primary influence on groundwater levels in the vicinity of the WWTP, and that average groundwater levels have remained consistent over time. Consequently, it was concluded that the existing WWTP operation including the soakage channel has not resulted in groundwater mounding, breakout or surface flooding to date. Continuing to discharge treated wastewater to land via the soakage channel is therefore unlikely to result in adverse effects on or from groundwater quantity.

6.3.3 Effects on the Meadow Burn

Lovett (2021) concluded that a portion of the treated wastewater discharged to the soakage channel is likely to enter the Meadow Burn given the proximity of the channel to the stream, the direction of groundwater flow towards the stream, and the correlation between groundwater levels and stream flow. It was concluded in the groundwater technical report that the quality of groundwater entering the stream however is likely to be much better than that of the direct operational discharges to the stream, having been further treated, diluted and dispersed in the aquifer. The resultant effect on the quality of water in the Meadow Burn is therefore minimal. The effects of the discharge from the soakage channel on water quantity are also minimal, with flows as a result of localised groundwater likely to be in the vicinity of 1 L/s. The effect of the discharge to the soakage channel on the Meadow Burn is less than minor.

6.3.4 Effects on Existing Groundwater Users

Groundwater is accessed and used for a range of domestic and farming purposes in the wider Riversdale area. Two recorded drinking water supplies have been identified within 5 km of Riversdale (as described in the Groundwater Report), with the closest being for Riversdale School approximately 1.6 km west of the WWTP. The other water supply is the Otama Rural Water Scheme operated by Gore District Council approximately 4.5 km east of the Riversdale WWTP. Other bores in the immediate vicinity of the WWTP are limited to the applicant's own groundwater monitoring bores, used to periodically sample groundwater for analysis and reporting in compliance with the resource consent conditions of AUTH-20147220-01.

The conclusions in the groundwater technical report note that as the nearest operational bore for water abstraction (versus monitoring) is over 2 km downstream of the WWTP, continuing to operate the soakage channel for the term applied for is not likely to result in an adverse effect on groundwater quality, and consequently the use of groundwater abstracted in the vicinity of Riversdale. The report concludes that there is unlikely to be any adverse effects on groundwater users as a result of the discharge, particularly given the absence of users immediately downstream of the WWTP, and the characteristics of the groundwater.

6.4 CULTURAL AND SPIRITUAL EFFECTS

Māori consider any discharge of human wastewater to water to be culturally unacceptable and degrading in terms of the Mauri of the receiving water and associated resources such as mahika kāi and other taonga. Nga Kaupapa policies in relation to wastewater discharges, as set out in Te Tangi a Tauira[8] include avoiding the use of water as a receiving environment for, and a means of disposing of, contaminants.

The applicant accepts that discharges to the Meadow Burn will continue to be culturally offensive. Enabling the discharges to continue for the five-year term sought will ultimately enable operational discharges to water to cease. This will be a significant positive effect from a Māori cultural perspective and will help to address the effects of the discharge on cultural values. Discussions with Hokonui Rūnanga's representative confirmed that the rūnanga is supportive of the long-term discharge to land, and therefore support the replacement of AUTH-20147220-01 in principle, and as a final stage towards removing operational discharges from the Meadow Burn.

6.5 EFFECTS ON NATURAL CHARACTER

The natural character of the Meadow Burn in the vicinity of the WWTP is highly modified by its channelised form resulting from the surrounding farming land use. The stream passes through culverts where it flows beneath roads and farm access tracks. The general character of the Meadow Burn is substantially dominated by surrounding land uses and takes on the appearance of a constructed drain in its upper reaches. The stream water typically flows clear (or with low turbidity) in the vicinity of the WWTP and downstream, however is substantially dominated by aquatic plants which make viewing or accessing open water difficult.

Overall, the Meadow Burn is not considered to hold high natural character values. The continuation of the current wastewater discharge is not considered to discernibly alter the perception of natural character as a result. The effect of the proposed activity on natural character negligible.

6.6 CUMULATIVE EFFECTS

The effects of the proposed discharges to the Meadow Burn are to be taken into account in combination with the effects of other discharges, including the indirect effects of land use in the vicinity of the stream. Cumulative effects of the WWTP operational discharges were considered in the assessment of effects in Section 6.0 of this application and observed in the assessment of the monitoring results in Section 3.0.

Where the treated wastewater discharges to land via the soakage channel, and discharges to the stream are infrequent, and / or are restricted to the authorised summer discharge rates (<1 L/s), the additional effect of the WWTP on the quality of the Meadow Burn will be moderate. This takes into account the effect of contaminants from upstream land uses (such as agricultural activities) and natural influences (waterfowl, wild fauna). The effects of the discharge on water quality, including the cumulative effect of the discharge result in a moderate (more than minor) effect on water quality and aquatic ecological communities caused by nutrient enrichment. The effect of winter discharges of <2 L/s is similarly moderate, as while the discharge volume is great, winter weather conditions provide greater in-stream dilution and increased assimilative capacity.

Overall, the cumulative effects of the discharge on the Meadow Burn, and on the Mataura River as the downstream receiving waterbody are considered moderate (more than minor) overall.

6.7 SOCIAL AND RECREATIONAL EFFECTS

6.7.1 Public Access to and along the Meadow Burn

Public access to the Meadow Burn is very limited in general, and particularly in the vicinity of the WWTP.

The stream passes through land under private ownership, used primarily for pastoral farming and residential purposes. The nearest upstream public access point is at Riversdale Pyramid Road. The stream is weed-choked

[8] The Iwi Management Plan for Southland

at this point and is not evidently a waterway. Access is restricted to the legal road shoulder, where it crosses beneath the road. There is no other public access point upstream of the WWTP discharge.

The closest public access downstream is over 3.5 km directly to the southeast where the stream crosses beneath Fingerpost Pyramid Road. Access is limited to the road shoulder on both sides before the stream continues heading in a generally southeast direction between private landholdings.

The Meadow Burn is not identified as a popular bathing site or as having particular public recreational value in the RWP or pSWLP.

The proposed discharge to the Meadow Burn will have no effect on existing public access to or along the stream.

6.7.2 Effects on Recreational Use

The presence of the discharge will not significantly diminish the appeal of the Meadow Burn to the community for social or recreational purposes, and hence continuing the discharge over the term sought will not result in a significant adverse effect on recreational values. The recreational use of the stream is further limited by the restricted access to the stream as noted above.

6.8 THE EFFECTS OF CLIMATE CHANGE AND NATURAL HAZARDS

The Ministry for the Environment (MfE) has projected changes in New Zealand's climate based on results from twelve global climate models, with additional information on extremes and other physical climate elements provided from NIWA's regional climate model.

Projected rainfall and wind patterns across New Zealand are expected to show greater seasonal variation over time. Westerlies are projected to increase in winter and spring, with more rainfall in the west, and drier conditions in the east and north of both the North and the South Island. Conversely, the models show a decrease in the frequency of westerly conditions in summer and autumn, with drier conditions in western areas. Other changes expected include decreased frost risk, increased frequency of high temperatures (especially in summer), increased frequency of extreme daily rainfalls, decreased seasonal snow cover, and a possible increase in strong winds. These predicted changes suggest that at a local level, winter and spring rainfall is expected to increase with the associated increased frequency of extreme daily rainfalls and strong winds in the long term.

Given the long term horizons in these models versus the short term sought for the discharge permit applied for, none of the anticipated effects of climate change are expected to impact over the next five years. Consequently, the Riversdale WWTP and the associated discharge to the Meadow Burn are not expected to be exposed to greater natural hazard risk, including weather-related events than at present.

6.9 EFFECTS OF CHANGED AND CANCELLED CONDITIONS

Application has been made to change, and to cancel some of the conditions of AUTH-20147220-02 so the permit 'makes sense' in the context of the replacement for AUTH-20147220-01 applied for, and the progress the applicant has already made toward implementing the RIB scheme.

The changes to the conditions of AUTH-20147220-02 applied for will not alter the implementation of the permit, noting that the changes apply either to conditions that have already been met, are no longer relevant, or that reflect the time needed to build and commission the RIB scheme. The conditions are largely administrative and relate mainly to milestones that have either already been met by the applicant, or that will need to be met to ensure the RIB scheme can be built and commissioned before the replacement permit applied for expires. There are therefore no effects on the environment from the change or cancellation of conditions proposed.

6.10 EFFECTS SUMMARY

The assessment of the effects above shows that continuing to discharge treated wastewater to the soakage channel and the Meadow Burn as proposed will result in adverse effects on biophysical values ranging from

negligible (less than minor) to moderate (more than minor). The significant adverse effects on Māori cultural and spiritual values are acknowledged. A summary of the evaluation of the effects of the activity is set out in Table 6-4.

Table 6-5: Effects Summary Table

Effect	Assessment summary
Positive Effects	Significant positive effects on public health outcomes, risk management, social and economic wellbeing.
Effects on land and soils	Negligible
Effects on groundwater quality / quantity	Negligible
Effects on surface water quality (including cumulative effects)	Moderate
Effects on aquatic ecology values (including cumulative)	Minor
Effects on natural character	Negligible
Effects on social and recreational values	Negligible
Effects on Māori cultural and spiritual values	Initially significant until the RIB scheme is operational.

Overall, the WWTP discharge proposed is considered to result in a moderate adverse environmental effect.

7.0 DESCRIPTION OF ALTERNATIVES

Section 6(1)(d)(ii) of the Fourth Schedule RMA directs that applications for resource consent to discharge contaminants must include a description of "any possible alternative methods of discharge, including discharge into any other receiving environment". A description of alternatives is also required under s105(1)(c) of the RMA.

7.1 ALTERNATIVES TO THE INTERIM DISCHARGE

Having committed to building and using RIBs for wastewater disposal at Riversdale and permanently removing operational discharges of treated wastewater from the Meadow Burn, the applicant has not investigated alternative discharge methods or receiving environments for the five-year discharge permit now sought.

The practicable alternative to discharging treated wastewater to the Meadow Burn as at present is to build and commission the RIB scheme as currently consented under AUTH-20147220-02. Achieving that outcome is important given the substantial investment over the last 10 years by the applicant, funding investigations and technical assessments, land acquisition talks, obtaining resource consents and the current programme of capital works for RIB construction. However, building the RIBs is reliant on the applicant being able to secure land, and then contractors to complete the works, and this cannot be achieved in the remaining term of AUTH-20147220-01, hence this application for an interim discharge permit.

The applicant undertook an extensive alternatives assessment in 2014 as part of the process that led to RIBs being identified as the preferred method of disposal. Those options were:

1. Maintain the status quo and continue to discharge via the channel and intermittently to the Meadow Burn
2. Discharge to land via RIBs into silty clay gravel subsoils
3. Discharge to land via RIBs into deeper and more permeable gravels
4. Discharge to land using slow rate irrigation onto topsoil
5. Enhanced treatment process and discharging to Meadow Burn
6. Pumping partially treated wastewater to the Gore WWTP via a 35 km pipeline for treatment and disposal.

The preferred RIBs option (Option 3) was selected due to its cost efficiency, coupled with the effectiveness and efficiency of the scheme as a disposal pathway, and its predominantly land-based discharge method. An agreement in principle was secured to purchase the necessary land area with the landowner at that time, however land purchase discussions are still ongoing, and the applicant does not currently have legal ownership of, nor access to the land to build the RIBs. However, the applicant remains committed to building and commissioning the RIB scheme that was approved when issuing AUTH-20147220-02 and removing treated wastewater discharges from the Meadow Burn in all but emergency or extreme weather circumstances.

8.0 CONSULTATION AND ENGAGEMENT

The applicant engaged with the stakeholders from the 2014 application process, being the Department of Conservation (DoC), Fish and Game New Zealand (Fish & Game) and Public Health South (PHS). Where Te Ao Marama Inc represented the Hokonui Rūnanga in the 2014 process, the rūnanga are now representing themselves and the applicant engaged directly with rūnanga representatives.

The applicant approached the stakeholders at the start of the process to prepare this application, to advise them that they would be seeking an interim discharge permit for the remaining time needed to complete the RIB scheme. The applicant noted that there has been considerable investment in the design process, that the delay to building the RIBs has been unavoidable and beyond their control despite best efforts, and that they remain committed to a land disposal scheme using the RIBs as provided for under AUTH-20147220-02.

A meeting was held in Invercargill on 13 April 2021 with DoC, Fish & Game and PHS with all parties present expressing support in principle for the short-term permit to be granted, contingent on the applicant building and commissioning the RIB scheme within the term of the permit.

In addition, the draft application document was provided to the stakeholders for consideration prior to lodging the application. The outcomes of that consultation process will be forwarded to Environment Southland as responses are received.

9.0 PROPOSED CONDITIONS AND MITIGATION

9.1 PROPOSED CONDITIONS FOR THE REPLACEMENT PERMIT

In seeking a replacement for AUTH-20147220-01, the applicant proposes to retain most of the existing conditions as they remain relevant and appropriate in the context of the RWP and the pSWLP. The applicant proposes several changes however, including removing conditions 3 and 4, and amending conditions 5 and 16 to ensure the permit remains relevant in the current context. The proposed conditions for the replacement permit are set out below and in full in Appendix D.

- **Condition 3:** This condition is no longer relevant as the RIB concept has been proven and reported to the consent authority and stakeholders listed in the condition. The dates within the condition are now several years passed and are no longer relevant. The condition has been complied with and is proposed to be replaced with a new condition which would require regular reporting to DoC, Fish & Game, Public Health South, Environment Southland and Hokonui Rūnanga. The reports will be updates that describe progress towards completing the RIB scheme, including actions completed in the previous six-month period, and planned actions for the next six-month period. The reports will include any updates to the programme for remaining works and activities such as testing and commissioning, through to the completion of the scheme. They are intended to provide transparency towards implementing the RIBs under AUTH-20147220-02 and reassure stakeholders that progress (which initially may not involve physical changes at the site) is being made.
- **Condition 4:** The milestone dates in Condition 4 are now several years passed and are no longer relevant. The condition has been complied with and can be deleted.
- **Condition 5(b):** The contact organisation is amended from Te Ao Marama Inc to Hokonui Rūnanga, now that the rūnanga is no longer operating through Te Ao Marama inc.

- **Condition 16:** Discharge Permit AUTH-20147220-01 refers to submitting an Operations and Maintenance Plan prior to the first exercise of the permit. The permit has already been exercised, and therefore this aspect of the condition is no longer relevant and has been removed from the proposed conditions.

9.2 PROPOSED CHANGES TO CONDITIONS OF AUTH-20147220-02

The applicant proposes several changes to the conditions of AUTH-20147220-02 in relation to milestone dates that are no longer relevant, specifically cancelling conditions 3, 4(a), and 4(d), amending the chapeau of condition 4, amending conditions 4(c) and 5, and introducing a new condition as Condition 4A. These proposed changes are made in accordance with s127 of the RMA as set out in Section 10.0 of this document and in full in Appendix D.

9.3 MITIGATION OF EFFECTS

The applicant is committed to commencing the RIB scheme as soon as practicable within the term of the new permit. The applicant will continue to operate the existing WWTP in a manner that maximises the quality and minimises the volume and frequency of discharges to the Meadow Burn, while advancing the RIB scheme.

Given the short term of the permit applied for and the applicant's commitment to building the RIB scheme, no alternative or additional treatment or disposal options to the current WWTP, or additional mitigation measures have been proposed. This will better enable the applicant to focus its attention solely on advancing the RIB scheme and ultimately removing operational discharges from the Meadow Burn.

10.0 LEGISLATIVE FRAMEWORK

10.1 NATIONAL PLANNING INSTRUMENTS

10.1.1 Resource Management Act 1991

10.1.1.1 Part 2

Section 104 RMA requires decision makers to have regard to a range of matters, subject to Part 2 of the RMA.

Part 2 contains section 5 which sets out the purpose and principles of the RMA, which fundamentally is to promote the sustainable management of natural and physical resources. Sustainable management is defined by the RMA as:

> *" … managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—*
>
> *a. sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
>
> *b. safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
>
> *c. avoiding, remedying, or mitigating any adverse effects of activities on the environment."*

Part 2 contains section 6 – Matters of National Importance which decision makers must recognise and provide for. Other matters which decision makers must have particular regard to are set out in Section 7. Section 8 – Treaty of Waitangi, requires decision makers to take into account the Treaty principles.

The provisions of Part 2 are reflected in the national and regional planning documents relevant to this application. Further detailed analysis of the proposed activity under the specific provisions of Part 2 is therefore not necessary[9] however for completeness they have been addressed at a general level below. A thorough assessment of the provisions of the regional plans has been undertaken in preparing this application and is contained in **Appendix G**.

[9] As consistent with the decision in *R J **Davidson** Family Trust v Marlborough District Council [2017] NZHC 52*

The assessment, along with the analysis of the effects of the activity in section 6.0 of this document shows that the proposal generally achieves the sustainable management purpose of the RMA, as framed in Part 2. Further consideration of the relevant Part 2 matters is set out below.

10.1.1.2 Section 6 – Matters of National Importance

The discharge of treated wastewater to the Meadow Burn will not affect the preservation of the natural character of the river or its margins (s6(a)). The values of the stream are protected from inappropriate use, noting the short term of the permit applied for, and the role of the discharge in transitioning to the RIB-based land disposal scheme. Public access to and along the Meadow Burn will not be reduced as a result of continuing the discharge (s6(d)). The discharge will continue to adversely affect the relationship of Māori with the Meadow Burn as a water body (s6(e)), noting that the RIB scheme will reduce and restrict such discharges to emergency or extreme weather events once operational. This cultural and spiritual offence is acknowledged by the applicant as a key driver for upgrading to the RIBs scheme.

The matters of national importance identified in section 6 of the RMA are not generally relevant to the discharge to land via the soakage channel, noting that s6(e) applies in respect of the effect of the discharge on groundwater. However, the discharge passes through the bed of the channel and land, and this does not cause spiritual or cultural offense.

10.1.1.3 Section 7 – Other Matters

In regard to Section 7 - *Other Matters* a key part of this application process was the engagement with stakeholders including tangata whenua, providing an opportunity to exercise kaitiakitanga (s7(a)) prior to the development of the resource consent application.

The proposed discharges to the soakage channel and the Meadow Burn represent an efficient use of the land and stream as a physical resource given the absence of significant adverse effects on the biophysical values of the receiving environment (including the effects described by s107 (c) – (g) RMA), taking into account the reason this permit is being applied for, and the absence of a practicable alternative for wastewater disposal over the interim period sought (s7(b)).

The effects of the discharges on amenity values are minimal (s7(c)). Amenity values associated with the Meadow Burn will ultimately be enhanced once the RIB scheme becomes operational. The discharge will continue to adversely affect the intrinsic values of the Meadow Burn's aquatic ecosystem (s7(d)) and the quality of the receiving environment (s7(f)) until the RIB scheme commences. The discharge does not appear to adversely affect the habitat of trout or salmon (s7(h)) which are present in the lower Meadow Burn and Mataura River to a more than minor degree, noting that implementing the RIB scheme will have a positive effect on the quality of aquatic habitat in the stream. As the permit has been applied for a short period, the effects of climate change (s7(i)) are unlikely to be tangible over that time, however have been incorporated into the longer term as part of the RIB design process.

The overall quality of the environment as affected by the proposal will be maintained in its present state for the term of the consent sought. The quality of the Meadow Burn as the current primary receiving environment will initially be maintained as at present and will ultimately be enhanced when the RIB scheme becomes operational.

The discharge to the soakage channel represents an efficient use of the land and groundwater resources involved given the minimal adverse effects on the receiving environment including other land uses and downstream groundwater (s7(b)), and the absence of a practicable alternative receiving environment over the interim term sought. Similarly, there are no adverse effects on amenity values (s7(c)) from the land discharge, and the effects on the intrinsic values of ecosystems (s7(d)) and the quality of the environment (s7(f)) when viewed overall are minimal.

10.1.1.4 Section 8 – Treaty of Waitangi

The key purpose of the proposal is to enable the discharges to land and water to lawfully continue until the RIB scheme can be commissioned, thereby enabling operational discharges to the Meadow Burn to cease. Once the scheme is operational, the recognised adverse effects on cultural and spiritual values of the stream stemming from operational discharges will be largely eliminated.

The applicant has actively engaged with tangata whenua over many years in regard to this WWTP scheme and continues to do so. The active protection of land and water resources, and the associated spiritual and cultural values are key drivers for implementing the RIB scheme and decommissioning the current operational discharges to the Meadow Burn.

10.1.1.5 Section 15 – Discharge of Contaminants into Environment

Section 15(1)(d) of the RMA prevents the discharge of any contaminant into land from an industrial or trade premises, to land where it may enter water, or directly to water unless that discharge is allowed by a rule in a national environmental standard (NES), a rule in an operative or proposed regional plan, or is authorised by resource consent.

There are no rules in a relevant NES or regional plan that permit the proposed discharges. The rules of the RWP and the pSWLP identify that wastewater discharges from community sewage schemes to land or water cannot be lawfully undertaken without resource consent.

10.1.1.6 Section 104 – Consideration of Applications

Section 104 of the RMA sets out the matters that decision makers must have regard to when considering applications for resource consent, and states:

(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to–

(a) any actual and potential effects on the environment of allowing the activity; and

(ab) any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and

(b) any relevant provisions of—

(i) a national environmental standard:

(ii) other regulations:

(iii) a national policy statement:

(iv) a New Zealand coastal policy statement:

(v) a regional policy statement or proposed regional policy statement:

(vi) a plan or proposed plan; and

(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.

The actual and potential effects of the proposed discharges, including positive effects are described in Section 6.0 of this document.

The relevant documents set out in Section 104(1)(b) are identified earlier in this section. Those documents are considered to have been prepared to give effect to Part 2 of the RMA, and therefore the lower order provisions take precedence in the decision-making process, with the provisions of Part 2 providing higher level guidance in the event of incomplete, conflicting or unclear plan-level provisions.

Section 104(2A) applies in respect of this application, and states:

> *When considering an application affected by section 124 or 165ZH(1)(c), the consent authority must have regard to the value of the investment of the existing consent holder.*

As the application has been made in accordance with s124 of the RMA, the consent authority must have regard to the value of the investment that the applicant has already made in establishing and operating the Riversdale WWTP, the associated network infrastructure associated with the WWTP, and the substantial investment made by

the applicant and the ongoing investment planned in respect of ultimately building and commissioning the RIB scheme and ceasing operational discharges to the Meadow Burn.

The applicant estimates the replacement cost of the Riversdale Wastewater Scheme as a whole to be approximately $3.16 Million. The estimated replacement cost of the Riversdale WWTP alone is approximately $1.0 Million. A further $2.6 Million has been budgeted between 2021 and 2023 to implement the land discharge scheme in compliance with AUTH-20147220-02.

The applicant has made substantial investment over a number of years into investigations and designs and securing regulatory approvals for the Riversdale WWTP and has committed to substantial further investment in building and commissioning the RIB scheme.

10.1.1.7 Section 104D

Section 104D of the RMA prevents resource consent applications for non-complying activities being granted unless the consent authority is satisfied that either:

a. the adverse effects of the activity on the environment will be no more than minor (s104D(1)(a)); or

b. the activity will not be contrary to the objectives and policies of the relevant operative and / or proposed plans (s104D(1)(b)).

An application for a non-complying activity must satisfy at least one of the above 'gateway tests' to be able to be granted. If an application passes, then it is to be determined in accordance with s104B of the RMA which provides the consent authority full discretion to either grant the application with conditions or to decline it.

The effects of the proposed discharge activities on the receiving environments have been assessed in Section 6.0 of this application. The assessment concludes that the discharge to the stream results in moderate adverse effects after reasonable mixing. The applicant proposes to continue to discharge wastewater up to the current consented volume, over the term sought. It is therefore expected that the effects on the receiving environment over the term applied for will continue to be moderate (i.e. more than minor) overall, and therefore will not pass the first gateway test of s104D which requires the effects of a non-complying activity to be minor at most.

The proposed activity has also been considered in the context of the objectives and policies of the relevant national and regional planning instruments as set out in Appendix G of this document. The assessment finds that the activity is generally consistent with the applicable objectives and policies, particularly those providing for critical infrastructure, despite being inconsistent with some provisions and contrary some. Importantly, it is not contrary[10] to the overall policy framework, and hence the application will meet the second gateway test.

Alignment with the overall policy direction is further strengthened when taking into account the purpose of the discharge permit, being to enable the discharges to lawfully continue only as long as needed to enable the RIB scheme to be completed in favour of ending operational discharges to the stream. It is appropriate therefore to consider this application broadly as a step in the applicant's shift from water to predominantly land disposal, rather than in isolation on its merits. This approach is supported by caselaw in *SKP Incorporated v Auckland Council* [2018] NZEnvC 81 in which the Court determined that an evaluation of an effect should be undertaken on an *'holistic basis, looking over the entire application and a range of effects*'[11]. The discharge permit is sought only for an interim period and solely to facilitate a move to the RIB scheme for which consents are already held, a design has been completed, and funding has been secured. It is reasonable therefore to expect that the applicant will (must) progress the RIB scheme and that, as an interim measure to achieve that scheme, it is appropriate to consider this application in the broader context.

In summary, the proposal adequately satisfies the policy gateway of s104D and therefore there is no statutory barrier to either considering the application under s104 or determining it under s104B RMA.

10.1.1.8 Section 105

Clause 6(1)(d)(ii) of the Fourth Schedule RMA directs that applications for resource consent to discharge contaminants must include a description of "any possible alternative methods of discharge, including discharge into

[10] To be contrary to a provision, an activity must be so opposed to its direction as to be 'repugnant' to it.
[11] Para 49, *SKP Incorporated v Auckland Council* [2018] NZEnvC 81.

any other receiving environment". A description of alternatives is also required by s105(1)(c) RMA which requires decision makers, when determining an application for a discharge permit that contravenes section 15 or 15B of the RMA, to have regard to:

(a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and

(b) the applicant's reasons for the proposed choice; and

(c) any possible alternative methods of discharge, including discharge into any other receiving environment.

These matters are discussed in turn below.

- ***The nature of the discharge and the sensitivity of the receiving environment***

The nature of the discharge is described in detail in Section 3.0 of this document. A description of the surface water and land receiving environments, an assessment of the effects of the discharge to each, and the receiving environments' sensitivity to those effects is made in Section 4.0.

The assessment found that given the volume and characteristics of the wastewater discharges and the characteristics of the Meadow Burn, the sensitivity of the river and ecosystem quality beyond the mixing zone is moderate.

The sensitivity of the land receiving environment to the effects of the discharge is considered to be low. The receiving environment is the land beneath the soakage channel, it does not hold any archaeological, ecological or biophysical value of note, and cannot be used for any other purpose.

- ***The applicant's reasons for the proposed discharge***

The reasons for the proposed discharges are set out in Section 2.0 of this document. Primarily, the applicant seeks a replacement discharge permit to authorise the continuation of the current treated discharge to land through the soakage channel, and to the Meadow Burn following the expiry of AUTH-20147220-01 in October 2021. Central to this application is that the interim term sought for the permit is to ensure the activity remains lawful until the RIB scheme can be built and commissioned. Key in considering this application is the scale and nature of the current discharges, the effects of those discharges on the respective receiving environments, and the period for which the permit is sought. Fundamentally, this application is to enable the existing wastewater discharges to lawfully continue as the final step towards implementing the RIB scheme.

- ***Alternative methods of discharge***

No specific alternative method or location for the proposed discharges have been contemplated in preparing this application. The application seeks consent to authorise the discharges only for the remaining time needed to construct, test and commission the RIB scheme so the discharge can be removed from the stream in favour of the land discharge approved under AUTH-20147220-02.

On a broad scale, the alternatives to the current discharges have been extensively investigated in identifying the RIB scheme as the preferred solution in 2014, securing the associated consents, and progressing the design process. The alternatives investigated included continuing with the status quo, various treatment options combined with RIB disposal, alternative treatment and discharge to the Meadow Burn, and discharge via slow rate irrigation. The previous alternatives assessment submitted with the 2013 application demonstrated that there are few viable alternatives to the RIB scheme, and the applicant remains committed to that option, with substantial progress having already been made towards its implementation, and funding committed by the Council.

The applicant has invested in consultation, engagement, investigations and concept design for the RIB scheme, and is committed to implementing the scheme within the term of the interim consent if granted. To implement an alternative discharge method or receiving environment at this stage would compromise the applicant's ability to develop the RIB scheme as the long-term wastewater solution for Riversdale in place of the Meadow Burn discharge. Issuing the interim discharge permit applied for is therefore the best practicable option to achieve long term land-based management of Riversdale's wastewater.

10.1.1.9 Section 107

Section 107(1) of the RMA prevents the granting of applications to discharge contaminants to land or water that contravene s15 of the RMA, if after reasonable mixing the contaminants discharged would result in the following receiving environment effects:

> *(c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials:*
>
> *(d) any conspicuous change in the colour or visual clarity:*
>
> *(e) any emission of objectionable odour:*
>
> *(f) the rendering of fresh water unsuitable for consumption by farm animals:*
>
> *(g) any significant adverse effects on aquatic life.*

The assessment of the monitoring results set out in Section 3.0 and the assessment of effects in Section 6.0 of this document demonstrate that the discharge has not caused to date, and therefore is likely to avoid in the future, the effects identified in s107(1)(c) – (g) in ground or surface water. Specifically, there is no conspicuous visual or odour effect resulting from the discharge, the suitability of the stream for stock water is not compromised, and the effect on temperature, pH, oxygen content and aquatic life is not statistically significant. Consequently, the application is not prevented by s107 from being granted.

Despite the restrictions set out in s107(1), the consent authority may grant applications for resource consent for activities that result in the effects in s107(1)(c) – (g) if the exceptions provided for in s107(2) are met, being:

> *(a) that exceptional circumstances justify the granting of the permit; or*
>
> *(b) that the discharge is of a temporary nature; or*
>
> *(c) that the discharge is associated with necessary maintenance work —*
>
> *and that it is consistent with the purpose of this Act to do so.*

There are no applicable exceptional circumstances relevant to the proposed discharge and the discharge is not a result of necessary maintenance work. The five-year term applied for may be considered 'temporary' in the longer-term context of the scheme. However, as the discharge will not result in the effects described in s107(1)(c) – (g) the application does not rely on the exceptions provided for by s107(2).

10.1.1.10 Section 124

Section 124(2) enables consent holders to lawfully continue to exercise an existing consent beyond the expiry date, where an application to replace that consent is lodged between three and six months prior to the date of expiry at the discretion of the consent authority. If that discretion is exercised, the consent holder may lawfully continue to exercise the consent until the application is determined and any appeals are resolved (s124(3)).

This application was lodged more than three months before AUTH-20147220-01 expires, so s124(3) applies. In discussions prior to lodging the application, Environment Southland advised they were likely to exercise their discretion under s124(3), and the application and associated consultation with previous submitters and stakeholders has proceeded on that basis.

10.1.1.11 Section 127

Section 127 of the Resource Management Act 1991 (RMA) provides for a consent holder to apply to change or cancel any consent condition other than in relation to consent duration. Section 127(3)(a) requires that such an application is to be treated as if it was an application for a discretionary activity. Under s127(3)(b), the scope of the actual and potential environmental effects that can be considered in determining the application to change or cancel a condition is limited to the effects resulting from the change or cancellation of the condition sought.

An application to change or cancel a condition under s127 RMA must not result in a change to the nature of the consent that is beyond the scope of what was anticipated when it was originally granted. That is, the change or cancellation cannot be so substantial that it materially changes the nature of the activity for which the consent was

first issued. Case law[12] directs that when deciding whether a change or cancellation is within the scope of the original resource consent or is fundamentally a new activity (and therefore needs to be considered as such), a consent authority should compare the adverse effects likely to result from the cancellation or change proposed, with the adverse effects of the activity as originally approved. Where the change or cancellation would result in a fundamentally different activity or materially different effects, a new application may be appropriate.

It follows therefore that, if the activity and effects are not fundamentally different, the application may be considered under s127. The cancellations and changes to the conditions of AUTH-20147220-02 applied for would not materially alter the scope or purpose of the consent and would remain within the scope of the original proposal.

The applicant applies to change or cancel the conditions as set out in Section 6.0 of this document because they refer to actions to be completed by dates which have passed, and the related tasks have already been completed.

There are no effects stemming from cancelling conditions 3 and 4(a) as they have already been met.

The change to condition 4(c) in respect of the date that the RIBs must be constructed and operational also will not fundamentally change the activity or scope of the consent but simply reflects the delays which the project has experienced. There is also no effect resulting from changing the milestone date in condition 4(c) or replacing condition 4(d) with proposed condition 4A as the applicant remains committed to building operational RIBs as soon as possible within the term of the new permit (if issued).

Section 127(4) RMA requires that when determining who is adversely affected by a proposed cancellation or change of conditions, the consent authority must consider particularly those who made a submission on the original application, as well as any parties who may be affected by the change sought. Case law[13] directs that when doing so, it is the effects of the change rather than the activity itself which are relevant. A comparison needs to be made between the adverse effects of the activity in its original form, and any adverse effects resulting from the activity in a form amended by the change or cancellation of a condition. The Court has directed that, if the effects after a condition is changed are no greater than under the original condition, there is no requirement to obtain written approvals for the change from parties who may be affected by the activity but are not affected by the change.

The applicant has engaged with the parties who lodged submissions on the 2014 application. The engagement process is described in Section 8.0 of this document, along with the outcomes, enabling the consent authority to take those parties views into account. While it is understood that all parties support the proposal in principle, the applicant has provided a copy of this application to those parties and will provide their feedback to the consent authority upon receipt.

10.1.2 National Policy Statement for Freshwater Management 2020

The National Policy Statement for Freshwater Management 2020 (NPSFM) sets an objective and a series of policies requiring and guiding local government to manage fresh water in an integrated and sustainable manner. The NPSFM is founded on the principle of Te Mana o te Wai, a concept that recognises the importance of water to life and wellbeing, and that protecting the health of fresh water safeguards the health and wellbeing of people and the environment. Te Mana o te Wai is based on six principles, which embody sustainable management of fresh water, and which align with the hierarchy of obligations that prioritises:

(a) The health and wellbeing of water bodies and freshwater ecosystems

(b) The health needs of people; and

(c) The ability of people and communities to provide for their social, economic and cultural wellbeing.

The provisions of the NPSFM relevant to this proposal include the Objective, and Policies 1, 2, 7, 9-10, 12 and 15. A full assessment of the proposal in the context of these provisions is included in Appendix G. Overall, the assessment finds that the proposal will achieve the objective and is consistent with the relevant policies when the scheme as a whole is considered, with the implementation of the RIB scheme taken into account.

[12] *Body Corporate 97010 v Auckland CC* (2000) 6 ELRNZ 183, [2000] NZRMA 202
[13] *Body Corporate 97010 v Auckland CC* (2000) 6 ELRNZ 183, [2000] NZRMA 202 (HC).

10.1.3 National Environmental Standards for Freshwater 2020

The National Environmental Standards for Freshwater 2020 (NES-F) is intended to regulate activities that could result in a potential adverse effect on fresh water. The NES-F sets out requirements specifically in respect of protecting wetlands, streams, connectivity of aquatic habitats, and farming practices that may affect water quality.

There are no structures proposed within the bed or margins of the Meadow Burn that would impact the stream, aquatic ecology or fish passage. The NES-F does not apply to this proposal.

10.1.4 National Environmental Standard for Sources of Human Drinking Water 2008

The National Environmental Standard for Sources of Human Drinking Water (NESDW) is a regulation under the RMA that sets requirements to protect sources of human drinking water from contamination. The NESDW requires regional councils to ensure that effects on drinking water sources are considered when making decisions on resource consent applications and when preparing regional plans. Specifically, councils are required to:

- Decline applications for discharge or water permits if those activities are likely to result in community drinking water becoming unsafe for human consumption following existing treatment processes;
- Be satisfied that permitted activity rules in regional plans will not result in community drinking water supplies becoming unsafe for human consumption following existing treatment processes;
- Place conditions on resource consents requiring the notification of drinking water suppliers if significant unintended events occur (e.g. contaminant spills) that may adversely affect sources of human drinking water.

Sources of drinking water include natural water bodies such as lakes, rivers or groundwater used to supply a community with drinking water. The standard applies to source water before it is treated, and only sources used to supply human drinking water i.e. not water supplied for stock or other non-consumptive uses.

There are no community water supply takes from, affected by or in proximity to the Meadow Burn, groundwater in the vicinity of Riversdale, or downgradient of the soakage channel.

10.1.5 Water Conservation (Mataura River) Order 1997

Water Conservation Orders (WCO) are issued over water bodies of particularly high or outstanding value. There are seven WCO issued before the RMA came into effect in 1991, and eight issued under the RMA. WCO acknowledge the natural state or outstanding values of note, and include methods to preserve such values, such as the quality of natural state water, or the protection of special characteristics like habitat, fishery, scientific, ecological, recreational or cultural values.

The Mataura WCO was established to protect the ‘outstanding fisheries and angling amenity features’, including the main stem and the rivers’ tributaries. The WCO specifically protects the rates of flow in the main stem river and the Waikaia River as a key tributary, prohibits damming of the river or the Waikaia, limits discharges and sets water quality standards after reasonable mixing, in the main stem and key tributaries. The Meadow Burn is not identified in the WCO as a key tributary, and regardless the effects of the discharge are indiscernible in the stream prior to its confluence with the Mataura River. The WCO does not appear to have an effect on the proposed discharge.

10.2 SOUTHLAND REGIONAL PLANS

10.2.1 Southland Regional Policy Statement 2017

The Southland Regional Policy Statement (RPS) became operative in October 2017. It identifies the resource management issues currently facing the region and sets out objectives and policies to guide the use, protection and development of the region’s natural and physical resources in a manner that addresses those issues.

The proposal was considered in the context of the relevant provisions of the RPS. An assessment of these provisions is contained in Appendix G of this document. The assessment shows that the proposal will generally achieve the objectives of the RPS and overall is consistent with the relevant policies. In particular, the scheme

constitutes critical infrastructure as consistent with the definition in the RPS. Objective INF.1 and Policies INF.1 and INF.2 provide support for the proposal as a phase in moving the overall process to a land-based scheme as proposed.

10.2.2 Southland Regional Effluent Land Application Plan

The Southland Regional Effluent Land Application Plan (RELAP) is the operative regional plan setting objectives, policies and rules in respect of discharges to land from industrial and trade processes, and the application of agricultural and municipal effluent. The assessment of these provisions in Appendix G shows that the proposal is consistent with the plan's policies and will achieve the relevant objectives.

10.2.3 Southland Regional Water Plan

The Southland Regional Water Plan (RWP) promotes the sustainable management of Southland's freshwater resources and is currently the operative water management plan for Southland. It sets out objectives, policies and rules for sustainably managing the region's water resources, including discharges to, and the take and use of fresh water.

The proposal has been considered in the context of the objectives and policies of the RWP in Appendix G, finding that, while the activity is not consistent with all policies, it will generally achieve the RWP's objectives and is consistent with most of the policies.

10.2.4 Proposed Southland Water and Land Plan

The proposed Southland Water and Land Plan (pSWLP) is part of Environment Southland's suite of regional plans aimed at managing the effects of activities on freshwater quality and quantity. Under the pSWLP, Southland's waterbodies are grouped into five areas defined as freshwater management units (FMU) for managing land and water in an integrated way. Through the limit setting process yet to be completed under the NPSFM, objectives, policies and rules will be developed for each FMU to establish quality and quantity limits to support the effective integrated management of land and water use, as aligned with the objectives of the NPSFM and the RPS.

The pSWLP was notified in June 2016 with Council hearings closing in November 2017. Following the issuing of the decision from that hearing, an amended (decisions) version of the pSWLP was released in April 2018. A number of appeals were lodged in respect of that version, and the hearing of those appeals has commenced. An interim decision was released by the Environment Court in November 2020 following the hearing of appeals on the Objectives and some policies, with the pSWLP now operative in part (objectives). Mediation on appeals on the remaining policies and rules commenced in 2021 and is ongoing.

At the time of this application, the provisions of the pSWLP have legal effect but remain uncertain until all appeals are resolved and the pSWLP becomes operative. While the rules of the pSWLP took immediate legal effect at notification, the weight that can be placed on the provisions relevant to this application that are not operative is generally limited. Until the remaining appeals are resolved, the RWP will remain the operative regional plan in respect of managing the effects of discharges.

The proposed activity was assessed against the relevant objectives and policies of the partly operative version of the pSWLP. The assessment is set out in Appendix G and found that the proposed activity will mostly achieve the objectives, is consistent with most of the relevant policies and overall is not contrary to the policy framework in its current form (noting that the appeal process is likely to result in some amendments to it).

10.3 OTHER PLANNING INSTRUMENTS

10.3.1 Te Tangi a Tauira

Te Tangi a Tauira is the Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan (IMP). It was officially endorsed by Te Rūnanga o Awarua, Te Rūnanga o Ōraka/Aparima, Te Rūnanga o Waihōpai and Te Rūnanga o Hokonui in January 2008. The IMP includes specific sections on Te Ra a Takitimu (Southland Plains), Takitimu Me Ona Uri (High Country & Foothills) and Te Atawhenua (Fiordland).

The purpose of the IMP is to consolidate Ngāi Tahu ki Murihiku values, knowledge and perspectives on natural resource and environmental management issues within Southland, and as an expression of kaitiakitanga. The IMP is a planning document which assists Ngāi Tahu ki Murihiku in their role and responsibility as kaitaki, and which reflects the outcomes sought by the tangata whenua of Murihiku. The IMP also recognises the role of communities in achieving good environmental outcomes and healthy environments and is designed to foster an understanding of tangata whenua values and policy.

The proposed activity was considered in the context of the objectives and policies of the IMP as a relevant non-statutory document for the consent authority to consider under s104(1)(c) of the RMA in determining the application. The assessment in Appendix G found that the proposal will be consistent with most of the stated policies, but is not consistent with several, and contrary to some insofar as they relate to the use of water as a receiving environment for waste and contaminants. When the scheme as a whole is viewed however, the removal of operational discharges to the Meadow Burn aligns well with and is supported by the provisions of this IMP.

10.3.2 Ngāi Tahu Freshwater Policy Statement

The Ngāi Tahu Freshwater Policy Statement was prepared by Te Rūnanga o Ngāi Tahu and is focused on guiding the management of the freshwater resource within the rohe of Ngāi Tahu. As water is central to all life, and is a taonga provided by Māori ancestors, the present generation of Ngāi Tahu is responsible for ensuring that this taonga continues to be available for future generations.

