22/RC/45

Before Commissioner Allan Cubitt **17 May 2022**
Via Zoom digital link **9.00 am**

Staff Report for Hearing

The recommendation in the staff report represents the opinion of the writer and it is not binding on the Hearing Commissioner. The report is evidence and has no greater weight than any other evidence that the Commissioner will hear and consider.

Hearing of Application – APP-20211381
Cashmere Bay Dairy Limited
Compiled by Jade McRae, Senior Consents Officer

Applicant: Cashmere Bay Dairy Limited

Application Number: APP-20211381

Location: 145 Jaffray Road, Otamita

Activities for Consent: See Table 1 (below). A consent term of 10 years is sought for all consents.

Notification: The application was limited notified on 21 February 2022.

Table 1: Consents Sought

Consent Type	Purpose
1. Discharge Permit	To discharge agricultural effluent to land from up to 1,140 cows
2. Water Permit	To take and use 136,800 L/day of groundwater
3. Land Use Consent	To use land for a feed pad
4. Land Use Consent	To use land for farming in the form of a dairy farm expansion

1. Introduction

1.1 Status and purpose of this report

1.1.1 This report has been prepared under Section 42A of the Resource Management Act 1991 (RMA or Act) to assist the Hearing Commissioner in the hearing of the application for resource consent made by Cashmere Bay Dairy Limited. Section 42A allows local authorities to require the preparation of such a report on an application for resource consent and allows the report to be considered at any hearing conducted by the local authority.

1.1.2 In accordance with s42A (1A) and (1B), material contained within the application documentation is largely referenced rather than repeated where it is efficient to do so.

1.1.3 The purpose of the report is to assist the Hearing Commissioner in making a decision on the application.

1.2 About the author

1.2.1 My name is Jade Linda McRae. I am a Senior Consents Officer employed by the Southland Regional Council. I have been employed by the Council firstly as a Consents Officer, and now Senior Consents Officer, since January 2019.

1.2.2 I hold the qualifications of Bachelor of Science majoring in Zoology and Psychology and a Certificate in Sustainable Nutrient Management in New Zealand Agriculture (intermediate Overseer). I am an accredited decision-maker through the Ministry for the Environment Making Good Decisions course and an Associate member of the New Zealand Planning Institute.

1.2.3 The application was lodged and received by Council on 7 October 2021. I have been involved with the application since January 2022. I have also visited the site on 9 July 2021 during a pre-application meeting.

1.2.4 For completeness, I have read the Environment Court of New Zealand Practice Note 2014 Code of Conduct for expert witnesses and agree to abide by it.

1.3 Information relied on in preparation of this report

1.3.1 In preparation of this report I have had regard to the following documents:

- resource consent application;
- further information requested under Section 92(1) of the RMA;
- report commissioned under Section 92(2) of the RMA;
- the submissions on the application;
- relevant statutory instruments including:
  - Resource Management Act 1991 (RMA or Act);
  - National Environmental Standards for Freshwater Regulations 2020 (NES-F);
  - National Environmental Standards for Sources of Human Drinking Water Regulations 2007 (NES-SHDW);
  - National Policy Statement on Freshwater Management 2020 (NPS-FM);
  - Southland Regional Policy Statement 2017 (RPS);
  - Regional Water Plan for Southland, 2010 (RWPS);

- Proposed Southland Water and Land Plan, 3 April 2018 (Decisions Version – with Appeals) (PSWLP);
- Environment Court Decisions on the Proposed Southland Water and Land Plan;
- Te Tangi a Tauira (Iwi Management Plan) 2008.

1.4 Attachments

1.4.1 The following attachments form part of this report:

Attachment 1: Irricon Resource Solutions OVERSEER Nutrient Budget Review Report on behalf of Council

Attachment 2: s92(1) Further information response

Attachment 3: Clare Winifred Ryan submission

Attachment 4: Hokonui Rūnanga submission

Attachment 5: Jenny Campbell & Dave Kennedy submission

Attachment 6: Ministry of Education submission

Attachment 7: Draft consent conditions

2. The application and procedural matters

2.1 The proposed activities

2.1.1 Consents have been sought as follows:

Applicant:	Cashmere Bay Dairy Limited
Application Number:	APP-20211381
Activities for consent is sought:	**Discharge Application:** To discharge agricultural effluent to land from milking up to 1,140 cows via centre pivot, low rate cobra rain gun, K-line pods, slurry tanker or umbilical system onto 236 ha. **Water Take Application:** To take and use 136.8 m^3/day of groundwater for stock drinking and dairy shed wash down. **Land use Application:** To use land for a feed pad. **Land use Application:** To use land for farming in the form of a dairy farm expansion.

2.2 Summary of the Proposal

2.2.1 The proposed activities are outlined in the submitted applications. However, by way of brief summary, the applicant is proposing to renew its current discharge and water permits (AUTH-301811-V2 and AUTH-301812-V1), which both expire on 19 December 2022, as well as expand the dairy farm by increasing the peak milking herd by 140 cows and incorporating an 80 ha support block into the dairy platform. It also requires land use consents for an existing 1,500 m^2 feed pad, which can accommodate up to 150 cows.

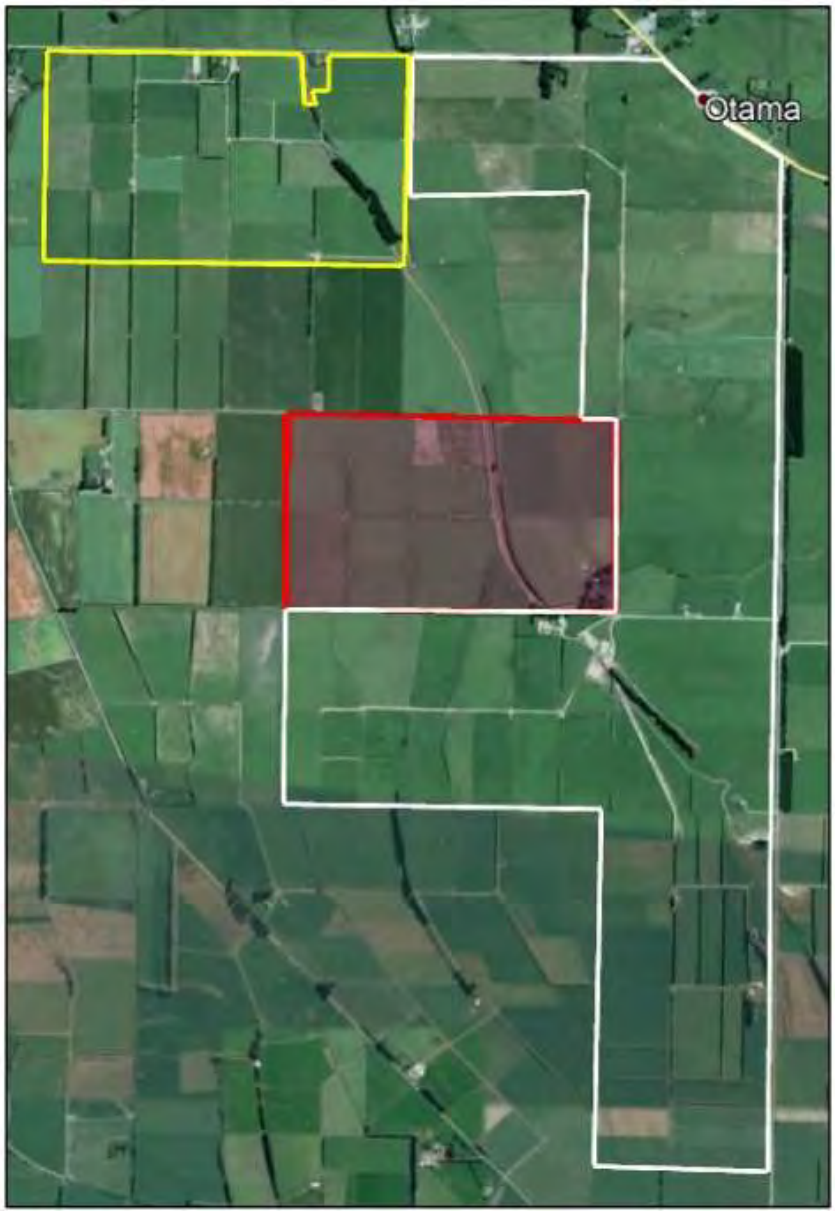


Figure 1: Map showing the locations of the Dairy Platform (white), Support Block 1 (yellow) and Support Block 2 (red) which is proposed to be incorporated into the dairy platform.

2.3 Regional Planning Framework

2.3.1 Resource consents for the above activities are required under the National Environmental Standards for Freshwater, the Regional Water Plan (RWP) and the proposed Southland Water and Land Plan (pSWLP).

2.3.2 An application for resource consents was lodged with Environment Southland in accordance with these requirements.

2.3.3 I generally concur with these assessments and summarise these as follows in Table 2 below. I note that the rules in the Proposed Plan (PP in the table below), which are subject to appeal, are greyed out.

Table 2: Activity Status of Consents Sought

Activity	Relevant Rule	Activity Status
To discharge dairy shed from up to 1,140 cows and feed pad effluent from up to 150 cows to land via centre pivot, low rate rain gun, K-line pods, umbilical system and slurry tanker.	OP: Rule 50: Discharges of dairy farm effluent to land	Restricted Discretionary activity
	PP: Rule 35: Discharge of agricultural effluent to land	Discretionary activity
To take and use 136,800 L per day of groundwater for the purpose of stock drinking and dairy shed wash down.	OP: Rule 23: Abstraction and use of groundwater	Discretionary activity
	PP: Rule 54: Abstraction and use of groundwater	Discretionary activity
To use land for a 1,500 m^2 wood material base feed pad which accommodates up to 150 cows.	NES: Regulation 14: Stockholding Areas	Discretionary activity
	PP: Rule 35A: The use of land for Feed pads/lots	Discretionary activity
To use land for farming in the form of a dairy farm expansion.	NES: Regulation 19: Conversion of land on farm to dairy farm land	Discretionary activity
	PP: Rule 20: The use of land for a farming activity	Discretionary activity

2.3.4 As the applications are bundled, the overall activity status is a **discretionary activity.**

2.3.5 Under Section 104B the Council may grant or refuse consent for a **discretionary activity**, and if it grants the application, may impose conditions under Section 108 of the RMA.

2.4 Further information request

2.4.1 Pursuant to Section 92(2) of the RMA, a request to commission an audit of, and report on, the Overseer nutrient budgets was sent to the applicant on 19 October 2021.

2.4.2 The applicant agreed to the commissioning of the report on 20 October 2021.

2.4.3 The report was received 29 October 2021 for the purpose of s92(2) is the OVERSEER Nutrient Budget Review report authored by Nicky Watt from Irricon Resource Solutions and is attached.

2.4.4 Further information was requested from the applicant on 22 November 2021. The following information was requested:

(a) a map of the proposed discharge area;
(b) the proposed rate(s) for the umbilical and slurry tanker systems;
(c) detail of any nibbing present around the calving pad to prevent both the overland flow of effluent off the pad and surface water runoff from entering the pad;
(d) confirmation of the proposed maximum number of cows on the pad at any one time;
(e) confirmation of when the pad is to be used. Is it proposed to be used for the month of August and during adverse weather events only?
(f) the Cashmere Bay OVERSEER Nutrient budget modelling report contained within the application as Appendix B provides recommendations around fertiliser use good practice. (Section 6.0 Recommendations from here). Are these adopted by the applicant?
(g) Will the current and future actions proposed by the FEMP be adopted and implemented by the target dates?
(h) Will the use of catch crops (oats) still be considered on an annual basis with proposed land use change?
(i) pages 37 and 38 of the FEMP identifies Critical Source Areas and states that in the short-term, these will be temporarily fenced to exclude stock when conditions are wet. It then goes on to detail some long-term options available to manage these. Please confirm if these long-term options will be implemented and detail how each identified CSA will be managed in the long-term;
(j) page 59 of the FEMP identifies some future Riparian Planting options and also suggests developing a riparian planting plan. Can you please confirm if a riparian planting plan is going to be developed and implemented?
(k) Is there to be further riparian planting of the pond/wetland area in paddock 69?
(l) Will the small section on the south side of paddock 69 be incorporated into the pond/wetland area of paddock 69? and if so, please provide a map showing the area to be incorporated.
(m) Is there to be further riparian planting in the section below paddock 63?
(n) Is there to be riparian planting/further riparian planting along the main creek which starts in paddock 53 and flows down to the boundary at paddock 13?
(o) if any or all of the potential mitigations identified in questions 9 to 14 above are to be implemented, please provide an estimated timeline these are expected to occur;
(p) during the on-farm pre-application meeting, we discussed the past groundwater sampling of bore F45/0172 and the potential decommissioning of the bore. Can you please provide further explanation as to how the elevated concentrations are likely from neighbouring activities? – I suggest mentioning the depth of the bore and distance from the septic tank system;
(q) also during the on-farm meeting, we were shown the fencing and riparian planting of the pond/wetland area below paddocks 63 and 64. Please provide a discussion on the arrangement of the fencing, any recent/proposed riparian planting of this area and also how this helps manage/mitigate contaminants. This should be accompanied by photographs of the site and include discussion of the CSA/swale up gradient of the pond;
(r) please provide a discussion on how the proposed activity will affect the future state of the environment. In particular, with regard to N losses and comparison between the existing activity continuing (with the required synthetic N cap) and the proposed activity occurring;