Strategy 31 of the statement is particularly relevant, stating that Councils should prohibit direct contaminant discharges to water, particularly of human effluent, and that discharges to land should be encouraged. As this application is underpinned by the applicant's commitment to ending operational discharges to the Meadow Burn in favour of the RIB scheme, the overall proposal is consistent with the freshwater policy's ultimate objectives in this regard.

The proposed discharges are considered against the provisions of the policy statement in Appendix G. The assessment found that the proposal will generally achieve the relevant objectives and is generally consistent with the relevant policies, when considered as a whole in the context of implementing the RIB scheme.

11.0 CONCLUSION

The replacement of AUTH-20147220-01 and the changes to AUTH-20147220-02 are sought to enable the applicant to lawfully continue the discharges only as long as needed to complete the final stages and commissioning of the RIB scheme.

The discharges will not result in any of the effects identified in s107 of the RMA that would prevent the application from being granted. The adverse effects of the discharges will be, at most consistent with the effects of the current discharges. The effects of the discharges will be limited to the time taken to complete the construction and commissioning of the RIB scheme. The effects are therefore mitigated by the five-year term sought and will ultimately be avoided by removing operational discharges to the Meadow Burn.

Granting the application will enable the Riversdale community to continue to provide for their health and safety, and their social and economic wellbeing while the RIB scheme is commissioned. The RIB scheme in turn will improve the degree to which those values are safeguarded, as well as helping to achieve long term cultural and environmental wellbeing by achieving improvements in surface water quality.

The discharges are aligned with many provisions of the relevant statutory and non-statutory documents when considered in the round, noting that they are also inconsistent with several and contrary to some. Overall, the proposal is consistent with the purpose of the RMA as embodied by Part 2, particularly in light of the role that the discharge permits play in enabling the implementation of the RIB scheme that will permanently end operational discharges to the Meadow Burn. There are no regulatory barriers to this application being granted as applied for.

Appendices

We design with community in mind

Appendix A AUTH-20147220-01 AND AUTH-20147220-02

AUTH-20147220-01

environment SOUTHLAND
Te Taiao Tonga

Cnr North Road and Price Street
(Private Bag 90116
DX YX 20175)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252
Southland Freephone No. 0800 76 88 45

Discharge Permit

Pursuant to Section 104D of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council to **Southland District Council, P O Box 903, Invercargill 9840** from **5 October 2016.**

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:		To discharge treated municipal wastewater from the Riversdale wastewater treatment plant to surface water (Meadow Burn) and to land via a soakage channel.
Location	- site locality	Riversdale
	- map reference	The existing discharge into the Meadow Burn is located immediately east of the oxidation pond at NZTM E1271094 N4907934 The wastewater will be discharged via the drainage channel at or about NZTM E1271035 N4907904
	- catchment	Mataura River
Legal description of land at the site:		Parts Lots 5 and 6, DP 92, Part Section 509, Hokonui Survey District
Expiry date:		**5 October 2021**

Schedule of Conditions

1. This consent authorises:
   a) The discharge of treated wastewater from the Riversdale Wastewater Treatment Plant oxidation pond to the soakage channel at an annual average daily flow of 260 m^3/day;

Note: Compliance with this condition shall be determined by a record of the daily volume of wastewater coming into the plant as the best available indication of wastewater flow, as specified in Condition 7.

b) The discharge of treated wastewater from the oxidation pond to the Meadow Burn via the soakage channel. The rate of discharge from December to March will be limited to less than 1 litre per second. The rate of discharge from April to November will be limited to less than 2 litres per second.

c) The discharge of treated wastewater from the oxidation pond to the Meadow Burn via the soakage channel at rate higher than that specified in Condition1(b) above may only occur as a result of high water levels in the soakage channel, where available freeboard from the top of the soakage channel is less than 300mm, which, if not lowered, may increase the risk in overflows from the soakage channel and/or oxidation pond. The consent holder shall advise the Consent Authority prior to any discharge under Condition 1(c), detailing the reason for the proposed discharge. The consent holder's staff shall undertake discussion with the Consent Authority prior to the discharge occurring.

2. The discharge authorised by this permit shall not give rise to any of the following effects 50 metres downstream of the discharge point in the Meadow Burn:

a) The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
b) Any conspicuous change in colour or visual clarity;
c) Any emission of objectionable odour;
d) The rendering of fresh water unsuitable for consumption by farm animals;
e) Any change in the natural water temperature of more than 3 degrees Celsius;
f) Any change in the pH outside of the range of 6.0 to 9.0, except when due to natural causes;
g) A reduction in the oxygen content in solution to less than 6 milligrams per litre; or
h) Any destruction of natural aquatic life as a result of a concentration of toxic substances.

Programme of Works for Rapid Infiltration Basins (RIBs)

3. The Consent Holder will provide an update on progress towards an outcome in the RIB investigations by 31 May 2017 and a further update by 31 May 2018. These updates shall include any preliminary conclusions based on the further groundwater monitoring as to whether the Rapid Infiltration Basins will likely be able to take all of the wastewater flow and subsequently be constructed and used. These updates shall be provided in writing to:

a) Environment Southland;
b) Operations Manager (Murihiku), Department of Conservation;
c) Fish & Game Southland;
d) Te Ao Marama Inc; and
e) Public Health South.

4. Prior to commencing AUTH-20147220-02 to construct and use the Rapid Infiltration Basins, and by no later than 31 May 2019, the Consent Holder will assess and determine whether the Rapid Infiltration Basins will accept all of the predicted wastewater flow. If the Consent Holder determines that the proposed Rapid Infiltration Basins cannot accept all of the wastewater flow (except under extreme events as defined in AUTH-20147220-02), the Consent Holder will give written notice of that to the Consent Authority by 31 May 2019. In that notice, the Consent Holder must elect whether the Rapid Infiltration Basins are to be constructed and used. If in that notice the Consent Holder concludes that the Rapid Infiltration Basins are not to be constructed and used then it will also give written notice

under Section 138 to the Consent Authority that it surrenders the consent for the long term discharge of wastewater to ground via the RIBs (AUTH-20147220-02) by 31 May 2019.

Accidental or Emergency Discharges

5. In the event of an emergency or accidental discharge of wastewater or partially treated wastewater to land or water (as opposed to normal treated wastewater discharging to ground and water through the Discharge Channel), the consent holder (or the consent holder's agent) shall without undue delay, notify:

    a) Public Health South (ph (03) 211 0900);
    b) Te Ao Marama Inc. (ph (03) 931 1242);
    c) The Consent Authority's Pollution Response Hotline (ph 0800 76 88 45);
    d) Fish & Game Southland (ph (03) 215 9117);
    e) Operations Manager (Murihiku), Department of Conservation (ph (03) 211 2400); and
    f) Users of downstream surface water abstractions within 200 metres of the discharge point of the WWTP to the Meadow Burn.

6. The consent holder shall maintain a record of all incidents and complaints relating to the exercise of this consent, including discharges occurring under Condition 1(c).

This record shall include, but not be limited to:

    a) The location where the incident was detected by the complainant;
    b) The date and time when the incident occurred;
    c) A description of the weather conditions when the incident was detected by the complainant;
    d) The nature of the incident;
    e) Operating conditions at the time of the complaint, including any malfunction or breakdown of plant or equipment;
    f) The duration of the incident;
    g) The most likely cause of the incident; and
    h) Any corrective action undertaken by the consent holder to avoid, remedy or mitigate the incident, and any future recurrence.

The incidents and complaints register shall be made available for viewing by the Consent Authority's staff at any time.

Within seven days of any complaint, the consent holder shall notify the Consent Authority in writing of the response taken to remedy the cause of the complaint, and provide a copy to the complainant (if known). The consent holder shall provide a copy of the incidents and complaints register maintained in accordance with Condition 6 to the Consent Authority on request.

Monitoring

7. The consent holder shall record the daily volume of wastewater coming into the plant. This shall determine compliance with Condition 1(a). The daily volume record shall be supplied to the Consent Authority by 31 July each year, or at any time upon request.

8. In March, June, September and December each year, the consent holder shall collect representative samples of:
    a) Treated wastewater at the end of the Soakage Channel prior to the discharge to the Meadow Burn;
    b) Groundwater from RD1, RD2, RD3, RD4 and RD5;

c) Water from the Meadow Burn at:
   i. a location five metres upstream of the discharge (Point 1);
   ii. a location 50 metres downstream of the discharge (Point 2); and
   iii. a location approximately 800 metres downstream of the oxidation pond (Point 3).

See **Appendix 1** for a location plan of monitoring points.

9. The following shall be measured at the time of sampling undertaken in accordance with Condition 8:

   a) Groundwater levels in each bore;
   b) The depth of the bores sampled;
   c) The instantaneous rate of direct discharge from the pipe at the end of the soakage channel to the Meadow Burn;
   d) Observations of any conspicuous oil or grease films, scums or foams or floatable or suspended material resulting from the discharge (supported by photographic evidence);
   e) Record of water level at the Environment Southland water level station on Meadow Burn at Round Hill Road; and
   f) Record of groundwater level at the Environment Southland monitoring bore F44/0181.

10. All samples collected in accordance with Condition 8 will be analysed for:

   - Temperature (field measurement)
   - pH
   - Electrical conductivity
   - Total suspended solids (discharge only)
   - Turbidity (surface water only)
   - Total five day carbonaceous biochemical oxygen demand (discharge only)
   - Dissolved oxygen (measurement of surface water only) (as mg/l and percentage of Saturation)
   - Total Ammoniacal nitrogen
   - Soluble inorganic nitrogen (nitrate-nitrogen+nitrite-nitrogen+ammoniacal nitrogen)
   - Total nitrogen
   - Dissolved reactive phosphorus
   - Total Phosphorus
   - *Escherichia coli*
   - Faecal coliforms
   - Fluoride
   - Chloride
   - Bromide

The analytical sample results for each monitoring event shall be reported in writing to the Consent Authority within four (4) weeks of receipt of the sample results by the Consent Holder.

11. In the event that monitoring undertaken in accordance with Condition 8 identifies that any of the trigger values listed in Condition 12 are exceeded, the consent holder shall undertake the following as appropriate:

   a) check for anomalous results;

   b) assess monitoring results against the up-gradient or up-stream samples to determine whether other land uses may be influencing the exceedance of the trigger value;

c) identify any mitigation measures that are considered necessary to ensure that groundwater and surface water quality complies with the trigger values given in Condition 12;

d) Within one month of receiving the results, submit a report to the Consent Authority on the actions undertaken, including identification of any mitigation measures that have been identified and a programme for implementing these measures;

e) Implement the identified mitigation measures within the proposed timeframes, which shall not be greater than 3 months from submission of the report according to Condition 11(d).

12. The following trigger values shall apply to the monitoring undertaken in accordance with Condition 8:

Parameter sampled	Discharge	Groundwater (at RD5 only)	Meadow Burn (at 50 m downstream only)
Total five-day carbonaceous biochemical oxygen demand (g/m^3)	50	-	-
Total Ammoniacal Nitrogen (mg/L)	-	-	0.9
Soluble Inorganic Nitrogen (mg/L)	30	5	-
Dissolved Reactive Phosphorus (mg/L)	10	-	-
Escherichia coli (cfu/100mL)	-	2	1,000

Note: - Indicates no trigger value set for this parameter at this location

13. The consent holder shall undertake an aquatic ecology survey, to characterise the impact of the discharge on the aquatic environment of the Meadow Burn within the first three years after commencement of this consent. This aquatic ecology survey shall consist of:

a) Macroinvertebrate sampling, following Protocol C3 (hard-bottomed, quantitative) as outlined in the document "*Protocols for sampling macroinvertebrates in wadeable streams*"[1], with analysis for a full range of metrics, including %EPT, MCI and SQMCI;

b) Survey of periphyton during the period 1 November – 30 April, using the rapid assessment protocols for periphyton as outlined in the document "*Stream Periphyton Monitoring Manual*"[2] to assess the:
   i. Presence of bacterial or fungal slime growths as obvious plumose growths or mats;
   ii. Percentage cover of filamentous algae greater than 2 cm long within the stream bed;
   iii. Percentage cover of diatoms any cyanobacteria greater than 0.3 cm thick.

[1] Stark, J., Boothroyd, I., Harding, J., Maxted, J., & Scarsbrook, M. (2001): Protocols for sampling macroinvertebrates in wadeable streams. Prepared for the Ministry for the Environment.

[2] Biggs & Kilroy (2000): Stream periphyton monitoring manual. Report prepared for the Ministry for the Environment.

c) Quantitative sampling protocols as outlined in the document "*Stream Periphyton Monitoring Manual*"[3] QM-1b to assess the following periphyton measures, in line with the requirements of the '*Spring Fed*' river standards in the Consent Authority's Regional Water Plan and attached as **Appendix 2**:
   i. Chlorophyll *a* per m^2 for both filamentous algae or diatoms and cyanobacteria.

14. Aquatic ecology monitoring outlined in Condition 13 shall be undertaken at two downstream sample locations and one upstream sample location (as identified on the attached plan), with an appropriate number of replicate samples being collected from each location as follows:
    a) Upstream Point 1;
    b) Downstream Point 2;
    c) Downstream Point 3.

Sampling should occur when flows are less than median flow conditions. No sampling shall be carried out within ten days of the Meadow Burn exceeding seven times its median flow or within seven days of flows that are greater than three times the median flow.

Median flow conditions in the Meadow Burn shall be taken as when the groundwater level in the Environment Southland monitoring bore F44/0181 is at 1.41 m below land surface as recorded by the Consent Authority.

15. The consent holder shall submit a report to the Consent Authority within two months of the receipt of results for monitoring undertaken as per requirements of Conditions 13 and 14. The report shall summarise the results of all monitoring, analyse trends and comment on the results comparing them to the '*Spring Fed*' standards within the Consent Authority's Regional Water Plan, 2010, or any subsequent plans and/or water quality targets.

    Note: The assessment outlined in Condition 15 shall be undertaken for comparative purposes only.

On Site Management

16. An Operations and Maintenance Plan ("the Plan") is to be submitted to the Consent Authority prior to the first exercise of this consent. This Plan shall cover the management of discharges from the site. The system shall be operated in accordance with this manual, which shall be updated as appropriate and updates provided to the Consent Authority, provided the changes do not result in non-compliance with any conditions of this consent. The manual shall include, but not be limited to:

    a) Description of the system, including a site map indicating the location of the system and ancillary structures;
    b) Key operational matters including weekly, monthly and annual maintenance checks;
    c) Monitoring requirements and procedures;
    d) Contingency plans in the event of system malfunctions or breakdowns;
    e) The means of receiving and dealing with any complaints; and
    f) The management of the discharge to the Meadow Burn.

At all times the consent holder shall ensure that the Consent Authority has a copy of the most recent version of the Operations and Maintenance Manual.

17. Records of maintenance, complaints, malfunctions and breakdowns shall be kept in a log and this log shall be made available to the Consent Authority at any time upon request.

[3] Biggs & Kilroy (2000): Stream periphyton monitoring manual. Report prepared for the Ministry for the Environment.

18. a) For the purpose of this consent, the analyses and preservation of all aqueous samples shall be carried out in accordance with the latest edition of APHA "Standard Methods for the Analysis of Water and Wastewater" or by methods approved by the Consent Authority.
    b) The analyses specified in these conditions are to be carried out by a laboratory with IANZ accreditation, or as agreed to in writing by the Consent Authority.

19. Throughout the duration of this consent, the consent holder shall maintain suitable warning signs adjacent to the discharge point from the WWTP into the Meadow Burn. These signs shall clearly indicate the presence of the treated wastewater discharge.

20. This permit does not authorise the discharge of sludge to land or water.

21. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent during the period 1 February to 30 September each year, or within two months of any enforcement action being taken by the Consent Authority in relation to the exercise of this consent, or on receiving monitoring results, for the purposes of:

    a) determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cumulative effects, which may arise from the exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit;
    b) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement;
    c) amending the monitoring programme to be undertaken;
    d) adding or adjusting compliance limits; or
    e) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this permit.

for the **Southland Regional Council**

Michael Durand
Consents Manager

Note

1. The consent holder shall pay an annual administration and monitoring charge to the Consent Authority, collected in accordance with Section 36 of the Resource Management Act 1991. This charge may include the costs of inspecting the site twice each year (or otherwise as set by the Consent Authority's Annual Plan).

APPENDIX 1: Monitoring Location Plan

APPENDIX 2: Water Quality Standards from Regional Plan: Water – Appendix G

Surface water bodies classified as "Spring Fed"

The temperature of the water

- shall not exceed 21°C
- shall not exceed 11°C in trout spawning areas during May to September inclusive
- the daily maximum ambient water temperature shall not be increased by more than 3°C when the natural or existing water temperature is 16°C or less, as a result of any discharge. If the natural or existing water temperature is above 16°C, the natural or existing water temperature shall not be exceeded by more than 1°C as a result of any discharge.

The pH of the water shall be within the range 6.5 to 9, and there shall be no pH change in water due to a discharge that results in a loss of biological diversity or a change in community composition.

The concentration of dissolved oxygen in water shall exceed 99% of saturation concentration.

There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats. Note that this standard also applies to within the zone of reasonable mixing for a discharge.

When the flow is below the median flow, the visual clarity of the water shall not be less than 3 metres. [3]

The concentration of total ammonia shall not exceed 0.32 milligrams per litre.

The concentration of faecal coliforms shall not exceed 1,000 coliforms per 100 millilitres, except for popular bathing sites, defined in Appendix K "Popular Bathing Sites" and within 1 km immediately upstream of these sites, where the concentration of *Escherichia coli* shall not exceed 130 *E. coli* per 100 millilitres.

Chlorophyll *a* shall not exceed 50 milligrams per square metre at any time, or exceed a monthly mean of 15 milligrams per square metre for filamentous algae or diatoms and cyanobacteria. [4]

The Macroinvertebrate Community Index shall exceed a score of 90 and the Semi-Quantitative Macroinvertebrate Community Index shall exceed a score of 4.5.

Fish shall not be rendered unsuitable for human consumption by the presence of contaminants.

[3] Visual clarity is assessed using the black disc method or other comparable method employed by Environment Southland.

[4] Expressed in terms of reach biomass per unit of exposed strata (i.e., tops and sides of stones) averaged across the full width of the stream or river.

BEFORE THE ENVIRONMENT COURT

IN THE MATTER	of the Resource Management Act 1991
AND	of an appeal under section 120 of the Act
BETWEEN	SOUTHLAND DISTRICT COUNCIL
	(ENV-2016-CHC-65)
	Appellant
AND	SOUTHLAND REGIONAL COUNCIL
	Respondent

Environment Judge J J M Hassan – sitting alone pursuant to section 279 of the Act

In Chambers at Christchurch

CONSENT ORDER

A: Under section 279(1)(b) of the Resource Management Act 1991, the Environment Court, by consent, orders that:

(1) the appeal is allowed and resource consent is granted to Southland District Council subject to the amended conditions marked Appendix A, attaching to and forming part of this order;

(2) the appeal is otherwise dismissed.

B: Under section 285 of the Resource Management Act 1991, there is no order as to costs.

REASONS

Introduction

[1] This proceeding concerns an appeal by Southland District Council against part of a decision of the Southland Regional Council granting consent[1] to discharge treated wastewater from the Riversdale Waste Water Treatment Plant ("WWTP") to land and surface water (the Meadow Burn). This consent requires an upgrade to the existing WWTP to occur before it can be exercised.

[2] The court has now read and considered the consent memorandum of the parties dated 29 March 2017 which proposes to resolve the appeal.

Other relevant matters

[3] No person has given notice of an intention to become a party under section 274 of the Resource Management Act ("the RMA" or "the Act").

[4] As a result of the proposed changes to the consent duration changes have been made to conditions 8, 11 and 13 to provide the Regional Council with some certainty regarding the performance of the proposed upgrade of the WWTP. While these changes were not explicitly sought in the District Council's appeal, it is accepted that the appeal did seek "such further or other relief as may be appropriate to give effect to the issues raised in this appeal" which brings the changes within the scope of the appeal.

Orders

[5] The court is making this order under section 279(1) of the Act, such order being by consent, rather than representing a decision or determination on the merits pursuant to section 297. The court understands for present purposes that:

(a) all parties to the proceedings have executed the memorandum requesting this order;

[1] AUTH-20147220-02.

(b) all parties are satisfied that all matters proposed for the court's endorsement fall within the court's jurisdiction, and conform to the relevant requirements and objectives of the Act including, in particular, Part 2.

DATED at CHRISTCHURCH this 1 May 2017

J J M Hassan
Environment Judge

Appendix A – Marked-up version of AUTH-20147220-02

environment SOUTHLAND
Te Taiao Tonga

AUTH-20147220-02

Cnr North Road and Price Street
(Private Bag 90116 DX YX 20175)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252

Southland Freephone No. 0800 76 88 45

Discharge Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council to **Southland District Council, PO Box 903, Invercargill 9840** from **5 October 2016.**

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:		To discharge treated wastewater from the Riversdale oxidation pond to land via Rapid Infiltration Beds and a soakage channel and to water in the Meadow Burn via a soakage channel.
Location	- site locality	Riversdale
	- map reference	Discharge into the Meadow Burn immediately east of the oxidation pond at NZTM E1271094 N4907934 Discharge into the soakage channel and via the Rapid Infiltration Basins in an area bounded by the following points: - NZTM E1270683 N4907818 - NZTM E1270736 N4907751 - NZTM E1270998 N4907907 - NZTM E1270976 N4907969
	- catchment	Mataura River
Legal description of land at the site:		Parts Lots 5 and 6, DP 92, Part Section 509, Hokonui Survey District; Part of Lot 3 DP 15122 Lot ~~27~~ DP 92, Lot 8 DP 92.
Expiry date:		***1 ~~January 2031~~ April 2037***

THE SEAL OF THE ENVIRONMENT COURT OF NEW ZEALAND

Schedule of Conditions

1. This consent authorises:

   a) the discharge of treated wastewater from the Riversdale Wastewater Treatment Plant oxidation pond to land via the Rapid Infiltration Beds and the soakage channel at an annual average daily flow of 260 m^3/day;
   b) the discharge of treated wastewater from the Riversdale Wastewater Treatment Plant oxidation pond to the Meadow Burn via the soakage channel. The consent holder may only discharge wastewater to the Meadow Burn, via the existing pipe from the soakage channel, in an emergency related to a natural disaster or extreme weather event which results in very high wastewater flow to the plant;
   c) the consent holder shall advise the Consent Authority as soon as possible and within at least 24 hours of any discharge under Condition 1(b), detailing the reason for the discharge.

2. The discharge authorised by this permit shall not give rise to any of the following effects in the Meadow Burn downstream of the discharge to land:

   a) the minimum standards set for '*Spring Fed*' waters, as described in the Regional Water Plan (attached as **Appendix 1** to this consent), being exceeded;
   b) the production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
   c) any conspicuous change in colour or visual clarity;
   d) any emission of objectionable odour;
   e) the rendering of fresh water unsuitable for consumption by farm animals;
   f) any change in the natural water temperature of more than 3 degrees Celsius;
   g) any change in the pH outside of the range of 6.0 to 9.0, except when due to natural causes;
   h) a reduction in the oxygen content in solution to less than 6 milligrams per litre; or
   i) any destruction of natural aquatic life as a result of a concentration of toxic substances.

   Note: Compliance with this Condition will be undertaken by way of the monitoring given in Conditions 8, 9 and 10, which will be undertaken for the first 2 years and will cease once compliance has been confirmed.

Programme of Works for Rapid Infiltration Basins

3. Prior to commencing this consent and construction and using the Rapid Infiltration Basins, by no later than 31 May 2019 the Consent Holder will assess and determine whether the Rapid Infiltration Basins will accept all of the predicted wastewater flow. If the Consent Holder determines that the proposed Rapid Infiltration Basins cannot accept all of the wastewater flow (except under extreme events), the Consent Holder will give written notice of that to the Consent Authority by 31 May 2019. In that notice, the Consent Holder must elect whether the Rapid Infiltration Basins are to be constructed and used. If in that notice the Consent Holder concludes that the Rapid Infiltration Basins are not to be constructed and used then it will also give written notice under Section 138 to the Consent Authority that it surrenders this consent by 31 May 2019.

4. If the Consent Holder determines that the proposed Rapid Infiltration Basins are to be constructed and used, then:

   a) the detailed design and specification of the proposed Rapid Infiltration Basins shall be submitted to the Consent Authority by 31 May 2020. The detailed design and

specification shall be reviewed by the Consent Authority prior to any construction works commencing;

b) a producer statement is to be submitted to the Consent Authority prior to commissioning of the Rapid Infiltration Basins, signed by a suitably qualified engineer to confirm construction of the Rapid Infiltration Basins is in accordance with the reviewed design;

c) the rapid infiltration basins shall be constructed and operational by 31 May 2021;

d) this consent will lapse (as per s125 of the Resource Management Act 1991) if the Rapid Infiltration Basins system is not in place and operational by 31 May 2023.

Accidental or Emergency Discharges

5. In the event of an emergency or accidental discharge of wastewater or partially treated wastewater) to land or water (as opposed to normal treated wastewater discharging to ground through the Rapid Infiltration Basins), the consent holder (or the consent holder's agent) shall without undue delay, notify:

a) the Medical Officer, or Health Protection Officer (ph (03) 211 0900);
b) Te Ao Marama Inc. (ph (03) 931 1242);
c) Operations Manager (Murihiku), Department of Conservation (ph (03) 211 2400);
d) Fish and Game Southland (ph (03) 215 9117);
e) the Council's Pollution Response Hotline (ph 0800 76 88 45); and
f) users of downstream surface water abstractions within 200 metres of the discharge point of the wastewater treatment plant to the Meadow Burn.

6. The consent holder shall maintain a record of all incidents and complaints relating to the exercise of this consent, including discharges occurring under Condition 1(b). This record shall include, but not be limited to:

a) the location where the incident was detected by the complainant;
b) the date and time when the incident occurred;
c) a description of the weather conditions when the incident was detected by the complainant;
d) the nature of the incident;
e) operating conditions at the time of the complaint, including any malfunction or breakdown of plant or equipment;
f) the duration of the incident;
g) the most likely cause of the incident; and
h) any corrective action undertaken by the consent holder to avoid, remedy or mitigate the incident, and any future recurrence.

Within seven days of any complaint, the consent holder shall notify the Consent Authority in writing of the response taken to remedy the cause of the complaint, and provide a copy to the complainant (if known). The consent holder shall provide a copy of the incidents and complaints register maintained in accordance with Condition 6 to the Consent Authority on request.

Monitoring

7. The consent holder shall record the daily volume of wastewater coming into the plant. This shall determine compliance with Condition 1(a). The daily volume record shall be supplied to the Consent Authority by 31 July each year, or at any time upon reasonable request.

8. In March, June, September and December each year, the consent holder shall collect representative samples of:

a) treated wastewater immediately prior to discharge into the Rapid Infiltration Basins;
b) groundwater from five bores, 1, 2, 3, 4 and 5, in locations as agreed to in writing with the Consent Authority as follows:
   i. Bore 1 shall enable collection of up-gradient water samples in accordance with Conditions 13A-13D.
   ii. Bore 2 shall enable the collection of down-gradient water samples in accordance with Conditions 13A-13D and shall be located at around 220 metres from the Rapid Infiltration Basins as marked in Appendix 2 as "Bore for Condition 12".
   iii. Bores 3, 4 and 5 shall be placed at other locations down-gradient from the Rapid Infiltration Basins but no further than 220 metres from the Rapid Infiltration Basins. These bores will be located along existing fence lines as far as practicable.

~~, one of which will be on the fence line down gradient of the Rapid Infiltration Basins, which enable collection of water quality data from both up-gradient and several distances down-gradient from the Rapid Infiltration Basins. These bores will be located along existing fence lines as far as practicable. The bore at which the trigger values given in Condition 13 apply shall be the bore on the fence line down gradient of the Rapid Infiltration Basins at around 220 metres from the Rapid Infiltration Basins (GPS point at or about location shown in **Appendix 2**).~~

c) water from the Meadow Burn at:
   i. a location 5 metres upstream of the WWTP (Point 1)
   ii. a location 400 metres downstream of the discharge (Point 4), and
   iii. a location approximately 800 metres south of the oxidation pond (Point 3).

See **Appendix 2** for a location plan of monitoring points.

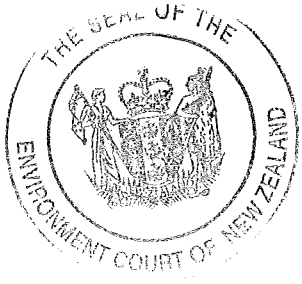
9. Once two years of monitoring has been completed, compliance with Condition 2 will be determined and reported to the Consent Authority. Provided that compliance with Condition 2 over at least two years is demonstrated, monitoring of the Meadow Burn under Condition 8(c) is no longer required.

10. The following shall be measured at the time of sampling undertaken in accordance with Condition 8:

a) groundwater levels in each bore;
b) the depth of the bores sampled;
c) observations of any conspicuous oil or grease films, scums or foams or floatable or suspended material resulting from the discharge (supported by photographic evidence);
d) water level at the Consent Authority's water level station on the Meadow Burn at Round Hill Road; and
e) groundwater level at the Consent Authority's monitoring bore F44/0181.

11. Samples collected in accordance with Condition 8 will be analysed for :

- Temperature (field measurement)
- pH
- Electrical conductivity
- Total suspended solids (discharge only)
- Turbidity (surface water only)



- Total 5 day carbonaceous biochemical oxygen demand (discharge only)
- Dissolved oxygen (measurement in surface water only) (as mg/l and percentage of Saturation)
- Total Ammoniacal nitrogen
- ~~Soluble inorganic~~ Total oxidised nitrogen ~~(Nitrate nitrogen+Nitrite nitrogen+ammoniacal nitrogen)~~
- Total nitrogen
- Dissolved reactive phosphorus
- Total Phosphorus
- *Escherichia coli*
- Faecal coliforms
- Fluoride
- Chloride
- Bromide

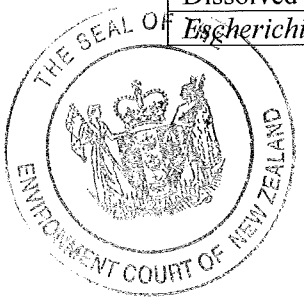
The analytical sample results for each sampling event shall be reported in writing to the Consent Authority within four (4) weeks of receipt of the sample results by the consent holder.

12. In the event that monitoring undertaken in accordance with Condition 8 identifies that any of the trigger values listed in Condition 13 are exceeded, the consent holder shall undertake the following as appropriate:

a) check for anomalous results;
b) assess monitoring results against the up-gradient or up-stream samples to determine whether other land uses may be influencing the exceedance of the trigger value;
c) identify any mitigation measures that are considered necessary to ensure that groundwater quality is compliant with the trigger values in Condition 13;
d) determine any mounding effect in the groundwater levels;
e) within one month of receiving the results, submit a report to the Consent Authority on the actions undertaken, including identification of any mitigation measures that have been identified and a programme for implementing these measures; and
f) implement the identified mitigation measures within the proposed timeframes, which shall not be greater than 12 months from submission of the report according to Condition 12(e).

13. The following trigger values shall apply to the monitoring undertaken in accordance with Condition 8:

Parameter sampled	**Discharge**	**Groundwater (at ~~b~~"Bore for Condition 12" on downgradient**
Total five day carbonaceous biochemical oxygen demand	50	
Soluble Inorganic Nitrogen ($g\ N/m^3$) (sum of total oxidised nitrogen and total ammoniacal nitrogen)	30	5
Dissolved Reactive Phosphorus	10	
Escherichia coli (~~efu~~MPN/100 mL)		2



Compliance Limits

13A. In the event that analyses of groundwater samples taken in accordance with Condition 8 (the first samples) show Bore 2 has a soluble inorganic nitrogen concentration ≥5 g N/m3 higher than the soluble inorganic nitrogen concentration in Bore 1, then the Consent Holder shall:

a) immediately obtain second samples from Bores 1 and 2;
b) analyse the second samples for soluble inorganic nitrogen using the same laboratory and same method as was used to analyse the first samples; and
c) provide copies of results from the analyses of the first and second samples (pair of samples) to the Consent Authority.

13B. The discharge authorised by this consent shall not cause the soluble inorganic nitrogen concentrations in Bore 2 to be ≥ 5 g N/m3 higher than the soluble inorganic nitrogen concentrations in Bore 1, for the pair of samples.

Note:

If the concentration of soluble inorganic nitrogen in Bore 2 exceeds the concentration in Bore 1 by more than 5 g N/m³ for the pair of samples, the consent authority shall be entitled to assume that the breach is caused by the Consent Holder, unless the Consent Holder demonstrates to the satisfaction of the consent authority that the exceedance has not been caused by the discharge authorised by this consent.

13C. In the event that analyses of groundwater samples taken in accordance with Condition 8 (the first samples) show Bore 2 has an *Escherichia coli* concentration of ≥2 MPN/100 mL, then the Consent Holder shall:

a) immediately obtain second samples from Bore 2;
b) analyse the second samples for *Escherichia coli* concentration using the same laboratory and same method as was used to analyse the first samples; and
c) provide copies of results from the analyses of the first and second samples (pair of samples) to the Consent Authority.

13D. The discharge authorised by this consent shall not cause the *Escherichia coli* concentration in Bore 2 to be ≥2 MPN/100 mL for five consecutive pairs of samples.

Note:

If the Escherichia coli concentration in Bore 2 exceeds ≥2 MPN/100 mL, for five consecutive pairs of samples, the consent authority shall be entitled to assume that the breach is caused by the Consent Holder, unless the Consent Holder demonstrates to the satisfaction of the consent authority that the exceedance has not been caused by the discharge authorised by this consent.

Reporting

14. The consent holder shall submit a report every two years from the date of granting this consent to the Consent Authority prior to 30 June. The report shall include the following:

a) a summary of the previous 24 months monitoring data collected in accordance with Condition 8 which shall include an assessment and interpretation of the collected data. This data assessment shall include assessment of the system performance, quality of discharge and implications of the discharge on the receiving environment including any monitoring limitations. The monitoring data shall be provided electronically in a suitable format;

b) a summary of any remedial or improvement works carried out to improve the quality of the discharges from 1 July to 30 June each year;
c) all available data collected under this consent relevant to wastewater system performance;
d) All available data collected under this consent relevant to the groundwater and freshwater receiving environment;
e) Any trends shown by data collection from the grant of consent related to the receiving environment, wastewater system performance or habitat;
f) Identification of areas where the water quality has exceeded the trigger values in Condition 13 and has triggered the actions required by Condition 12.

On Site Management

15. The Operations and Maintenance Plan ("the Plan") is to be updated and submitted to the Consent Authority prior to the first exercise of this consent. This Plan shall cover the management of discharges from the site. The system shall be operated in accordance with this manual, which shall be updated as appropriate and updates provided to the Consent Authority, provided the changes do not result in non-compliance with any conditions of this consent. The manual shall include, but not be limited to:

a) a brief description of the system, including a site map indicating the location of the system;
b) key operational matters including weekly, monthly and annual maintenance checks;
c) monitoring requirements and procedures;
d) contingency plans in the event of system malfunctions or breakdowns;
e) the means of receiving and dealing with any complaints; and
f) the management of discharges to the Rapid Infiltration Basins.

At all times the consent holder shall ensure that the Consent Authority has a copy of the most recent version of the Operations and Maintenance Manual.

16. Records of maintenance, complaints, malfunctions and breakdowns shall be kept in a log and this log shall be made available to the Consent Authority's staff at any time upon request.

17. a) For the purpose of this consent, the analyses and preservation of all aqueous samples shall be carried out in accordance with the latest edition of APHA "Standard Methods for the Analysis of Water and Wastewater" or by methods approved by the Consent Authority.

b) The analyses specified in these conditions are to be carried out by a laboratory with IANZ accreditation, or as agreed to in writing by the Consent Authority.

18. Throughout the duration of this consent, the consent holder shall maintain suitable warning signs at the wastewater treatment plant and adjacent to the Rapid Infiltration Basins that clearly indicate the presence of treated wastewater.

19. This permit does not authorise the discharge of sludge to land or water.

20. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent during the period 1 February to 30 September each year, or within two months of any enforcement action being taken by the Consent Authority in

relation to the exercise of this consent, or on receiving monitoring results, for the purposes of:

a) determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cumulative effects, which may arise from the exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit; or
b) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement; or
c) amending the monitoring programme to be undertaken; or
d) adding or adjusting compliance limits;. or
e) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this permit.

for the **Southland Regional Council**

Michael Durand
Consents Manager

Note

1. The consent holder shall pay an annual administration and monitoring charge to the Consent Authority, collected in accordance with Section 36 of the Resource Management Act 1991. This charge may include the costs of inspecting the site twice each year (or otherwise as set by the Consent Authority's Annual Plan).

THE SEAL OF THE ENVIRONMENT COURT OF NEW ZEALAND

APPENDIX 1: Water Quality Standards from Regional Plan: Water – Appendix G

Surface water bodies classified as "Spring Fed"

The temperature of the water:

- shall not exceed 21°C
- shall not exceed 11°C in trout spawning areas during May to September inclusive
- the daily maximum ambient water temperature shall not be increased by more than 3°C when the natural or existing water temperature is 16□C or less, as a result of any discharge. If the natural or existing water temperature is above 16□C, the natural or existing water temperature shall not be exceeded by more than 1□C as a result of any discharge.

The pH of the water shall be within the range 6.5 to 9, and there shall be no pH change in water due to a discharge that results in a loss of biological diversity or a change in community composition.

The concentration of dissolved oxygen in water shall exceed 99% of saturation concentration.

There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats. Note that this standard also applies to within the zone of reasonable mixing for a discharge.

When the flow is below the median flow, the visual clarity of the water shall not be less than 3 metres. [1]

The concentration of total ammonia shall not exceed 0.32 milligrams per litre.

The concentration of faecal coliforms shall not exceed 1,000 coliforms per 100 millilitres, except for popular bathing sites, defined in Appendix K "Popular Bathing Sites" and within 1 km immediately upstream of these sites, where the concentration of *Escherichia coli* shall not exceed 130 *E. coli* per 100 millilitres.

Chlorophyll *a* shall not exceed 50 milligrams per square metre at any time, or exceed a monthly mean of 15 milligrams per square metre for filamentous algae or diatoms and cyanobacteria. [2]

The Macroinvertebrate Community Index shall exceed a score of 90 and the Semi-Quantitative Macroinvertebrate Community Index shall exceed a score of 4.5.

Fish shall not be rendered unsuitable for human consumption by the presence of contaminants.

Note: *Not all the Spring Fed standards in Condition 2(a) are being specifically monitored for given that discharge will be to groundwater and hence is not expected to have these effects in the Meadow Burn.*

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[1] Visual clarity is assessed using the black disc method or other comparable method employed by Environment Southland.

[2] Expressed in terms of reach biomass per unit of exposed strata (i.e., tops and sides of stones) averaged across the full width of the river.

AUTH-20147220-02

APPENDIX 2: Surface Water Monitoring Location Plan

THE SEAL OF THE ENVIRONMENT COURT OF NEW ZEALAND

Appendix B 2019 RYDER ENVIRONMENTAL REPORT

Southland District Council

Riversdale WWTP

Biological Survey: Meadow Burn

March 2019

ryder

Southland District Council

Riversdale Wastewater Treatment Plant

Biological Survey: Meadow Burn

March 2019

Prepared for Southland District Council

by

Ben Ludgate, MSc.

Reviewed by

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Document version: 7 August 2019

Cover page: Meadow Burn in the vicinity of the Riversdale Wastewater Treatment Plant, 22 March 2019.

Table of Contents

1 Introduction

Southland District Council (SDC) have a discharge permit (Environment Southland consent AUTH-20147220-01) authorising the discharge of treated municipal wastewater into the Meadow Burn from the Riversdale Wastewater Treatment Plant (WWTP) and to land via a soakage channel.

Conditions 13 and 14 of the permit state:

13. *The consent holder shall undertake an aquatic ecology survey, to characterise the impact of the discharge on the aquatic environment of the Meadow Burn within the first three years after commencement of this consent. This aquatic ecology survey shall consist of:*

    a) *Macroinvertebrate sampling, following Protocol C3 (hard-bottomed, quantitative) as outlined in the document "*Protocols for sampling macroinvertebrates in wadeable streams*"*[1]*, with analysis for a full range of metrics, including %EPT, MCI and SQMCI;*

    b) *Survey of periphyton during the period 1 November – 30 April, using the rapid assessment protocols for periphyton as outlined in the document "*Stream Periphyton Monitoring Manual*"* [2] *to assess the:*

        i. *Presence of bacterial or fungal slime growths as obvious plumose growths or mats;*

        ii. *Percentage cover of filamentous algae greater than 2 cm long within the stream bed;*

        iii. *Percentage cover of diatoms any* (sic) *cyanobacteria greater than 0.3 cm thick.*

    c) *Quantitative sampling protocols as outlined in the document "*Stream Periphyton Monitoring Manual*" QM-1b to assess the following periphyton measures, in line with the requirements of the 'Spring Fed' river standards in the Consent Authority's Regional Water Plan and attached as Appendix 2:*

        i. *Chlorophyll* a *per* m^2 *for both filamentous algae or diatoms and cyanobacteria.*

14. *Aquatic ecology monitoring outlined in Condition 13 shall be undertaken at two downstream sample locations and one upstream sample location (as identified on the attached plan), with an appropriate number of replicate samples being collected from each location as follows:*

[1] Stark, J.D., Boothroyd, I.K.G., Harding, J.S., Maxted, J.R. and Scarsbrook, M.R. 2001. Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment.
[2] Biggs, B.J.F. and Kilroy, K.C. 2000. Stream periphyton monitoring manual. Ministry for the Environment, Wellington.

a) *Upstream Point 1;*

b) *Downstream Point 2;*

c) *Downstream Point 3.*

Sampling should occur when flows are less than median flow conditions. No sampling shall be carried out within ten days of the Meadow Burn exceeding seven times its median flow or within seven days of flows that are greater than three times the median flow.

Median flow conditions in the Meadow Burn shall be taken as when the groundwater level in the Environment Southland monitoring bore F44/0181 is at 1.41 m below land surface as recorded by the Consent Authority.

SDC engaged Ryder Environmental to undertake a biological survey of the Meadow Burn in the vicinity of the Riversdale WWTP discharge in 2019, in accordance with conditions 13 and 14. This report summarises the March 2019 survey.

2 Survey sites

The WWTP discharges to the true right edge of the Meadow Burn. Three sites in the Meadow Burn were assessed, as required by consent: one site upstream and two sites downstream of the discharge (Figure 1). The upstream site was immediately upstream of the discharge, and the downstream sites were 50 m and 800 m downstream of the discharge (as identified in Appendix 1 of the consent).

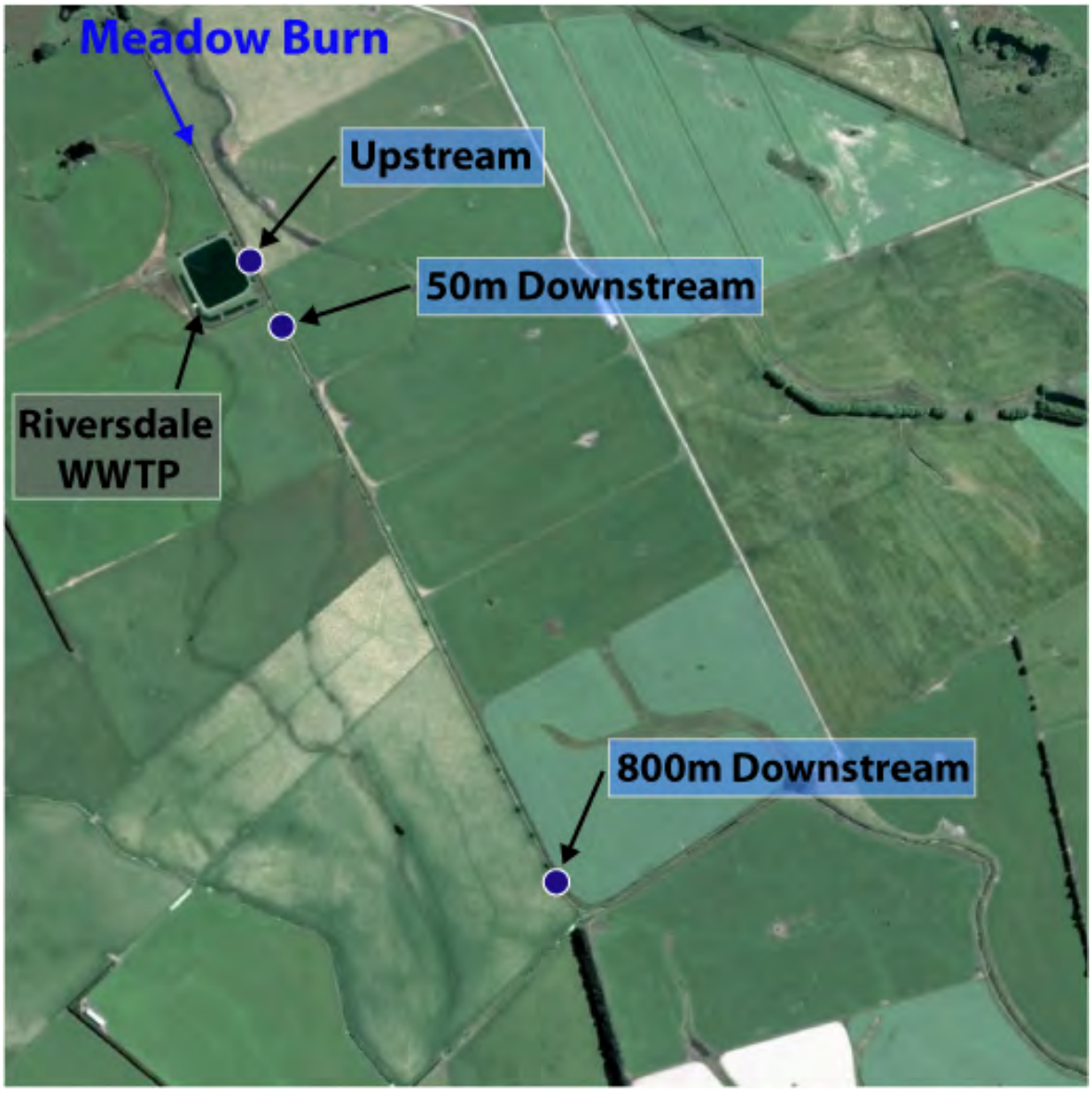

Figure 1. Map showing the location of the WWTP and the three survey sites. Photo from Google Earth.

3 Methodology

3.1 General

The discharge permit specified sampling methodologies to be used for the biological survey, which included sampling macroinvertebrates following Protocol C3 (hard-bottomed, quantitative – Surber samples), periphyton cover using rapid assessment protocols for periphyton cover, and periphyton biomass following Protocol QM-1b. These methodologies are appropriate for sampling hard-bottomed streams. However, at the time of the field survey, the Meadow Burn was found to be dominated by aquatic plants (macrophytes) throughout the entire channel. The abundance of these macrophytes restricted access to the stream bed and prevented any visual assessment of the stream bed. Due to these conditions, the methodologies were amended to be appropriate to the conditions. These methodologies are described below.

3.2 'Spring Fed' stream standards

The Meadow Burn is classed in the Environment Southland Water Regional Plan (2014) and in Environment Southland's Proposed Southland Water and Land Plan (decision version, 4 April 2018), as a 'Spring Fed' stream. Appendix 2 of consent AUTH-20147220-01 defines the water quality standards for 'Spring Fed' water bodies (Table 1). However, Environment Southland's Proposed Southland Water and Land Plan (decision version, 4 April 2018) includes an additional receiving water quality standard for sediment cover (Table 1). It was therefore intended to undertake an assessment of sediment cover during the biological survey, however the abundance of macrophytes prevented any visual assessment of the stream bed and therefore prevented any assessments of sediment cover other than general observations.

Table 1. Relevant standards for 'Spring Fed' surface water bodies, from Appendix 2 of consent AUTH-20147220-01, Environment Southland's Water Regional Plan (2014), and Environment Southland's Proposed Southland Water and Land Plan (decision version, 4 April 2018).

Surface water bodies classified as 'Spring Fed'	
Bacterial or fungal slime growths	There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats. Note that this standard also applies to within the zone of reasonable mixing for a discharge.
Periphyton	Chlorophyll *a* shall not exceed 50 milligrams per square metre at any time, or exceed a monthly mean of 15 milligrams per square metre for filamentous algae or diatoms and cyanobacteria (expressed in terms of reach biomass per unit of exposed strata (i.e., tops and sides of stones) averaged across the full width of the river).
Macroinvertebrates	MCI shall exceed 90 and SQMCI shall exceed 4.5.
Sediment	The change in sediment cover must not exceed 10%.

3.3 Periphyton

Cover

Periphyton cover assessments could not be completed at any of the survey sites due to the macrophytes that dominated each site. Instead, assessments of macrophyte cover were undertaken – see Section 3.4 of this report for a description of the methods used.

Biomass

Periphyton biomass was assessed using "Quantitative Method 1b (QM-1b): Scraping or brushing a sample from a defined area on the top of a stone" described by the Ministry for the Environment (Biggs and Kilroy 2000). A predetermined area of stone surfaces was scrubbed with a small brush into a tray and rinsed with river water. The contents of the tray were transferred into a sample container using river water to ensure all traces of periphyton were removed. The samples were stored in a chilly bin and transported to the laboratory.

In the laboratory each sample was tipped into a glass beaker and blended for about 30 seconds or until the mixture was free of obvious clumps of material. The blended liquid was then made up to a known volume (e.g., 100 ml). Each sample was shaken and three 5 ml aliquots were withdrawn using an automatic pipette and filtered on to a Microscience MS-GC 47 mm glass fibre filter. The filter was placed in a tube containing 20 ml of 90% ethanol, immersed in a water bath (78°C for five minutes) and then put into a refrigerator overnight. The tube was centrifuged for 10 minutes at 6000 rpm before the absorption of a 13.5 ml aliquot of the ethanol homogenate was measured at 665 nm and 750 nm using a 4 cm cuvette in a Shimadzu UV-1601 spectrophotometer. The ethanol

homogenate was then acidified with 0.375 ml of 0.3 M HCl then, following a 30 second delay, absorbances at 665 nm and 750 nm were re-read. The total amount of chlorophyll *a* was calculated using a standard formula (Biggs and Kilroy 2000) and scaled to the number of milligrams of chlorophyll *a* per m^2 of stream bed.

3.4 Macrophytes

Macrophyte assessment was undertaken using the macrophyte cover rapid assessment protocol outlined in 'Aquatic Plant Cover in Wadeable Streams' (Collier *et al.* 2014). Five evenly-spaced transects were assessed at each site. The percentage cover of macrophytes in a 1 m wide belt across the entire wetted width of the stream was estimated at each transect. Macrophytes were divided into emergent macrophytes and submerged macrophytes. Emergent macrophytes are those with parts clearly rising above the water whereas submerged macrophytes are those that occur beneath the water surface or extend to the surface.

Macrophyte indices were calculated from the macrophyte cover assessment (Collier *et al.* 2014):

Macrophyte total cover (MTC): extent of cover over the bottom.

= {(SUM (% emergent + % submerged)} / 5

Macrophyte channel clogginess (MCC): extent of cover through the water column.

= (SUM (% emergent + % surface reaching) + (% below surface * 0.5)) / 5

Macrophyte native cover (MNC): naturalness of the rooted macrophyte community.

= (SUM % native species) / 5

3.5 Macroinvertebrates

Field collection

Benthic macroinvertebrates were sampled using a kicknet with 500 µm diameter mesh, following Ministry for the Environment's 'Protocols for sampling macroinvertebrates in wadeable streams' (Stark *et al.* 2001). Samples were collected by sweeping the net through the macrophyte beds and disturbing the bed substrate beneath the macrophytes. Three samples were collected from each sampling site. Samples were preserved in 70% ethanol and returned to the laboratory.

Laboratory assessment

Macroinvertebrate samples were processed for macroinvertebrate taxa identification and their relative abundance using the semi-quantitative protocols outlined in the Ministry for the Environment's 'Protocols for sampling macroinvertebrates in wadeable streams' (Stark *et al.* 2001). Protocol 'P1: Coded abundance' was used, which is summarised briefly below.

In the laboratory, samples were passed through a 500 µm sieve to remove fine material and residual ethanol. Contents of the sieve were then placed in a white tray. Each taxon present in the sample was assigned to one of five coded abundance categories using the codes established by Stark (1998) (Table 2). Up to 20 individuals representative of each taxon were removed from each sample to confirm identifications under a dissecting microscope (10-40x) using criteria from Winterbourn *et al.* (2006).

Table 2. Coded abundance scores used to summarise macroinvertebrate data (after Stark 1998).

Abundance	Coded abundance	Weighting factor
1 - 4	Rare (R)	1
5 - 19	Common (C)	5
20 - 99	Abundant (A)	20
100 - 499	Very abundant (VA)	100
> 500	Very very abundant (VVA)	500

Data presentation and analyses

For each site, benthic macroinvertebrate community health was assessed by determining the following characteristics:

Number of taxa: A measurement of the number of taxa present.

Number of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa, and percentage of the total number of taxa comprising EPT taxa (% EPT taxa): These insect groups are generally dominated by invertebrates that are indicative of higher quality conditions. In stony bed rivers, these indexes usually increase with improved water quality and increased habitat diversity. Note that the caddisflies *Oxyethira* and *Paroxyethira* (Hydroptilidae) are often excluded from EPT calculations as these taxa are considered indicative of lower quality conditions.

Macroinvertebrate Community Index (MCI) (Stark 1993): The MCI uses the occurrence of specific macroinvertebrate taxa to determine the level of organic enrichment in a stream. Taxon scores are between 1 and 10, 1 representing species highly tolerant to organic pollution (e.g., worms and some dipteran species) and 10 representing species highly sensitive to organic pollution (e.g., most mayflies and stoneflies). A site score is obtained by summing the scores of individual taxa and dividing this total by the number of taxa present at the site. These scores can be interpreted in comparison with national standards (Table 3). For example, a low site score (e.g., 40) represents 'poor' conditions and a high score (e.g., 140) represents 'excellent' conditions.

$$MCI = \left(\frac{\text{Sum of taxa scores}}{\text{Number of scoring taxa}} \right) \times 20$$

Semi-quantitative MCI (SQMCI) (Stark 1998): The SQMCI uses the same approach as the MCI but weights each taxa score based on how abundant the taxa is within the community. Abundance of all taxa is recorded using a five-point scale (Table 2). As for MCI, SQMCI scores can be interpreted in the context of national standards (Table 3).

$$SQMCI = \frac{\text{Sum of (Taxa coded abundance x Taxa score)}}{\text{Sum of coded abundances for sample}}$$

Table 3. Interpretation of macroinvertebrate community index values from Boothroyd and Stark (2000) (Quality class A) and Stark and Maxted (2007) (Quality class B).

Quality Class A	Quality Class B	MCI	SQMCI
Clean water	Excellent	≥ 120	≥ 6.00
Doubtful quality	Good	100 – 119	5.00 – 5.99
Probable moderate pollution	Fair	80 – 99	4.00 – 4.99
Probable severe pollution	Poor	< 80	< 4.00

Data has been presented graphically as means +/- one standard error. A one-way Analysis of Variance (ANOVA) was used to test for differences between sites using the statistical package Data Desk®.

4 Results

4.1 General

Sampling was undertaken on 22 March 2019. Weather conditions were overcast.

The discharge permit required sampling to occur when flows in the Meadow Burn were less than median flow, with median flow conditions taken as when the groundwater level in the Environment Southland monitoring bore F44/0181 is at 1.41 m below land surface. Also, no sampling was to be carried out within ten days of the Meadow Burn exceeding seven times its median flow or within seven days of flows that are greater than three times the median flow. Monitoring bore F44/0181 is Environment Southland's groundwater bore at the Riversdale Aquifer at Liverpool Street, and the limit of 1.41 m below land surface has been confirmed as a groundwater level of 126.24 m (Paul Reid, SDC, pers. comm.). Groundwater level data obtained from Environment Southland shows the groundwater level at the time of the March 2019 survey was 126.076 m (Figure 2), which indicates that the flow in the Meadow Burn was lower than the median flow, therefore complying with the requirements of the discharge permit.

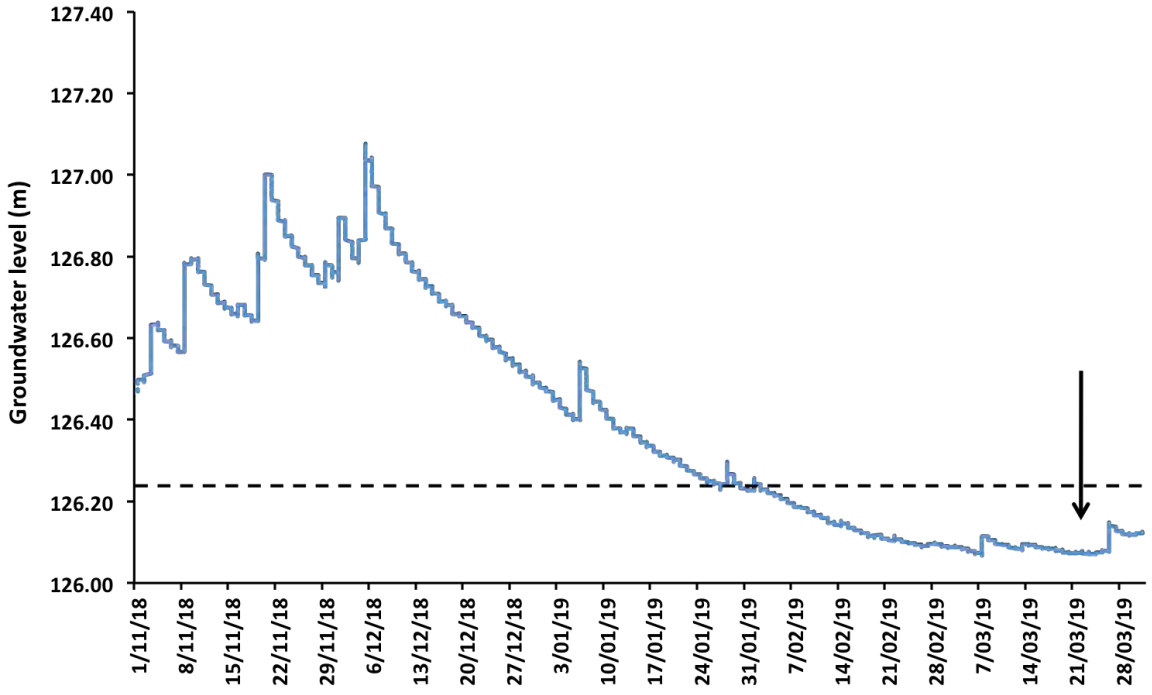

Figure 2. Mean hourly groundwater levels (m) of the Riversdale Aquifer at Liverpool Street from 1 November 2018 to 31 March 2019. Sampling date indicated by arrow. Horizontal line indicates the limit of 1.41 m below land surface, which is a groundwater level of 126.24 m. Data from Environment Southland.

4.2 Survey site descriptions

The three survey sites had very similar habitat characteristics. The channel was 3-4 m wide, approximately 35-60 cm deep (45 cm deep upstream, 55-60 cm deep 50 m downstream, and 35 cm deep 800 m downstream), and dominated by beds of watercress (*Nasturtium officinale*) (Figure 3). There was no visible water movement at any site, except when macrophyte beds were moved aside to expose open water. Bed substrates comprised gravels and isolated cobbles, which were only observed when macrophytes were moved aside. While no assessments of sediment cover were undertaken, observations at each site included only small patches of fine sediments associated with the macrophyte beds and no visible fine sediments on the stream bed. This indicates that sediment cover likely met the standard required for 'Spring Fed' streams of a change in sediment cover not exceeding 10% (see Table 1).

Figure 3. Meadow Burn survey sites, March 2019. Top to bottom: Upstream, 50 m downstream, 800 m downstream.

4.3 Periphyton

Periphyton was limited at each survey site, due to the extensive cover of macrophytes. Small patches of filamentous green algae were visible amongst macrophytes along the edge of the upstream site, but otherwise the only periphyton observed at each site was thin diatom films on cobbles and gravels that were scrubbed for biomass analysis. There were no visible bacterial or fungal slime growths observed at any site, thereby meeting the standard required for 'Spring Fed' streams (see Table 1).

Periphyton biomass (chlorophyll *a*) was very low at each site, with average levels at each site well below the Environment Southland Water Regional Plan (2014) and Environment Southland's Proposed Southland Water and Land Plan (decision version, 4 April 2018) 'Spring Fed' limit of a monthly mean of 15 mg/m^2 (Table 1, Figure 4).

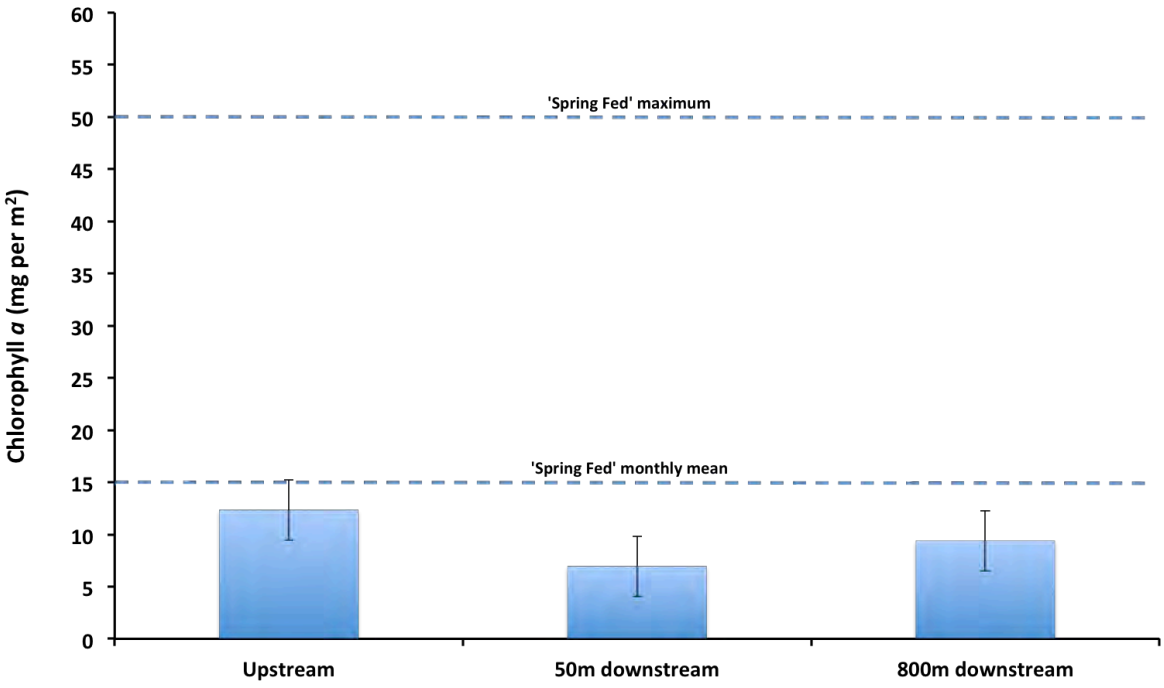

Figure 4. Periphyton biomass expressed as chlorophyll a in the Meadow Burn, March 2019 (mean +/- one standard error). Dashed lines indicate standards from Appendix 2 of consent AUTH-20147220-01, Environment Southland's Water Regional Plan (2014), and Environment Southland's Proposed Southland Water and Land Plan (decision version, 4 April 2018) (Table 1).

4.4 Macrophytes

Macrophytes in the Meadow Burn were dominated by the exotic *Nasturtium officinale* (watercress), with 100% of the channel covered at each of the survey sites. Macrophyte indices, calculated according to the macrophyte cover assessment (Collier *et al.* 2014), reveal that cover levels over the stream bed (total cover) and through the water column (channel clogginess) were 100% at each site, while cover of native species was 0% at each site (Table 4). However, while watercress visually dominated each site, other macrophyte species were also observed amongst the watercress when it was moved aside to expose open water. Other macrophytes at each site included the native red pondweed (*Potamogeton cheesemanii*), the native common duckweed (*Lemna disperma*), and the exotic monkey musk (*Erythranthe guttata*). At the 800 m downstream site, small patches of native charophytes were also observed. It is possible that charophytes were also present at the other survey sites, but were not detected due to the extensive cover by watercress.

Table 4. Macrophyte indices calculated for the Meadow Burn, March 2019.

	Upstream	50 m downstream	800 m downstream
Macrophyte total cover (%)	100	100	100
Macrophyte channel clogginess (%)	100	100	100
Macrophyte native cover (%)	0	0	0

4.5 Macroinvertebrates

A total of 39 different invertebrate taxa were identified from samples collected from the three sites (Table 5). Twenty-eight taxa were found at the upstream site, with 27 taxa at 50 m downstream, and 25 at 800 m downstream. Taxonomic diversity at all three sites was therefore considerably higher than the national median of 18 taxa per site, as determined by Scarsbrook *et al.* (2000) in a study of 66 stream and river sites throughout New Zealand. There was no statistically significant difference in the number of taxa between sites ($p>0.05$, Table 6, Figure 5).

Communities were numerically dominated by snails, ostracods, and chironomid midge larvae (e.g., *Corynoneura*, Orthocladiinae, Tanytarsini) (Table 5). Other taxa included amphipods, isopods (including Phreatoicids, which live in groundwater), *Xanthocnemis* damselfly larvae, and purse-cased caddisflies (Hydroptilidae). These taxa are all commonly found in low velocity waters and in areas with abundant plant growth. EPT taxa (invertebrates typically indicative of higher water quality; i.e., mayflies, stoneflies

and caddisflies) were only represented by very low diversity of caddisflies, with Hydroptilidae caddisflies found at all three sites (Hydroptilidae are often excluded from EPT calculations as these taxa are considered indicative of lower quality conditions). The only other caddisflies in the Meadow Burn were *Hudsonema* (and one Hydrobiosidae individual), which were only found at the upstream site. Interpretation of EPT taxa is difficult in systems with such low EPT richness. In this case, diversity of EPT taxa isn't a reliable indicator, and MCI and SQMCI scores are likely to be more useful indicators.

Macroinvertebrate community health index (MCI and SQMCI) scores were similar at all three sites, with average scores at each site indicative of 'poor' quality conditions, using the narrative terminology of Stark and Maxted (2007) (Tables 3 and 5, Figure 5). There were no statistically significant differences in MCI scores or SQMCI scores between sites (*p>0.05*, Table 6, Figure 5).

Average MCI and SQMCI scores at all three sites were lower than Environment Southland's standards for 'spring fed' streams (standards of 90 for MCI and 4.5 for SQMCI) (Table 1, Figure 5).

Table 5. Invertebrate taxa found in the Meadow Burn in the vicinity of the Riversdale WWTP discharge, March 2019. Coded abundance scores from Stark (1998).

		Upstream			50m downstream			800m downstream		
TAXON	**MCI score**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
ARACHNIDA										
Dolomedes species	5	R								
CNIDARIA										
Hydra species	3					A		C	A	C
COLEOPTERA										
Rhantus pulverosus	5			R						
Scirtidae	8			R						
COLLEMBOLA	6			R	R		R			R
CRUSTACEA										
Cladocera	5						A		C	
Copepoda	5		R	C						
Isopoda (Phreatoicidae)	5					R			C	
Isopoda (*Styloniscus*)	5			R	R					
Ostracoda	3		A	VA	VA	VVA	VVA	VA	VA	A
Paracalliope fluviatilis	5	C	A	C	C	C	C	VA	VA	VVA
Paraleptamphopus species	5	R	C	C				VA	VA	VVA
DIPTERA										
Austrosimulium species	3	C	R							
Chironomus species	1				A	A	A	A	VA	
Corynoneura scutellata	2	VA	VA	VA	VA	VA	VA	VA	C	VA
Ephydridae	4				C			C		
Muscidae	3		R	R						
Orthocladiinae	2	A	C	A	A	C	C	C	R	A
Paradixa species	4			C		R	C			
Sciomyzidae	3						R			
Stratiomyidae	5				R		R			R
Tanypodinae	5								R	
Tanytarsini	3	VA	VA	A	A	A	A	A	VA	
HEMIPTERA										
Microvelia macgregori	5			R						R
Sigara species	5	C	R	C			R			
HIRUDINEA	3				R			R	C	
MOLLUSCA										
Gyraulus species	3				A	R	A			
Physa / Physella species	3	A	VA	VA	VA	A	VA	VA	VA	VVA
Potamopyrgus antipodarum	4	R	A	VVA	VVA	A	VA	VVA	VVA	VVA
Sphaeriidae	3				R	A	A	A	VA	
NEMATODA	3	R	R			C	R	C	A	
ODONATA										
Xanthocnemis zealandica	5	C	C	VA	C	R	R	R	R	C
OLIGOCHAETA	1	R	A	R	C	VA	A	C	VA	C
PLATYHELMINTHES	3	R	R	R	A	R	A	C	A	C
TRICHOPTERA										
Hudsonema alienum	6	C	C	A						
Hudsonema amabile	6	R	R	C						
Hydrobiosidae early instar	5			R						
Oxyethira albiceps	2	VA	A	VA	A		C	VA	VA	A
Paroxyethira species	2	C	R	A	C		C	A	A	C
Number of taxa		18	20	25	20	17	22	19	21	16
Number of EPT taxa (excluding Hydroptilidae)		2	2	3	0	0	0	0	0	0
% EPT taxa (excluding Hydroptilidae)		11	10	12	0	0	0	0	0	0
MCI score		72	71	82	65	62	66	60	65	70
SQMCI score		2.5	2.9	3.5	3.4	2.6	3.0	3.5	3.3	4.1
Average MCI score			75			65			65	
Average SQMCI score			3.0			3.0			3.6	

Table 6. Results of one-way analysis of variance (ANOVA) testing for differences between sites for each of the main invertebrate matrices measured. There were no statistically significant differences.

Variable	$F_{1, 8}$	p-value	Interpretation
Number of taxa	0.48	0.64	No significant difference
MCI score	4.81	0.06	No significant difference
SQMCI score	2.21	0.19	No significant difference

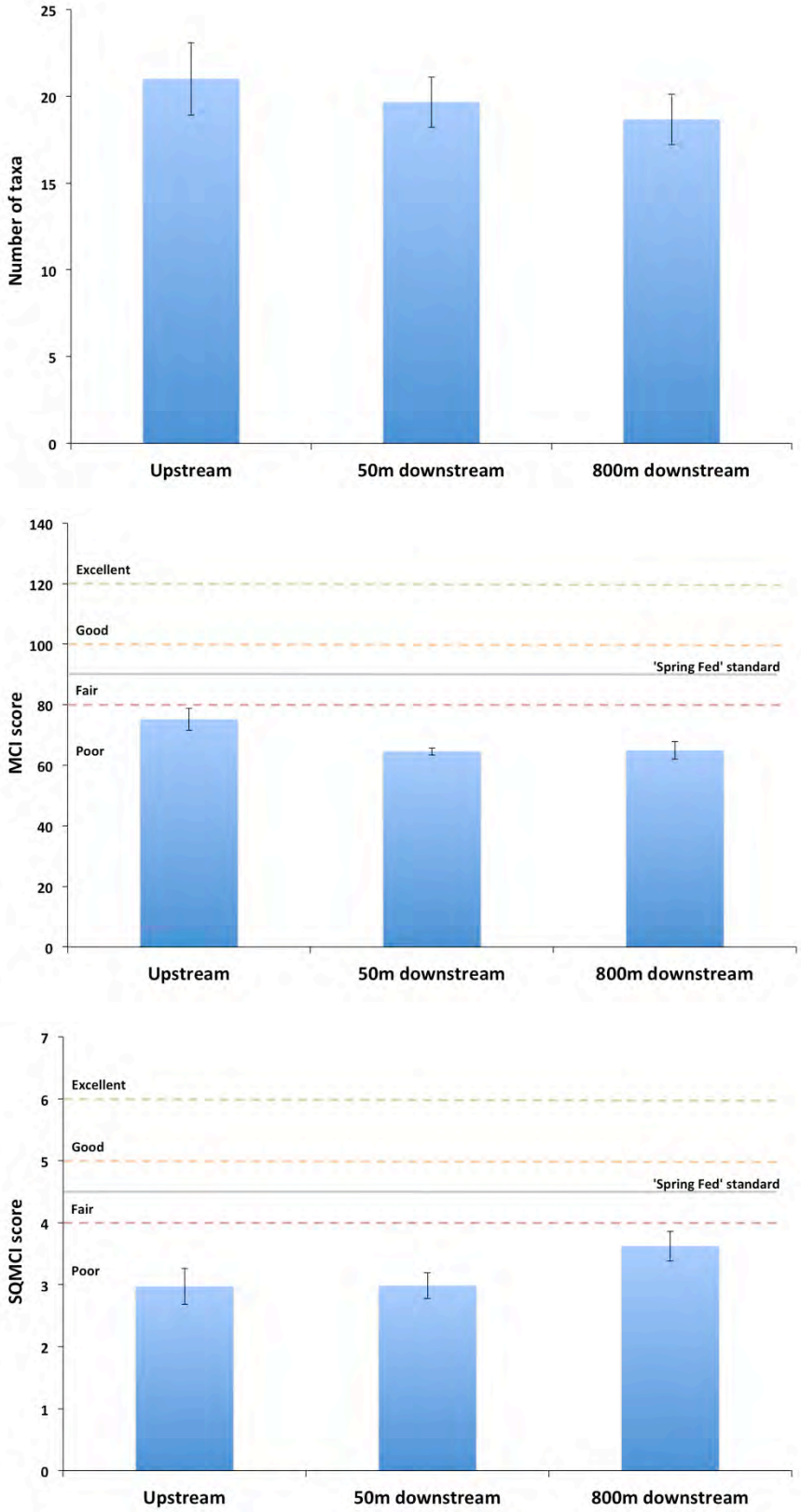

Figure 5. Values for invertebrate metrics for samples collected from the Meadow Burn, March 2019 (mean +/- one standard error). Grey lines indicate the relevant standards from the resource consent, and from Environment Southland's Water and Land Plan (see Table 1).

5 Summary and Conclusion

The March 2019 biological survey of the Meadow Burn in the vicinity of the Riversdale WWTP discharge revealed the channel was dominated by watercress, with no visible water movement. Periphyton biomass on the bed substrate beneath the watercress was well within the standards required by the resource consent and from Environment Southland's Proposed Southland Water and Land Plan. Macroinvertebrate communities comprised taxa typically found in macrophyte-dominated streams, with community health index scores similar at each survey site and indicative of 'poor' quality conditions.

Overall, despite subtle differences in macroinvertebrate communities between sites, the results of the March 2019 biological survey of the Meadow Burn found no evidence that discharges from the Riversdale WWTP were having any adverse effects on aquatic communities of the Meadow Burn.

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Appendix C GROUNDWATER REPORT

Riversdale Wastewater Treatment Plant Resource Consent Application: Groundwater Technical Report

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Peer Reviewer: James Dommisse (Stantec)

Client Review: Janan Dunning (Stantec)

09 April 2021

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1.0 Introduction

1.1 Background

Southland District Council (SDC) own and manage the Riversdale Wastewater Treatment Plant (WWTP). The WWTP consists of a single stage oxidation pond and infiltration trench that are used to treat and discharge municipal wastewater to land and to surface water. Infiltration from the trench is less than that required to discharge all of the treated wastewater to ground, therefore excess wastewater is discharged directly into the adjacent Meadow Burn. A short-term (5 year) resource consent was granted to SDC by Environment Southland (ES) for the period 5 October 2016 – 2021 (AUTH-20147220-01). The consent provides for treated wastewater to be discharged to surface water and land via a soakage trench, and requires the investigation of the feasibility of using Rapid Infiltration Basins (RIBs) to discharge treated wastewater to land on a long-term basis, minimising direct discharges to the Meadow Burn (Dommisse, 2019). At the same time, a long-term consent was granted to use the RIBs should the testing confirm the feasibility of this method. There have been delays in securing the necessary land for the RIB scheme and SDC require additional time to undertake RIB installation and commissioning. Therefore, SDC are applying for a replacement permit to discharge treated wastewater to land from the infiltration trench that surrounds the oxidation pond and the excess directly to Meadow Burn (surface water). This will allow for the continued operation of the Riversdale WWTP until the new RIB scheme is fully operational. The purpose of this report is to identify the potential impacts on groundwater as a result of the wastewater discharges from the base of the infiltration trench, which will occur as a continued operation of the Riversdale WWTP.

1.2 Summary of Previous Investigations

A number of investigations have been undertaken to understand the site setting and to support resource consent applications for the operation of the Riversdale WWTP. In addition, there are a range of existing science and consultancy reports relevant to this project.

- Dommisse (2019) completed field work and numerical groundwater modelling to assess the feasibility of RIBs at the site consented in 2016.
    - The study considered site investigations (2013 - 2018) and used a numerical model to predict the capability of RIBs to discharge the wastewater for 3 – 42 years based on historic datasets (Dommisse, 2019). The study assumed that future wastewater generation remained static, based on population forecasts for Riversdale. The study identified the primary factor that would restrict RIB discharges is the 'naturally high' groundwater table (0 - 1.5 m below land surface). Model results indicated that discharging the wastewater during very wet periods (e.g., when groundwater levels and wastewater discharges to the RIBs are highest) may be difficult. In contrast, during dry weather, the modelling indicated that all the treated wastewater from the WWTP would be discharged through the RIBs.
    - It was concluded that increased onsite storage may be required to buffer wet periods. The period of time that groundwater levels exceed or come close to land surface (at or beneath the RIBs) is very short (e.g., one to two days). The study concluded that: mounding from wastewater discharge is expected to be relatively small (< 10 cm) and mounding is likely to extend < 300 m from the RIBs. The greatest impact on water levels was identified to be climatic influences. It was identified that treated wastewater may emerge within historic Meadow Burn channels downgradient and adjacent to the RIBs. It was concluded that infilling of these channels may mitigate these potential effects.
- MWH (2016) undertook a desktop investigation that included a feasibility assessment based on whether groundwater levels would remain sufficiently low as to avoid causing surface flooding and/or creation of boggy ground conditions. Key conclusions were that:

    - As a result of groundwater mounding from the RIBs, it was predicted that groundwater levels at the RIBs would:
        - Never rise above the natural land surface beneath the RIBs under the best-case scenario, and 40% of the time under the worst case; and
        - Rise above 0.5 m below the natural land surface beneath the RIBs 10% of the time under the best-case scenario, and 100% of the time under the worst case.

    These predictions were slightly more favourable than those of East (2013).
- Davoren (2013) completed field work and an accompanying report that focused on the infiltration rates of the topsoil. The report provides a description of the soil materials and infiltration tests undertaken approximately 25 m upgradient from the Riversdale WWTP oxidation pond. A key conclusion was the soil and subsoil conditions adjacent to the existing oxidation pond were best suited to slow rate infiltration rather than RIBs.
- East (2013) undertook a desktop investigation and presented: the hydrogeological setting at the proposed RIB site; an assessment of effects on Meadow Burn; and an assessment of whether RIBs would be feasible at the site. The feasibility assessment discussed both RIB infiltration rates and whether groundwater levels would remain sufficiently low to avoid resulting in surface flooding and/or creation of boggy ground conditions. Key conclusions of East (2013) were:
    - Material from 0.5 m - 1.2 m beneath the proposed RIB site is generally finer-grained than the deeper material, and should be removed to allow for sufficient wastewater infiltration from the RIB's;
    - In the presence of a sufficiently deep unsaturated zone, the permeability of sediments below the RIB site will allow all the treated wastewater to be discharged to ground;
    - Predicted maximum groundwater level rise beneath the RIBs of 0.1 m to 0.7 m;
    - Groundwater levels at the site are relatively high and the unsaturated zone is thinner than would generally be recommended for RIB wastewater disposal. As a result of groundwater mounding from the RIBs, it was predicted that groundwater levels at the RIBs would:
        - Never rise above the natural land surface beneath the RIBs under the best-case scenario, but would 50% of the time under the worst-case scenario; and
        - Would rise above 0.5 m below the natural ground surface beneath the RIBs 25% of the time under the best-case scenario, and 100 % of the time under the worst case.
    - At least some of the time, discharge from the RIBs will not enter the Meadow Burn immediately downgradient of the RIBs. However, during periods of high groundwater levels and/or mounding resulting from the RIB discharge, discharge from the RIBs would likely enter the Meadow Burn via groundwater.

2.0 Geographic Setting

2.1 Climate

Rainfall and evapotranspiration exert a controlling influence on groundwater levels at the Riversdale site (Figure 2.1). Rainfall is relatively consistent throughout the year (i.e., 50 – 80 mm/month), albeit slightly higher in summer (Figure 2.1). However, modelled evapotranspiration is comparatively lower in winter (10 – 20 mm/month) and higher in summer (110 – 130 mm/month). This pattern results in a water deficit for the period September – March, and water excess during winter.

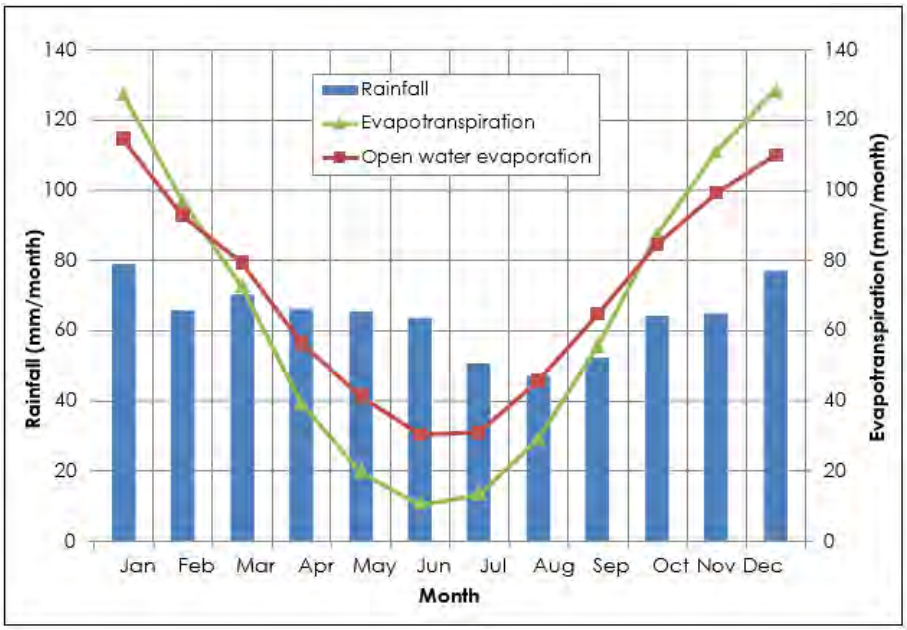

Figure 2.1: Mean monthly rainfall at Riversdale (1917 – 2018), modelled evapotranspiration from NIWA Virtual Climate Station network (1971 – 2018), and measured open water evaporation near Gore (1977 – 2018) (Dommisse, 2019).

2.2 Surface water

The site is located within the Mataura Freshwater Management Unit (FMU), which covers approximately 640,000 hectares (20% of the Southland Region). Headwaters of the Mataura River originate in the Eyre Mountains, located west of Kingston. The Mataura River is the primary surface water feature in the FMU, for which the catchment covers 5,360 km^2. Major tributaries of the Mataura River include the Eyre, Nokomai, Waikaia, Waikaka, Mimihau and Wyndham Rivers. Minor tributaries include Meadow Burn. Surface water from the Mataura FMU ultimately discharges into several coastal environments including Waituna Lagoon, Toetoes Harbour, Haldane Bay, Waikawa Harbour, Lake Brunton and Lake Vincent. The site is located within the Mid-Mataura surface water management zone (SWLP, 2018).

2.3 Hydrogeology

2.3.1 Groundwater management zone

The site is located within the Riversdale Groundwater Management Zone (GMZ), which is a riparian aquifer that covers *c.* 11,000 ha within an alluvial terrace of the Mataura Catchment (Figure 2.2). The Riversdale GMZ is demarcated to the north by the middle reaches of the Mataura River, and to the south by the Waimea Plains (Environment Southland, 2021). Primary surface water catchments within the Riversdale GMZ are the Mataura River and Meadow Burn.