(s) an assessment of the increasing N losses modelled for Support Block 1 against the relevant regional plans, the NES and the NPS;
(t) the application states that there is a decrease in (cow) stocking rate, however the nutrient budgets show that there is an overall increase in stocking rate (RSU) on both the proposed dairy platform and the Support Block 1, from the existing operation (dairy platform + Support Block 2, and Support Block 1, respectively) to the proposed activity. Please confirm if this is correct;
(u) address the concerns regarding the Proposed model raised by the Nutrient Budget auditor in the Irricon review. Please note that this has been updated from the previous version sent through due to a couple of superficial corrections.

2.4.5 The above information was provided by the applicant (attached) on 19 January 2022.

2.5 Notification and Submissions

2.5.1 The application was publicly notified on 21 February 2022.

2.5.2 Four submissions were received. These are included in the appendices, and are summarised as follows:

Table 3: Summary of Submissions

Submitter	Oppose/ Support	Issues/comments	Decision Sought	Wish to be heard at hearing?
Hokonui Rūnanga	Oppose	Lack of engagement with mana whenua. Inconsistent with Te Mana o te Wai, NPS-FM and Te Tangi a Tauira. Proposed mitigation measures have in appropriate timeframes.	Decline the application	Yes
Jenny Campbell & Dave Kennedy	Oppose	Inadequate mitigation measures. No consideration of climate change. Degraded groundwater quality. Inconsistent with the NPS-FM, RPS and pSWLP. Lack of consultation with iwi.	Decline the application	Yes
Clare Winifred Ryan	Oppose	High groundwater nitrate levels in the area.	Decline the application	No
Ministry of Education	No formal response	Drawdown effects on Otama School groundwater bore, reduction in quality of drinking water due to discharge of contaminants.	If granted then appropriate monitoring specified as a consent condition	Yes

2.6 Section 99 pre-hearing meeting

2.6.1 No pre-hearing meeting was held for the application, as no submitters indicated they wanted to partake in one.

3. Assessment

3.1 Statutory Considerations

3.1.1 Section 104 of the Act sets out the matters to be considered when assessing an application for a resource consent. Section 104(1) of the Resource Management Act, 1991, states:

> *(1) When considering an application for a resource consent and any submission 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*
> *(b) any relevant provisions of:*
> *(i) a national environmental standard:*
> *(ii) other regulations:*
> *(iii) a national policy statement:*
> *(v) a regional 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.*

3.1.2 Those matters which are relevant for this application are discussed in the following sections as follows:

- description of the receiving environment;
- assessment of the actual and potential effect of the activity on the environment;
- relevant provisions of the Regional Water Plan and the Proposed Southland Water and Land Plan;
- relevant provisions of the Southland Regional Policy Statement;
- relevant provisions of the National Policy Statements and National Environmental Standards;
- Part 2 of the RMA.

3.1.3 Section 108 provides for consent to be granted subject to conditions and sets out the kind of conditions that may be imposed.

3.2 Description of the affected environment

3.2.1 The existing site is an operational dairy farm located approximately 14k m north west of Gore. Currently the applicant holds discharge permit AUTH-301811-V2 and water permit AUTH-301812-V1. Both these permits expire 19 December 2022. The discharge permit authorises the discharge of dairy shed effluent from 1,000 cows onto 100 ha via two centre pivots, K-line pods, cobra rain gun and umbilical system. The water permit authorises the abstraction of 120,000 L/day of groundwater.

3.2.2 The landholding is made up of the dairy platform, Support Block 1 and Support Block 2. The applicant purchased the 80 ha Support Block 2 from the neighbouring farm in June 2018. This parcel of land had been historically sheep farmed and has never been included in a dairy platform. Since the purchase in 2018, the applicant has been using this block of land for grazing beef cattle and growing winter crop. I undertook a pre-application site visit on 9 July 2021,

before the application was lodged on 7 October 2021, and at that time Support Block 2 was in crop.

3.2.3 Soils and Physiographic Zones within the property are detailed in Table 4 below.

Table 4: Soil and Physiographic Zones with the Property

	Soil Type	Vulnerability Factors		
		Structural Compaction	Nutrient Leaching	Waterlogging
Soils	Mataura	Very Severe	Moderate	Slight
	Oreti	Slight	Very Severe	Nil
	Fleming	Severe	Slight	Severe
	Jacobstown	Severe	Slight	Severe
	Gore	Moderate	Very Severe	Nil
	Pyramid	Severe	Severe	Nil
	Glenure	Very Severe	Slight	Severe
	Dipton	Severe	Slight	Severe
Physiographic Zones	Oxidising (69%) Gleyed (16%) Old Mataura (11%) Bedrock/Hill Country (4%)			