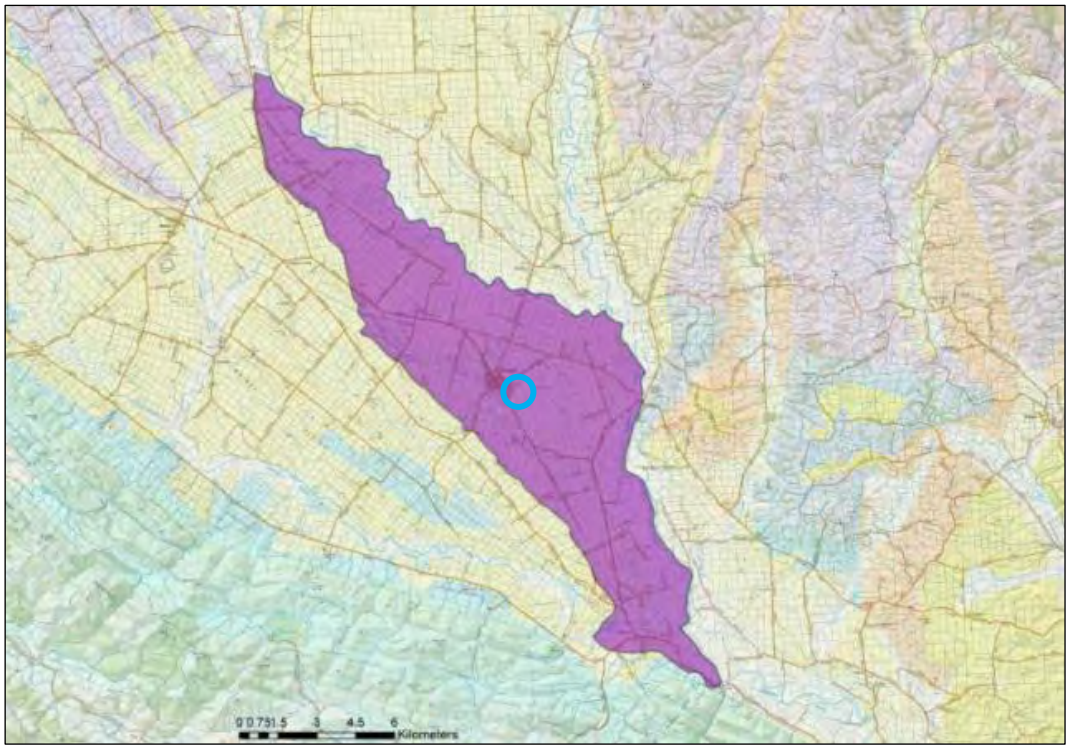

Figure 2.2: Riversdale Groundwater Management Zone and approximate location of the Riversdale WWTP site (blue circle). Source: SWLP, 2018.

2.3.2 Geology

Subsurface geology of the Riversdale GMZ consists of a typical sequence of heterogeneous alluvial gravels associated with a moderate to large braided river (Environment Southland, 2021). The gravel deposits comprise of moderately to poorly sorted gravel, clay-bound gravel, sand and silt. Deposits extend to a depth of up to 30 m below ground level (m BGL) to the west of the Riversdale township, and reduce to less than 10 m BGL towards Mandeville (Figure 2.3). Tertiary sediments of the East Southland Group (Gore Lignite Measures) underly the Quaternary alluvium across the Riversdale GMZ, cropping out at the land surface at locations along the southern boundary. These sediments comprise thick layers of carbonaceous mudstone interspersed with localised layers of sand and gravel. Basement rock consists of sandstone and volcaniclastic sediments of the Dun Mountain-Maitai Terrane, and semi-schist of the Caples Terrane.

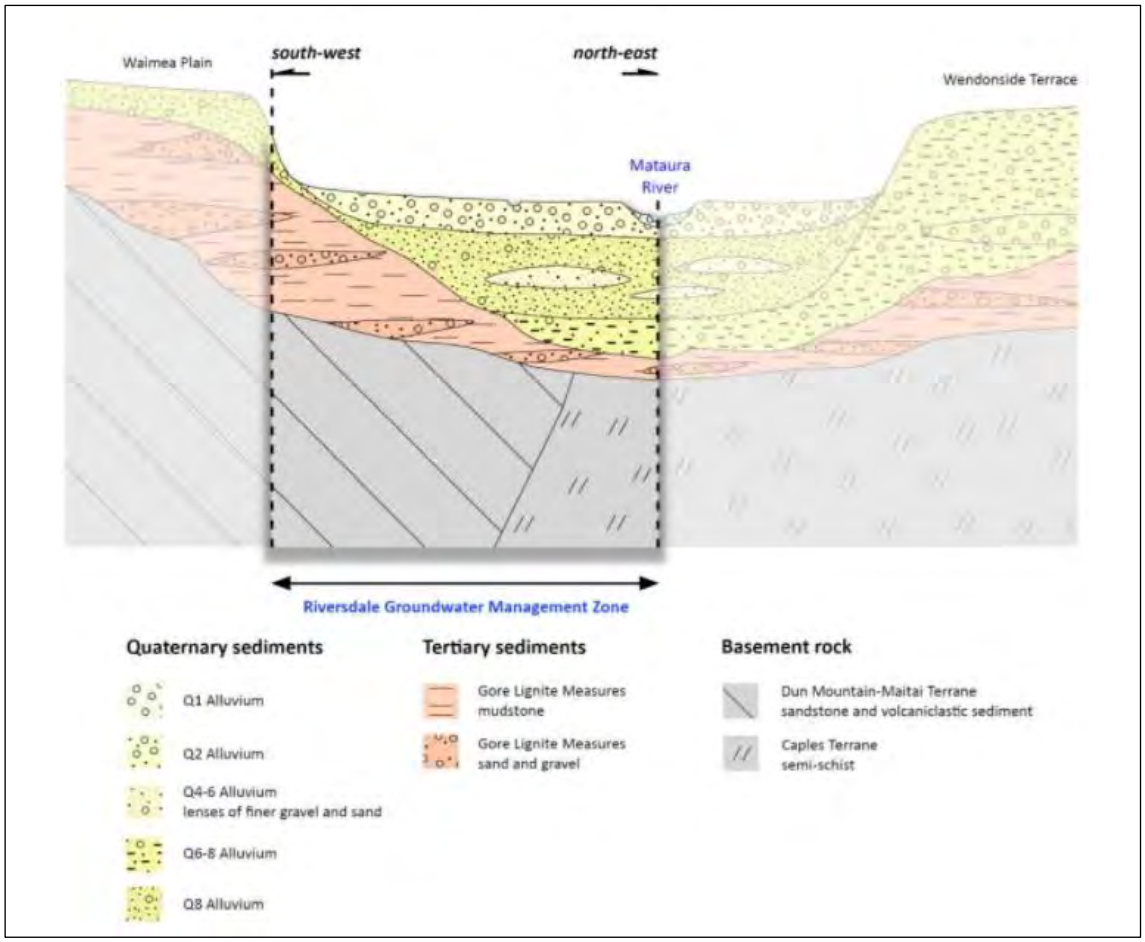

Figure 2.3: Schematic of Riversdale Groundwater Management Zone geology (Environment Southland, 2021).

2.3.3 Groundwater Recharge

Recharge to the Riversdale GMZ occurs through land surface (rainfall and irrigation), surface water (for which the Mataura River is the largest source), and groundwater inflow from the other GMZ's (i.e., Waimea Plains). The majority of soil types in the zone are alluvial, shallow, and well drained. These properties result in land surface recharge (from rainfall and irrigation) into the underlying groundwater. Environment Southland (2021) estimate rainfall recharge to be 170 mm/yr., which is equivalent to 18.7 million m^3/yr. across the zone. Dommisse (2019) undertook detailed soil-moisture balance modelling to estimate rainfall and irrigation recharge for the period 1977 – 2018. Rainfall recharge estimates were 165 – 244 mm/yr. compared to rainfall and irrigation recharge estimates of 208 – 301 mm/yr. (Dommisse, 2019). Similar rainfall recharge estimates were provided by Gyopari (2007) based on the period 1999 – 2007 of 214 mm/yr. The Q2 alluvial deposits in the Riversdale GMZ host a spatially extensive unconfined aquifer system that is hydraulically connected to the Mataura River and local spring-fed streams. The Mataura River recharges the Riversdale aquifer in the upstream reaches and groundwater from the Riversdale aquifer recharges the Mataura River in the downstream reaches (Figure 2.4). Flow measurements indicate loss of between 1.2 to 2.0 m^3/s^{-1} between Ardlussa and the Riversdale Bridge. Inflow to the Riversdale aquifer occurs from the adjacent Waimea Plains GMZ, located to the south-east. Groundwater along the north-west boundary of the Riversdale GMZ is either connected to the Mataura river or perched above the Riversdale aquifer (Gyopari, 2007).

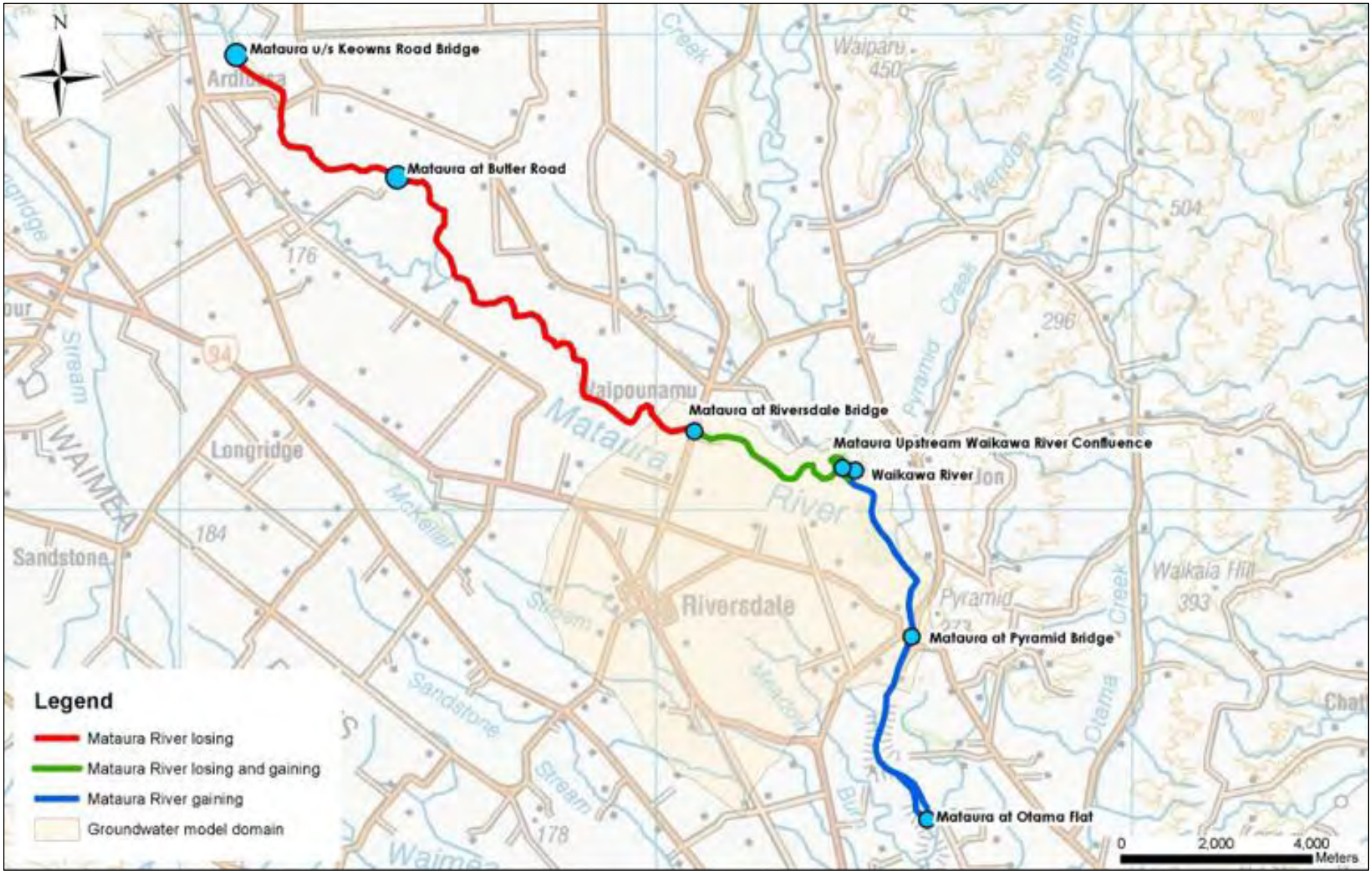

Figure 2.4: Estimated gaining and losing reaches of the Mataura River from concurrent river gauging during the period 2003 – 2018 (Dommisse, 2019).

2.3.4 Groundwater Discharge

Groundwater discharges from the Riversdale GMZ via baseflow to the Mataura River and spring-fed streams that originate across the Q2 terrace. For example, a flow gain of *c.* 25% greater than that occurring over the upstream section of the Mataura River is observed between Pyramid and the Otamita Bridge. The five main springs / spring-fed streams that receive flow from the Riversdale GMZ (in order of decreasing discharge) are: Meadow Burn, spring at Tayles – Fingerpost Pyramid Road; spring at Fingerpost Pyramid Road; spring at Mandeville Riversdale Highway Crossing; and McKellar Stream (Dommisse, 2019).

Meadow Burn has the largest discharge and is directly adjacent to the Riversdale WWTP site. The stream originates north of Riversdale Township, approximately 2 km upstream of the site. The Meadow Burn flows in a southeast direction before entering the Mataura River approximately 6.5 km downstream of Pyramid Bridge. Flow into the Meadow Burn is well documented to increase progressively downstream from York Road (e.g., median 30 L/s) to Fingerpost Pyramid Road (e.g., median 199 L/s) (Dommisse, 2019). These values are based on 76 spot gauging measurements by Environment Southland during the period 2003 – 2016. The increase in flow is attributed to direct groundwater discharges into the stream bed and input from tributary spring fed streams. Stream flows are very well correlated to long term monitoring bore at Riversdale Township, F44/0181.

2.3.5 Groundwater levels and flow direction

Groundwater levels in the Riversdale aquifer are monitored by Environment Southland at the Liverpool Street, Riversdale bore F44/0181. The long-term groundwater level monitoring bore is the closest to the WWTP site and has the highest temporal resolution (e.g., daily). Groundwater depth ranges from 1 m BGL to 3 m BGL across a majority of the Riversdale GMZ. Seasonal groundwater level variations reflect temporal rainfall variability. Localised groundwater level variations are from flow changes in the Mataura River and groundwater abstraction (e.g., for irrigation). Groundwater levels generally vary by < 1 m, reflecting the hydraulic connection to the Mataura River and dampening effects of the spring feds streams and drains. Groundwater flow occurs in a south-easterly direction across the zone towards the downstream reach of the Mataura River.

2.3.6 Hydraulic properties

Bore yields in the unconfined aquifers are generally high, declining toward the southern margin of the Q2 terrace (Environment Southland, 2018). Low yielding confined aquifers occur in localised sand and gravel layers within the Gore Lignite Measure sediments underlying the Quaternary alluvium. A summary of potential hydraulic conductivity from generic and site-specific studies was compiled by Dommisse (2019) and is presented in Table 2.1. These values indicate that the unconfined aquifer has moderate to very high permeability that varies considerably at different locations. The closest aquifer test was identified to be a step-drawdown test undertaken a distant 1 km from the WWTP. Therefore, rising head and low-flow-rate constant-rate testing was undertaken on selected existing monitoring bores to help estimate the K values for the site (Table 2.1; Dommisse, 2019). The majority of bores showed moderate - very high K values with a very rapid water level recovery (2 - 30 seconds) in response to the rising head test. Observations indicated that K values in the aquifer were generally much higher than determined from the vadose zone.

The aquifer at the WWTP site is unconfined and therefore groundwater storage is dominated by aquifer specify yield (Sy). A lower specific yield results in a greater water level rise compared to higher specific yield in response to recharge events. A summary of specific yield values from generic studies and the Riversdale aquifer were compiled by Dommisse (2019) and are presented in Table 2.2.

Table 2.1: Summary of estimated hydraulic conductivity (K) relevant to the Riversdale WWTP Site. This table has been modified from Dommisse (2019).

Method	Source	K (m/d)
Range for clean gravels, minor or no fines	Kruseman and de-Ridder (2000); Domenico and Schwartz (1998)	200 - 2,000
Range for sand, gravel mixtures	Kruseman and de-Ridder (2000); CIRIA (2000)	1 - 200
Numerical groundwater model	Williamson (2004)	250
	Gyopari (2007)	300
	Liburne *et al.*, (2014)	50 - 200
Constant-rate and step-drawdown aquifer testing	Williamson (2004); Gyopari (2007); Wilson (2011)	25 - 600
On site testing (rising head andlow flow constant rate tests)	Dommisse (2019)	5 - 580

Table 2.2: Summary of specific yields determined from generic ranges and groundwater studies on the Riversdale aquifer. This table has been modified from Dommisse (2019).

Method	Source	Specific Yield (m^3/m^3)
Generic range for unconfined aquifers	Freeze and Cherry (1979)	0.01 – 0.3
Generic values for sand and gravel	Fetter (2001)	0.1 – 0.35
Numerical groundwater model	Gyopari (2007)	0.2
	Liburne *et al.*, (2014)	0.25
Eigen modelling	Dommisse (2019)	0.07 – 0.1

2.3.7 Groundwater quality

Natural groundwater quality in the Riversdale GMZ is generally good, however many areas now show moderate to very high levels of contamination as a result of land use activities. Groundwater contains low concentrations of dissolved ions reflecting the significant recharge contribution from the Mataura River. Hardness is low, and iron and manganese concentrations are typically below detection levels.

Soils within the Riversdale GMZ are well draining and the groundwater is in an oxidised redox state. As a result, there is limited potential for attenuation (e.g., denitrification) in groundwater once it has infiltrated the soil zone. Nitrate concentrations are generally lower in areas close to the Mataura River due to high seepages losses of low Nitrate water from the river, but are commonly high in areas away from the river and associated with intensive land use. Phosphorus is typically strongly bound to soils and concentrations in the unconfined aquifer are generally low. Microbial contamination of groundwater is typically limited by natural attenuation in the soil zone and underlying aquifers. Due to the well-drained nature of soils, there is potential for microbial contaminants to be transported through the soil zone into groundwater where the water table is shallow.

2.3.8 Groundwater use

Groundwater is extensively utilised for domestic, farm and irrigation water supplies across the Riversdale GMZ. Current allocation status of the unconfined aquifer is described by Environment Southland (2021) as 'moderate'. Potential environmental effects of groundwater abstraction in the zone include well interference, stream depletion, water quality, and sustainability.

2.4 Drinking water supply

Two drinking water supplies were identified within 5 km of the Riversdale WWTP site (Figure 2.5). The closest drinking water supply is located at Riversdale School (RIV009) located 1.6 km to the west of the WWTP (Environment Southland, 2021). The supply is sourced from a bore (groundwater) and used for < 25 people. The Otama Rural Water Scheme (OTA004) site is located approximately 4.5 km to the east of the WWTP. The supply is currently operated by Gore District Council (GDC) and the water source is identified as bore/river – indicating a riparian take from the Mataura River. The Otama RWS scheme supplies water to 253 connections on 210 farms and includes 239 km of pipeline (GDC, 2021). The water supply is used for drinking water at homes, two schools, and a marae. Historically, the water was untreated as the scheme was originally only for stock water. Chlorination of the Otama RWS scheme was introduced following a catchment study that identified a high risk of microbiological contamination. Weekly water quality sampling from the bore is currently undertaken and analysed for *E. coli*. The closest downstream drinking water supplies are located at Gore, 23 km to the south-east of the WWTP site.

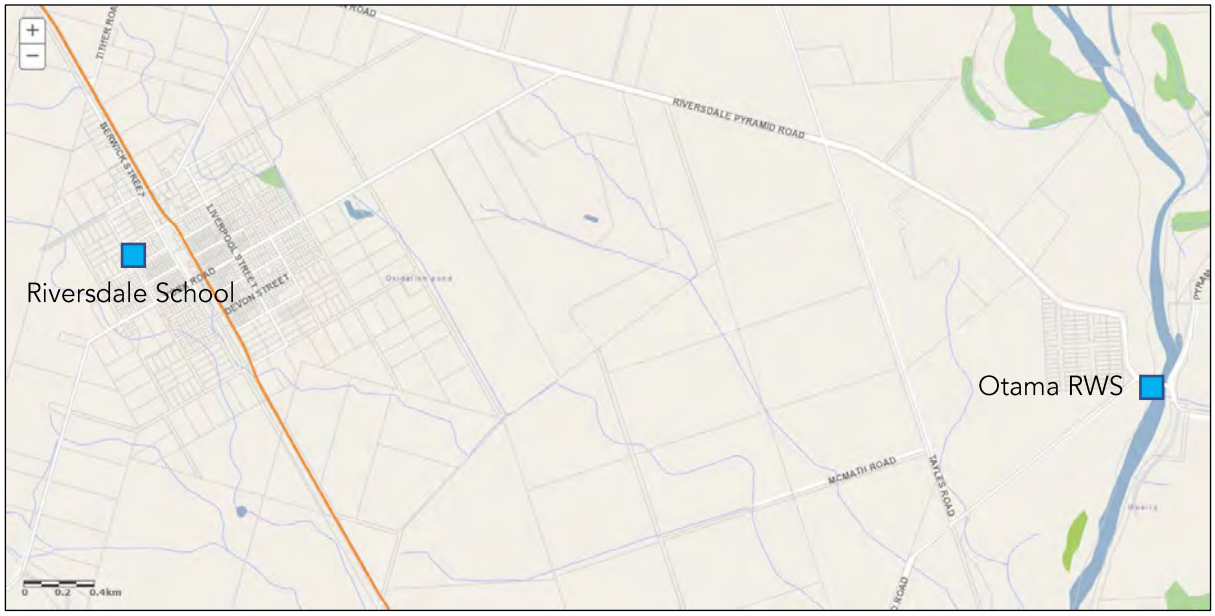

Figure 2.5: Location of groundwater drinking water supplies within 5 km of the Riversdale WWTP site, including Riversdale School and Otama Rural Water Supply Scheme.

2.5 Land use

The Mataura FMU consists of approximately 550,500 hectares for which 86% of the land is developed (Figure 2.6). Primary land uses in the Mataura FMU largely include sheep and beef farming (71% of developed land) and dairy farming (16% of developed land) (Nicol and Robertson, 2018). Minority land uses within the Mataura FMU include deer, arable, forestry, urban and 'other' land uses, all of which account for between 2 – 3% of developed land within the FMU (Nicol and Robertson, 2018). There are numerous surface water and groundwater takes, stormwater, and sewage discharges within the FMU. Primary urban settlements include (but are not limited to) Gore, Wyndham, Mataura, and Riversdale. The Riversdale WWTP site is located in the Upper Mataura Catchment adjacent to the urban centre of Riversdale town and within an area of intensive agriculture (Figure 2.6). Land use surrounding the site predominantly includes sheep and beef farming, dairy farming, and livestock support. Irrigation command areas located to the north and north-east of the WWTP predominantly rely on groundwater abstraction from the Riversdale Aquifer.

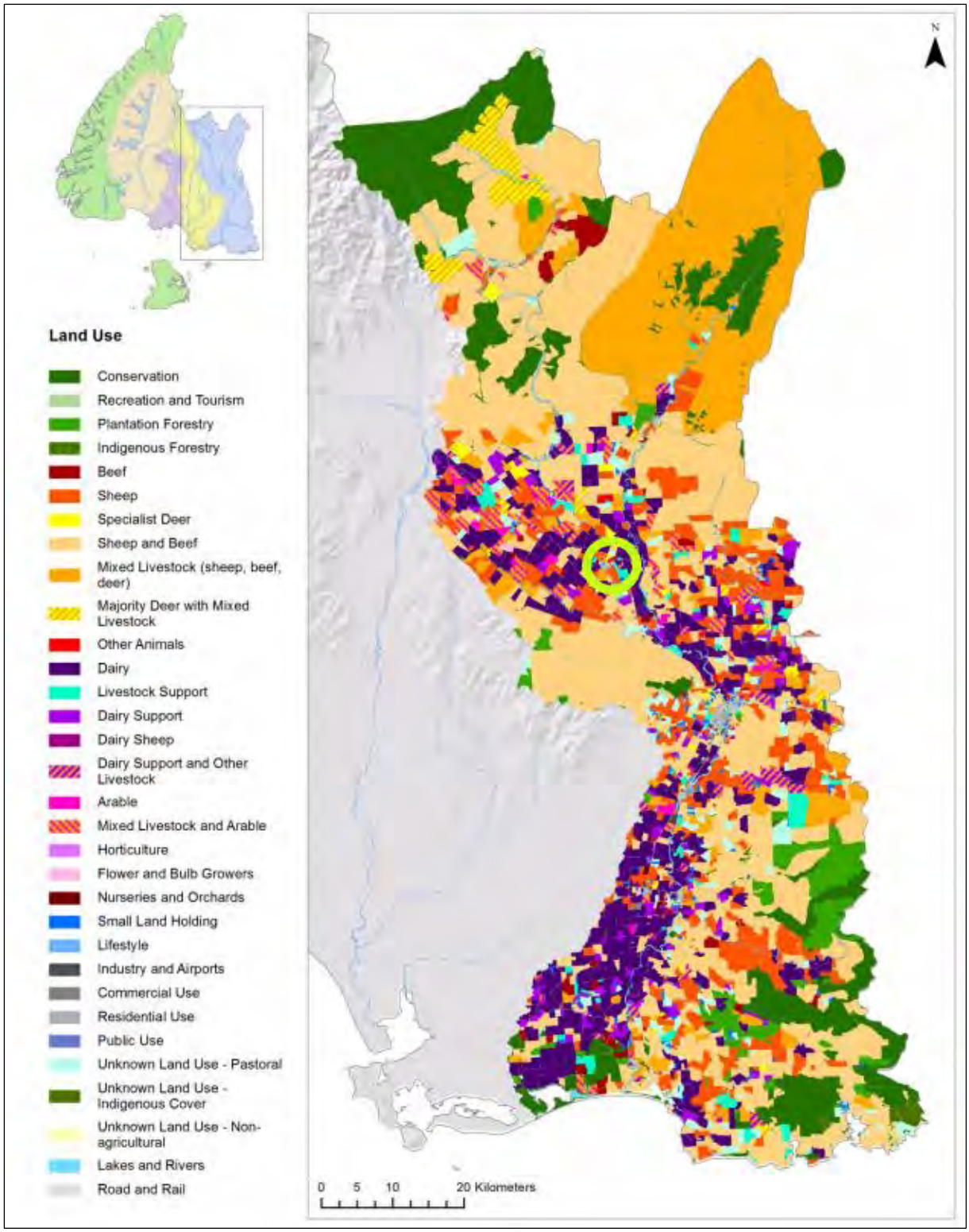

Figure 2.6: Land use within the Mataura FMU showing the approximate location of Riversdale WWTP (lime green circle). Adapted from Nicol and Robertson (2018).

3.0 Riversdale WWTP Site setting

3.1 Oxidation Pond and Infiltration Trench

3.1.1 Wastewater Treatment

The oxidation pond was likely constructed in the late 1970's. It has a surface area of approximately 5,000 m^2 and approximate operating depth 1.3 m (Dommisse, 2019). The base of the pond is thought to be constructed with a clay-liner, and the pond includes a wave band of cast in-situ concrete slabs. A low-rate of seepage to groundwater likely occurs through the base of the pond. Wastewater is treated using a single stage oxidation pond and discharged into an adjacent L-shaped infiltration trench (Figure 3.1). Wastewater that does not infiltrate to land overflows from the trench into Meadow Burn via an outfall.

Figure 3.1: Riversdale oxidation pond and infiltration trench (2010 – present. Figure from Dommisse (2019).

3.1.2 Infiltration trench

The infiltration trench originally started out as a wetland and soakage channel constructed to the south and east of the oxidation pond. This was constructed in 2000 to (ideally) allow wastewater discharge to land, thus eliminating operational discharges into the Meadow Burn. The infiltrative surface of the trench frequently blocked within the first ten years of operation, resulting in controlled overflows to Meadow Burn (MWH, 2014). To mitigate this, the wetland and soakage channel were excavated to form a continuous 'L shaped' infiltration trench around the oxidation pond in 2010. The infiltration trench is 5 m wide by 135 m long and exists to the present day (Figure 3.1). The trench was excavated below the natural ground surface (depth unknown) into clayey gravel and backfilled with evenly graded gravel (MWH, 2014). Based on test pits dug near the trench it is likely that the trench is no deeper than 0.75 m BGL. At depths below 0.75 m, the soil becomes significantly more permeable as the clay and silt content is negligible. The water level in trench is approximately 1.0 m above the surrounding ground level (Dommisse, 2019).

The infiltration trench was designed to allow for infiltration of oxidation pond inflow and rainfall directly to land to avoid discharge of treated wastewater directly into the Meadow Burn. However, the infiltration trench has never been capable of discharging all of the wastewater and rainfall to land. The trench has been drained and rehabilitated using an excavator on several occasions, in attempts to minimise the frequency of overflows to the Meadow Burn. However, there has been little improvement

in infiltration after rehabilitation. The infiltration trench was rehabilitated twice during the period 2012 – 2014, with no evidence of clogging and no significant improvement in infiltration. At the time, these observations were considered to support the idea that high groundwater levels were responsible for low rates of infiltration (MWH, 2014). Another possible reason might be the presence and or thicker sequence of low permeability shallow sediments at this location.

No detailed testing has been undertaken to estimate infiltration from the trench. However, water quality monitoring of groundwater bores downgradient indicates that seepage is likely occurring. For the year May 2012 - April 2013 it was estimated that total direct discharge to the Meadow Burn was 26,000 m^3, or about 32% of the total treated wastewater discharge (MWH, 2013). This estimate was based on an average daily discharge of 220 m^3 and did not consider rainfall and evaporation. During this time, treated wastewater was discharged to the Meadow Burn for 51 days (equivalent to 14% of the year). In contrast, an estimated seepage rate of 150 m^3/d from the scheme equates to 70% of the mean annual daily flow (Appendix B; MWH, 2013). In October 2016 SDC installed a device which limits outflow from the trench to 1 L/s between (December – March) and 2 L/s (April – November).

3.2 Water Balance

Dommisse (2019) presented daily datasets of inflows to the oxidation pond, rainfall, and groundwater levels from Environment Southland Riversdale monitoring bore (F44/0181) (Figure 3.2 and Figure 3.3). Wastewater inflows ranged from 85 m^3/d to 120 m^3/d (Table 3.4). Inflows were identified to increase directly in response to rainfall and during winter when groundwater levels are reported to be the highest. Additional inflow during rainfall and elevated groundwater conditions likely originates from infiltration of cracks in the piped sewer network. For the period 2013 – 2017, average wastewater inflow during 'dry' weather conditions in summer is approximately 220 m^3/d (2.5 L/s). For the same period, average wastewater inflow during 'dry' weather conditions during winter is 40% to 70% higher. Wastewater generation for Riversdale was modelled based on the current resident population (470 people) and predicted 2043 resident population of 623 people. Typical wastewater generation is 85 – 118 m^3/day under the current setting, and predicted wastewater generation in 2043 is 112 – 156 m^3/day (Stantec, 2018).

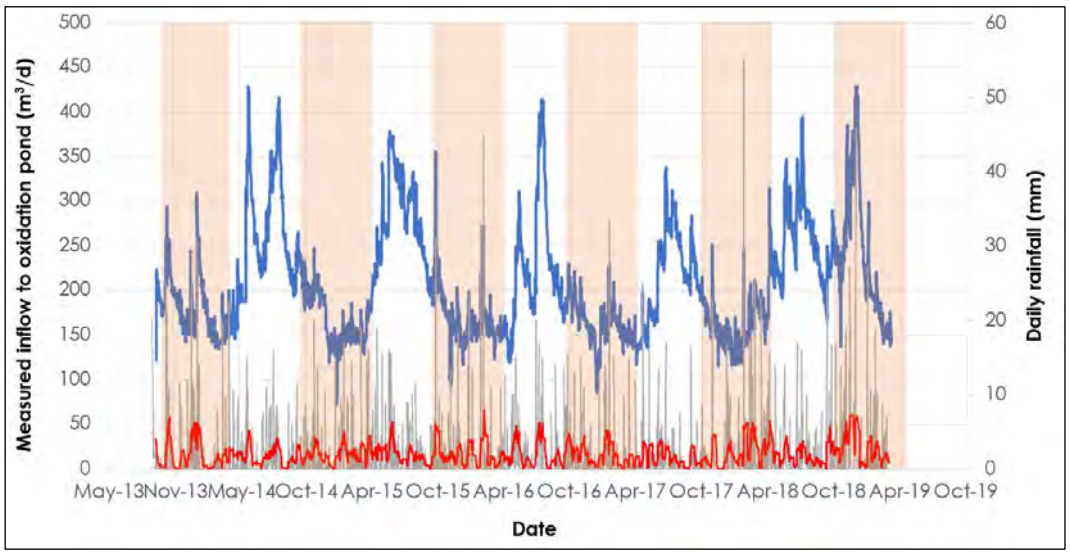

Figure 3.2: Wastewater inflow to oxidation pond (blue) versus daily rainfall (grey) and moving average daily rainfall (red). Summer periods highlighted light orange (Dommisse, 2019).

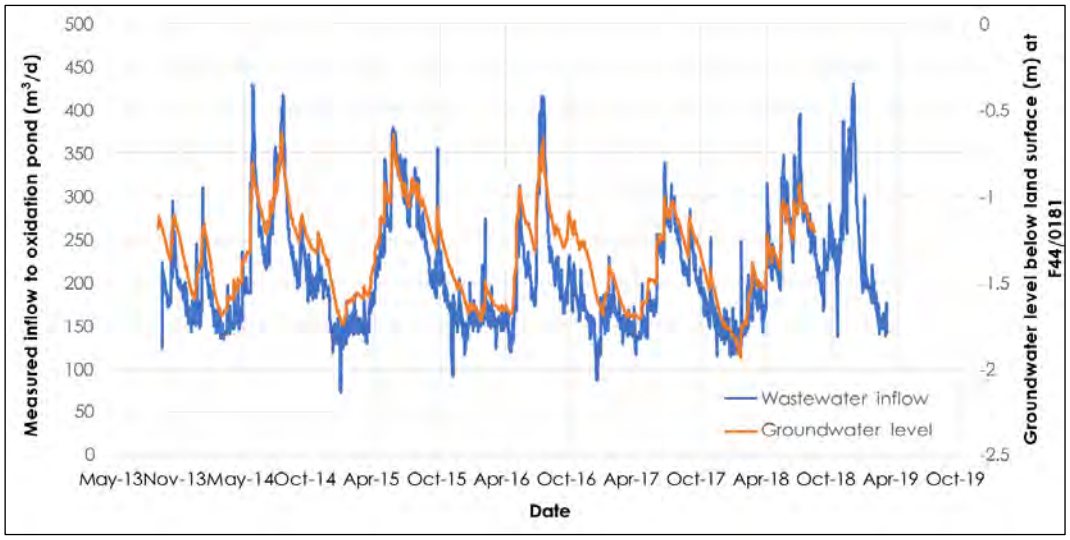

Figure 3.3: Wastewater inflow to oxidation pond versus groundwater levels in 6 m deep bore F44/0181 at Riversdale Township.

3.3 Topography

Land surface elevation at the site is relatively flat. Small undulations observed at the site represent the historical drainage network of Meadow Burn, prior to channelisation in the 1950's. A drone survey was undertaken in 2018 to measure land surface levels and covered a 1,200 m x 1,200 m area centred on the proposed RIB sites and oxidation pond (Figure 3.4). The survey showed that the land surface gradually dips in the NW - SE direction. It is likely that groundwater flow direction aligns with local topography, and flows towards the south-east of the site. Lowest points in the landscape occur within the historical drainage channel/s of Meadow Burn. These areas will be the most likely to receive groundwater discharge or experience permanent wet ground conditions. Original and recently revised locations for the proposed RIBs are located on slightly elevated ground surrounded by historic drainage channels. The closest channels which could act as conduits for wastewater discharges occur immediately downgradient and west of the revised RIBs (Figure 3.4).

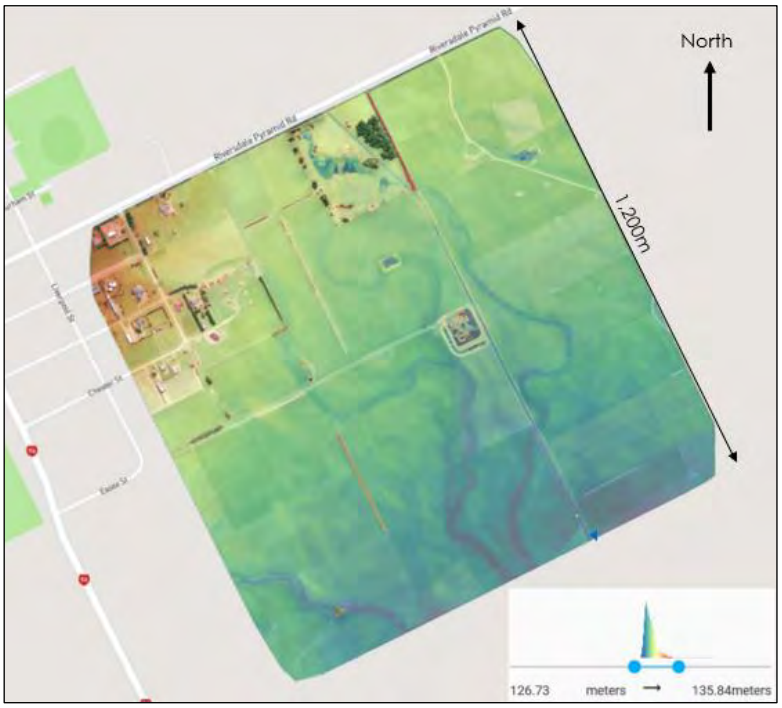

Figure 3.4: Drone survey of land surface elevation on 26th April 2018. Adapted from Dommisse (2019).

3.4 Groundwater quality

3.4.1 Groundwater quality sampling

The hydrological setting of the Mataura FMU and Riversdale GMZ are provided in Sections 2.2 and 2.3. A summary of key water quality variables that are relevant to understanding the hydrogeological setting and impacts of effluent discharge are presented below. Where available, reference to the Maximum Acceptable Value (MAV) and Guideline Value (GV) for the New Zealand Drinking Water Standards are presented.

- Bacterial contaminants are harmful to humans and livestock and subsequently will impact groundwater quality. Presence of these contaminants indicate that the water has been contaminated with faecal matter and may contain other pathogens that can cause illness:
    - Escherichia coli (*E. coli*) MAV in drinking water is < 1 cfu/100mL and contact recreation is not recommended at concentrations > 550 cfu/100mL.
    - Faecal coliforms are a subset of the coliform group (for which *E. coli* is one coliform) and was historically monitored in New Zealand so provides a good comparison for change over time. There are no guideline values for faecal coliforms.
- General chemistry (pH, dissolved oxygen, electrical conductivity, anions):
    - pH can also affect water supply as end users (stock and irrigated land) are sensitive to pH ranges;
    - Dissolved oxygen (DO) is an important groundwater quality variable that can affect aquatic life at different threshold values, according to species and life stage; DO is particularly relevant in this setting where groundwater discharges to surface water (e.g., spring-fed systems); and
    - Electrical conductivity (EC) is a measure of the total dissolved salts or ions in water; elevated concentrations may indicate the presence of point-source discharges (e.g., effluent) or diffuse nutrient inputs, and can also occur naturally as a result of catchment geology; EC of fresh groundwater is typically < 100 mS/m; there are no guideline values for EC.
    - Chloride (Cl^-) concentration can be used as an indicator of human wastewater discharges or other contamination; chloride concentration in rainwater derived groundwater is generally < 10 mg/L, with an increase to > 20 - 30 mg/L as a result of fertiliser and/or wastewater discharge; the guideline value (GV) for chloride in groundwater that may affect human taste is 250 mg/L.
- Nutrients:
    - Dissolved inorganic forms of nutrients including phosphorus (e.g., dissolved reactive phosphorus (DRP)) are bioavailable and in excess, promote growth of aquatic plants and algae; in turns decreasing DO concentrations block sunlight, reduce aesthetic values, and deter public use of the water body;
        - DRP is the mobile form of phosphorus and most likely to be transported from groundwater to surface water. Groundwater typically has low DRP concentration (e.g., < 0.1 mg/L) and elevated concentrations may indicate anthropogenic influences. There are currently no national guideline values set for DRP
    - Total Phosphorus is a measure of all forms of phosphorus present in the groundwater sample (e.g., soil P, DRP) and a key component of domestic and animal waste.
    - Total nitrogen is a measure of all forms of nitrogen present in the groundwater sample (e.g., nitrate, nitrite, ammoniacal-nitrogen).

SDC have undertaken groundwater quality sampling at the Riversdale WWTP at varying intervals and for a variety of parameters for the period 2012 - 2021. Sampling has been taken from up to five piezometers at the site. Piezo 1 (P1) is upgradient of the WWTP, Piezo 2 (P2) is slightly-upgradient of the WWTP. Piezo 3 (P3) and Piezo 4 (P3) are two downgradient piezometers closest to the WWTP, and

Piezo 5 (P5) is the monitoring site furthest downgradient from the WWTP (Table 3.1; Figure 3.5). Groundwater quality sampling was initially undertaken during the October 2012 – January 2013 period. No sampling was undertaken during the 2013 – December 2016 period. Sampling resumed in December 2016 at a quarterly interval and has continued to date (December 2020). Not all sampling parameters have been recorded for the duration of sampling at the site. For example, parameters including chloride, electrical conductivity, total nitrogen, and *E. coli* have relatively consistently been sampled during the programme. In comparison, other parameters including faecal coliforms, nitrate-nitrogen, and total phosphorus have been sampled for approximately half of the duration of the sampling programme. Due to the limited number of results for dissolved oxygen and temperature, no further analysis of these parameters has been undertaken as part of this report.

Table 3.1: Summary of SDC groundwater quality monitoring sites (piezometers 1 – 5) at the Riversdale WWTP.

Bore ID	Easting	Northing	Depth (m BGL)	Screen (m BGL)
P1	1270909.558	4908152.371	4	2 - 4
P2	1270896.987	4907931.948	4	2 - 4
P3	1271051.558	4907891.240	4	2 - 4
P4	1271064.352	4907881.961	4	2 - 4
P5	1271114.894	4907845.414	4	2 - 4

Figure 3.5: Location of SDC groundwater quality monitoring piezometers at the Riversdale WWTP.

3.4.2 Groundwater quality results

Concentrations of selected anions (i.e., bromide, chloride, and fluoride) are generally lowest in P1, P2, and P5 and highest in P3 and P4 (Table 3.2). For example, bromide concentration ranges from 0.02 – 0.05 mg/L in P1, P2 and P5 compared to a range of 0.05 – 0.1 mg/L in P3 and P4. Similar trends are observed in chloride (e.g., an average of 7 – 9 mg/L in P1, P2, and P5 compared to an average of 22 mg/L in P3 and P4) and fluoride (e.g., an average of 0.06 mg/L in P1, P2, and P5 compared to an average of 0.08 mg/L in P3 and P4). The higher concentrations in P3 and P4 are likely to reflect seepage losses to groundwater from the WWTP scheme. The reduced concentration in P5 is considered to be the result of increased dilution with the natural groundwater as the contaminant plume moves further downgradient from the WWTP scheme.

As expected, electrical conductivity is consistently lower in P1, P2, and P5 (e.g., averages of 157 – 189 µs/cm) when compared to P3 and P4 (e.g., averages of 376 – 386 µs/cm). Electrical conductivity does not appear to be increasing over time and suggesting relatively constant seepage from the WWTP scheme all year round (Figure 3.6). All median values are similar to the average values with a minimum sampling size often indicate a normal distribution.

Table 3.2: Summary of general chemistry from the Riversdale WWTP groundwater sampling programme. Data was provided from SDC for the period 2012 – 2020.

Parameter	Peizo.	Min	Max	Average	Median	Count
Electrical Conductivity (µs/cm)	P1	149	164	158	159	24
	P2	144	171	156	157	24
	P3	7	461	353	376	24
	P4	313	465	387	386	24
	P5	160	220	187	189	24
Bromide (mg/L)	P1	0.03	0.05	0.03	0.03	10
	P2	0.02	0.04	0.03	0.03	10
	P3	0.05	0.11	0.08	0.08	10
	P4	0.05	0.1	0.07	0.07	10
	P5	0.03	0.05	0.04	0.04	10
Chloride (mg/L)	P1	6.25	30.5	8.87	8.24	24
	P2	4.88	8.8	7.49	7.75	24
	P3	12	35	22	23	24
	P4	13.3	31	22.3	22	24
	P5	7.88	13	9.93	9.7	24
Fluoride (mg/L)	P1	0.04	0.09	0.06	0.06	10
	P2	0.04	0.08	0.06	0.06	10
	P3	0.06	0.1	0.08	0.08	10
	P4	0.06	0.1	0.08	0.08	10
	P5	0.04	0.08	0.06	0.06	10

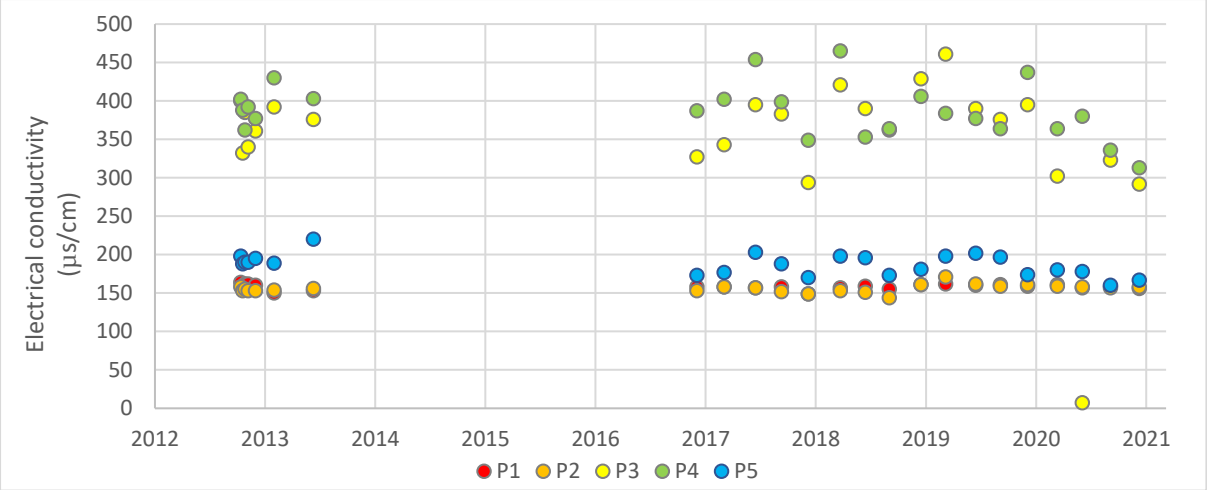

Figure 3.6: Electrical conductivity from the Riversdale WWTP groundwater sampling programme (2012 – 2020). Refer to Table 3.2 for a summary of results.

Concentration of bacterial contaminants (i.e., faecal coliforms and *E. coli*) are generally low in P1, P2, and P5, with elevated concentrations in P3 and P4 (Table 3.3). The concentration of bacterial contaminants does not appear to be increasing over time (Figure 3.7A and Figure 3.7B). Groundwater samples exceed the MAV for *E. coli* in drinking water in all sampling sites at the WWTP with greater exceedances in P3 and P4 in comparison to the upgradient and farthest downgradient sites (P1, P2, and P5). However, all bores showed no detection of *E. coli* throughout the sampling programme (Table 3.3) and maximum concentrations of *E. coli* were consistently less than the MAV for contact recreation (550 cfu/100 mL). Overall, the discharge of treated wastewater from the WWTP scheme has a localised and temporary impact on local groundwater at the site (e.g., P3 and P4).

Table 3.3: Summary of bacterial contaminants in groundwater from the Riversdale WWTP groundwater sampling programme. ND represents 'not detected' and indicates that the concentration was below the detection level. Data was provided from SDC for the period 2012 – 2020.

Parameter	Peizo.	Min	Max	Count (ND)
E. coli (cfu/100 mL)	P1	2	215	6 (17)
	P2	1	41	5 (18)
	P3	1	300	19 (4)
	P4	1	250	17 (6)
	P5	1	24	9 (14)
Faecal Coliforms (cfu/100 mL)	P1	3	3	1 (9)
	P2	1	1	2 (8)
	P3	1	380	8 (2)
	P4	1	300	8 (2)
	P5	1	9	3 (7)

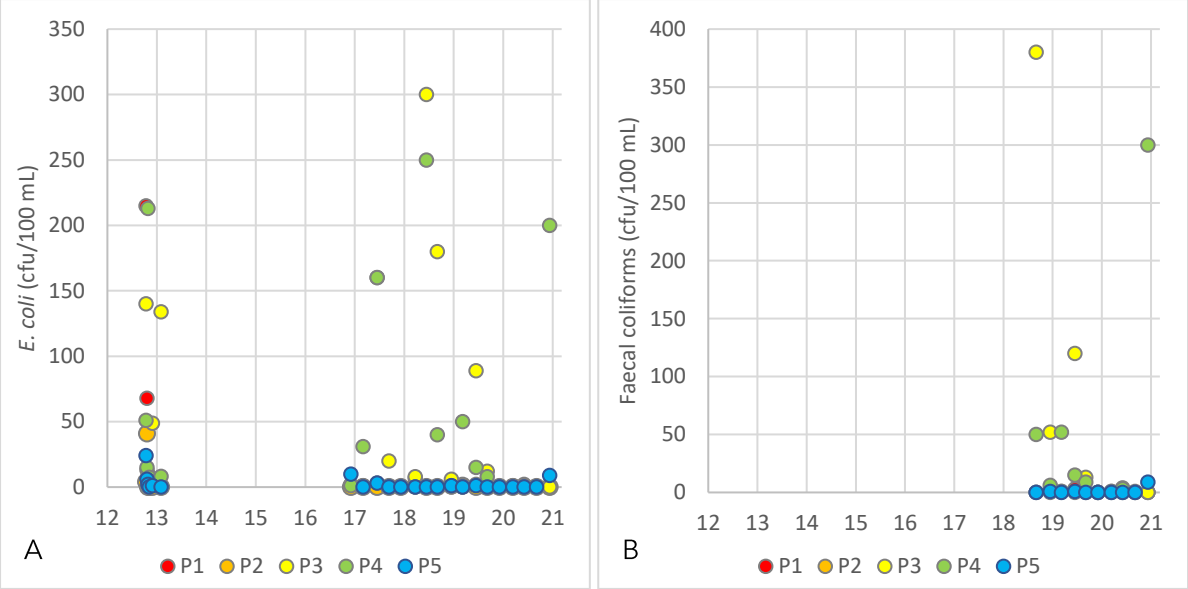

Figure 3.7: Concentration of bacterial contaminants in groundwater quality sampling at the Riversdale WWTP sites, A) E. coli; and B) Faecal Coliforms. Data was provided from Southland District Council for the period 2012 – 2020. Refer to Table 3.1 for a summary of results.

Nutrient concentrations are generally lowest in P1 and P2, with slight elevations in P5, and highest concentrations in P3 and P4 (Table 3.3; Figures 3.8A and 3.8B). For example, average DRP concentration is 0.01 – 0.02 mg/L in P1 and P2 respectively, 0.11 mg/L in P5, and 0.72 – 0.88 mg/L in P3 and P4, respectively (Table 3.4). Similarly, the average TN concentration is 3.2 mg/L, 4.3 mg/L and 3.9 mg/L in P1, P2, and P5 respectively, compared to an average of 10.23 mg/L and 12.24 mg/L in P3 and P4, respectively. Groundwater sampling for nitrate-nitrogen was undertaken for the period 2012 – 2017 (Table 3.4). Overall, nitrate-nitrogen was highest in P1, P2, and P5 (e.g., ranges from 1.5 – 4.2 mg/L) in comparison to P3 and P4 (e.g., ranges from 0.01 – 2.3 mg/L) (Table 3.4). The lower nitrate-nitrogen concentrations measured in the downgradient piezometers likely reflects seepage losses to groundwater from the WWTP scheme, where the treated wastewater is higher in total ammoniacal nitrogen, but lower in nitrate-nitrogen.

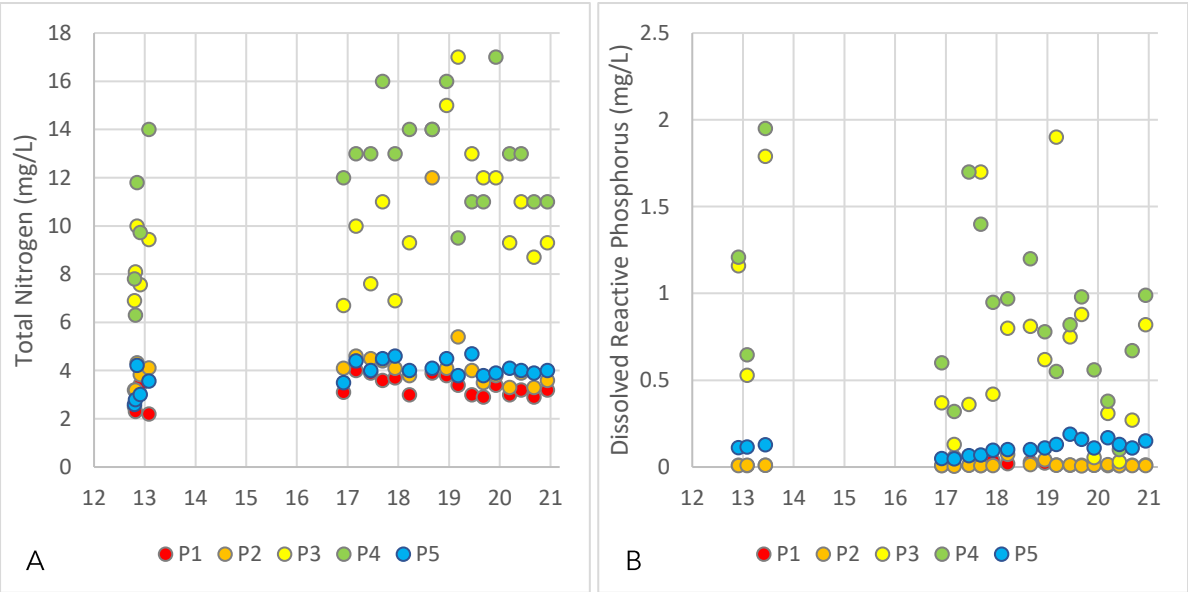

Figure 3.8: Concentration of nutrients in groundwater quality sampling at the Riversdale WWTP sites, A) Total Nitrogen (TN); and B) Dissolved Reactive Phosphorus (DRP). Data was provided from SDC for the period 2012 – 2020. Refer to Table 3.3 for a summary of results.

Table 3.4: Summary of nutrient parameters in groundwater from the Riversdale WWTP groundwater sampling programme. ND represents 'not detected' and indicates that concentration was below the detection level. Data was provided from SDC for the period 2012 – 2020.

Parameter	Piezo	Min	Max	Average	Median	Count (ND)
Dissolved Reactive Phosphorus (DRP) (mg/L)	P1	0.01	0.06	0.02	0.01	19
	P2	0.01	0.07	0.01	0.01	19
	P3	0.03	1.9	0.72	0.62	19
	P4	0.1	1.95	0.88	0.82	19
	P5	0.05	0.19	0.11	0.11	19
Total Phosphorus (TP) (mg/L)	P1	0.01	0.42	-	0.14	7 (3)
	P2	0.01	3	-	0.03	7 (3)
	P3	0.3	3.2	1.72	1.75	10
	P4	1	3.4	1.79	1.6	10
	P5	0.16	0.78	0.31	0.24	10
Nitrate-Nitrogen (NO_3-N) (mg/L)	P1	2.1	3.5	2.45	2.33	10
	P2	2.5	4.2	3.41	3.52	10
	P3	0.01	2.3	-	0.09	9 (1)
	P4	0.01	0.54	-	0.05	8 (2)
	P5	1.5	3	2.05	2.03	10
Total Oxidised Nitrogen (TON) (mg/L)	P1	1.5	3.1	2.7	2.8	10
	P2	2.9	4	3.45	3.4	10
	P3	0.06	2.1	-	0.23	8 (2)
	P4	0.02	0.66	-	0.04	6 (4)
	P5	1.8	3.1	2.51	2.65	10
Total Nitrogen (TN) (mg/L)	P1	2.2	4	3.22	3.2	21
	P2	3.2	12	4.34	4	21
	P3	6.7	17	10.23	9.43	21
	P4	6.3	17	12.24	13	21
	P5	2.6	4.7	3.9	4	21

3.5 Groundwater level monitoring

SDC installed piezometers to monitor groundwater levels at the site in 2015 (P1 – P5) and 2018 (P6 – P10). Groundwater levels intermittently been monitored using a pressure transducer in: P1 – P5 (13/5/2015 to present); and P6 – P10 (May 2018 to August 2018). Exceptions to groundwater level monitoring include instances when dataloggers have failed to record groundwater levels. All the piezometers were installed to a shallow depth (e.g., 1.5 m - 12.5 m BGL) into the unconfined aquifer (Dommisse, 2019). An Environment Southland groundwater level monitoring bore (F44/0044) is located approximately 2.5 km to the north-west of the site at Liverpool Street, Riversdale.

Groundwater level measurements at the site are consistent with Environment Southland monitoring reports which indicate that the water table in the Riversdale GMZ is generally < 2 m BGL and fluctuates ± 1 m. Flow loss from the Mataura River provides a base groundwater level and rainfall recharge provides the more dynamic responses. A summary of groundwater levels relative to land surface in monitoring bores P1 – P7 and further bores is provided in Figure 3.9. Groundwater level monitoring datasets were used to develop a groundwater level contour map for the Riversdale WWTP site. Shallow groundwater in the alluvial gravel aquifer flows in a south to south-east direction at site (Figure 3.10). This suggests that treated wastewater contaminants that enter groundwater have potential to discharge into Meadow Burn within approximately 200 m downgradient of the WWTP.

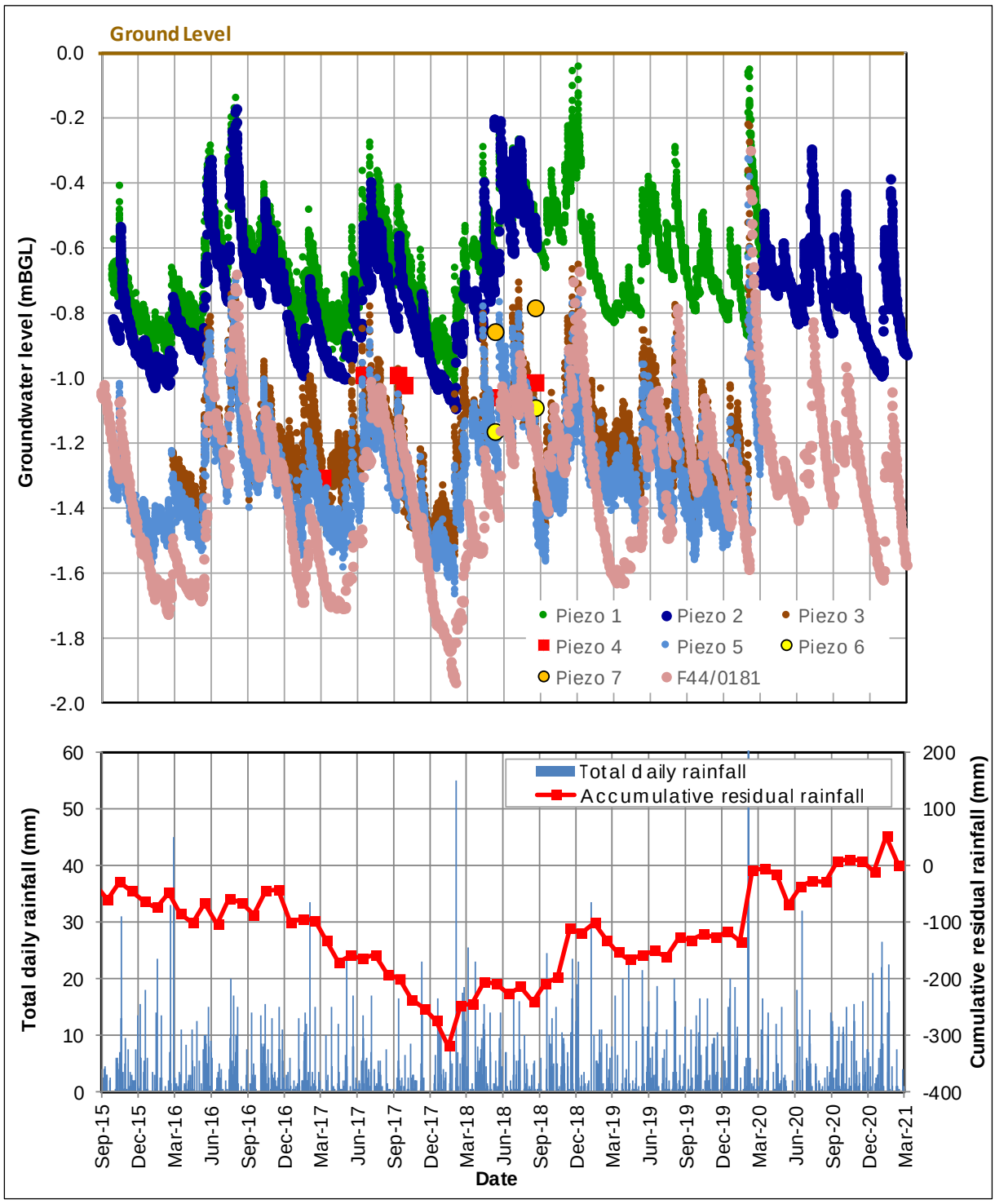

Figure 3.9: Groundwater level summary at the WWTP site, ES long-term monitoring bore F44/0181, daily rainfall, and cumulative residual rainfall. Updated from Dommisse (2019).

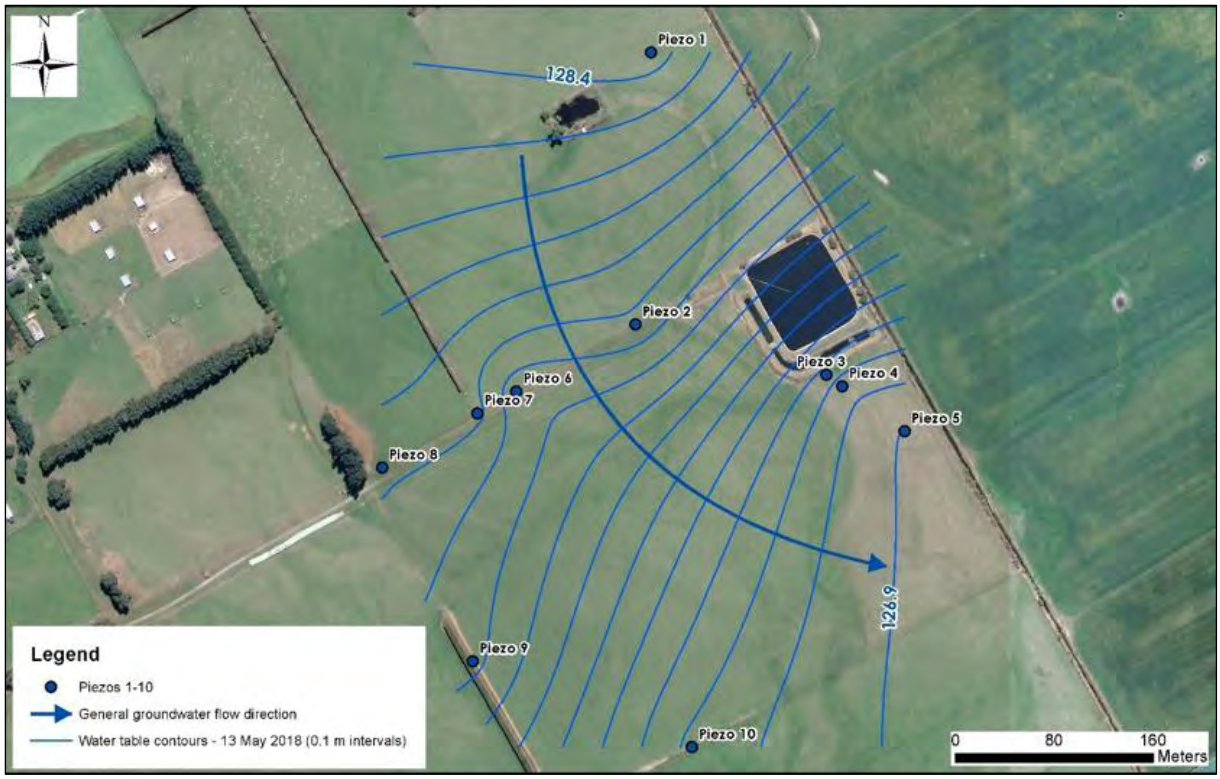

Figure 3.10: Location of groundwater monitoring piezometers at the Riversdale WWTP and inferred groundwater flow direction based on data up to May, 2018 (Dommisse, 2019)

3.6 Wetlands

The closest wetland was identified approximately 5.1 km to the west of the site, on the east bank of the Mataura River (Figure 3.11). No other wetlands wee identified within the vicinity of the WWTP.

Figure 3.11: Location of closest wetland to the Riversdale WWTP site (MfE, 2016).

4.0 Potential Impacts

4.1 Maintenance of WWTP site

The Riversdale wastewater scheme consists of an underground pipe network that will likely start to reach the end of useful life within the next 30 years. Higher rates of inflow and infiltration occur where rain and groundwater enter the sewers through pipe defects, increasing the risk of overflows and the cost of treatment. A number of improvements to the Riversdale wastewater scheme are proposed in the long-term plan (2018 – 2028). These improvements include replacement of poor-quality pipe networks will mitigate the impacts on local water quality and improve efficiency of wastewater treatment. Continued operation of the Riversdale WWTP is required to treat the residential and commercial effluent from Riversdale township.

4.2 Groundwater quantity

4.2.1 Groundwater mounding

Discharge of treated wastewater from the infiltration trench has the potential to cause a groundwater mounding effect. Potential groundwater mounding impacts include an increased potential for flooding and/or change to the local groundwater flow direction. Observations of groundwater levels at the WWTP monitoring sites indicate that that the primary control on groundwater level is rainfall and that there appears to be no increase in average groundwater level over time (Section 3.5). Therefore, it is unlikely that there is any groundwater mounding occurring at the site or within the local environment. These observations are further supported by recent groundwater modelling of the WWTP site (Dommisse, 2019), free draining soils beneath the infiltration trench, and high rates of hydraulic conductivity observed at the WWTP site. Based on the physical observations, groundwater level monitoring, and modelling - there is likely to be minimal (if any) groundwater mounding within the vicinity of the WWTP site. As a result, there will likely be no change to groundwater flow direction or increased flooding potential.

4.2.2 Groundwater recharge

Groundwater recharge at the site will be dominated by land surface recharge. Dynamic river effects on groundwater levels reduce with increased distance from the Mataura River. At a distance of approximately 3.8 km from the river, the dynamic effects on groundwater levels at the site will be substantially less than the effects of rainfall. However, since the river is also affected by rainfall, the two responses are difficult to isolate in the measured data. The combined rate of seepage from the infiltration trench for 2018 – 2019 ranged from approximately from 40 m^3/d to 70 m^3/d. Most of this seepage is likely to recharge groundwater. With higher seepage rates likely in summer given lower groundwater levels, it is possible that this recharge moderates nearby groundwater levels by reducing the water level decline over summer.

4.3 Meadow Burn flow

Flows in the Meadow Burn are well correlated to groundwater levels in long-term shallow monitoring bore F44/0181 at Riversdale. It is likely that some of the wastewater discharged to land and entering groundwater will flow into the Meadow Burn. The Meadow Burn may also reduce the effects of groundwater mounding by allowing excess groundwater to discharge from the site. Therefore, treated wastewater that is discharged to land from the infiltration trench will likely flow through the local system and discharge into the Meadow Burn. The likely increase in flow in the Meadow Burn as a result of localised groundwater discharge is *c.* 1 L/s.

4.4 Groundwater quality

Water quality sampling at the Riversdale WWTP has been undertaken during the period 2012 – 2021. A number of water quality parameters have been consistently sampled over time whereas other

parameters have fewer sampling points. Overall, groundwater quality monitoring indicates a very localised impact on groundwater quality at the site as a result of discharging treated effluent through the infiltration trench. Key outcomes of the groundwater quality monitoring are that:

- A localised impact of general chemistry (e.g., electrical conductivity, chloride) is observed. Highest concentrations of chloride and electrical conductivity are observed at in P3 and P4, and lower concentrations upgradient and downgradient of the WWTP site (P1, P2 and P5) (Table 3.2; Figure 3.5).
- A localised impact of bacterial contaminants (*E. coli* and faecal coliforms) is observed. Highest concentrations of bacterial contaminants occur at P3 and P4, with lower concentrations upgradient and downgradient of the WWTP site (P1, P2 and P5) (Table 3.3; Figure 3.6). There is also a rapid decline in bacterial contaminants downgradient of the WWTP showing that the aquifer is providing a large amount of filtration and time for bacterial die-off.
- A localised impact of nutrient contamination is observed at the site. Highest concentrations of the majority of nutrient indicators (e.g., dissolved reactive phosphorus, total nitrogen), occur at P3 and P4, with lower concentrations upgradient and downgradient of the WWTP site (P1, P2 and P5) (Table 3.4; Figure 3.7).
- An anomaly to this is that the concentration of nitrate-nitrogen is lowest at sites P3 and P4 and higher at P1, P2 and P5. This observation is likely due to the origin of nitrate-nitrogen species originating from agricultural contaminants (e.g., stock effluent, fertiliser) compared to ammoniacal-nitrogen that is predominant nitrogen species in wastewater.

Overall, a very localised (and limited) impact on groundwater quality as a result of discharge through the infiltration trench, is observed at the site. This is demonstrated through the groundwater quality impacts described at P3 and P4, immediately downgradient of the site. Dilution of the contaminants is likely to occur rapidly, as demonstrated by the relative improvement of groundwater quality in P5, within 100 m of the infiltration trench. Based on groundwater quality observations and a lack of groundwater users downgradient of the site, it is unlikely that there will be any adverse impact on other groundwater users as a result of the discharge or treated wastewater to land via the existing infiltration trench of the infiltration trench.

4.5 Surface water quality

Groundwater quality sampling indicates a very localised impact on groundwater as a result of infiltration of treated effluent through the infiltration trench (e.g., Section 3.4). Though some of the wastewater is likely to discharge into the Meadow Burn via groundwater, the quality of this discharge is expected to be much better than the direct discharge into the stream. For example, the water quality results show a considerable reduction in *E. coli* as the wastewater passes through the aquifer. In addition, the concentration of other contaminants such as nutrients will reduce as a result of advection/ dispersion processes in the aquifer. Further analysis of the water quality impacts on the Meadow Burn are covered in the surface water quality technical report.

4.6 Stock, domestic and other water supplies

Groundwater users downgradient of the WWTP site that may be impacted by water quality include consented groundwater abstractions (e.g., for dairy operations; irrigation) and permitted uses of the groundwater resources (e.g., stock water supply, domestic water supply). Overall, it has been demonstrated that there is a very localised (and limited) impact on groundwater quality in the vicinity of the WWTP site. Given that the nearest potentially downgradient bores are more than 2 km from the WWTP site, it is considered it is unlikely that there will be any adverse impact on downgradient groundwater users as a result of continued operation of the infiltration trench.

4.7 Community drinking water supplies

Continued operation of the infiltration trench at the Riversdale WWTP, including groundwater discharge of treated wastewater, is unlikely to have an impact on drinking water supplies sourced from groundwater (e.g., Riversdale, Otama, and Gore; Figure 2.5). This is predominantly due to the location of the drinking water sites in an upgradient or perpendicular direction to the inferred groundwater flow direction in the vicinity of the WWTP site and discharge.

4.8 Wetlands

The continued operation of infiltration trench at the Riversdale WWTP, including groundwater discharge of treated effluent, is unlikely to have any impact on the closest wetland identified from the MfE (2016) wetlands map (Figure 3.10). This is predominantly due to the distant location of the wetland (e.g., > 5 km) and location of two surface water features (e.g., Meadow Burn and Mataura River) that lie between the WWTP and the wetland, and are likely to intercept shallow groundwater flow.

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Appendix 1

Electronic excel file: 'Riversdale_GWQ_2012_2020.xlxs"

Riversdale Groundwater results

RD 1 E:1270909 N:4908156 Upstand 497mm													
Date	Bromide	Chloride	Flouride	Conductivity	E-coli	Faecal	Nitrate N	Total Nitrogen	TON	DRP	TP as P	Dissolved Oxygen	GW Depth
12-10-12		6.25		164	215		2.32						
19-10-12		30.5		158	68		2.44	2.5					350mm
26-10-12		8.41		162	<2		2.2	2.3					450mm
06-11-12		6.39		162	2		2.34	3.2					570mm
30-11-12		6.42		160	<1		2.1	3.42		0.01		4.2	670mm
31-01-13		6.4		150	<2		2.14	2.2		0.009		1.7	600mm
11-06-13		7.7		153			2.1			0.01			
06-12-16		8.5		158	<1		3	3.1		0.008			690mm
06-03-17		8.4		158	<1		2.4	4		0.057			798mm
19-06-17		8.7		157	3		3.5	3.9		0.012			548mm
13-09-17		8.6		158	<1			3.6		0.009			
11-12-17		8		149	<1			3.7		0.039			
27-03-18		7.7		157	7			3		0.019			
18-06-18		8.4		159	<1								
06-09-18	0.03	8.1	0.046	155	<1.0	<1.0		3.9	3	0.029	0.14		
20-12-18	0.029	6.6	0.06	161	<1.0	<1.0		3.8	1.5	0.024	0.42		
12-03-19	0.03	8	0.064	162	<1.0	<1.0		3.4	3.1	0.012	0.17		
20-06-19	0.048	9.4	0.055	160	2	3		3	2.6	0.01	0.02		
10-09-19	0.034	8.34	0.05	161	<1.0	<1.0		2.9	2.8	0.011	<0.01		
10-12-19	0.03	8.13	0.092	159	<1.0	<1.0		3.4	2.9	0.011	0.09		
18-03-20	0.035	8.54	0.058	161	<1.0	<1.0		3	2.8	0.008	0.01		
09-06-20	0.031	7.52	0.055	157	<1.0	<1.0		3.2	2.9	0.009	<0.01		
10-09-20	0.029	8.77	0.061	159	<1.0	<1.0		2.9	2.8	0.01	<0.01		
15-12-20	0.034	9.04	0.043	156	<1.0	<1.0		3.2	2.6	0.013	0.39		

RD 2 E:1270898 N:4907939 Upstand 480mm													
Date	Bromide	Chloride	Flouride	Conductivity	E-coli	Faecal	Nitrate N	Total Nitrogen	TON	DRP	TP as P	Dissolved Oxygen	GW Depth
12-10-12		6.27		158	4		3.15						
19-10-12		8.14		153	41		3.54	3.2					400mm
26-10-12		6.99		155	<2		3.2	3.2					520mm
06-11-12		5.74		153	<1		3.56	4.32					680mm
30-11-12		4.88		153	<1		3.1	3.84		0.009		5.5	770mm
31-01-13		6.53		154	<2		3.7	4.11		0.01		4.3	700mm
11-06-13		7.3		156			3.5			0.01			
06-12-16		8.1		153	<1		3.6	4.1		0.008			750mm
06-03-17		8.2		158	<1		2.5	4.6		0.005			940mm
19-06-17		8.8		157	<1		4.2	4.5		0.01			615mm
13-09-17		7.5		152	<1			4.4		0.008			
11-12-17		7.7		149	<1			4.1		0.009			
27-03-18		7.5		153	1			3.8		0.073			
18-06-18		7.9		151	<1								
06-09-18	0.03	7.5	0.053	144	<1.0	<1.0		12	3.4	0.015	3		
20-12-18	0.024	6.4	0.05	161	1	1		4.1	3.3	0.042	0.1		
12-03-19	0.031	8.6	0.061	171	1	1		5.4	3.9	0.011	0.1		
20-06-19	0.033	7.8	0.057	162	<1.0	<1.0		4	4	0.012	0.02		
10-09-19	0.033	7.22	0.06	159	<1.0	<1.0		3.5	3.5	0.007	<0.01		
10-12-19	0.028	7.84	0.079	161	<1.0	<1.0		3.8	3.3	0.011	0.03		
18-03-20	0.033	7.79	0.057	159	<1.0	<1.0		3.3	3.4	0.014	0.01		
09-06-20	0.036	7.92	0.06	158	<1.0	<1.0		3.9	2.9	0.009	<0.01		
10-09-20	0.03	8.45	0.061	157	<1.0	<1.0		3.3	3.3	0.009	<0.01		
15-12-20	0.034	8.71	0.044	158	<1.0	<1.0		3.6	3.5	0.008	0.01		

RD 3 E:1271052 N:4907897 Upstand 496mm													
Date	Bromide	Chloride	Flouride	Conductivity	E-coli	Faecal	Nitrate N	Total Nitrogen	TON	DRP	TP as P	Dissolved Oxygen	GW Depth
12-10-12		19.6		400	140		0.017						
19-10-12		21		332	13		0.033	6.9					950mm
26-10-12		25.9		385	8.2		0.34	8.1					1.06mm
06-11-12		19.9		340	8.6		0.054	10					1.20mm
30-11-12		24.5		361	48.7		0.085	7.56		1.16		2.4	1300mm
31-01-13		35.4		392	134		<0.010	9.43		0.528		<0.5	1240mm
12-03-13													1360mm
11-06-13		27		376			0.005			1.79			
06-12-16		24		327	2		0.28	6.7		0.37			1370mm
06-03-17		26		343	1		0.11	10		0.13			1390mm
19-06-17		31		395	160		2.3	7.6		0.36			1165mm
13-09-17		24		383	20			11		1.7			
11-12-17		16		294	<1			6.9		0.42			
27-03-18		31		421	8			9.3		0.8			
18-06-18		26		390	300								
06-09-18	0.078	23	0.077	362	180	380		14	0.24	0.81	2.7		
20-12-18	0.071	17	0.07	429	6	52		15	0.06	0.62	2.2		
12-03-19	0.09	30	0.08	461	1	1		17	<0.01	1.9	2.1		
20-06-19	0.1	22	0.093	390	89	120		13	<0.01	0.75	1.9		
10-09-19	0.0732	19.4	0.1	376	12	13		12	0.11	0.88	1.6		
10-12-19	0.0755	15.9	0.087	395	<1.0	<1.0		12	0.07	0.054	3.2		
18-03-20	0.0562	11.9	0.074	302	1	1		9.3	0.21	0.31	1.2		
09-06-20	0.107	17.6	0.068	7.4	2	4		11	2.1	0.03	0.85		
10-09-20	0.0917	15.3	0.065	323	<1.0	1		8.7	1.6	0.27	0.3		
15-12-20	0.0539	12.9	0.058	292	<1.0	<1.0		9.3	0.72	0.82	1.1		

RD 4 E:1271066 N:4907888 Upstand 471mm													
Date	Bromide	Chloride	Flouride	Conductivity	E-coli	Faecal	Nitrate N	Total Nitrogen	TON	DRP	TP as P	Dissolved Oxygen	GW Depth
		RD4		RD4	RD4		RD4	RD4		RD4		RD4	RD4
12-10-12		21.7		402	51		0.079						
19-10-12		25		388	15		0.095	7.8					790mm
26-10-12		21.9		362	213		0.12	6.3					880mm
06-11-12		22.8		392	7.5		0.013	11.8					1050 mm
30-11-12		20.3		377	4		0.012	9.73		1.21		1.5	1120mm
31-01-13		24.5		430	8.3		<0.010	14		0.647		<0.5	1070mm
11-06-13		28		403			0.54			1.95			
06-12-16		22		387	1		0.0081	12		0.6			1120mm
06-03-17		25		402	31		<0.01	13		0.32			1324mm
19-06-17		31		454	160		0.02	13		1.7			974mm
13-09-17		25		399	< 1			16		1.4			
11-12-17		16		349	<1			13		0.95			
27-03-18		31		465	<1			14		0.97			
18-06-18		25		353	250								
06-09-18	0.078	23	0.064	364	40	50		14	0.02	1.2	2.2		
20-12-18	0.067	19	0.07	406	1	6		16	0.02	0.78	2.1		
12-03-19	0.089	31	0.078	384	50	52		9.5	0.66	0.55	3.4		
20-06-19	0.1	22	0.073	377	15	15		11	0.05	0.82	1.3		
10-09-19	0.0674	18.8	0.08	364	8	9		11	0.02	0.98	1.8		
10-12-19	0.0682	18.8	0.086	437	<1.0	<1.0		17	<0.01	0.56	1.6		
18-03-20	0.0634	14	0.079	364	<1.0	1		13	<0.01	0.38	1.6		
09-06-20	0.0724	19.5	0.097	380	1	3		13	<0.01	0.1	1.5		
10-09-20	0.0609	17.5	0.078	336	<1.0	<1.0		11	0.16	0.67	1		
15-12-20	0.0507	13.3	0.059	313	200	300		11	<0.01	0.99	1.4		

RD 5 E:1271118 N:4907849 Upstand 477mm													
Date	**Bromide**	**Chloride**	**Flouride**	**Conductivity**	**E-coli**	**Faecal**	**Nitrate N**	**Total Nitrogen**	**TON**	**DRP**	**TP as P**	**Dissolved Oxygen**	**GW Depth**
		RD5		**RD5**	**RD5**		**RD5**	**RD5**		**RD5**		**RD5**	**RD5**
12-10-12		9.33		198	24		1.78						
19-10-12		10.4		188	6.1		2.42	2.6					950mm
26-10-12		11.5		190	2		2.2	2.8					1080 mm
06-11-12		9.78		190	<1		2.15	4.22					1210mm
30-11-12		9.24		195	1		1.5	3.01		0.112		2.9	1310mm
31-01-13		8.22		189	<2		1.9	3.57		0.115		1.7	1250mm
11-06-13		12.7		220			1.7			0.128			
06-12-16		9.7		173	10		3	3.5		0.049			1270mm
06-03-17		9.7		177	<1		2.2	4.4		0.048			1424mm
19-06-17		13		203	3		1.6	4		0.066			1304mm
13-09-17		11		188	< 1			4.5		0.07			
11-12-17		8.7		170	<1			4.6		0.097			
27-03-18		11		198	<1			4		0.1			
18-06-18		12		196	<1.0								
06-09-18	0.037	9.6	0.058	173	<1.0	<1.0		4.1	2.6	0.1	0.78		
20-12-18	0.028	8.5	0.04	181	1	1		4.5	1.8	0.11	0.27		
12-03-19	0.039	11	0.065	198	<1.0	<1.0		3.8	1.8	0.13	0.55		
20-06-19	0.05	11	0.066	202	1	1		4.7	2.8	0.19	0.21		
10-09-19	0.042	10	0.06	197	<1.0	<1.0		3.8	2.2	0.16	0.16		
10-12-19	0.029	8.28	0.07	174	<1.0	<1.0		3.9	2.8	0.11	0.3		
18-03-20	0.034	7.88	0.059	180	<1.0	<1.0		4.1	2.7	0.17	0.22		
09-06-20	0.039	8.61	0.077	178	<1.0	<1.0		4	2.5	0.13	0.18		
10-09-20	0.031	8.68	0.059	160	<1.0	<1.0		3.9	3.1	0.11	0.25		
15-12-20	0.032	8.42	0.045	167	9	9		4	2.8	0.15	0.16		

11/06/2013 data from Environment Southland

Appendix D PROPOSED CONSENT CONDITIONS

environment SOUTHLAND
Te Taiao Tonga

Cnr North Road and Price Street
(Private Bag 90116
DX YX 20175)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252
Southland Freephone No. 0800 76 88 45

Discharge Permit

Pursuant to Section 104D of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council to **Southland District Council, P O Box 903, Invercargill 9840**

Details of Permit

Purpose for which permit is granted:		To discharge treated municipal wastewater from the Riversdale wastewater treatment plant to surface water (Meadow Burn) and to land via a soakage channel.
Location	- site locality	Riversdale
	- map reference	The existing discharge into the Meadow Burn is located immediately east of the oxidation pond at NZTM E1271094 N4907934 The wastewater will be discharged via the drainage channel at or about NZTM E1271035 N4907904
	- catchment	Mataura River
Legal description of land at the site:		Parts Lots 5 and 6, DP 92, Part Section 509, Hokonui Survey District
Expiry date:		**5 October ~~2021~~2026**[1]

Schedule of Conditions

1. This consent authorises:
   a) The discharge of treated wastewater from the Riversdale Wastewater Treatment Plant oxidation pond to the soakage channel at an annual average daily flow of 260 m^3/day;

Note: Compliance with this condition shall be determined by a record of the daily volume of wastewater coming into the plant as the best available indication of wastewater flow, as specified in Condition 7.