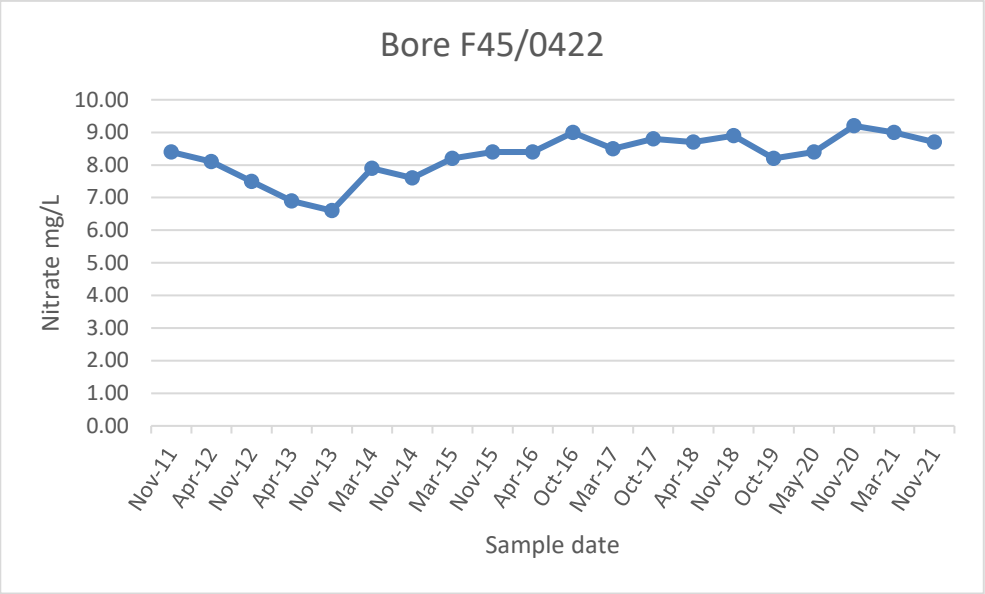
3.2.4 In the Oxidising physiographic zone, the main risk is to groundwater due to contaminant movement via deep drainage. The soils in this zone may accumulate nitrogen during the drier months and then leach into the groundwater during the wetter months.

3.2.5 Soils in the Gleyed physiographic zone are poorly drained and prone to water logging. The soils may accumulate and store nitrogen during summer and early autumn months when soil moisture levels are low. This accumulated nitrogen starts moving with water when soils become wet in late autumn and winter and may be lost via artificial drains or overland flow. However, some nitrogen will be removed from the soil and aquifers via denitrification, resulting in relatively low groundwater nitrate concentrations.

3.2.6 The Old Mataura physiographic zone poses a high risk to groundwater via deep drainage allowing water and contaminants to drain straight down to the underlying aquifers.

3.2.7 In the Bedrock/Hill Country Physiographic zone, the main risk is to surface water quality from contaminant movement via overland flow. Water and contaminants quickly flow downslope during heavy or prolonged rainfall.

3.2.8 *Groundwater quality* - There are two groundwater monitoring bore on the property, F45/0422 and F45/0172. F45/0422 (16.75 m deep) was tested 20 times between November 2011 and November 2021 with groundwater nitrate levels ranging between 6.6 mg/L and 9.2 mg/L. Monitoring bore F45/0172 (4.6 m deep) was tested 35 times between December 2010 and December 2019 and showed nitrate levels ranging between 8.8 mg/L and 24 mg/L. Of the 35 samples, the groundwater nitrate levels exceeded New Zealand Drinking Water Standards (NZDWS) 32 times. The applicant has confirmed it no longer uses F45/0172 and will decommission this bore. It also provided potential reasons for the elevated nitrate levels detected which include the bore being shallow and being located approximately 80 m south of a domestic wastewater septic tank disposal field.



3.2.9 *Surface water quality* - the surface water quality within the catchment is degraded, in particular the Mataura River at Gore sits in the worst 25% of all sites for E.coli, Total Nitrogen and Nitrate Nitrogen[1].

3.3 Actual and potential effects

3.3.1 *Effects that must be disregarded (Section 104(2))*

3.3.1.1 Policy 39 of the proposed Southland Water and Land Plan states:

"*When considering any application for resource consent for the use of land for a farming activity, the Southland Regional Council should consider all adverse effects of the proposed activity on water quality, whether or not this Plan permits an activity with that effect*".

As such, **all effects** related to the use of land for farming and the associated activities undertaken as part of the entire farming operation have been considered, and **no effects have been disregarded**.

3.3.2 *Effects to be considered* (Section 104(1)(a))

3.3.2.1 *Water Quality*

Discharge

Potential adverse effects of discharging effluent onto land include contamination of groundwater and contamination of surface waterways. The applicant has proposed good management practices that will be adopted to minimise adverse effects arising from the activity:

- storage of effluent in the sufficiently sized effluent pond (total pond volume = 1,943 m^3 and DESC 90th percentile requirement = 893m^3) when conditions are not suitable for discharge;

[1] https://www.lawa.org.nz/explore-data/southland-region/river-quality/mataura-river/mataura-river-at-gore/

- the pond is synthetically lined, has a leak detection system and has passed a Pond Drop Test;
- adhering to buffer distances from surface waterways and bores;
- avoiding irrigating over tile drains;
- application of effluent at low rates and depths; and
- use of a slurry tanker and umbilical system as required.

Land Use – Expanded dairy farm

The applicant has provided nutrient budgets of the current scenarios and proposed amalgamated scenario as required by Part B Section 4 of Appendix N in the proposed Southland Water and Land plan. These budgets have been created by Miranda Hunter, who is a Certified Nutrient Management Advisor, using the Overseer Software. Council commissioned Nicky Watt, who is a Certified Nutrient Management Advisor, to review the nutrient budgets for a "sensibility check". She has confirmed that the figures that have been used in the budgets are appropriate and that the Overseer Best Practice Data Input Standards have been followed.

Table 5 below shows the nutrient losses from the current dairy platform and current Support Block 2 combined vs the proposed scenario of Support Block 2 amalgamated in to the dairy platform. It also shows the nutrient losses from the current Support Block 1 vs proposed Support Block 1, which is not considered part of the dairy platform as it is used to graze R1 and R2 replacement heifers year round. A version change within Overseer occurred since the application was lodged resulting in changes shown in red below.

Table 5: Nutrient losses from the dairy platform and the Support blocks

	Combined platform + S2 (433.3ha)	Proposed platform (433.3ha)	Difference	Current Support 1 (89.6ha)	Proposed Support 1 (89.6ha)	Difference
N Loss to water (kg/ha/yr)	~~50~~ 52	~~45~~ 46	-11.5%	~~24~~ 25	~~26~~ 27	+8%
N Loss to water (kg/yr)	~~21,813~~ 22,688	~~19,563~~ 20,059	-11.6%	~~2,186~~ 2,282	~~2,344~~ 2,453	+7.5%
P Loss to water (kg/ha/yr)	0.9	0.8	-11.1%	~~0.3~~ 0.4	0.3	-25%
P Loss to water (kg/yr)	373	357	-4.3%	32	27	-15.6%

Table 6 below outlines a number of standard good management practices (GMPs) and additional mitigation measures, which either currently occur or are proposed to be undertaken on-farm. Each GMP/mitigation has a varying degree of effectiveness in terms of nitrogen, phosphorus, microbes (e.g. *E. coli*) and sediment loss. The mitigation measures and GMPs for the landholding have been selected based on specific characteristics of the physiographic zones and key contaminant pathways present on farm. As a result, the applicant has identified that both loss of P via overland flow and leaching of N to groundwater are concerning contaminant pathways in different areas of the property.