[1] This date being five years from the date of issue

b) The discharge of treated wastewater from the oxidation pond to the Meadow Burn via the soakage channel. The rate of discharge from December to March will be limited to less than 1 litre per second. The rate of discharge from April to November will be limited to less than 2 litres per second.

c) The discharge of treated wastewater from the oxidation pond to the Meadow Burn via the soakage channel at rate higher than that specified in Condition1(b) above may only occur as a result of high water levels in the soakage channel, where available freeboard from the top of the soakage channel is less than 300mm, which, if not lowered, may increase the risk in overflows from the soakage channel and/or oxidation pond. The consent holder shall advise the Consent Authority prior to any discharge under Condition 1(c), detailing the reason for the proposed discharge. The consent holder's staff shall undertake discussion with the Consent Authority prior to the discharge occurring.

2. The discharge authorised by this permit shall not give rise to any of the following effects 50 metres downstream of the discharge point in the Meadow Burn:

a) The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
b) Any conspicuous change in colour or visual clarity;
c) Any emission of objectionable odour;
d) The rendering of fresh water unsuitable for consumption by farm animals;
e) Any change in the natural water temperature of more than 3 degrees Celsius;
f) Any change in the pH outside of the range of 6.0 to 9.0, except when due to natural causes;
g) A reduction in the oxygen content in solution to less than 6 milligrams per litre; or
h) Any destruction of natural aquatic life as a result of a concentration of toxic substances.

Reporting on Programme of Works for Rapid Infiltration Basins (RIBs)

3. Six months after the commencement of this consent, and every six months thereafter for the term of this consent, the consent holder shall submit an update report describing progress made towards building and commissioning the Rapid Infiltration Basins authorised by AUTH-20147220-02, to the following parties:
   Environment Southland;
   Operations Manager (Murihiku), Department of Conservation;
   Fish & Game Southland;
   Hokonui Rūnanga; and
   Public Health South.

   The update report shall be submitted by email to the specified parties, and shall include but not be limited to:
   (i) A description of the actions undertaken toward building and commissioning the RIB scheme in the previous six-month period;
   (ii) A description of the actions programmed for the next six-month period; and
   (iii) Progress against the Consent Holder's anticipated programme for completing and commissioning the RIB scheme and giving effect to AUTH-20147220-02.

~~3. The Consent Holder will provide an update on progress towards an outcome in the RIB investigations by 31 May 2017 and a further update by 31 May 2018. These updates shall include any preliminary conclusions based on the further groundwater monitoring as to whether the Rapid Infiltration Basins will likely be able to take all of the wastewater flow and subsequently be constructed and used. These updates shall be provided in writing to:~~

~~a. Environment Southland;~~
~~b. Operations Manager (Murihiku), Department of Conservation;~~
~~c. Fish & Game Southland;~~
~~d. Te Ao Marama Inc; and~~
~~e. Public Health South.~~

~~4. Prior to commencing AUTH-20147220-02 to construct and use the Rapid Infiltration Basins, and by no later than 31 May 2019, the Consent Holder will assess and determine whether the Rapid Infiltration Basins will accept all of the predicted wastewater flow. If the Consent Holder determines that the proposed Rapid Infiltration Basins cannot accept all of the wastewater flow (except under extreme events as defined in AUTH-20147220-02), the Consent Holder will give written notice of that to the Consent Authority by 31 May 2019. In that notice, the Consent Holder must elect whether the Rapid Infiltration Basins are to be constructed and used. If in that notice the Consent Holder concludes that the Rapid Infiltration Basins are not to be constructed and used then it will also give written notice under Section 138 to the Consent Authority that it surrenders the consent for the long-term discharge of wastewater to ground via the RIBs (AUTH-20147220-02) by 31 May 2019.~~

Accidental or Emergency Discharges

5. In the event of an emergency or accidental discharge of wastewater or partially treated wastewater to land or water (as opposed to normal treated wastewater discharging to ground and water through the Discharge Channel), the consent holder (or the consent holder's agent) shall without undue delay, notify:

    a. Public Health South (ph (03) 211 0900);
    b. ~~Te Ao Marama Inc. (ph (03) 931 1242)~~ Hokonui Rūnanga (ph (03) 208 7954);
    c. The Consent Authority's Pollution Response Hotline (ph 0800 76 88 45);
    d. Fish & Game Southland (ph (03) 215 9117);
    e. Operations Manager (Murihiku), Department of Conservation (ph (03) 211 2400); and
    f. Users of downstream surface water abstractions within 200 metres of the dischargepoint of the WWTP to the Meadow Burn.

6. The consent holder shall maintain a record of all incidents and complaints relating to the exercise of this consent, including discharges occurring under Condition 1(c).
   This record shall include, but not be limited to:

    a. The location where the incident was detected by the complainant;
    b. The date and time when the incident occurred;
    c. A description of the weather conditions when the incident was detected by thecomplainant;
    d. The nature of the incident;
    e. Operating conditions at the time of the complaint, including any malfunction orbreakdown of plant or equipment;
    f. The duration of the incident;
    g. The most likely cause of the incident; and
    h. Any corrective action undertaken by the consent holder to avoid, remedy or mitigatethe incident, and any future recurrence.

The incidents and complaints register shall be made available for viewing by the Consent Authority's staff at any time.

Within seven days of any complaint, the consent holder shall notify the Consent Authority in writing of the response taken to remedy the cause of the complaint, and provide a copy to the complainant (if known). The consent holder shall provide a copy of the incidents and complaints register maintained in accordance with Condition 6 to the Consent Authority on request.

Monitoring

7. The consent holder shall record the daily volume of wastewater coming into the plant. This shall determine compliance with Condition 1(a). The daily volume record shall be supplied to the Consent Authority by 31 July each year, or at any time upon request.

8. In March, June, September and December each year, the consent holder shall collect representative samples of:
    a. Treated wastewater at the end of the Soakage Channel prior to the discharge to theMeadow Burn;
    b. Groundwater from monitoring bores [**location to be determined]**;
    c. Water from the Meadow Burn at:
        i. a location 50 metres upstream of the discharge (Point 1);
        ii. a location 50 metres downstream of the discharge (Point 2); and
        iii. a location approximately 800 metres downstream of the oxidation pond (Point 3).

9. The following shall be measured at the time of sampling undertaken in accordance with Condition 8:

    a. Groundwater levels in each bore;
    b. The depth of the bores sampled;
    c. The instantaneous rate of direct discharge from the pipe at the end of the soakagechannel to the Meadow Burn;
    d. Observations of any conspicuous oil or grease films, scums or foams or floatable orsuspended material resulting from the discharge (supported by photographic evidence);
    e. Record of water level at the Environment Southland water level station on MeadowBurn at Round Hill Road; and
    f. Record of groundwater level at the Environment Southland monitoring bore F44/0181.

10. All samples collected in accordance with Condition 8 will be analysed for:

- Temperature (field measurement)
- pH
- Electrical conductivity
- Total suspended solids (discharge only)
- Turbidity (surface water only)
- Total five day carbonaceous biochemical oxygen demand (discharge only)
- Dissolved oxygen (measurement of surface water only) (as mg/l and percentage of Saturation)
- Total Ammoniacal nitrogen
- Total Oxidised Nitrogen
- Total nitrogen
- Dissolved reactive phosphorus
- Total Phosphorus
- *Escherichia coli*
- Faecal coliforms
- Fluoride
- Chloride
- Bromide

The analytical sample results for each monitoring event shall be reported in writing to the Consent Authority within four (4) weeks of receipt of the sample results by the Consent Holder.

11. In the event that monitoring undertaken in accordance with Condition 8 identifies that any of the trigger values listed in Condition 12 are exceeded, the consent holder shall undertake the following as appropriate:
    a. check for anomalous results;

    b. assess monitoring results against the up-gradient or up-stream samples to determinewhether other land uses may be influencing the exceedance of the trigger value;

    c. identify any mitigation measures that are considered necessary to ensure that groundwater and surface water quality complies with the trigger values given in Condition 12;

    d. Within one month of receiving the results, submit a report to the Consent Authority on the actions undertaken, including identification of any mitigation measures that have been identified and a programme for implementing these measures;

    e. Implement the identified mitigation measures within the proposed timeframes, which shall not be greater than 3 months from submission of the report according to Condition 11(d).

12. The following trigger values shall apply to the monitoring undertaken in accordance with Condition 8:

Parameter sampled	**Discharge**	**Groundwater**	**Meadow Burn (at 50 m downstream only)**
Total five-day carbonaceous biochemical oxygen demand (g/m^3)	50	-	-
Total Ammoniacal Nitrogen (mg/L)	-	-	0.9
Soluble Inorganic Nitrogen (mg/L)	30	5	-
Dissolved Reactive Phosphorus (mg/L)	10	-	-
Escherichia coli (cfu/100mL)	-	2	1,000

Note: - Indicates no trigger value set for this parameter at this location

13. The consent holder shall undertake an aquatic ecology survey, to characterise the impact of the discharge on the aquatic environment of the Meadow Burn within the first three years after commencement of this consent. This aquatic ecology survey shall consist of:

    a. Macroinvertebrate sampling, following Protocol C3 (hard-bottomed, quantitative) as outlined in the document "*Protocols for sampling macroinvertebrates in wadeable streams*"[1], withanalysis for a full range of metrics, including %EPT, MCI and SQMCI;

    b. Survey of periphyton during the period 1 November – 30 April, using the rapid assessment protocols for periphyton as outlined in the document "*Stream Periphyton Monitoring Manual*"[2] to assess the:
        i. Presence of bacterial or fungal slime growths as obvious plumose growths or mats;
        ii. Percentage cover of filamentous algae greater than 2 cm long within the streambed;
        iii. Percentage cover of diatoms any cyanobacteria greater than 0.3 cm thick.

[1] Stark, J., Boothroyd, I., Harding, J., Maxted, J., & Scarsbrook, M. (2001): Protocols for sampling macroinvertebrates in wadeable streams. Prepared for the Ministry for the Environment.

[2] Biggs & Kilroy (2000): Stream periphyton monitoring manual. Report prepared for the Ministry for the Environment.

c. Quantitative sampling protocols as outlined in the document "*Stream Periphyton Monitoring Manual*"[3] QM-1b to assess the following periphyton measures, in line with the requirements of the '*Spring Fed*' river standards in the Consent Authority's RegionalWater Plan and attached as **Appendix 1**:
    i. Chlorophyll *a* per m^2 for both filamentous algae or diatoms and cyanobacteria.

14. Aquatic ecology monitoring outlined in Condition 13 shall be undertaken at two downstream sample locations and one upstream sample location (as identified on the attached plan), with an appropriate number of replicate samples being collected from each location as follows:
    a. Upstream Point 1;
    b. Downstream Point 2;
    c. Downstream Point 3.

Sampling should occur when flows are less than median flow conditions. No sampling shall be carried out within ten days of the Meadow Burn exceeding seven times its median flow or within seven days of flows that are greater than three times the median flow.

Median flow conditions in the Meadow Burn shall be taken as when the groundwater level in the Environment Southland monitoring bore F44/0181 is at 1.41 m below land surface as recorded by the Consent Authority.

15. The consent holder shall submit a report to the Consent Authority within two months of the receipt of results for monitoring undertaken as per requirements of Conditions 13 and 14. The report shall summarise the results of all monitoring, analyse trends and comment on the results comparing them to the '*Spring Fed*' standards within the Consent Authority's Regional Water Plan, 2010, or any subsequent plans and/or water quality targets.

    Note: The assessment outlined in Condition 15 shall be undertaken for comparative purposes only.

On Site Management

16. An Operations and Maintenance Plan ("the Plan") shall be maintained at all times. The system shall be operated in accordance with this Plan, which shall be updated as appropriate and any updates provided to the Consent Authority, provided the changes do not result in non-compliance with any conditions of this consent. The Plan shall include, but not be limited to:

a. Description of the system, including a site map indicating the location of the system and ancillary structures;
b. Key operational matters including weekly, monthly and annual maintenance checks;
c. Monitoring requirements and procedures;
d. Contingency plans in the event of system malfunctions or breakdowns;
e. The means of receiving and dealing with any complaints; and
f. The management of the discharge to the Meadow Burn.

At all times the consent holder shall ensure that the Consent Authority has a copy of the most recent version of the Operations and Maintenance Manual.

17. Records of maintenance, complaints, malfunctions and breakdowns shall be kept in a log and this log shall be made available to the Consent Authority at any time upon request.

[3] Biggs & Kilroy (2000): Stream periphyton monitoring manual. Report prepared for the Ministry for the Environment.

18. a) For the purpose of this consent, the analyses and preservation of all aqueous samples shall be carried out in accordance with the latest edition of APHA "Standard Methodsfor the Analysis of Water and Wastewater" or by methods approved by the Consent Authority.
    b) The analyses specified in these conditions are to be carried out by a laboratory with IANZ accreditation, or as agreed to in writing by the Consent Authority.

19. Throughout the duration of this consent, the consent holder shall maintain suitable warning signs adjacent to the discharge point from the WWTP into the Meadow Burn. These signs shall clearly indicate the presence of the treated wastewater discharge.

20. This permit does not authorise the discharge of sludge to land or water.

21. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent during the period 1 February to 30 September each year, or within two months of any enforcement action being taken by the Consent Authority in relation to the exercise of this consent, or on receiving monitoring results, for the purposes of:

    a. determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cumulative effects, which may arise fromthe exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit;
    b. ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement;
    c. amending the monitoring programme to be undertaken;
    d. adding or adjusting compliance limits; or
    e. requiring the consent holder to adopt the best practicable option to remove or reduceany adverse effect on the environment arising as a result of the exercise of this permit.

for the **Southland Regional Council**

Note

1. The consent holder shall pay an annual administration and monitoring charge to the Consent Authority, collected in accordance with Section 36 of the Resource ManagementAct 1991. This charge may include the costs of inspecting the site twice each year (or otherwise as set by the Consent Authority's Annual Plan).

APPENDIX 1: Water Quality Standards from Regional Plan: Water – Appendix G

Surface water bodies classified as "Spring Fed"

The temperature of the water

- shall not exceed 21°C
- shall not exceed 11°C in trout spawning areas during May to September inclusive
- the daily maximum ambient water temperature shall not be increased by more than 3°C when the natural or existing water temperature is 16°C or less, as a result of any discharge. If the natural or existing water temperature is above 16°C, the natural or existing water temperature shall not be exceeded by more than 1°C as a result of any discharge.

The pH of the water shall be within the range 6.5 to 9, and there shall be no pH change in water due to a discharge that results in a loss of biological diversity or a change in community composition.

The concentration of dissolved oxygen in water shall exceed 99% of saturation concentration.

There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats. Note that this standard also applies to within the zone of reasonable mixing for a discharge.

When the flow is below the median flow, the visual clarity of the water shall not be less than 3 metres. [3]

The concentration of total ammonia shall not exceed 0.32 milligrams per litre.

The concentration of faecal coliforms shall not exceed 1,000 coliforms per 100 millilitres, except for popular bathing sites, defined in Appendix K "Popular Bathing Sites" and within 1 km immediately upstream of these sites, where the concentration of *Escherichia coli* shall not exceed 130 *E. coli* per 100 millilitres.

Chlorophyll *a* shall not exceed 50 milligrams per square metre at any time, or exceed a monthly mean of 15 milligrams per square metre for filamentous algae or diatoms and cyanobacteria. [4]

The Macroinvertebrate Community Index shall exceed a score of 90 and the Semi-Quantitative Macroinvertebrate Community Index shall exceed a score of 4.5.

Fish shall not be rendered unsuitable for human consumption by the presence of contaminants.

[3] Visual clarity is assessed using the black disc method or other comparable method employed by Environment Southland.

[4] Expressed in terms of reach biomass per unit of exposed strata (i.e., tops and sides of stones) averaged across the full width of the stream or river.

Proposed Changes to AUTH20147220-02

1. This consent authorises:

   a) the discharge of treated wastewater from the Riversdale Wastewater Treatment Plant oxidation pond to land via the Rapid Infiltration Beds and the soakage channel at an annual average daily flow of 260 m^3/day;
   b) the discharge of treated wastewater from the Riversdale Wastewater Treatment Plant oxidation pond to the Meadow Burn via the soakage channel. The consent holder may only discharge wastewater to the Meadow Burn, via the existing pipe from the soakage channel, in an emergency related to a natural disaster or extreme weather event which results in very high wastewater flow to the plant;
   c) the consent holder shall advise the Consent Authority as soon as possible and within at least 24 hours of any discharge under Condition 1(b), detailing the reason for the discharge.

2. The discharge authorised by this permit shall not give rise to any of the following effects in the Meadow Burn downstream of the discharge to land:

   a) the minimum standards set for *'Spring Fed'* waters, as described in the Regional Water Plan (attached as Appendix 1 to this consent), being exceeded;
   b) the production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
   c) any conspicuous change in colour or visual clarity;
   d) any emission of objectionable odour;
   e) the rendering of fresh water unsuitable for consumption by farm animals;
   f) any change in the natural water temperature of more than 3 degrees Celsius;
   g) any change in the pH outside of the range of 6.0 to 9.0, except when due to natural causes;
   h) a reduction in the oxygen content in solution to less than 6 milligrams per litre; or
   any destruction of natural aquatic life as a result of a concentration of toxic substances.

   Note: Compliance with this Condition will be undertaken by way of the monitoring given in Conditions 8, 9 and 10, which will be undertaken for the first 2 years and will cease once compliance has been confirmed.

Programme of Works for Rapid Infiltration Basins

~~3. Prior to commencing this consent and construction and using the Rapid Infiltration Basins, by no later than 31 May 2019 the Consent Holder will assess and determine whether the Rapid Infiltration Basins will accept all of the predicted wastewater flow. If the Consent Holder determines that the proposed Rapid Infiltration Basins cannot accept all of the wastewater flow (except under extreme events), the Consent Holder will give written notice of that to the Consent Authority by 31 May 2019. In that notice, the Consent Holder must elect whether the Rapid Infiltration Basins are to be constructed and used. If in that notice the Consent Holder concludes that the Rapid Infiltration Basins are not to be constructed and used then it will also give written notice under Section 138 to the Consent Authority that it surrenders this consent by 31 May 2019.~~

4. ~~If the Consent Holder determines that the proposed~~ Prior to the using the Rapid Infiltration Basins ~~are to be constructed and used, then~~, the consent holder shall:

   ~~a) the detailed design and specification of the proposed Rapid Infiltration Basins shall be submitted to the Consent Authority by 31 May 2020. The detailed design and~~

~~specification shall be reviewed by the Consent Authority prior to any construction works commencing;~~

b) a producer statement is to be submitted to the Consent Authority prior to commissioning of the Rapid Infiltration Basins, signed by a suitably qualified engineer to confirm construction of the Rapid Infiltration Basins is in accordance with the reviewed design;

c) construct and commission the rapid infiltration basins ~~shall be constructed~~ and ensure they are operational by no later than 31 May ~~2021~~ 2025~~;~~

~~d) this consent will lapse (as per s125 of the Resource Management Act 1991) if the Rapid Infiltration Basins system is not in place and operational by 31 May 2023.~~

4A. This consent will lapse (as per s125 of the Resource Management Act 1991) if the Rapid Infiltration Basins are not built and operational by 31 May **20XX**[1].

Accidental or Emergency Discharges

5. In the event of an emergency or accidental discharge of wastewater or partially treated wastewater) to land or water (as opposed to normal. treated wastewater discharging to ground through the Rapid Infiltration Basins), the consent holder (or the consent holder's agent) shall without undue delay, notify:

a) the Medical Officer, or Health Protection Officer (ph (03) 211 0900);
b) ~~Te Ao Marama Inc. (ph (03) 931 1242)~~ Hokonui Runanga (ph (03) 208 7954);
c) Operations Manager (Murihiku), Department of Conservation (ph (03) 2112400);
d) Fish and Game Southland (ph (03) 215 9117);
e) the Council's Pollution Response Hotline (ph 0800 76 88 45); and
users of downstream surface water abstractions within 200 metres of the discharge point of the wastewater treatment plant to the Meadow Burn.

6. The consent holder shall maintain a record of all incidents and complaints relating to the exercise of this consent, including discharges occurring under Condition 1(b). This record shall include, but not be limited to:

[1] This date is to align with the expiry of the short term replacement permit applied for.

a) the location where the incident was detected by the complainant;
b) the date and time when the incident occurred;
c) a description of the weather conditions when the incident was detected by the complainant;
d) the nature of the incident;
e) operating conditions at the time of the complaint, including any malfunction or breakdown of plant or equipment;
the duration of the incident;
the most likely cause of the incident; and
f) any corrective action undertaken by the consent holder to avoid, remedy or mitigate the incident, and any future recurrence.

Within seven days of any complaint, the consent holder shall notify the Consent Authority in writing of the response taken to remedy the cause of the complaint, and provide a copy to the complainant (if known). The consent holder shall provide a copy of the incidents and complaints register maintained in accordance with Condition 6 to the Consent Authority on request.

Monitoring

7. The consent holder shall record the daily volume of wastewater coming into the plant. This shall determine compliance with Condition l(a). The daily volume record shall be supplied to the Consent Authority by 31 July each year, or at any time upon reasonable request.

8. In March, June, September and December each year, the consent holder shall collect representative samples of:

a) treated wastewater immediately prior to discharge into the Rapid Infiltration Basins;
b) groundwater from five bores, 1, 2, 3, 4 and 5, in locations as agreed to in writing with the Consent Authority as follows:
   i Bore 1 shall enable collection of up-gradient water samples in accordance with Conditions 13A-13D.
   ii. Bore 2 shall enable the collection of down-gradient water samples in accordance with Conditions 13A-13D and shall be located at around 220 metres from the Rapid Infiltration Basins as marked in Appendix 2 as "Bore for Condition 12".
   iii. Bores 3, 4 and 5 shall be placed at other locations down-gradient from the Rapid Infiltration Basins but no further than 220 metres from the Rapid Infiltration Basins. These bores will be located along existing fence lines as far as practicable.
c) water from the Meadow Burn at:
   i a location 5 metres upstream of the WWTP (Point 1)
   ii a location 400 metres downstream of the discharge (Point 4), and
   iii a location approximately 800 metres south of the oxidation pond (Point 3).

See **Appendix 2** for a location plan of monitoring points.

9. Once two years of monitoring has been completed, compliance with Condition 2 will be determined and reported to the Consent Authority. Provided that compliance with Condition 2 over at least two years is demonstrated, monitoring of the Meadow Burn under Condition 8(c) is no longer required.

10. The following shall be measured at the time of sampling undertaken in accordance with Condition 8:

a) groundwater levels in each bore;
b) the depth of the bores sampled;
c) observations of any conspicuous oil or grease films, scums or foams or floatable or suspended material resulting from the discharge (supported by photographic evidence);
d) water level at the Consent Authority's water level station on the Meadow Burn at Round Hill Road; and
e) groundwater level at the Consent Authority's monitoring bore F44/0181.

11. Samples collected in accordance with Condition 8 will be analysed for:

- Temperature (field measurement)
- pH
- Electrical conductivity
- Total suspended solids (discharge only)Turbidity (surface water only)
- Total 5 day carbonaceous biochemical oxygen demand (discharge only)
- Dissolved oxygen (measurement in surface water only) (as mg/l and percentage of Saturation)
- Total Ammoniacal nitrogen
- Total oxidized nitrogen
- Total nitrogen
- Dissolved reactive phosphorus
- Total Phosphorus
- *Escherichia coli*
- Faecal coliforms
- Fluoride Chloride
- Bromide

The analytical sample results for each sampling event shall be reported in writing to the Consent Authority within four (4) weeks of receipt of the sample results by the consent holder.

12. In the event that monitoring undertaken in accordance with Condition 8 identifies that any of the trigger values listed in Condition 13 are exceeded, the consent holder shall undertake the following as appropriate:

a) check for anomalous results;
b) assess monitoring results against the up-gradient or up-stream samples to determinewhether other land uses may be influencing the exceedance of the trigger value;
c) identify any mitigation measures that are considered necessary to ensure that groundwater quality is compliant with the trigger values in Condition 13;
d) determine any mounding effect in the groundwater levels;
e) within one month of receiving the results, submit a report to the Consent Authority on the actions undertaken, including identification of any mitigation measures that have been identified and a programme for implementing these measures; and
implement the identified mitigation measures within the proposed timeframes, which shall not be greater than 12 months from submission of the report according to Condition12(e).

13. The following trigger values shall apply to the monitoring undertaken in accordance with Condition 8:

Parameter sampled	**Discharge**	**Groundwater at "Bore for Condition 12" on downgradient**
Total five day carbonaceous biochemical oxygen demand	50	
Soluble Inorganic Nitrogen (g N/m^3) (sum of total oxidized nitrogen and total ammoniacal nitrogen)	30	5
Dissolved Reactive Phosphorus	10	
Escherichia coli (MPN/100 mL)		2

Compliance Limits

13A. In the event that analyses of groundwater samples taken in accordance with Condition 8 (the first samples) show Bore 2 has a soluble inorganic nitrogen concentration >5 g N/m3 higher than the soluble inorganic nitrogen concentration in Bore 1, then the Consent Holder shall:

a) immediately obtain second samples from Bores 1 and 2;
b) analyse the second samples for soluble inorganic nitrogen using the same laboratoryand same method as was used to analyse the first samples; and
c) provide copies of results from the analyses of the first and second samples (pair of samples) to the Consent Authority.

13B. The discharge authorised by this consent shall not cause the soluble inorganic nitrogen concentrations in Bore 2 to be > 5 g N/m^3 higher than the soluble inorganic nitrogen concentrations in Bore 1, for the pair of samples.

Note:

If the concentration of soluble inorganic nitrogen in Bore 2 exceeds the concentration in Bore 1 by more than 5 g N/m³ for the pair of samples, the consent authority shall be entitled to assume that the breach is caused bv the Consent Holder, unless the Consent Holder demonstrates to the satisfaction of the consent authority that the exceedance has not been caused by the discharge authorised by this consent.

13C. In the event that analyses of groundwater samples taken in accordance with Condition 8 (the first samples) show Bore 2 has an *Escherichia coli* concentration of >2 MPN/100 mL, then the Consent Holder shall:

a) immediately obtain second samples from Bore 2;
b) analyse the second samples for *Escherichia coli* concentration using the same laboratory and same method as was used to analyse the first samples; and
c) provide copies of results from the analyses of the first and second samples (pair ofsamples) to the Consent Authority.

13D. The discharge authorised by this consent shall not cause the *Escherichia coli* concentration in Bore 2 to be ≥2 MPN/100 mL for five consecutive pairs of samples.

Note:

If the Escherichia coli concentration in Bore 2 exceeds >2 MPN/100 ml, for five consecutive pairs of samples, the consent authority shall be entitled to assume that the breach is caused by the Consent Holder, unless the Consent Holder demonstrates to the satisfaction of the consent authority that the exceedance has not been caused by the discharge authorised bv this consent.

Reporting

14. The consent holder shall submit a report to Environment Southland, Attn: Compliance Manager and to Hokonui Rūnanga every two years from the date of granting this consent to the Consent Authority prior to 30 June. The report shall include thefollowing:

a) a summary of the previous 24 months monitoring data collected in accordance with Condition 8 which shall include an assessment and interpretation of the collected data. This data assessment shall include assessment of the system performance, quality of discharge and implications of the discharge on the receiving environment including any monitoring limitations. The monitoring data shall be provided electronically in a suitable format;

b) a summary of any remedial or improvement works carried out to improve the quality of the discharges from 1 July to 30 June each year;
c) all available data collected under this consent relevant to wastewater system performance;
d) All available data collected under this consent relevant to the groundwater and freshwater receiving environment;
e) Any trends shown by data collection from the grant of consent related to the receiving environment, wastewater system performance or habitat;
Identification of areas where the water quality has exceeded the trigger values in Condition 13 and has triggered the actions required by Condition 12.

On Site Management

15. The Operations and Maintenance Plan ("the Plan") is to be updated and submitted to the Consent Authority prior to the first exercise of this consent. This Plan shall cover the management of discharges from the site. The system shall be operated in accordance with this manual, which shall be updated as appropriate and updates provided to the Consent Authority, provided the changes do not result in non-compliance with any conditions of this consent. The manual shall include, but not be limited to:

a) a brief description of the system, including a site map indicating the location of the system;
b) key operational matters including weekly, monthly and annual maintenance checks;
c) monitoring requirements and procedures;
d) contingency plans in the event of system malfunctions or breakdowns;
e) the means of receiving and dealing with any complaints; and
the management of discharges to the Rapid Infiltration Basins.

At all times the consent holder shall ensure that the Consent Authority has a copy of the most recent version of the Operations and Maintenance Manual.

16. Records of maintenance, complaints, malfunctions and breakdowns shall be kept in a log and this log shall be made available to the Consent Authority's staff at any time upon request.

17. a) For the purpose of this consent, the analyses and preservation of all aqueous samples shall be carried out in accordance with the latest edition of APHA "Standard Methods for the Analysis of Water and Wastewater" or by methods approved by the Consent Authority.

b) The analyses specified in these conditions are to be carried out by a laboratory with IANZ accreditation, or as agreed to in writing by the Consent Authority.

18. Throughout the duration of this consent, the consent holder shall maintain suitable warning signs at the wastewater treatment plant and adjacent to the Rapid Infiltration Basins that clearly indicate the presence of treated wastewater.

19. This permit does not authorise the discharge of sludge to land or water.

20. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent during the period 1 February to 30 September each year, or within two months of any enforcement action being taken by the Consent Authority in relation to the exercise of this consent, or on receiving monitoring results, for the purposes of:

a) determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cumulative effects, which may arise from the exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit; or
b) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy

Statement; or

c) amending the monitoring programme to be undertaken; or

d) adding or adjusting compliance limits; or

e) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this permit.

Appendix E MONITORING DATA ASSESSMENT

MEADOWN BURN WATER QUALITY DATA ASSESSMENT

Physico-chemical Stressors

Surface water results for water temperature, pH, suspended sediment and dissolved oxygen from 2017 - 2020 are summarised below. These are compared to the Spring Fed guidelines which are referenced in the Southland Regional Water Plan (RWP), the proposed Southland Water and Land Plan (pSWLP), and the National Policy Statement for Freshwater Management 2020 (NPSFM).

It is noted that seasonal (quarterly) water quality sampling means that there is a relatively limited dataset on which to compare to trigger values and to assess effects. In all cases, this small data set must be taken into account, noting that NPSFM Attribute bands are to be based on a minimum of 60 samples over 5 years. The monitoring data set for the Meadow Burn has only 16 samples over 4 years, and so compared to the NPSFM values for context.

Table 1: Summary of physicochemical water quality standards

Policy	Trigger	Notes from 2017 - 2020 data	Condition Status 50 m downstream (D/S)
Temperature			
Consent standards for 'Spring Fed' surface water bodies	Water Temperature shall not exceed 21 ˚C	No temperatures were above 21 ˚C	Condition Met
Consent standards for 'Spring Fed' surface water bodies	Water Temperature shall not exceed 11 ˚C Between May to September	No temperatures exceeded 11 °C between March 2017 and December 2020 at Point 2 (50 m D/S of the WWTP). One exceedance of 11.2 ˚C occurred at Point 3 (800 m D/S) in June 2020	Condition Met
Consent standards for 'Spring Fed' surface water bodies and consent condition 2	Daily Maximum ambient Water temperature shall not increase by more the 3 ˚C when natural (upstream) temperature is 16 ˚C or below as a result of discharge, or if natural (upstream) temperature is above 16 ˚C, then no greater than a 1 ˚C increase.	Temperature was below 16˚C at all monitoring sites. The maximum increase in temperature from upstream to 50 m downstream was 1.3 °C.	Condition Met
pH			
Consent standards for 'Spring Fed' surface water bodies & consent condition 2	pH shall be within the range of 6.5 and 9 (between 6.0 and 9 for consent condition 2)	All concentrations upstream and downstream within ranges.	Condition Met
Sediment			
Consent standards for 'Spring Fed' surface water bodies	Visual Clarity shall be >3.0 m (Secchi depth)	No records. Not required to be monitored	N/A

Consent standards for 'Spring Fed' surface water bodies	The change in sediment cover must not exceed 10%.	No survey undertaken, however deposited sediment was observed during the Ryder (2019) assessment and no fine sediment was present.	Condition Met
NPSFM	Percentage fine sediment cover. For CD_Low_Al: A = ≤9; B = >9&≤18; C = >18 &<27; D = >27. NBL = 27%	As above	A | 2019
Dissolved Oxygen			
Consent standards for 'Spring Fed' surface water bodies	The concentration of dissolved oxygen in water shall exceed 99% of saturation concentration	Concentrations based on mg/l, however, minimum concentrations at all sites are well below 8.18 mg/L which equates to 99% dissolved oxygen. Median values for all sites are ≥8.1 mg/L.	Condition Not Met U/S and D/S of the WWTP
Consent Condition 2	A reduction in the oxygen content in solution to less than 6 mg/L	Concentrations below 6 mg/L every March at both 50 m and 800 m D/S	Condition Not Met
NPSFM	Dissolved oxygen (below point sources only) 7-day mean minimum (summer period: 1 November to 30th April)	Unable to be calculated as only dissolved oxygen only recorded four times across the year.	N/A
NPSFM	Dissolved oxygen (below point sources only) 1-day minimum (summer period: 1 November to 30th April) A = ≥7.5; B = ≥5.0 and <7.5; C = ≥4.0 and <5.0; National Bottom line = 4; D = <4	Taken from 2 summer measurements across three years. Assessed for point 2, 50 m downstream of discharge point.	Attribute band: C | 2017/2018 D | 2018/2019 B | 2019/2020

➢ Temperature

Temperatures ranged from 7.4 °C to 15.5 °C across the four-year period assessed. The Meadow Burn meets the water quality standards for spring-fed streams for temperature being below 21 ˚C. In most cases, water temperatures were slightly higher upstream, likely due to lower flows.

No temperatures exceeded 11 °C between May to September (trout spawning season) 50 m D/S of the WWTP. Two small exceedances have been recorded upstream and downstream of the WWTP. On 10 September 2019, temperatures at the upstream site were 11.4°C. On 09 June 2020, temperatures at the site 800 m downstream were 11.2 °C. These results are unlikely to be due to the operation of the WWTP and, so long as the exceedances are occasional, will have little impact on trout spawning which occurs further downstream near the confluence with Mataura River.

Temperature was below 16 ˚C at all monitoring sites. The maximum increase in temperature from upstream to 50 m downstream was 1.3 °C, in June 2019.

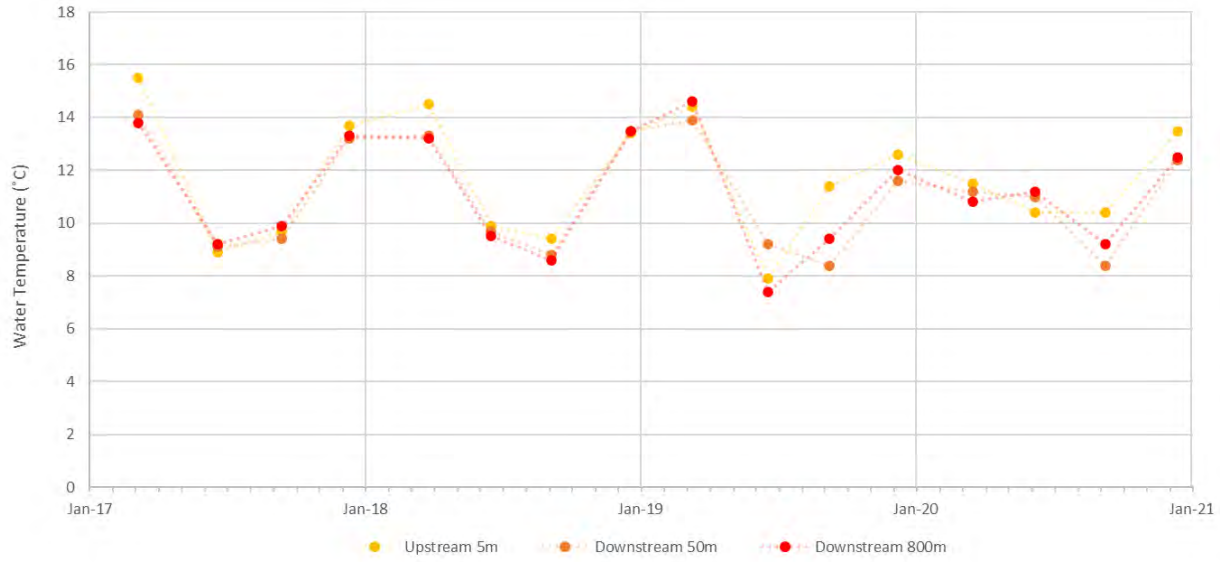

Figure 1: Water temperature concentrations in Meadow Burn 2017 - 2020

➢ pH

The pH of all monitored sites was within the range of 6.5 to 9.0 across all years. There is evidence of increasing pH in downstream reaches, with the highest pH recorded 800 m downstream. This is unlikely to be as a result of the WWTP and may be due to inputs from groundwater and/or adjacent land use downstream.

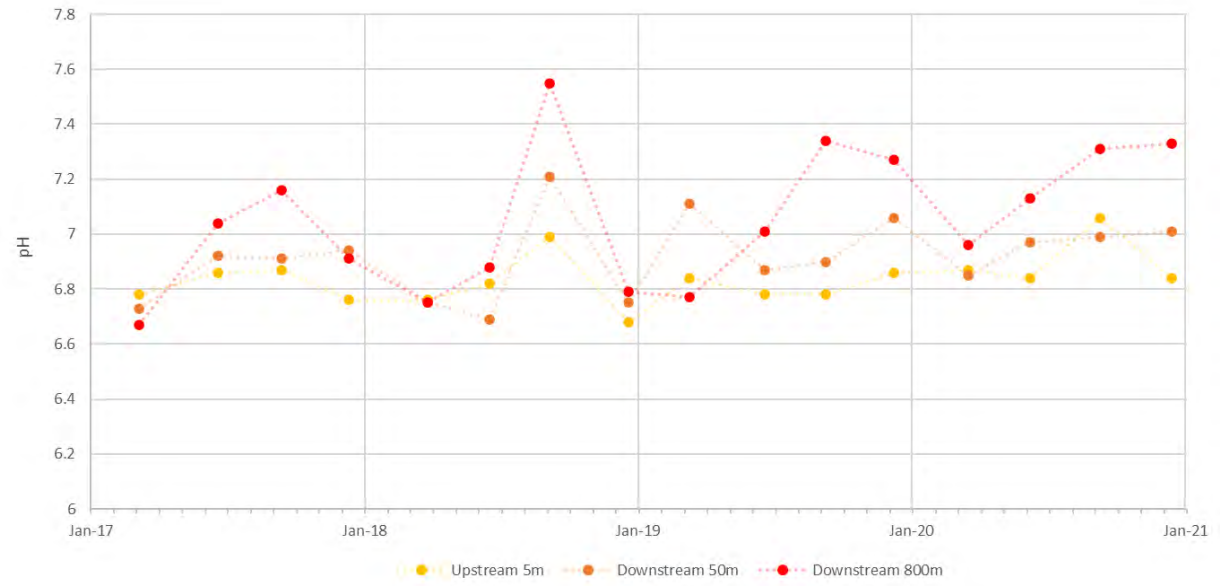

Figure 2: pH concentrations in Meadow Burn 2017 - 2020

➢ Sediment

Turbidity records are shown in Figure 3. Records of turbidity at 50 m downstream of the WWTP were generally below 4 NTU, with the exception of December 2020 (5.3 NTU) and March 2019 (which spiked

at 8.1 NTU). This latter result coincides with very high electrical conductivity, ammoniacal nitrogen, total phosphorus, dissolved reactive phosphorus, chloride and fluoride.

Sediment cover and visual clarity in the Meadow Burn is not routinely monitored. Therefore, a comparison with the spring fed water quality standards and NPSFM cannot be accurately done. However, observations of the stream bed in 2019 showed no visible fine sediments on the stream bed at any of the three monitoring sites (Ryders, 2019). This indicates that sediment cover likely met the standard required for spring fed streams of a change in sediment cover not exceeding 10%. Additionally, while a full instream visual SAM2 method survey was not undertaken, the attribute band A for the NPSFM 2020 also associates with less than or equal to 9 % fine sediment cover (Ryders 2019).

In 2009, a sediment flushing assessment noted that instream fine sediment covered nearly all of the stream bed at Riverside Pyramid Road site but was uncommon or absent further downstream (Golders, 2009). In the upper reaches of the Meadow Burn, a lack of riparian fencing and stock access was noted to be the source of sediment inputs. Low summer flows coupled with a lack of riparian fencing was said to lead to degradation of habitat values. Fencing was recommended (ibid.).

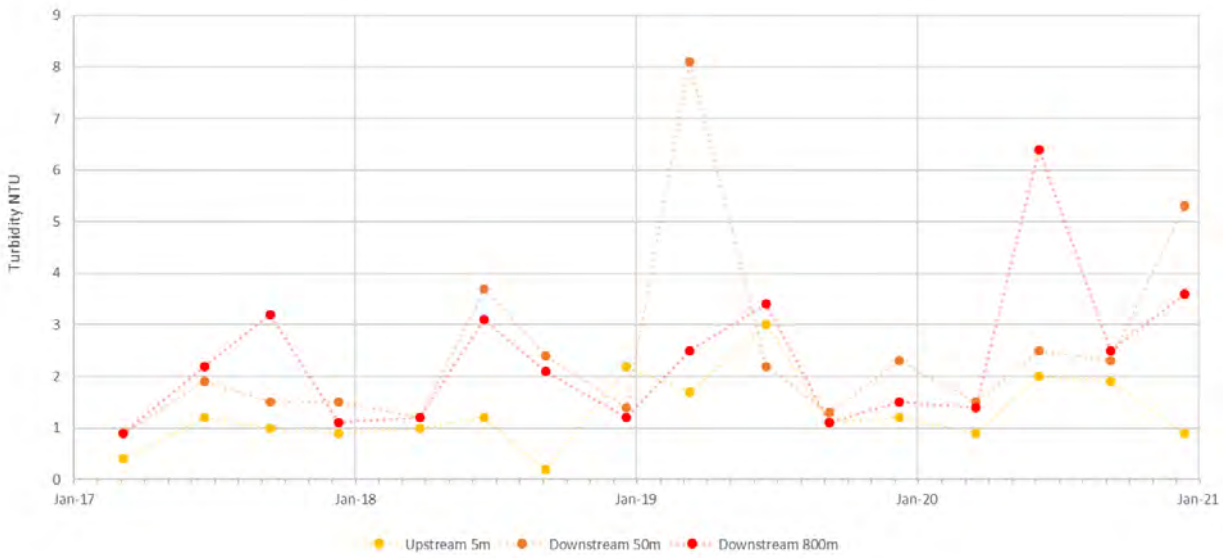

Figure 3: Turbidity concentrations in Meadow Burn 2017 - 2020

➢ Dissolved Oxygen

Across the three-year period, dissolved oxygen concentrations fluctuated markedly between seasons. Dissolved oxygen is lowest in March each year, reflecting high temperatures and low flows in late summer and early autumn. The highest dissolved oxygen is in September each year reflecting winter and early autumn conditions. Levels were most stable at the upstream site, and most variable 800 m downstream. However, median dissolved oxygen levels were similar across all three sites, at between 8.40 to 8.85 mg/l.

Dissolved oxygen concentrations ranged from 0.8 to 13.2 mg/L. When these values are converted to percentage saturation, dissolved oxygen levels regularly fell below 99% saturation at all sites. The standards for spring-fed streams were not met upstream or downstream of the WWTP.

The dissolved oxygen trigger values in the NPSFM are defined during the summer period (01 November to 30 April). The 1-day minimum showed concentrations below the national bottom line of 4.0 mg/L once 50 m downstream of the discharge point (1.4 mg/L in March 2019) and three times 800 m downstream of the discharge point (3.1 mg/L in March 2017; 0.8 mg/L in March 2018; 1.3 mg/L in March 2019). The 1-day minimum concentrations upstream of the discharge point is consistently above the national bottom line.

Fifty metres downstream of the WWTP, attribute band C is met for 2017/2018 summer, band D for 2018/2019 summer and band B for summer 2019/2020. The NPSFM description for attribute band D (anything below the National Bottom Line) is that there is likely to be significant, persistent stress on a range of aquatic organisms caused by dissolved oxygen exceeding tolerance levels. Attribute B for comparison is described as occasional minor stress on sensitive organisms caused by short periods (a few hours each day) of lower dissolved oxygen, with risk of reduced abundance of sensitive fish and macroinvertebrate species.

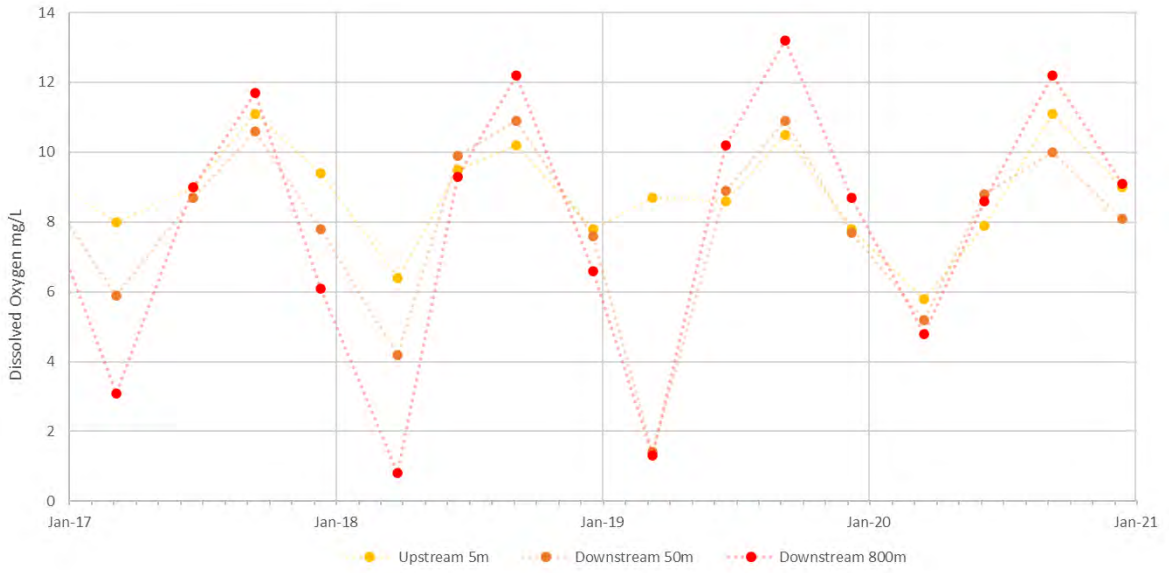

Figure 4: Dissolved Oxygen concentrations in Meadow Burn 2017 - 2020

➢ Bacteria

Results for faecal coliform and *E.coli* monitoring are summarised below.

Table 1: Summary of bacteria water quality standards

Policy	Trigger	Notes from 2017-2020 data	Condition Status 50 m downstream (D/S)
Consent standards for 'Spring Fed' surface water bodies	Faecal coliforms shall not exceed 1000 coliforms per 100 ml.	Exceeded 1000 cfu/100 ml on four occasions 50 m downstream, three times 800 m downstream, and once upstream.	Condition Not Met
Consent condition 12 trigger	*E.coli* concentrations trigger limit of 1000 cfu/100 ml at Meadow Burn 50 m downstream	Exceeded 1000 cfu/100 ml on four occasions 50 m downstream, three times 800 m downstream, and once upstream.	Condition Not Met
NPSFM	*E.coli* concentrations	Refer Table 3.	Attribute band: E
Consent standards for 'Spring Fed' surface water bodies	There shall be no bacterial or fungal slime growths visible to the naked eye as	No visible bacterial or fungal slime growths observed during the ecological survey	Condition Met

	obvious plumose growths or mats. Note that this standard also applies to within the zone of reasonable mixing for a discharge	undertaken in March 2019 (Ryder, 2019)	

The Meadow Burn in not classified as a popular bathing site, therefore faecal coliforms must be below 1,000 mg/l to comply with the spring fed surface water standard. Levels exceeded the standard four times 50 m downstream of the WWTP, three times at 800 m downstream, and only once upstream. December 2017 was the only time when faecal coliforms exceeded 1,000 cfu/100 ml at all three sites. The maximum faecal coliform level was 2,300 cfu/100 ml upstream, 10,000 cfu/100 ml 50 m downstream, and 2,600 cfu/100ml 800 m downstream. This indicates a source of bacteria from the WWTP.

The discharge consent condition 12 has a limit of 1,000 cfu/100ml *Escherichia coli* (*E. coli*). This was exceeded within the Meadow Burn on four occasions 50 m downstream, three times 800 m downstream, and once upstream, on the same dates as the faecal coliform exceedances.

As the Meadow Burn in not classified as a popular bathing site, the Freshwater NPSFM 2020 National Bottom Line of a 95%ile of 540 cfu/100ml for *Escherichia coli* does not apply. However, attribute bands do apply. Attribute bands are based on the 95%ile *E coli* level and the proportion of samples that exceed various states. For Riversdale, the upstream site classifies as attribute state B, whereas both downstream sites classify as state E (the lowest class). For attribute state E, there is a predicted average infection risk of *Campylobacter* of >7%.

Observations from Ryder Environmental's Biological survey in March 2019 identified that there were no visible bacterial or fungal slime growths observed at any site, thereby meeting the standard required for 'Spring Fed' streams.

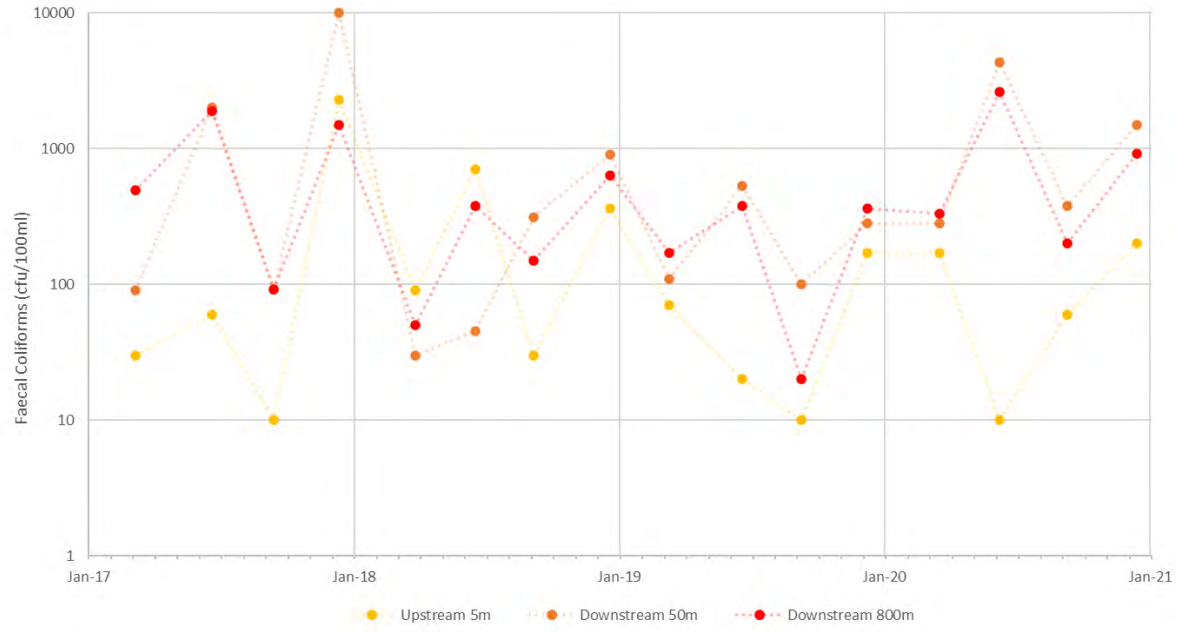

Figure 1: Faecal coliform concentrations in Meadow Burn 2017 - 2020 (log scale)

Figure 2: E. coli concentrations in Meadow Burn 2017 - 2020 (log scale)

Table 2: Comparison of E. coli levels with NPSFM attribute bands

Site	*E. coli* (cfu/100 ml)				Attribute Band*
	% >540	% >260	Median	95%ile	
5 m upstream	6.25%	12.5%	60	765	B (Green)
50 m downstream	31.25%	37.5%	220	5225	E (Red)
800 m downstream	25%	50%	295	1675	E (Red)

*Attribute bands need to be based on a minimum of 60 samples over 5 years. Meadow Burn has 16 samples over 4 years. This table is therefore provided for context only.

Nutrients

Surface water results for nutrients from 2017 - 2020 are summarised below.

Table 1: Nutrient water quality standards limits under consent and NPSFM

Policy	Trigger	Notes from 2017-2020 data	Condition Status 50 m downstream (D/S)
Consent standards for 'Spring Fed' surface water bodies	Total ammoniacal-nitrogen shall not exceed 0.32 mg/l	Concentrations regularly exceeded at 50 m downstream and 800 m downstream of discharge point, but only once upstream.	Condition Not Met
Consent condition 12 trigger	Total ammoniacal-nitrogen trigger limit of 0.9 mg/l at Meadow Burn 50 m downstream of the discharge point	One exceedance on 12 March 2019, with a concentration 0f 1.2 mg/l.	Condition Not Met

NPSFM	Ammonia (toxicity) Annual median A = ≤0.03; B = >0.03 and ≤0.24; National Bottom line = 0.24; C = >0.24 and ≤1.30; D = >1.30 Ammonia (toxicity) Annual maximum A = ≤0.05; B = 0.05 and ≤0.40; National Bottom line = 0.40; C = 0.40 and ≤2.20; D = >2.20	Refer Table 5.	Attribute band: B | 2017 B | 2018 C | 2019 B | 2020
NPSFM	Nitrate (toxicity) Annual median A = ≤1.0; B = >1.0 and ≤2.4; National Bottom line = 2.4; C = >2.4 and ≤6.9; D = >6.9 Nitrate (toxicity) 95 percentile A = ≤1.5; B = >1.5 and ≤3.5; National Bottom line = 3.5; C = >3.5 and ≤9.8; D = >9.8	Unable to be calculated as NO3 not monitored separately to TON.	N/A
NPSFM	Dissolved reactive phosphorus Median A = ≤0.006; B = >0.006 and ≤0.010; C = >0.010 and ≤0.018; D = >0.018 Dissolved reactive phosphorus 95 percentile A = ≤0.021; B = >0.021 and ≤0.030; C = >0.030 and ≤0.054; D = >0.054	Refer Table 6	Attribute band: D

Total ammoniacal nitrogen concentrations were consistently higher downstream of the discharge point compared to upstream. Concentrations often exceeded 0.32 mg/l standard for spring fed surface water bodies once upstream, eight times at 50 m downstream, and four times 800 m downstream of discharge point over past four years. t-tests showed a statistical difference between 5 m upstream and 50 m downstream and 800 m downstream.

Consent condition 12 trigger value of 0.9 mg/l total ammoniacal-nitrogen was exceeded within the Meadow Burn 50 m downstream of the discharge point once between 2017 to 2020 on 12 March 2019, with a concentration 0f 1.2 mg/l. This was nearly an order of magnitude higher when compared to upstream and 800 m downstream.

NPSFM National Bottom Line for ammonia toxicity annual maximum of 0.40 mgNH_4-/l (adjusted for pH) was exceeded at 50 m downstream once in four years. The attribute band of B applies for most years, with band C for 2019. The site upstream and 800 m downstream were above the national bottom line annual maximum for ammonia toxicity (attribute band B in all years 800 m downstream, and attribute band A in most year except band B in 2018. Annual median national bottom line concentrations were not exceeded at any site (when adjusted for pH).

Total organic nitrogen ranged from 0.44 to 5.1 mg/L across the three sites. Levels were markedly consistent upstream and 50 m downstream of the discharge, as well as 800 m downstream. (The exception is the 0.44 mg/L datapoint collected 800 m downstream. It is possible that the 0.44 figure is an outlier or erroneous result, as a level of 4.4 mg/L would be more consistent.) Nitrate toxicity was not able to be compared to the NPSFM as this parameter (NO_3) is not monitored separately.

Dissolved reactive phosphorus and total phosphorus were higher downstream than upstream with t-tests showing a statistical difference between 5 m upstream and both the 50 m downstream and 800 m downstream sites over the past four years. DRP is the largest component of TP with the upstream site

showing an average of 86% DRP portion of TP, this decreased to 72% at 50 m downstream and 68% 800 m downstream.

Dissolved reactive phosphorus upstream of the WWTP equated to attribute band C, whereas 50 m downstream and 800 m downstream both equated to band D. No National Bottom Line is set for DRP. Attribute band D is described in the NPSFM as ecological communities being impacted by substantial DRP elevation above natural reference conditions. In combination with other conditions favouring eutrophication, DRP enrichment drives excessive primary production and significant changes in macroinvertebrate and fish communities, as taxa sensitive to hypoxia are lost.

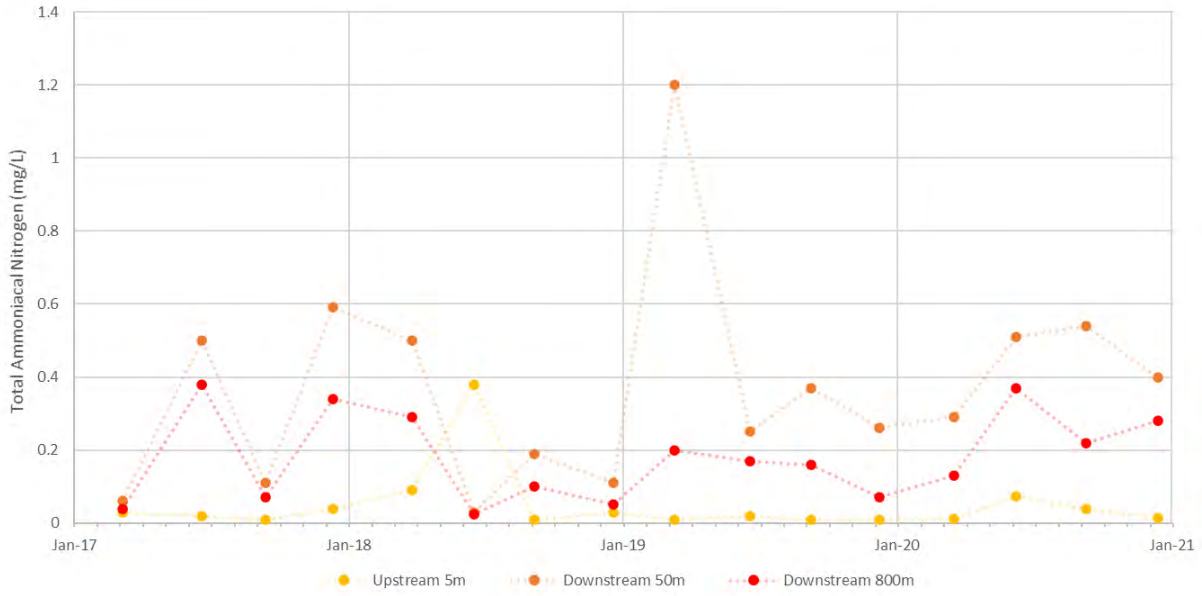

Figure 1: Total ammoniacal nitrogen concentrations in Meadow Burn 2017 - 2020

Table 2: Comparison of ammoniacal nitrogen results with NPSFM attribute bands

Site	Year	NH_4 (mg/L) pH adjusted*		Attribute Band
		Annual median	Annual maximum	
5 m Upstream	2017	0.01	0.02	A
	2018	0.02	0.15	B
	2019	0.004	0.01	A
	2020	0.01	0.03	A
	MAX	**0.02**	**0.15**	**B**
50 m downstream	2017	0.12	0.24	B
	2018	0.06	0.19	B
	2019	0.13	0.52	C
	2020	0.19	0.22	B
	MAX	**0.19**	**0.52**	**C**
800 m downstream	2017	0.08	0.16	B
	2018	0.04	0.11	B
	2019	0.07	0.08	B
	2020	0.12	0.16	B
	MAX	**0.12**	**0.16**	**B**

*As required under the NPSFM, NH_4 has been adjusted for pH.

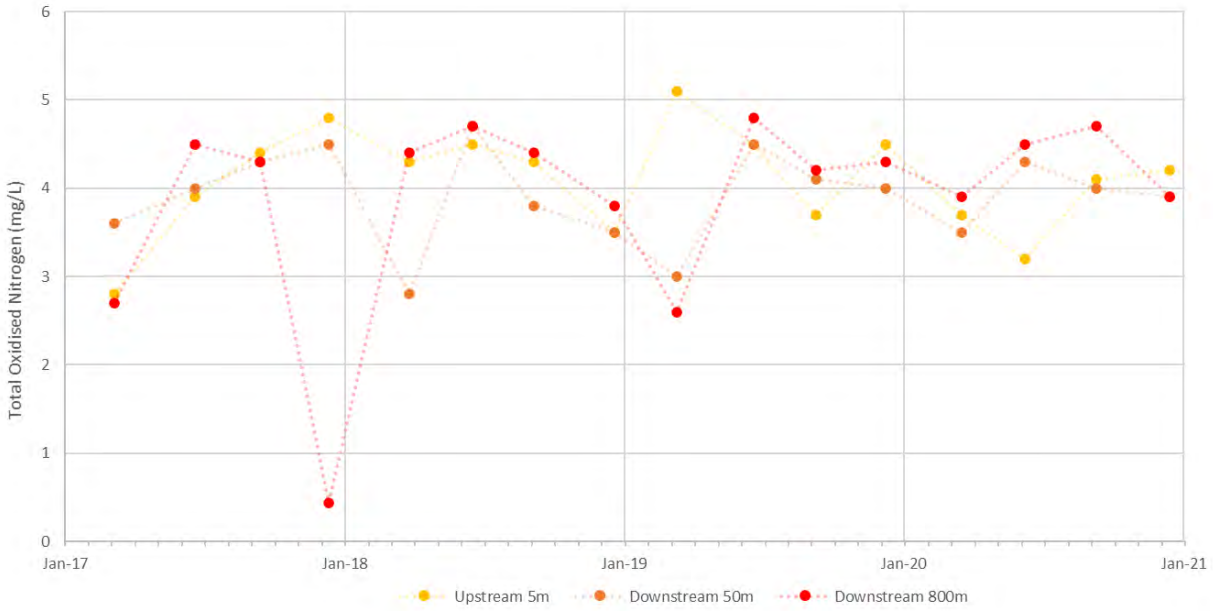

Figure 2: Total oxidized nitrogen concentrations in Meadow Burn 2017-2020

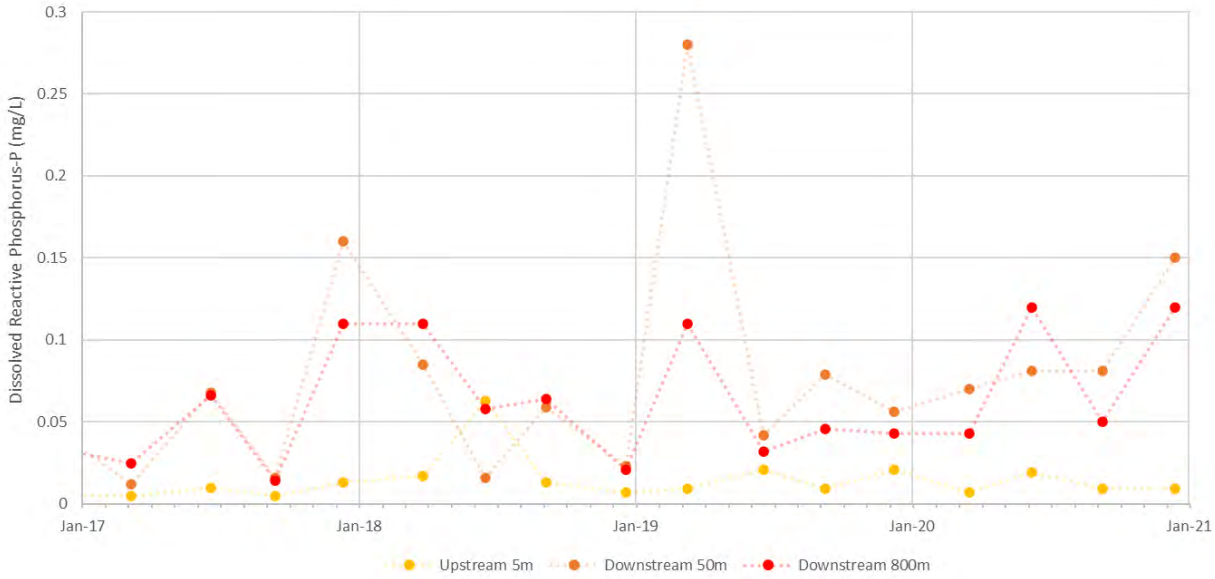

Figure 3: Dissolved reactive phosphorus concentrations in Meadow Burn 2017 - 2020

Table 3: Comparison of dissolved reactive phosphorus levels with NPSFM attribute bands

Site	DRP (mg/L)		Attribute Band*
	Median	95%ile	
5 m upstream	0.0095	0.0315	C
50 m downstream	0.069	0.12	D
800 m downstream	0.054	0.19	D

*Attribute bands need to be based on monthly monitoring over 5 years. Meadow Burn has quarterly samples over four years. This table is therefore provided for context only.

Halogens

Figure 10 to Figure 12 show bromide, chloride and fluoride over the four years. There are no surface water quality standards for the parameters, although a trigger value for fluoride is under development (ANZ 2018).

Bromide and chloride concentrations were significantly higher downstream of the WWTP discharge than upstream. Bromide concentrations are statistically different between 5 m upstream and 50 m downstream, however, concentrations between 5 m upstream and 800 m downstream as not statistically different, indicating that the WWTP is a likely source of bromide. Chloride is statistically significantly different between upstream and both downstream, indicating that the WWTP is a likely source of chloride. There is no statistically significant difference in fluoride from upstream to downstream.

There were peaks in chloride and fluoride concentrations in March 2019. This coincided with peaks in electrical conductivity, ammoniacal nitrogen, total phosphorus, dissolved reactive phosphorus, and turbidity.

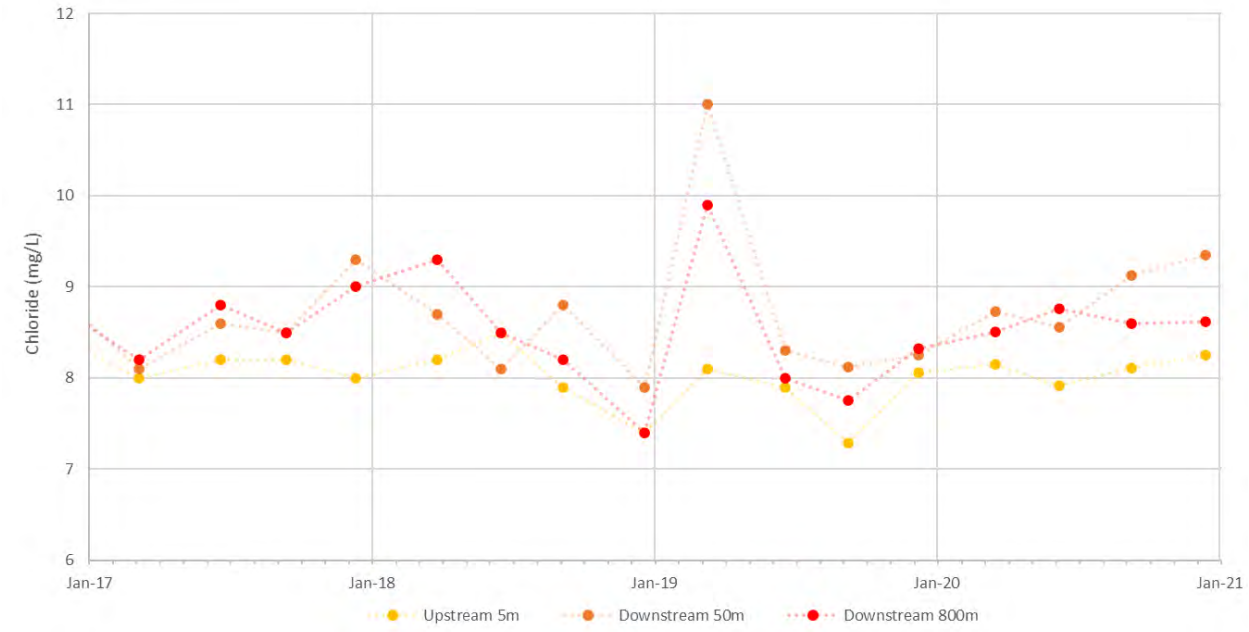

Figure 1: Chloride concentrations in Meadow Burn 2017 - 2020

Figure 2: Bromide concentrations in Meadow Burn 2017 - 2020

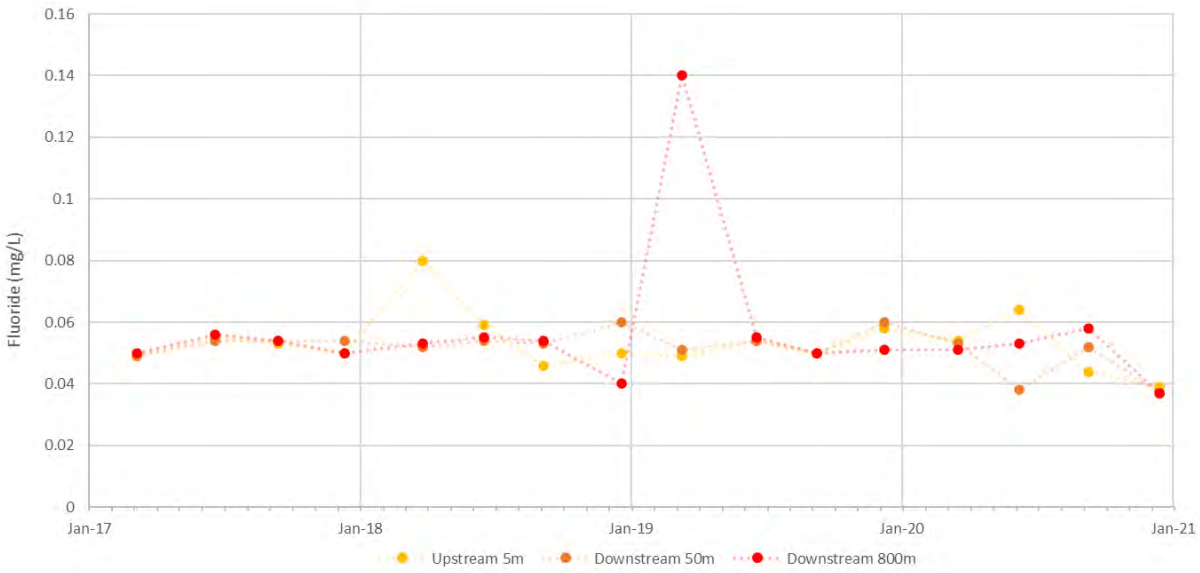

Figure 3: Fluoride concentrations in Meadow Burn 2017 - 2020

Appendix F CONSULTATION SUMMARY DOCUMENT

Riversdale Wastewater Treatment Plant - Summary

Background

The Southland District Council (SDC) holds discharge permit AUTH-20147220-01 (the existing permit) which authorises the discharge of treated wastewater from the Riversdale Wastewater Treatment Plant (WWTP) to land via a soakage channel, and to surface water (the Meadow Burn). The soakage channel is evident as the L-shape along the west and south boundary in the image below in Figure 1. Meadow Burn passes by the eastern boundary. The existing permit expires on 5 October 2021.

Figure 1: The Riversdale Wastewater Treatment Plant

The SDC also holds discharge permit AUTH-20147220-02 (the new permit) which authorises the discharge of treated wastewater to land via the WWTP's current soakage channel and using proposed Rapid Infiltration Basins (RIB's) to be built to the immediate west of the oxidation pond. Under the conditions of the new permit, discharges to the Meadow Burn can only lawfully occur in emergency or extreme weather events, so Riversdale's wastewater disposal would essentially become land-based.

Both the existing and the new permit were issued in 2016, and both are attached to this summary.

The five-year term of the existing permit was issued to allow time to investigate the feasibility of RIBs on land adjacent to the WWTP, complete the design of RIBs if they were proven feasible, and to build and commission the RIB scheme. It was expected when the consents were issued that the RIB scheme would be operational before the existing permit expired, and there would be a seamless transition from the existing surface water discharge to the land-based RIB scheme.

However, no provision for delays was allowed for in the permits. While the new permit expires 1 April 2037, it only authorises operational discharges to land via RIBs and the soakage channel - discharges to the Meadow Burn are only allowed in emergencies or extreme weather events. The project delays mean that the current discharge permit will expire in October 2021 before the RIBs can be built. Because the new permit doesn't allow discharges to the Meadow Burn, the SDC will not have a consented discharge

route for treated wastewater once the existing permit expires. Also, a key milestone condition in the new permit which sets a date by which the RIBs must be built, will be missed creating a non-compliance with that permit that is beyond the SDC's control.

Proposal

Consequently, SDC is now preparing applications to:

- replace the existing discharge permit with a new three-year permit to allow treated wastewater discharges to the Meadow Burn to continue under the current conditions, until the RIB scheme can be built and commissioned. The SDC considers the three-year term to be adequate to complete the land purchase, and build and commission the RIB scheme; and
- cancel condition conditions 3 and 4(a) of the new permit and vary conditions 4(c) and 4(d). Conditions 3 and 4(a) are 'milestone' conditions which refer to past dates and require actions of the SDC which have already been met. Conditions 4(c) and (d) are milestone dates for future actions and need to be amended to reflect the impact of the delay, and to align with the new discharge permit being applied for.

Once the RIB scheme is operational, treated wastewater will be discharged to land, and normal operational discharges to the Meadow Burn will permanently cease. The SDC remains committed to the RIB scheme and to commissioning it before the end of the three-year replacement permit for that will be applied for shortly.

Planning framework

The relevant regional plan rules are set out in Table 1 below:

Table 1: Regional Rules

Regional Plan / Rule	Rule and Assessment	Status
Regional Effluent Land Application Plan (RELAP) **Rule 5.2.1**	The discharge of effluent **onto or into land** from a community sewage scheme is a discretionary activity	**Discretionary**
Proposed Southland Water and Land Plan (pSWLP) **Rule 33** *(under appeal)*	Discharges of effluent or biosolids **onto or into land** from a community sewerage scheme in circumstances where contaminants may enter water are discretionary activities subject to compliance with setbacks from waterbodies, places of assembly or dwellings, or authorised water abstraction points.	**Discretionary**
Regional Water Plan (RWP) **Rule 2**	Discharges of contaminants to **surface water** that do not reduce the quality of the receiving water below the water quality standards, after reasonable mixing, in Appendix F are discretionary activities under Rule 1. Discharges which do cause water quality to fall below those standards after mixing are non-complying activities.	**Discretionary /** **Non-complying**
Proposed Southland Water and Land Plan (pSWLP) **Rule 33A** *(under appeal)*	The discharge of effluent or bio-solids from a community sewage scheme **into water in a river**, lake, artificial watercourse, modified watercourse or natural wetland is a non-complying activity.	**Non-complying**

Relevant policies are contained in National Policy Statement for Freshwater Management 2020, the Southland Regional Policy Statement, Southland Regional Effluent Land Application Plan, Southland Regional Water Plan, proposed Southland Water and Land Plan and Te Tangi a Tauira.

We would value your questions and thoughts as we prepare the applications – and would be happy to discuss the proposal.

AUTH-20147220-01:
Existing Discharge Permit

AUTH-20147220-02:
New Discharge Permit

Appendix G POLICY FRAMEWORK ASSESSMENT

Assessment of the Activity in the Policy Framework

National Policy Statement for Freshwater Management 2020

Table 1. NPS-FM: Policy Framework Assessment

Provision	Assessment
Objective *(1) The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:* *(a) first, the health and well-being of water bodies and freshwater ecosystems* *(b) second, the health needs of people (such as drinking water)* *(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.*	The wider proposal, of which this application is a component, will achieve this objective. In particular, the RIB scheme, which will be enabled by granting the permit applied for, will better provide for the health and wellbeing of the Meadow Burn. The RIB scheme will also continue to enable the community to provide for its social, cultural and economic wellbeing through effective wastewater treatment and disposal.
Policy 1: *Freshwater is managed in a way that gives effect to Te Mana o te Wai.*	Taking the wider proposal into account and acknowledging that the short-term discharge permit is required in order to implement the RIB scheme for which the applicant already holds consent, the activity is consistent with this policy.
Policy 2: *Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for.*	The applicant engaged with tangata whenua through Hokonui Rūnanga as kaitiaki rūnanga to provide an opportunity for their views, values and feedback to be taken into account. The application was prepared in a manner consistent with this policy. As an outcome of that process, the rūnanga indicated support in principle, contingent on the RIB scheme being commissioned as soon as possible.
Policy 7: *The loss of river extent and values is avoided to the extent practicable.*	The existing discharge of treated wastewater to the Meadow Burn does have an adverse effect on the receiving environment that results in a loss of the river's ability to provide for ecosystem health, indigenous biodiversity, and Māori freshwater values. However, the change to the RIB scheme will result in those effects being reduced (avoided) to the extent practicable. The move to the RIB scheme will also help to protect the habitats of the freshwater species present in the Meadow Burn, including indigenous species, and the habitat of trout and salmon in the lower Meadow Burn and Mataura River. The activity is consistent with these policies.
Policy 9: *The habitats of indigenous freshwater species are protected.*	
Policy 10: *The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9.*	

Provision	Assessment
Policy 12: *The national target (as set out in Appendix 3) for water quality improvement is achieved.*	Transitioning from the current discharge to the RIB scheme will help to achieve the National target for primary contact as set out in Appendix 3, to the extent that it is affected by the discharge, noting that the stream is not used for primary contact given limited accessibility, small size and low amenity value.
Policy 15: *Communities are enabled to provide for their social, economic, and cultural well-being in a way that is consistent with this National Policy Statement.*	Approving this application will enable the applicant to continue to lawfully discharge treated wastewater to the Meadow Burn until the RIB scheme is constructed and commissioned. Being able to lawfully operate the Riversdale WWTP is important as it is critical infrastructure that safeguards community health and wellbeing and enables the community to provide for its social and cultural wellbeing. This is consistent with Policy 15 of the NPSFM

Southland Regional Policy Statement 2017

Table 2. SRPS: Policy Framework Assessment

Provision	Assessment
Chapter 3 - Tangata Whenua	
Objective TW.1 – Decision-making and partnerships with tangata whenua *The principles of the Treaty of Waitangi/Te Tiriti o Waitangi are taken into account in a systematic way through effective partnerships between tangata whenua and local authorities, which provide the capacity for tangata whenua to be fully involved in council decision-making processes.*	This objective directs local authorities to involve tangata whenua in resource management decision-making. The applicant has given effect to Treaty principles by engaging with tangata whenua through Hokonui Rūnanga representatives. The applicant has worked with tangata whenua throughout the process including in securing the original resource consents in 2017, and the development of the RIB concept which was driven in part by the desire to remove wastewater discharges from the Meadow Burn. This application is an extension of that process, and the final step in realising that goal. The applicant has achieved this objective.
Objective TW.2 – Provision for iwi management plans *All local authority resource management processes and decisions take into account iwi management plans.*	*Te Tangi a Tauira* as an incorporated iwi management plan was taken into account in developing the proposal and preparing this application. Hokonui Rūnanga was actively involved in preparing that document. An assessment of the relevant provisions is set out in Table 6 of this appendix. The application process has met this objective.
Objective TW.3 – Tangata whenua spiritual values and customary resources *Mauri and wairua are sustained or improved where degraded, and mahinga kai and customary resources are healthy, abundant and accessible to tangata whenua.*	The discharge to the Meadow Burn will continue to adversely affect the biophysical quality of the river and associated aquatic habitats to some degree and will also affect the river's cultural and spiritual values, Mauri and wairua until such time as the discharge ceases. Minimising adverse effects on tangata whenua values associated with the Meadow Burn, and helping the stream values to recover are key drivers of the proposed RIB scheme, and the interim discharge permit now applied for is key to achieving that goal.

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	The discharge to the Meadow Burn will not achieve this objective over the term of the interim permit, which is integral to achieving the RIB scheme, which will achieve this objective. The timeframe over which this objective will not be achieved is therefore limited to the period needed to build and commission the RIB scheme and decommission operational discharges to the Meadow Burn.
Policy TW.1 – Treaty of Waitangi *Consult with, and enhance tangata whenua involvement in local authority resource management decision-making processes, in a manner that is consistent with the principles of the Treaty of Waitangi/Te Tiriti o Waitangi.*	As for Objective TW.1, the applicant has involved tangata whenua throughout the decision-making processes associated with the long-term management of Riversdale's wastewater, and also from the early stages of preparing this application. Maori cultural and spiritual values are key drivers of the approach to wastewater management across Southland and have been taken into account in choosing to adopt a RIB scheme. The application process for this proposal is consistent with this policy.
Policy TW.3 – Iwi management plans *Take iwi management plans into account within local authority resource management decision making processes.*	*Te Tangi a Tauira* was taken into account in preparing this application, and an assessment of the relevant policy provisions is included in Table 6 of this Appendix. The proposed activity is therefore consistent with this policy.
Chapter 4A – Water Quality	
Objective WQUAL.1 – Water quality goals *Water quality in the region:* *(a) safeguards the life-supporting capacity of water and related ecosystems;* *(b) safeguards the health of people and communities;* *(c) is maintained, or improved in accordance with freshwater objectives formulated under the National Policy Statement for Freshwater Management 2014;* *(d) is managed to meet the reasonably foreseeable social, economic and cultural needs of future generations.*	The discharge to the Meadow Burn results in low to moderate adverse effects on water quality (surface water). In respect of the life-supporting capacity of the river therefore, while the activity will not wholly safeguard those values, neither will it fail to safeguard them to some degree, as it will occur in compliance with the conditions of the current discharge permit. The effects of the discharge to land on life-supporting capacity is negligible. The adverse effects of the discharge to the Meadow Burn on community health from recreational contact are negligible given the limited opportunities for recreational contact with the Meadow Burn. There is no opportunity for recreational contact with the discharge to land from the soakage channel. While the current discharges are not considered to be part of the existing environment, the effects of the discharges are, and form the starting point for assessing the effects of continuing the discharges as applied for. The discharge to the Meadow Burn will not change from the current discharge and will therefore maintain current water quality, not degrade it. The proposal will achieve the relevant NPS-FM objectives (see preceding analysis) when contemplated as part of the wider changes to wastewater management at Riversdale, in moving to a RIB scheme. The discharges are a key part of enabling the community to provide for its foreseeable social, cultural and economic needs as a stepping-stone to permanently removing the discharge to

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	the Meadow Burn, acknowledging however that the discharge to the river will result in adverse effects on biophysical, cultural and spiritual values in the interim. When considered as part of the wider management of Riversdale's wastewater, the proposal will meet this objective.
Policy WQUAL.1 – Overall management of water quality *(a) ...; and* *(b) Manage discharges and land use activities to maintain or improve water quality to ensure freshwater objectives in freshwater management units are met.*	While there will be localised adverse effects on water quality as a result of the discharge to the Meadow Burn over the term of the permit applied for, the effect on water quality across the Mataura FMU will be undetectable. The discharges will not prevent the achievement of the objectives in the NPS-FM (see previous assessment), noting that objectives for each FMU have not yet been set (scheduled for 2024) and the RIB scheme is expected to be constructed and operational within the term of this permit. The proposed discharges will be consistent with this policy.
Policy WQUAL.2 – All waterbodies *Maintain or improve water quality, having particular regard to the following contaminants:* *(a) nitrogen;* *(b) phosphorus;* *(c) sediment;* *(d) microbiological contaminants.*	Water quality in the Meadow Burn will be maintained in its current state in respect of the contaminants identified in Policy WQUAL.2 until the RIB scheme is operational, as the treatment process, and the scale and nature of the discharges will not discernibly change. However, once operational wastewater discharges to the Meadow Burn cease, water quality as affected by the discharge will measurably improve. The discharge to the Meadow Burn as anticipated in this application is therefore not consistent with this policy, however when viewed as a whole the scheme is consistent.
Policy WQUAL.7 – Social, economic and cultural benefits *Recognise the social, economic and cultural benefits that may be derived from the use, development or protection of water resources.*	There are substantial social and economic benefits to be derived by managing public health risks from wastewater through effective wastewater treatment and disposal. The use of groundwater and the Meadow Burn as receiving environments for Riversdale's treated wastewater is central to achieving those benefits for the time being, enabling the applicant to operate the WWTP in an economically sustainable and affordable manner proportionate to the effects on the environment, and generally minimise the significance of adverse social, economic and environmental effects. For the interim period, there is no economically or technically feasible alternative than to continue to discharge treated wastewater to the Meadow Burn until the RIB scheme is operational. The significance of the adverse effects of the discharge to surface water on cultural values is acknowledged and is a key driver in commissioning the RIB scheme as soon as possible. The proposal is therefore not wholly consistent with this policy.
Policy WQUAL.8 – Preference for discharge to land *Prefer discharges of contaminants to land over discharges of contaminants to water, where:* *(a) a discharge to land is practicable;*	The discharge to land via the soakage channel is consistent with this policy. Extensive investigations prior to progressing the RIB scheme concept concluded that there were few practicable disposal options available for wastewater from Riversdale, other than the status quo or the RIB option at the WWTP site. The RIB scheme cannot be completed before

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(b) the adverse effects associated with a discharge to land are less than a discharge to water.	the current permit expires, and there are no practicable land-based alternatives to the current discharge pathways over the term of the permit sought. In the absence of a practicable alternative, the proposed discharge to the Meadow Burn is consistent with this policy.
Policy WQUAL.9 – Untreated human and animal wastes *Avoid the direct discharge of sewage, wastewater, industrial and trade waste and agricultural effluent to water unless these discharges have undergone treatment.*	The proposed discharge to the Meadow Burn is consistent with this policy, as no untreated wastewater is discharged to the stream from the Riversdale WWTP.
Policy WQUAL.10 – Siting and operation *Manage the siting and operation of activities that result in point source discharges of contaminants to land to ensure that adverse effects on groundwater, surface water and coastal water quality are avoided, remedied or mitigated.*	The WWTP is located at this site for practical and operational reasons. The WWTP is operated in a manner that minimises to the extent practicable, adverse effects on groundwater and the water quality of the Meadow Burn. The treatment process ensures that adverse effects from discharging wastewater to the stream are substantially mitigated but cannot be wholly avoided. The discharge to land via the soakage channel results in minimal adverse effects on water quality or quantity. The proposed activity is therefore consistent with this policy.
Infrastructure	
Objective INF.1 – Southland's infrastructure *Southland's regionally significant, nationally significant and critical infrastructure is secure, operates efficiently, and is appropriately integrated with land use activities and the environment.*	The WWTP falls within the definition of 'critical infrastructure'. Obtaining regulatory approval to discharge from the WWTP is critical to the ongoing operational security of the WWTP. The WWTP is operated efficiently, both in respect of managing and treating wastewater prior to discharge, in a cost efficient and effective manner. The WWTP occupies a site that is well outside the Riversdale urban boundary, is separated from incompatible land use activities, and does not encroach on the values of the Meadow Burn. The activity will achieve Objective INF.1.
Policy INF.1 – Regional, national and critical infrastructure *Recognise the benefits to be derived from, and make provision for, the development, maintenance, upgrade and ongoing operation of regionally significant, nationally significant and critical infrastructure and associated activities.*	The WWTP is within the definition of critical infrastructure, as it is essential to the health and wellbeing of the community, and its economic and social wellbeing. Approving the application for the replacement discharge permit is essential to 'making provision for' the secure and ongoing operation of the WWTP, and to enable the RIB scheme to be progressed. Enabling the proposed discharge as a short-term stage in the proposed WWTP improvements supports the long-term development, upgrading and maintenance of the WWTP as critical infrastructure. The proposal as a whole is consistent with this policy.