Table 6: Good Management Practices (GMPs) and mitigation measures which have either occurred or are proposed to be undertaken on-farm

Mitigation/GMP	Implementation timeframe	Mitigation measure or GMP?
Fence off all waterways	Done	Good management practice
Plant all riparian margins	Main creek between paddocks 53 and 13 to be completed by 2025	Good management practice
Plant wetland/pond area by paddocks 63/64 with natives	After the main creek between paddocks 53 and 13 is completed	**Mitigation measure**
Removal of beef cattle from the property	From first exercise of new consent	**Mitigation measure**
Provide sufficient effluent storage to enable deferred application	Done	Good management practice
Defer effluent application when soil conditions are unsuitable	Currently happens	Good management practice
Increased effluent discharge area	From first exercise of new consent	**Mitigation measure**
Minimising run-off from tracks, gateways, and crossings by ensuring they are designed and maintained adequately	From first exercise of new consent – culvert repairs done	Good management practice
Use of feed pad to take cows off pasture during adverse weather	From first exercise of new feed pad consent	Good management practice
Apply effluent at low rates and depths	Centre pivot, K-line pods and rain gun used	Good management practice
Avoid irrigating over tile drains	From first exercise of new consent	Good management practice
Re-sow bare soils as soon as possible	From first exercise of new consent	Good management practice
Catch crop	To be used on an as required/where practicable basis	**Mitigation measure**
Back fence stock off land that has already been grazed	From first exercise of new consent	Good management practice
Use portable water troughs and portable feeders when baleage is fed on crop paddocks.	From first exercise of new consent	Good management practice
Mob sizes less than 120 cattle when intensively winter grazing	From first exercise of new consent	Good management practice
Graze from the top to the bottom of any slope when intensively winter grazing	From first exercise of new consent	Good management practice

Mitigation/GMP	Implementation timeframe	Mitigation measure or GMP?
CSAs are identified and protected	Tile drain unblocked in paddock 77, temp fencing used in paddock 76 when wet and permanent fencing in paddock 69 and 64.	Good management practice and **mitigation measure**
Reduction in synthetic fertiliser use to 190kg/ha/yr	From first exercise of new consent	Good management practice
Fertiliser only applied if conditions are suitable	Currently occurs	Good management practice
Fertiliser application matches plant requirements	From first exercise of new consent	Good management practice
Reducing Olsen P levels to 30	From first exercise of new consent	Good management practice
Decommission bore F45/0172	From first exercise of new consent	**Mitigation measure**

Table 6 above shows which measures are identified as mitigations and which are GMPs. Overseer assumes some of the GMPs above are being used, which means some of the GMPs are already accounted for in Overseer. Others are not accounted for in Overseer and are therefore not taken into account by the budget, so they can be considered a mitigation as they represent something additional that the applicant is putting in place to mitigate the effects.

In light of the Government's Science Advisory Panel's review of the effectiveness of Overseer in assessing and predicting farm-scale nitrogen losses, and the conclusion that the current Overseer model is not fully fit for purpose in the way it is being currently used in the consenting process, mitigation measures are of the utmost importance when assessing this application. This is because they represent additional steps that can be taken to offset or compensate for the effects of the change or intensification of land use. Those crucial mitigations are:

- removal of beef cattle;
- increased native plants in wetland/pond area adjacent to paddocks 63/64 (Support 2);
- CSA directly north of the wetland/pond area permanently fenced;
- CSA in paddock 69 permanently fenced and left to regenerate in native wetland species;
- increasing the discharge area;
- catch crops; and
- decommissioning bore F45/0172.

Nitrogen

The budgets show that the N losses on the landholding are expected to decrease by 2,629 kg/year or -11.6% when the 80 ha dairy Support Block 2 is amalgamated into the platform in comparison with the current scenario. Notably though the N losses on Support Block 1 are expected to increase by 171 kg/year and by 2 kg/ha/year. The applicant has provided an explanation for the increase – "*Minimal effects from a possible increase in contaminants on Support Block 1 are in the same waterbody and same catchment as that on Support Block 2 and the milking platform where significant reductions in contaminants are proposed*."

The removal of some of the beef stock from the property is one measure the applicant has offered in order to mitigate N losses to water. However, this measure was necessary in order to provide capacity within the nutrient budget to increase the maximum dairy herd. This

measure has actually resulted in a higher revised stock units (RSU) for the proposed scenario compared to the current scenario. The RSU for the landholding for the current scenario is 13,983, whereas the RSU for the landholding for the proposed scenario is 15,031. Another factor to be considered is with an increase in the milking herd comes a need for more replacement R1s and R2s to maintain the herd at the maximum herd size. The nutrients budgets show an increase from 210 R1s to 265 R1s.

Catch crops is another measure that the applicant has offered to mitigate N losses to water. However, the applicant has also stated that it will only "*use catch crops on an as required/where practicable basis*." This suggests the applicant is not considering including this measure in consent conditions nor has it offered a condition regarding catch cropping. Therefore, I have placed less weight on this mitigation to avoid, manage or remedy the adverse effects due to the uncertainty of it occurring when excess nitrogen is available in the deep draining soils. Considering the landholding is approximately 80% deep draining and 20% overland flow, I consider the property suitable for catch crops post annual intensive winter grazing on any of the deep draining soils.

Decommissioning bore F45/0172 is another measure the applicant has offered to mitigate N losses to water. F45/0172 showed groundwater nitrate results that exceeded the New Zealand Drinking Water Standards between 2010 and 2019 when the bore stopped being tested. The applicant has agreed to decommission this bore, as it is no longer in use. This gives Council reassurance that this bore will never be used again for irrigation water or drinking water, both human and stock. However, this mitigation does not mitigate any of the actual or potential adverse effects arising from the change in land use proposed by way of this application. In short, decommissioning F45/0172 will not in itself improve water quality nor mitigate adverse effects on groundwater quality from the proposed activities.