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Policy INF.2 – Infrastructure and the environment *Where practicable, avoid, remedy or mitigate the adverse effects of infrastructure on the environment. In determining the practicability of avoiding, remedying, or mitigating adverse effects on the environment, the following matters should be taken into account:* *(a) any functional, operational or technical constraints that require the physical infrastructure of regional or national significance to be located or designed in the manner proposed;* *(b) whether there are any reasonably practical alternative designs or locations;* *(c) whether good practice approaches in design and construction are being adopted;* *(d) ... (e)*	The adverse effects of the existing WWTP discharges are identified in the assessment of effects in this application document. The replacement permit applied for will not result in any increase in the scale, nature or extent of those effects, and no operational changes are intended. There is a functional and operational need for the WWTP to be in its current location, insofar as it is in proximity to the wastewater source (Riversdale), and is an established WWTP and significant community asset. There are no reasonably practicable alternative designs or locations for the WWTP or the current discharges, taking into account the cost (as a consideration of practicality) of moving or redesigning the WWTP, or of finding an alternative receiving environment for treated wastewater in the interim, until the RIB scheme (which is the practicable alternative) is commissioned. Given the pending move to the RIB scheme, there would be little benefit in relocating or redesigning the WWTP at this time. The WWTP has been designed and is operating in a manner that achieves effective wastewater treatment and minimises the adverse environmental effects of wastewater management. The proposed activity is consistent with this policy.

Southland Regional Effluent Land Application Plan

Table 3. RELAP: Policy Framework Assessment

Provision	Assessment
Objective 4.1.1 Soil To ensure the life supporting capacity of the soil ecosystem is safeguarded from the adverse effects of discharges of effluent and sludge onto or into land.	The extent to which the life supporting capacity of the soil ecosystems downgradient of the WWTP will be affected by the discharge to land from the base of the soakage channel will be negligible. The proposal will achieve this objective.
Objective 4.1.2 – Water To ensure that water quality and the life supporting capacity of the water ecosystem is safeguarded from the adverse effects of discharges of effluent and sludge onto or into land which may enter water.	The discharges from the soakage channel will enter land and be treated further, then diluted and dispersed in groundwater. The discharge will have a negligible adverse effect on the quality and therefore the life-supporting capacity of the soil or associated groundwater ecosystems downgradient of the WWTP. The effect of groundwater then entering the Meadow Burn is also negligible. The life-supporting capacity of water will be safeguarded, particularly once the RIB scheme is operational, and the activity will help to achieve this objective.

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Objective 4.1.3 - Human and animal health To ensure that effluent and sludge discharges onto or into land do not adversely affect human and animal health.	The discharges from the soakage channel are to the underlying soils, with no opportunity for human or animal contact. The discharge will therefore not affect groundwater users in the wider vicinity of the WWTP, and will have no effect on human or animal health. The discharge to land will not be visible or generate odour, and therefore there will be no adverse effects on amenity values. The proposal will achieve these objectives.
Objective 4.1.4 - Amenity values To ensure that amenity values are not adversely affected by discharges of effluent and sludge onto or into land.	
Objective 4.1.5 - Tangata whenua To recognise and provide for the relationship of tangata whenua with ancestral sites, wahi tapu and other taoka.	The discharge of wastewater to land is preferable to the community including tangata whenua over discharges to water. The soakage channel provides land contact consistent with tangata whenua preferences and values. The discharge via the soakage channel will achieve this objective. In the longer term, the discharge to the Meadow Burn will be discontinued and replaced by the discharge to land via the RIB scheme, and the activity will be consistent with this objective insofar as operational discharges to water will cease.
Policy 4.2.2 - Discharge to land Utilise land treatment of effluent and sludge where this can be undertaken in a sustainable manner and without significant adverse effects.	The discharge from the soakage channel to land enables further treatment in the underlying unsaturated soil layer, and then dilution and dispersion in groundwater. The discharge does not result in significant adverse effects on soil or groundwater quality or quantity in the vicinity of the WWTP or further afield. Central to this application is the applicant's commitment to commissioning the RIB scheme to replace the current surface water discharge and supplement the soakage channel. Both types of discharge will enable land treatment and disposal without significant adverse effects, and they are sustainable and consistent with the purpose of the RMA. The proposal is consistent with this policy.
Policy 4.2.3 - Avoid where practicable, remedy or mitigate adverse effects on water Avoid where practicable, remedy or mitigate adverse effects on water quality, water ecosystems and water potability from effluent and sludge discharges onto or into land.	The adverse effect of the discharge to land on the receiving environment, including the Meadow Burn, and the soil and groundwater in the vicinity of the WWTP will be minimal. There are no known drinking water bores in the vicinity of the WWTP, and no public water supply is drawn from the Meadow Burn or from downgradient bores. The proposal is consistent with this policy.
Policy 4.2.6 - Human and animal health Avoid where practicable, remedy or mitigate any adverse effects to human and animal health arising from discharges of effluent and sludge onto or into land.	The discharge from the soakage channel to the underlying soil means there is no opportunity for human or animal contact, and therefore no opportunity to adversely affect human or animal health. No discernible effects on known bores in the vicinity of the WWTP are anticipated. The proposal is consistent with this policy.
Policy 4.2.8 - Tangata whenua	Tangata whenua concerns have been taken into account in considering the effects of the discharges from the soakage channel to land. The adverse effects of the discharge on tangata whenua values will be minimal, noting that there is support in principle from the

Provision	Assessment
Recognise and provide for tangata whenua concerns related to the discharge of effluent and sludge onto or into land.	Hokonui Rūnanga in respect of the RIB scheme which will involve a discharge to land of a much greater scale. The proposal is consistent with this policy.
Policy 4.2.9 - Amenity values Avoid where practicable, remedy or mitigate any adverse effects on amenity values from discharges of effluent and sludge systems onto or into land.	The discharge from the soakage channel to land is wholly subsurface, and therefore is not visible. There is no odour from the land discharge, and no effects on the amenity values of the site or its vicinity. The proposal is consistent with this policy.

Southland Regional Water Plan 2010

Table 4. RWP: Policy Framework Assessment

Provision	Assessment
Water Quality Objectives	
Objective 2 – Maintain water quality *To manage water quality so that there is no reduction in the quality of the water in any surface water body, beyond the zone of reasonable mixing for discharges, below that of the date this Plan became operative (January 2010).*	The proposed discharge to the Meadow Burn will not fully meet this objective, as it requires that any discharges to water avoid reducing water quality. This is in the context however of the upstream quality of the Meadow Burn, as affected by the surrounding land uses, and also noting that the discharge preceded the January 2010 date in this objective, and since then the addition of the soakage channel has reduced the volume and frequency of discharges to the stream. The proposal will not help to achieve this objective.
Objective 3 – Surface water bodies other than in Natural State Waters *To maintain and enhance the quality of surface water bodies so that the following values are protected where water quality is already suitable for them, and where water quality is currently not suitable, measurable progress is achieved towards making it suitable for them.* *In surface water bodies classified as mountain, hill, lake-fed, spring-fed, lowland (hard bed), lowland (soft bed) and Mataura 1, Mataura 2 and Mataura 3:* *(a) bathing, in those sites where bathing is popular;* *(b) trout where present, otherwise native fish;*	The quality of the Meadow Burn as the receiving water body will continue to be moderately affected as a result of the discharge. However: i. There are no high value bathing sites identified in Appendix K of the RWP anywhere along or near the Meadow Burn. ii. The effect of the discharge on the water quality as a habitat for trout is minimal, confined to the vicinity of the discharge, and undetectable well before the confluence of the Meadow Burn with the Mataura River. It will also be limited to the term of the permit sought. iii. The discharge has minimal adverse effect on the suitability of the Meadow Burn for stock drinking water. iv. Ngāi Tahu cultural values are adversely affected by the direct discharge to the Meadow Burn. v. Any adverse effects on natural character values including aesthetic values will be negligible.

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(c) stock drinking water; *(d) Ngāi Tahu cultural values, including mahinga kai;* *(e) natural character including aesthetics.*	The proposed activity will generally achieve this objective insofar as the portion of wastewater discharged to land via the soakage channel will avoid directly discharging to the stream, and therefore minimise potential effects on surface water quality. The discharge to the stream will not wholly achieve the objective however, particularly in respect of the effects on Ngāi Tahu cultural values.
Objective 4 – Gradual improvement in surface water quality parameters *To manage the discharge of contaminants and encourage best environmental practice to improve the water quality in surface water bodies classified as hill, lowland (hard bed), lowland (soft bed) and spring fed, and in particular to achieve a minimum of 10 percent improvement in levels of the following water quality parameters over 10 years from the date this Plan became operative (January 2010):* *(a) microbiological contaminants* *(b) nitrate* *(c) phosphorus* *(d) clarity*	The Riversdale wastewater scheme will move from the current land and surface water discharge to a RIB scheme and conditional (emergency) surface water discharge within the term of this permit, in accordance with permit AUTH-20147220-02. The RIB scheme is the best practicable option for affordably improving environmental practice and water quality in the stream. The replacement discharge permit is a critical step in achieving that outcome, which will also provide a significant contribution to reducing the contaminants identified in this objective, in receiving surface water. The objective seeks improvements by January 2020, so the proposed activity cannot achieve the desired change as that date has now passed. Regardless, the water quality improvements achieved by implementing the RIB scheme represent a positive contribution. The proposal is therefore consistent with the principle of this objective, being gradual improvement in surface water quality.
Land and Soil Objectives	
Objective 9A – Maintain soil quality *To manage discharges onto or into land so that the quality and structure of soil resources are maintained*	The effects of discharging treated wastewater to land on soil quality and structure will be minimal given that the discharge will occur beneath the soakage channel and will not result in adverse effects on downgradient soil structure. The proposed discharge will achieve this objective.
Objective 9B – Human health *To manage discharges onto or into land so that adverse effects on human health are avoided.*	Adverse effects on human health from discharging treated wastewater to land will be avoided given the discharge is via the bed of the soakage channel, and the effects on soils downgradient of the WWTP are negligible. The proposed discharge will therefore achieve this objective.
Objective 9C – Habitats and ecosystems and other values *To manage discharges onto or into land so that any adverse effects on:*	The WWTP site is dominated by exotic pasture and does not contain any significant habitats or ecosystems. Similarly, there are no such habitats in the immediate vicinity of or affected by the WWTP or associated discharges. The site does not contain any known heritage values. The discharge to land will not result in adverse effects on amenity values as the site will continue to

Provision	Assessment
(a) the diversity and integrity of habitats and ecosystems; and *(b) amenity and historic heritage values are avoided, remedied or mitigated to ensure that these values are maintained or enhanced.*	be used for wastewater treatment, and the surrounding area will retain a predominantly rural aesthetic. Accordingly, the discharge to land will achieve this objective.
Policies	
Policy 1A – Take into account Iwi Management Plans *Any assessment of an activity covered by this plan must take into account any relevant Iwi Management Plan.*	The assessment of effects contained in the application, and this policy assessment takes into account the provisions of *Te Tangi a Tauira* as the iwi management plan relevant to this application, and is therefore consistent with this policy.
Policy 3 – No reduction in water quality *Notwithstanding any other policy or objective in this plan, allow no discharges to surface water bodies that will result in a reduction of water quality beyond the zone of reasonable mixing, unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so.*	The current discharge to surface water measurably reduces water quality after reasonable mixing. However, the discharge is consistent with the promotion of sustainable management as set out in the RMA, as (broadly) the WWTP allows the community to provide for their health and safety as well as their social economic and (partly) cultural wellbeing, while sustaining the life-supporting capacity of the land and (in part) water receiving environments and avoiding or mitigating adverse effects. In particular, the discharge permit is sought to enable the RIB scheme to become operational and provide the community with a long term sustainable wastewater scheme. In that respect, the proposal is consistent with this policy.
Policy 4 – Surface water bodies outside Natural State Waters *For surface water bodies outside Natural State Waters, manage point source and non-point source discharges to meet or exceed the water quality standards referred to in Rule 1 and specified in Appendix G "Water Quality Standards", unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so and so avoid levels of contaminants in water and sediments that could harm the health of humans, domestic animals including stock and/or aquatic life.*	The discharge to the surface water discharge does not meet all of the water quality standards set out in Appendix G for 'Spring Fed' waterbodies, after reasonable mixing. The discharge in isolation after reasonable mixing does not harm human or animal health but has been found to result in a moderate adverse effect on aquatic life. The volume of the discharge to the stream is limited by conditions in AUTH-20147220-01 – the effects of the discharges have been shown to be moderate at most. Removing the discharge from the stream in time will contribute to a cumulative improvement in water quality, and progress towards the 'spring fed' water quality standards in Appendix G. As the discharge does not currently meet the standards in Appendix G, the proposed activity is not consistent with this policy, however it is not contrary to it given that the discharge is consistent with Part 2 of the RMA (as discussed above).

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Policy 7 – Prefer discharges to land *Prefer discharges to land over discharges to water where this is practicable and the effects are less adverse.*	The WWTP discharges to land via the base of the soakage channel is consistent with this policy. The effects of the discharges to the Meadow Burn will be moderate at most. Over the term of the consent sought, there are no practicable opportunities to discharge all wastewater to land, until such time as the RIB scheme is operational. In that sense the proposed discharges are consistent with this policy.
Policy 8 – Discharges to water *Prefer point source discharges of contaminants to water at times of high flow over discharges at normal or low flows, and ensure that where discharging does take place at low flows, the effects that could not be practically avoided are minimised.*	Discharges to the Meadow Burn cannot be limited to times of high flow, as the need to discharge to the stream is driven by inflows and soakage rates via the channel. The effects on the stream that cannot be avoided are minimised, primarily by the treatment process, and by discharging a portion of the wastewater to land. The proposed activity is therefore consistent with this policy.
Policy 9 – Zone of reasonable mixing *When determining the size of the zone of reasonable mixing, minimise the size of the area where the relevant water quality standards are breached. Consideration should be given to, but not be limited to, the following matters:* *(a) the aquatic ecosystem values in the affected reach;* *(b) the need for fish passage;* *(c) the uses of the water body adjacent to and downstream of the point of discharge.*	The zone of reasonable mixing has been set through previous resource consent processes at 50 m downstream. This was determined to be appropriate, and consistent with this policy in the decision issued for AUTH-20147220-01. Consequently, the monitoring programme was established on that basis. No changes to the discharge activity, the monitoring programme or the mixing zone are proposed, and it therefore follows that the size of the mixing zone remains consistent with this policy.
Policy 25 - Adverse effects arising from point source and non-point source discharges *To avoid, remedy or mitigate the adverse effects arising from point source and non-point source discharges so that there is no deterioration in groundwater quality after reasonable mixing, unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so.*	Given the characteristics of the underlying soil and the modelled dilution, along with the absence of groundwater users in the vicinity of the WWTP, adverse effects on the quality of groundwater beyond the immediate proximity of the WWTP will be minimal. The effect of the comparatively small discharge to land from the soakage channel can also be compared to the effect of discharging all operational wastewater to land via RIBs, an effect which was acceptable in issuing AUTH-20147220-02 for the RIB scheme. The discharge to land is consistent with the promotion of sustainable management as set out in Part 2 of the RMA and is consistent with this policy.

Provision	Assessment
Policy 31C - Manage discharges of contaminants onto or into land *Manage discharges of contaminants onto or into land to avoid, remedy or mitigate adverse effects, including on:* *(a) soil quality;* *(b) amenity values;* *(c) habitats, ecosystems and indigenous biological diversity;* *(d) historic heritage, cultural and traditional values;* *(e) natural character;* *(f) outstanding natural features.*	The discharge to land and the effects on the receiving environment are actively managed and will be monitored to ensure that any risk to the receiving environments (land, groundwater and surface water) is appropriately managed to avoid or mitigate adverse effects. There will be no increase in the effects of the existing discharges on amenity values or natural character. Any adverse effects on soil quality will be minimal and will be limited in scale and extent. The adverse effects on habitats, ecosystems, and biological diversity are currently minimal. The discharge of treated wastewater to land is consistent with cultural and traditional values. The proposed discharge to land is consistent with Policy 31C.
Policy inserted by Regulation 3.24 of the NPSFM: *The loss of river extent and values is avoided, unless the council is satisfied:* (a) *that there is a functional need for the activity in that location; and* (b) *the effects of the activity are managed by applying the effects management hierarchy.*	This policy (or words to that effect) is required to be inserted into regional plans by Regulation 3.24 of the NPSFM. The WWTP has been designed and consented under a rules regime which authorised discharges of treated wastewater to surface water. As it currently stands, there is a functional need for the near term, for the WWTP to continue to discharge to the Meadow Burn when wastewater volumes exceed infiltration rates in the soakage channel. Essentially, for the term of the permit sought, the discharge can only occur in this environment, as there is no practicable alternative, noting that it is an interim measure 'on the way' to implementing the RIB scheme. Application of the effects management hierarchy demonstrates that: a) adverse effects on the Meadow Burn are, and will continue to be avoided where practicable with most wastewater discharged via the soakage channel; and b) the effects of direct discharge to the Meadow Burn are minimised by limiting the rate of discharge to 1 or 2 L/sec (seasonally). In achieving a) and b) above, the activity satisfies the effects management hierarchy, and consideration of clauses c) – f) is not required. The proposal is therefore consistent with this policy.

Proposed Southland Water and Land Plan (Partially operative version)

Table 5. pSWLP: Policy Framework Assessment

Provision	Assessment
Region-wide Objectives	
Objective 1: *Land and water and associated ecosystems are sustainably managed as integrated natural resources, recognising the connectivity between surface water and groundwater, and between freshwater, land and the coast.*	The success of the WWTP as a means of treating and disposing of Riversdale's treated wastewater relies on the interaction between the land (unsaturated soil), the underlying groundwater and the Meadow Burn. The treatment process and discharges to land and water will minimise the potential adverse effects on both receiving environments to the extent practicable, for the term of the permit sought. The integration of the land of the WWTP and soakage channel, the Meadow Burn and groundwater has been taken into account and is acknowledged. The proposed activity will achieve this objective.
Objective 2: *The mauri of water provides for te hauora o te taiao (health and mauri of the environment), te hauora o te wai (health and mauri of the waterbody) and te hauora o te tangata (health and mauri of the people).*	In considering the short term permit as a stage in achieving the long term RIB scheme and therefore removing operational discharges from the Meadow Burn, the proposal will achieve this objective by moving treated wastewater discharges from the stream to land. Doing so will better provide for the health and mauri of the environment, the waterbody and ultimately the community, noting that in the interim, te hauora o te taiao and te hauora o te wai will not be wholly provided for until operational discharges to the stream cease.
Objective 3 *Water and land are recognised as enablers of the economic, social and cultural wellbeing of the region.*	The use of land and water in wastewater management is unavoidable to varying degrees. The operation of effective wastewater treatment facilities is fundamental to providing for economic, social and cultural wellbeing in the community. The use of land and water in treating and disposing of treated wastewater is therefore consistent with this objective.
Objective 4 *Tāngata whenua values and interests are identified and reflected in the management of freshwater and associated ecosystems.*	Moving to the RIB scheme is driven to a large degree by the community's desire to better accommodate the values and interests of tangata whenua. The proposal, as a critical step in achieving the RIB scheme is an important means of achieving this objective.
Objective 6 *Water quality in each freshwater body, coastal lagoon and estuary will be:* *(a) maintained where the water quality is not degraded; and*	Water in the Meadow Burn has been degraded by human land use and activities including upstream of the WWTP outfall. The current discharge to the scheme is not considered to be part of the existing environment however the residual effects of the discharge are, and they form the starting point for assessing the effects of continuing with the discharge, albeit temporarily.

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(b) improved where the water quality is degraded by human activities.	The discharge will continue to reduce the quality of the river until it ceases once the RIB scheme is operational. Until that time, the proposed discharge to the river will not achieve this objective as the short term discharge will not help to improve water quality in the stream.
Objective 9B *The importance of Southland's regionally and nationally significant infrastructure is recognised and its sustainable and effective development, operation, maintenance and upgrading enabled.*	Granting this application will enable the development of the RIB scheme as regionally significant infrastructure. The RIB scheme will be a more sustainable means of achieving land disposal of treated wastewater and will therefore help to achieve this objective.
Objective 13 *Provided that:* *(a) the quantity, quality and structure of soil resources are not irreversibly degraded through land use activities or discharges to land; and* *(b) the health of people and communities is safeguarded from the adverse effects of discharges of contaminants to land and water; and* *(c) ecosystems (including indigenous biological diversity and integrity of habitats), are safeguarded,* *then land and soils may be used and developed to enable the economic, social and cultural wellbeing of the region.*	The discharge of treated wastewater to land will continue through the base of the soakage channel by design and will be retained as part of the land discharge method to be augmented by the RIB scheme. It will result in negligible effects on soil quality and structure beyond the WWTP. The effects will not be irreversible. The discharges to land will not result in adverse effects on the health of people and communities. The discharges to water may result in minimal adverse effects on the health of people if they come into contact with the water in the mixing zone, however these effects will cease soon after the RIB scheme becomes operational. The effects on ecosystems affected by the discharges will be mitigated by carefully managing the treatment process and therefore the quality of the discharge and will ultimately be avoided by removing operational discharges from the stream. A well operated WWTP significantly contributes to the economic, social and cultural wellbeing of the community. The proposed discharges are consistent with achieving this objective.
Objective 14 *The range and diversity of indigenous ecosystems and habitats within rivers, estuaries, wetlands and lakes, including their margins, and their life-supporting capacity are maintained or enhanced.*	The current discharge is assumed to be having a moderate adverse effect on ecosystems and habitats in the Meadow Burn, but an otherwise minor effect overall. Discharging a portion of the wastewater to land via the soakage channel will continue to limit the overall effect of wastewater discharges on the stream until the RIB scheme can commence. The life-supporting capacity of the river and its margin will be maintained in its current state by continuing the discharges and will be enhanced by enabling the RIB scheme to become operational. The proposed discharges will achieve this objective.
Objective 15 *Taonga species, as set out in Appendix M, and related habitats, are recognised and provided for.*	Moving the discharge to land via RIBs will more appropriately recognise and provide for taonga species present in the stream. Overall, changing to the RIB scheme will achieve this objective.

Provision	Assessment
Objective 16 *Public access to, and along, river (excluding ephemeral rivers) and lake beds is maintained and enhanced, except in circumstances where public health and safety or significant indigenous biodiversity values are at risk.*	Public access to the Meadow Burn will be maintained as at present. The proposed activity will meet this objective.
Objective 17 *Preserve the natural character values of wetlands, rivers and lakes and their margins, including channel and bed form, rapids, seasonably variable flows and natural habitats, and protect them from inappropriate use and development.*	The discharge to the Meadow Burn will not result in adverse effects on natural character values in the sense that the effects are indiscernible, and in the circumstances are not considered inappropriate. The proposed activity will meet this objective.
Objective 18 *All persons implement environmental practices that optimise efficient resource use, safeguard the life supporting capacity of the region's land and soils, and maintain or improve the quality and quantity of the region's water resources.*	The WWTP operation is consistent with good practice for single-stage oxidation ponds and will result in treated wastewater that does not cause significant adverse environmental effects when discharged. The current scheme therefore optimises the efficient use of the river for wastewater disposal. However, moving to the RIB scheme will further improve environmental and cultural outcomes, and will help to improve the quality of the Meadow Burn in the long term, while safeguarding the soil resources in proximity to the WWTP. The activity will help to achieve this objective.
Region-wide Policies - ***Ngai Tahu Policies***	
Policy 2 – Take into account iwi management plans *Any assessment of an activity covered by this plan must:* *1. take into account any relevant iwi management plan; and* *2. assess water quality and quantity based on Ngāi Tahu indicators of health.*	The assessment of effects contained in this application, and this policy assessment takes into account the provisions of *Te Tangi a Tauira* as the relevant iwi management plan. The proposed activity is consistent with Policy 2(1). The provisions of *Te Tangi a Tauira* have been assumed to provide direction on Ngāi Tahu indicators of health, supplemented by the pre-application engagement with tangata whenua by the applicant. The assessment satisfies this policy.
Policy 3 – Ngāi Tahu ki Murihiku taonga species *To manage activities that adversely affect taonga species, identified in Appendix M.*	Taonga species listed in Appendix M of the pSWLP are understood to be present downstream in the Meadow Burn, and within the Mataura River. The potential for adverse effects on these species, including their cultural health will be minimised by continuing the discharge to land via soakage channel, and ultimately by ending operational discharges to the Meadow Burn. In

Provision	Assessment
	this sense the applicant will manage the adverse effects on taonga species, and the activity will be consistent with this policy.
- **Water Quality Policies**	
Policy 13 – Management of land use activities and discharges *1. Recognise that the use and development of Southland's land and water resources, including for primary production, enables people and communities to provide for their social, economic and cultural wellbeing.* *2. Manage land use activities and discharges (point source and non-point source) to enable the achievement of Policies 15A, 15B and 15C.*	The use of land and water for wastewater treatment and disposal is fundamental to enabling the community to provide for its social, economic and cultural wellbeing insofar as the adverse effects of wastewater treatment and disposal are largely avoided or mitigated by the process. The assessment below shows that, overall the activity will be managed in a manner consistent with Policies 15A – C, and therefore the activity will be consistent with this policy.
Policy 14 – Preference for discharges to land *Prefer discharges to land, rather than direct discharges to water.*	The WWTP discharge to land via the base of the soakage channel is consistent with this policy. There are no practicable alternatives to the discharges to the Meadow Burn over the term of the consent sought until the RIB scheme is operational. As the discharge to water is a stage that will enable the discharge to the RIB scheme, the proposal overall is consistent with this policy.
Policy 15B – Improve water quality where standards are not met *Where existing water quality does not meet the Appendix E Water Quality Standards or bed sediments do not meet the Appendix C ANZECC sediment guidelines, improve water quality including by:* *1. avoiding where practicable and otherwise remedying or mitigating any adverse effects of new discharges on water quality or sediment quality that would exacerbate the exceedance of those standards or sediment guidelines beyond the zone of reasonable mixing; and* *2. requiring any application for replacement of an expiring discharge permit to demonstrate how*	The water quality of the Meadow Burn does not currently meet Appendix E standards upstream of the WWTP discharge. The short-term permit is sought as a step towards removing operational discharges from the stream. The adverse effects of the discharge on water quality will continue to be mitigated by only discharging treated wastewater, and by minimising the rate and volume of discharge through compliance with the conditions of AUTH-20147220-01. The application for this replacement permit demonstrates how the consent holder will help to improve receiving water quality, being to convert to a RIB scheme within the term of the permit sought. On that basis the proposed activity is consistent with this policy.

Provision	Assessment
and by when adverse effects will be avoided where practicable and otherwise remedied or mitigated, so that beyond the zone of reasonable mixing water quality will be improved to assist with meeting those standards or sediment guidelines.	
Policy 17A – Community sewerage schemes and on-site wastewater systems *1. Minimise adverse effects on water quality, and avoid, remedy, or mitigate other adverse effects of the operation of, and discharges from, community sewerage schemes by:* *(a) designing, operating and maintaining community sewerage schemes in accordance with recognised industry standards;* *(b) implementing measures to progressively reduce the frequency and volume of wet weather overflows from community sewerage schemes; and* *(c) ensuring community sewerage schemes are operated and maintained to minimise the likelihood of dry weather overflows occurring.*	The Riversdale WWTP has been designed and is operated and maintained in accordance with recognised industry standards for single stage oxidation-pond schemes. The applicant is implementing measures through the RIB scheme so that there will be no discharges (overflows or otherwise) from the WWTP to the Meadow Burn other than in emergency or extreme weather events. The proposed activity is therefore consistent with this policy.
- **Activities that affect water quality and quantity**	
Policy 26A – Infrastructure *Recognise and provide for the effective development, operation, maintenance and upgrading of regionally significant, nationally significant and critical infrastructure in a way that avoids where practicable, or otherwise remedies or mitigates, adverse effects on the environment.*	The WWTP is consistent with the definition of critical infrastructure, and the proposed change to a RIB scheme is principally driven by the need to avoid and minimise adverse effects on the Meadow Burn. The proposal is consistent with this policy.
- **Consideration of Resource Consent Applications**	

Provision	Assessment
Policy 40 – Determining the term of resource consents *When determining the term of a resource consent consideration will be given, but not limited, to:* *1. granting a shorter duration when there is uncertainty regarding the nature, scale, duration and frequency of adverse effects from the activity or the capacity of the resource;* *2. relevant tangata whenua values and Ngāi Tahu indicators of health;* *3. the duration sought by the applicant, plus material to support the duration sought;* *4. the permanence and economic life of any capital investment;* *5. the desirability of applying a common expiry date for water permits that allocate water from the same resource or land use and discharges that may affect the quality of the same resource;* *6. the applicant's compliance with the conditions of any previous resource consent; and* *7. the timing of development of FMU sections of this Plan, and whether granting a shorter or longer duration will better enable implementation of the any revised frameworks established in those sections.*	The nature, scale, duration and frequency of the effects of the activity are well understood as the WWTP has been operational for some time, and the applicant has undertaken appropriate receiving environment assessments and monitoring. The effects of the discharge to surface water on tangata whenua values are acknowledged and will be addressed in due course by moving the discharge to the RIB scheme. The applicant seeks a 5 year term for this discharge permit taking into account the time needed to secure the site, and to construct and commission the RIB scheme. The WWTP is a permanent part of the district's wastewater infrastructure. The cost of relocating it or providing an alternative would be prohibitive, and disproportionate to the potential benefits. The applicant has invested substantially in the infrastructure leading to the WWTP, and the scheme itself, as well as investigations to confirm that the RIB scheme is feasible on this site. There are no known water permits with expiry dates that would be appropriate to apply to this application. Section 128(1)(b) of the RMA allows regional councils to review the conditions of resource consents following rules relating to maximum and minimum water quality standards becoming operative, without any effects triggers being required. A consent term therefore does not need to take into account the development of FMU limits as any necessary changes to consent conditions can be made to ensure any future framework can be appropriately implemented. Regardless, the discharge to the Meadow Burn is expected to cease before the FMU limits are established. The proposal is consistent with this policy.

Te Tangi a Tauira

Table 6. Te Tangi a Tauira Policy Framework Assessment

Provision	Assessment
Wastewater Disposal	
Policy 3.5.2.6:	The discharge of wastewater to land from the soakage channel is consistent with this policy.

Provision	Assessment
Avoid the use of water as a receiving environment for the direct, or point source, discharge of contaminants. Even if the discharge is treated and therefore considered "clean", it may still be culturally unacceptable. Generally, all discharge must first be to land.	While the discharges to water are at odds with the direction in the policy to avoid direct or point source discharges to water, the policy also notes that 'generally' discharges should be to land first. The policy contemplates circumstances where surface water discharges may be appropriate / acceptable. In this case the interim discharge is proposed to continue to land and to water to enable the RIB scheme to be completed. In that sense the proposal is, at most inconsistent with this policy, and will become more consistent as the RIB scheme is commissioned.
Policy 3.5.2.8: *Wastewater disposal options that propose the direct discharge of treated or untreated effluent to water need to be assessed by the kaitiaki rūnanga on a case by case, individual waterway, basis. The appropriateness of any proposal will depend on the nature of the proposal, and what waterway is involved. Individual waterways possess their individual mauri and values, and kaitiaki rūnanga are in the best position to assess the potential impacts of a proposal on such values.*	The applicant has engaged with tangata whenua through Hokonui Rūnanga as kaitiaki rūnanga, and to discuss the acceptability or otherwise of the proposed activity through that engagement. The application has been prepared in a manner consistent with this policy.
Policy 3.5.2.10: *Require that the highest environmental standards are applied to consent applications involving the discharge of contaminants to land or water (e.g. standards of treatment of sewage).*	The highest environmental standards achievable for wastewater treatment is not provided by the WWTP as the cost of doing so would be prohibitive, and significantly disproportionate to the scale and nature of the effects of the current discharges. However, the WWTP process is an appropriate and practical scheme, and the permit to discharge to the Meadow Burn is sought only for the period needed to complete the RIB scheme at the WWTP. The proposal is no more than inconsistent with this policy.
Policy 3.5.2.15: *Any discharge activity must include a robust monitoring programme that includes regular monitoring of the discharge and the potential effects on the receiving environment. Monitoring can confirm system performance, and identify and remedy any system failures.*	The applicant proposes to continue with the established monitoring programme as required by the conditions of the existing discharge permits. The proposed activity is consistent with this policy.
Policy 3.5.2.17: *Duration of consent for wastewater disposal must recognise and provide for the future growth and development of the industry or community, and the ability of the existing operations to accommodate such growth or development.*	The application seeks only a five-year term as an interim measure, during which no substantial growth is anticipated. Regardless, the current WWTP has the capacity to manage any additional anticipated volumes. The proposed activity is consistent with these policies.
Policy 3.5.2.18:	

Provision	Assessment
Recommend a duration not exceeding 25 years, for discharge consents relating to wastewater disposal, with an assumption that upon expiry (if not before), the quality of the system will be improved as technological improvements become available. In some instances, a lesser term may be appropriate, with a condition requiring the system is upgraded within a specified time period.	
General Water Policies	
Policy 3.5.10.3: *Protect and enhance the mauri, or life supporting capacity, of freshwater resources throughout Murihiku.*	The conversion to discharge via the RIB scheme will help to protect and enhance the mauri of the Meadow Burn by discharging all normal operational discharges to land. However, the mauri, life supporting capacity and customary relationship of Ngāi Tahu with the stream will be better protected once the discharge to surface water ends. As the proposed activity is to continue the current discharges to water, it will result in an adverse effect on mauri and the relationship of Ngāi Tahu ki Murihiku with the Meadow Burn for the term of the consent, and hence those values will not be protected or enhanced. The proposal is contrary to these policies.
Policy 3.5.10.8: *Protect and enhance the customary relationship of Ngāi Tahu ki Murihiku with freshwater resources.*	
Rivers	
Policy 3.5.11.15: *Avoid the use of rivers as a receiving environment for the discharge of contaminants (e.g. industrial, residential, recreational or agricultural sources).*	The proposal is contrary to this policy in respect of the surface water discharge to the Meadow Burn.
Discharge to Water	
Policy 3.5.12.1: *Avoid the use of water as a receiving environment for the direct, or point source, discharge of contaminants. Even if the discharge is treated and therefore considered "clean", it may still be culturally unacceptable. Generally, all discharge must first be to land. This general policy is a baseline or starting point. From this point, the Rūnanga can assess applications on a case by case basis.*	The preference in this proposal is to discharge treated wastewater to land and avoid using rivers to receive contaminants. The policy forms a starting point for the consideration by tangata whenua of the appropriateness of discharges to rivers on a case-by-case basis, noting that 'generally all discharges must first be to land', and therefore contemplates that in some circumstances, discharges to water may be appropriate. The proposal is therefore inconsistent with, but not contrary to this policy.
Policy 3.5.12.4: *When existing rights to discharge to water come up for renewal, they must be considered in terms of alternative discharge options.*	The applicant investigated alternative discharge options at the time of applying for the permit for the RIB scheme and has since substantially invested in the RIB scheme as the most practicable alternative to the Meadow Burn discharge. Given the short term requested, the

Provision	Assessment
	purpose of the short-term consent being to enable the RIB scheme to be implemented and the previous consideration of alternatives, the proposal is consistent with this policy.
Policy 3.5.12.7: *Any discharge activity must include a robust monitoring programme that includes regular monitoring of the discharge and the potential effects on the receiving environment.*	The applicant proposes to continue with the established monitoring programme as required by the conditions of the existing discharge permits. The proposed activity is consistent with this policy.
Water Quality	
Policy 3.5.13.2: *Strive for the highest possible standard of water quality that is characteristic of a particular place/waterway, recognising principles of achievability. This means that we strive for drinking water quality in water we once drank from, contact recreation in water we once used for bathing or swimming, water quality capable of sustaining healthy mahinga kai in waters we use for providing kai.*	While discharging to an alternative receiving environment will contribute to reducing the cumulative effect of the discharge on the Meadow Burn's water quality, the stream's water quality will still not meet the intent of this policy given upstream influences. However, removing the discharge from the stream as intended will be a step toward achieving the goal. The proposed discharges are inconsistent with the intent of this policy in the short term, but aligned longer term given the purpose of the interim consents in enabling the discharge to move to the RIB scheme.
Policy 3.5.13.5: *Avoid the use of water as a receiving environment for the direct, or point source, discharge of contaminants. Generally, all discharge must first be to land.*	The discharge of wastewater to land from the soakage channel and RIB scheme is consistent with this policy. While the discharges to the Meadow Burn are at odds with the direction in the policy to avoid direct or point source discharges to water, the policy also notes that 'generally' discharges should be to land first. The policy contemplates circumstances where surface water discharges may be appropriate / acceptable. In this case the interim discharge is proposed to continue to water to enable the land-based alternative to be completed. In that sense the proposal is, at most inconsistent with this policy.
Policy 3.5.13.6: *Avoid impacts on water as a result of inappropriate discharge to land activities.*	The discharges to land are not considered to be inappropriate for the reasons set out in the application. The proposed activity is consistent with this policy.
Mahinga kai and biodiversity	
Policy 3.5.16.2: *Work towards the restoration of key mahinga kai areas and species, and the tikanga associated with managing those places and species.*	There are mahinga kai species present in the Meadow Burn, and in the Mataura River downstream. The interim permit now sought is key in providing time to implement the RIB scheme to enable operational discharges to the stream to end. In this sense, the proposal is working towards restoration of the stream's mahinga kai values and is therefore consistent with this policy.

Provision	Assessment
Policy 3.5.17.12: *Make full use of the knowledge of tangata whenua with regards to indigenous biodiversity, and the value of such knowledge in understanding how to protect and enhance biodiversity.*	The applicant has engaged with tangata whenua through the Hokonui Rūnanga to draw on their knowledge as kaitiaki rūnanga, of the values of the Meadow Burn. Accordingly, the application has been prepared in a manner consistent with this policy.

Te Rūnanga o Ngāi Tahu Freshwater Policy Statement

Table 7. Te Rūnanga o Ngāi Tahu Freshwater Policy Statement Policy Framework Assessment

Provision	Assessment
Mauri	
Objective 6.2 – Mauri *Restore, maintain and protect the mauri of freshwater resources*	The Mauri of the Meadow Burn will not be restored or protected by continuing discharges over the term sought, however it will be maintained in its current state (i.e., will not be made worse). Once the discharge ceases within the term of the permit sought, the mauri of the river will be restored to the extent that it is diminished by the discharge. The proposal will therefore contribute in the longer term to the restoration and protection of the mauri of the stream and will therefore help to achieve this objective.
Policy 6.2.4: *Protect the opportunities for Ngai Tahu's uses of freshwater resources in the future.*	The use of the Meadow Burn for cultural purposes is currently compromised by the discharge in the section below the outfall, and more generally by the water quality within the catchment. However removing the discharge as is the ultimate goal of this application will help to protect opportunities for future cultural use as affected by the discharge. The proposal is therefore consistent with this policy overall.
Objective 6.3 – Priority *To maintain vital, healthy mahinga kai populations and habitats capable of sustaining harvesting activity.*	The Meadow Burn provides habitat for some mahinga kai species. The effect of the discharge on aquatic habitat and the effect on the cultural value of the stream as a source of mahinga kai is noted. The stream's value in this regard will be maintained as at present by continuing the discharges, but overall will be enhanced by converting to the RIB scheme in time. The proposal will therefore contribute in the round to achieving this objective, and the related policies.
Policy 6.3.2: *Restore and enhance the mahinga kai values of lakes, rivers, streams, estuaries and riparian margins.*	
Policy 6.3.3: *Ensure that activities in the upper catchments have no adverse effect on mahinga kai resources in the lower catchments.*	
Policy 6.3.4:	

Provision	Assessment
Restore access to freshwater resources for cultural activities, including the harvest of mahinga kai.	

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