It is also worth noting that the applicant has decreased their synthetic nitrogen fertiliser use from 268kg/ha on the platform and 244kg/ha on Support Block 1 down to below the 190kg/ha/year cap set by Regulation 33 of the National Environmental Standards for Freshwater 2020. This is obviously a significant contributor to the decrease in N losses from the landholding but I consider it should be regarded as a good management practice as opposed to a mitigation as the applicant suggests as it is a legal requirement of Regulations 32 and 33.

Phosphorus

The budgets show that the P losses on the landholding are expected to decrease by 16 kg/year or -4.3% when the 80 ha Support Block 2 is amalgamated into the platform in comparison with the current scenario.

The wetland/pond area in paddock 69 appears as though it was permanently fenced for stock protection and left to naturally regenerate more than ten years ago. This area is fed by a swale that runs through paddocks 69, 70 and 71 and has more than likely been catching phosphorus and sediment from that swale for many years. This is an important mitigation that has more than likely been improving water quality for more than a decade.

Figure 2: Wetland/pond area in paddock 69 which was fenced and left to naturally regenerate more than 10 years ago

Planting more native plants in the wetland/pond area adjacent to paddocks 63/64 and adjacent to the main dairy lane is a measure the applicant has offered to mitigate P losses to water. This is especially important as the main dairy lane that runs to the milking shed runs adjacent to this pond area and enhanced planting would filter and catch effluent and stormwater run-off from this lane. However, the applicant notes their "*current priority is to plant the area between paddocks 53 and 13 that is currently not planted*". As a result, the benefits to water quality that will arise from enhancing the planting around the wetland/pond area adjacent to the main dairy lane will be delayed while the land use activity will have commenced. However, since purchasing Support Block 2 the applicant has made an effort to permanently fence off and protect a large CSA located directly north of the wetland/pond area.

Figure 3: CSA located in Support Block 2 adjacent to paddocks 63/64 which drains directly to the wetland/pond area.

Microbes (e.g. E.coli) and sediment loss

Sediment and microbiological contaminants are not modelled within Overseer. However, Phosphorus loss modelling can be used to indicate the probability of sediment and microbiological contaminant losses. This is because phosphorus in the soil readily bonds to fine soil particles and is therefore lost to the environment via the same contaminant pathways e.g. overland flow and erosion. Microbiological contaminants are also lost to the environment by the mechanics of water flow via these same pathways. In spite of this, P loss processes are not exactly the same as microbial and sediment losses, and therefore the assessment only provides a very broad assumption of the likely losses and risks to the environment from sediment and faecal indicator bacteria. That assumption being if P losses are predicted to reduce then there is likely to be a roughly similar level of reduction in sediment and microbe losses to freshwater.

3.3.2.2 ***Water Quantity***

The applicant is proposing to increase their abstraction volume from 120 m^3/day to 136.8 m^3/day and its yearly volume from 43,800 m^3/year to 49,932 m^3/year. The increase in water abstraction is driven by the increase in milking herd size from 1,000 cows to 1,140 cows. The daily take is the equivalent to 120 L/cow/day, which is the industry standard of efficient use for shed and stock water use. The rate of abstraction is less than 2 L/sec from bore F45/0422. The groundwater zones from which the water would be taken (Croydon and Knapdale) are not over-allocated, and the proposed abstraction will not result in over-allocation. The closest waterway to the abstraction bore (F45/0422) is a small tributary of Otama Creek located 100 m north, and with the proposed maximum rate of abstraction of <2L per second, no hydraulic connection is expected. Therefore, I consider the adverse effects on water quantity to be less than minor.

3.3.2.3 ***Soil Health***

The liquid effluent disposal field is proposed to increase from 155 ha to 264 ha to include Support Block 2. The proposed discharge area is more than the area needed to meet the minimum requirement of 4 hectares per 100 cows, which is calculated to achieve a maximum loading of 150 kg of nitrogen/hectare/year from effluent irrigation and more than the 8 hectares per 100 cows as recommended in the Best Practice Guidelines Booklet[2]. Therefore, I consider the adverse effects on soil health to be less than minor.

3.3.2.4 ***Odour***

As long as the effluent is applied in accordance with the specified application rates and depths, and the buffers specified by recommended consent conditions are maintained, then there should little risk of adverse effects from odour and spray drift on surrounding landowners and occupiers. Effluent storage and wintering facilities can cause problems with odour, however, the closest dwelling on another property is located over 750 m and 600 m from the effluent storage pond and feed pad, respectively. Additionally, all facilities are more than 480 m from the property boundary. A recommended condition of consent requires that the stored or discharged agricultural effluent shall not cause any odour beyond the boundary of the site that is offensive or objectionable.

[2] Farm Dairy Effluent, Best Practice Guidelines (2007), Environment Southland

3.3.2.5 ***Mataura River***

Otama Creek and another small tributary of Otama Creek run through parts of the applicant's property and eventually join the Mataura River approximately 6 km downstream. The Mataura River is subject to the Water Conservation (Mataura River) Order 1997, which is a statutory instrument which recognises that the river is an outstanding fishery and angling feature. The Mataura River is also a Statutory Acknowledgement Area under Schedule 42 of the Ngāi Tahu Claims Settlement Act 1998, due to its cultural significance to Ngāi Tahu. The Mataura River ultimately drains to the Toetoes Estuary, which is a shallow (~2 m depth) medium sized (~500 ha) short residence, tidal river type estuary. The primary issue when it comes to Toetoes Estuary water quality is excess macro algae growth, large sediment deposition (and phosphorus which sticks to the surface of soil particles) and low oxygen conditions. The applicant proposes to, or already has, implemented GMPs and mitigations to prevent overland flow to the Mataura River. These include:

(a) riparian planting the main surface waterway that runs through the farm from paddock 53 to 13;
(b) permanently fencing the CSA north of the wetland/pond area adjacent to paddocks 63/64, as well as enhancing the wetland/pond area itself, which ultimately drains to the main surface waterway mentioned above;
(c) permanently fencing the wetland/pond area in paddock 69 and allowing it to regenerate in native wetland plant species, which also ultimately drains to the main surface waterway mentioned above;
(d) utilising the existing feed pad over winter as well as being available to accommodate cows during adverse weather conditions; and
(e) reducing the winter crop area from the current permitted baseline of 54 ha to 51.5 ha.

I do note however, I am not a suitably qualified person with regard to the scale of potential effects on the Mauri of waterbodies and I also note the concerns Hokonui Rūnanga has regarding the hauora of the Mataura River and their desire to be heard at the hearing.

3.3.3 ***Effects Conclusion***

3.3.3.1 The applicant has demonstrated that there will be sufficient storage available in the pond when the land is not suitable to discharge effluent to. The existing pond is synthetically lined, was authorised by land use consent AUTH-301813-01, has a leak detection system and has passed a pond drop test. The effluent discharge area is proposed to increase to include Support Block 2, which will accommodate the extra effluent from milking the additional cows. Effluent can be discharged at low rates and depths, which is consistent with the key policies in avoiding and mitigating effects on water quality. The water abstraction volume is considered efficient and reasonable for its end use, which is consistent with key water quantity policies. The feed pad allows the applicant to stand cows off pasture during adverse weather and the effluent generated on the pad is collected in the effluent system, which ensures it can be managed and will not flow beyond the perimeter of the pad. In my opinion, the removal of beef cattle from the property, utilising catch crops on deep draining soils to absorb excess nitrogen, riparian planting the main surface waterway and the wetland/pond area and decreasing the crop area below the permitted baseline will avoid, remedy or mitigate any potential or actual adverse effects that arise from the inclusion of 80 ha into the dairy platform.

3.3.3.2 The applicant has not sought resource consent for intensive winter grazing under the NES-F, which is currently a permitted activity under Regulations 29(6) and (7). The NES-F intensive winter grazing regulations were set to change on 1 May 2022. However, the Resource Management (National Environmental Standards for Freshwater) Amendment Regulations 2022 extended the operative date of Regulations 26 and 27 to 1 November 2022. The applicant will need to comply with any intensive winter grazing regulations that come into force subsequent to the determination of this consent application by, for example, applying for resource consent under the NEF or reducing the area of farm that is used for winter grazing to within permitted activity standards.

3.3.3.3 Overall, I consider the environmental effects will not be significantly adverse, with the exception of cultural effects. This is because there is a lack of assessment by a suitably qualified person of the potential cultural effects of the proposal so I am unable to conclude on the scale of potential effects on cultural values. I also note a number of submitters raised concern regarding elevated groundwater nitrates in the area. However, I do not consider Cashmere Bay's current or proposed activities to be the sole contributor to the elevated groundwater nitrates in the area and its proposed mitigations that target the deep drainage contaminant pathway (utilising catch crops, removing beef stock and reducing crop area) adequate to avoid, remedy or mitigate any potential or actual adverse effects on groundwater quality.

3.3.4 *Monitoring (future)*

3.3.4.1 Groundwater monitoring does currently occur on the property from bore F45/0422. Mr Ewen Rodway (Council's Environmental Scientist) was asked to assess whether the current Groundwater quality monitoring bore was still appropriate in this scenario. Mr Rodway confirmed he was happy with F45/0422 being used as the ongoing monitoring bore. Mr Rodway also noted "*Nitrate concentrations are very high especially considering the depth of F45/0422. Significant changes in land use management are likely required to reduce these. I suspect shallower groundwater would have higher N concentrations in this vicinity. The results so far appear consistent indicating that the bore is effectively providing a representative sample of surrounding groundwater and does not appear to be impacted by obvious point source contamination. There is greater uncertainty about the area contributing to the water quality in the bore (the capture zone) this is predominantly due to the depth but I am satisfied with the location of the bore relative to the proposed activity*."

3.3.4.2 Should consent be granted, it is recommended that three compliance inspections be carried out on the property per year. These inspections will be added as an advice note to the discharge permit and farming land use consent for the landholding. The number of inspections required is in my opinion appropriate because:

- most dairy farms in Southland have two or three routine compliance inspections each year;
- the applicant is proposing to winter the entire herd on 51.5 ha of crop and grass and baleage; and
- the feed pad will be utilised for up to 150 cows during the months of August and September.

3.3.5 *Consideration of Alternatives*

3.3.5.1 The application included an assessment of alternatives for the change of land use for Support Block 2 and the discharge activity. The alternatives included continuing operations on Support Block 2, as they currently exist, and alternative methods of discharge to water and discharge to land on an "as required" basis regardless of the conditions.

3.3.5.2 The applicant considered "*If the applicant was to continue as is, wintering the majority of the milking herd on Support Block 2, there would be less opportunity for crop location selection and sustainable crop rotation. Nutrient losses would be higher and adverse effects on the environment would be considered more likely than under the proposed scenario*". The applicant considers discharge on an "as required" basis "*would likely result in over saturation of soils, ponding, overland flow and/or excessive leaching of contaminants, all of which can lead to significant adverse environmental effects*". The applicant also considers discharge to water would result in significant adverse effects on the environment. The consideration of alternatives is addressed further in this report in the section on Section 105 of the RMA.

3.4 Relevant provisions of the relevant regional plan objectives, policies and rules (Section 104(1)(b)(v))

3.4.1 At present, both the Regional Water Plan for Southland and the proposed Southland Water and Land Plan are in effect. The Regional Water Plan is operative. The proposed Southland Water and Land Plan has been through the notification, submission and hearing stages, and is currently before the Court with regard to decisions on appeals.

3.4.2 For completeness, if there is a conflict between the planning framework of the Regional Water Plan for Southland and the proposed Southland Water and Land Plan, I consider greater weight should be placed on the proposed Southland Water and Land Plan framework. This is because the proposed Southland Water and Land Plan is a more recent planning document, which has been developed under the National Policy Statement for Freshwater Management and has been through a submissions and hearing process where the majority of the objectives have been resolved.

3.4.3 Both plans pre-date the NPSFM 2020 so may not fully give effect to it. Therefore, regard should be given to the higher order document.

3.4.4 **Regional Water Plan (2010)**

The application is not inconsistent with the relevant objectives and policies of the Regional Water Plan. The following objectives and policies in the Regional Water Plan for Southland are of particular relevance to this application:

Water Quality

Objective 2 *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.*

Objective 3 *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;
(c) stock drinking water;
(d) Ngāi Tahu cultural values, including mahinga kai;
(e) natural character including aesthetics.

Objective 4 *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

Policy 6

(a) Use non-regulatory methods, in addition to rules, to maintain and enhance surface water and groundwater quality, and to avoid, remedy or mitigate adverse effects on soil quality.
(b) Assess on an ongoing basis whether the adoption of non-regulatory methods has resulted in improvements to water or soil quality, and consider the introduction of other interventions if improvements have not resulted.

Policy 7 *Prefer discharges to land over discharges to water where this is practicable and the effects are less adverse.*

Policy 13 *Avoid the point source discharge of raw sewage, foul water and untreated agricultural effluent to water.*

Policy 25 *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.*

Water Quantity

Objective 5 *To have sufficient water to support the reasonably foreseeable needs of current and future generations and enable people and communities to provide for their social, economic and cultural wellbeing while protecting aquatic ecosystem health, life supporting capacity, natural character and historic heritage values of surface water bodies.*

Objective 7 *To maximise the efficiency of water use.*

Objective 9 *To ensure that the total volume and rate of groundwater abstraction is sustainable.*

Policy 21 *To ensure that the rate of abstraction and abstraction volumes specified on water permits to take and use water are no more than reasonable for the intended end use.*

Policy 22 *Require, where appropriate, the installation of water measuring devices on all new permits to take and use water.*

Policy 23 *Impose a condition enabling the review of consent conditions in accordance with Sections 128 and 129 of the Resource Management Act 1991 on all new permits to take and use water*

Policy 28 *To manage groundwater abstraction to avoid significant adverse effects on:*

- *long-term aquifer storage volumes*
- *existing water users*
- *surface water flows and aquatic ecosystems and habitats*
- *groundwater quality*

Policy 29 *Manage the stream depletion effect of any groundwater abstraction with a rate of take exceeding 2 litres per second.*

Policy 30 *Use a staged management approach to allocate groundwater for abstraction in Southland to allow the knowledge gained by the progressive development of the region's groundwater resources to be built into its future management and recognise and assess the different characteristics of aquifer types.*

Land and Soils

Objective 9A *To manage discharges onto or into land so that the quality and structure of soil resources are maintained.*

Policy 31A *Match the level of management that is required for discharges of contaminants onto or into land to the level of environmental risk posed by the following risk factors:*

(a) *nature and quantity of contaminants in the discharge*
(b) *sloping land*
(c) *soils with artificial drainage or coarse structures*
(d) *soils with impeded drainage or low infiltration rates*
(e) *well drained soils*
(f) *climate*
(g) *proximity to groundwater*
(h) *proximity to surface water*
(i) *soil's current physical, chemical and biological characteristics and its potential to leach nutrients*
(j) *natural hazards (for example, flooding and erosion).*

Policy 31C *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.

Policy 31D *Encourage the beneficial reuse of materials where this is appropriate, and promote discharges of these materials onto or into land to maximise the potential reuse of the nutrients and water contained in the discharge.*

Term and granting of Consent

Policy 14A *To determine the term of a water permit consideration will be given, but not limited, to:*

(a) the degree of certainty regarding the nature, scale, duration and frequency of adverse effects from the activity;
(b) the level of knowledge of the resource;
(c) relevant tangata whenua values
(d) the allocation sought, particularly the proportion of the resource sought;
(e) the duration sought by the applicant, plus material to support the duration sought;
(f) the permanence and economic life of the activity;
(g) capital investment in the activity;
(h) monitoring and review requirement in permit conditions;
(i) the desirability of applying a common expiry date for water permits that allocate water from the same resource; and
(j) the applicant's compliance with the conditions of the previous permit (where a new water permit is sought for a previously authorised activity).

Policy 14B *In addition to the matters specified in section 104 of the Act, when considering a water permit application for a previously authorised activity where:*

(a) the status of the activity has altered solely as a consequence of subsequent permits being granted to increase allocation from that resource;
(b) the activity and knowledge of its adverse effects are the same or similar in character, intensity, and scale to that which existed previously; and
(c) the adverse environmental effects of the activity are not significant.

Policy 43 *Match consent duration and inspection and audit requirements on resource consents to apply farm dairy effluent to land to the level of risk of adverse environmental effects.*

Agricultural Effluent

Policy 41 *Avoid adverse effects on water quality, and avoid as far as possible other adverse environmental effects, associated with the location, design, construction, operation and maintenance of agricultural effluent ponds.*

Policy 42 *Avoid adverse effects on water quality and other adverse environmental effects associated with the application of farm dairy effluent to land by matching farm dairy effluent management to receiving environment risk.*

Comment

The groundwater nitrate under the property and within the surrounding area do exceed the New Zealand Drinking Water standards according to results obtained from bore F45/0172 on the applicant's property and bore F45/0343 on the neighbouring property down gradient to the south east. However, I do not consider Cashmere Bay's discharge and land use activities the sole contributor to the groundwater nitrate levels detected from the neighbouring bore. This is because the neighbouring property and the property located in between are both dairy farms with discharge areas up gradient of bore F45/0343. Additionally, when the applicant's bore, F45/0172, is disregarded due to its close proximity down gradient to an existing domestic wastewater septic tank disposal field, the groundwater nitrate results on-farm, and down gradient for approximately 12 km to the township of Gore, show nitrate levels ranging from 1.0 mg/L to the New Zealand Drinking Water Standard limit of 11.3mg/L. I consider the applicant's mitigation that target the deep drainage contaminant pathway (utilising catch crops, removing beef stock and reducing crop area) consistent with Policy 25.

The proposed discharge is to land rather than water, and is expected to appropriately mitigate any potential adverse effects on water quality through the provision of low rate discharge, buffers to surface waterbodies and sufficient effluent storage. The current effluent storage pond is appropriately located, designed and constructed with a leak detection system and synthetic liner and has appropriate capacity for the proposed increase in milking herd size. The discharge will include conditions relating to ongoing maintenance and operation of the pond such as annual visual inspections of the pond when empty and ensuring there is always 0.5 m freeboard available. The level of risk is taken into consideration, including in relation to recommending compliance monitoring. The proposed water abstraction will not exceed 2 L/s so is not expected to result in stream depletion and will not result in full allocation or over-allocation of the groundwater zone. The volume of water the applicant is seeking is deemed an efficient use of water at 120 L/cow/day. Furthermore, the applicant has the ability to use a recycled greenwash which maximises the efficiency of water use. The water permit will include a condition relating to the installation of a water meter and a review condition. The term of consent is considered in Section 4.2 below.

3.4.5 Proposed Southland Water and Land Plan (2018)

The application is not inconsistent with the relevant objectives of the Proposed Southland Water and Land Plan. The following provisions are relevant to the application and are considered in turn below.

Interpretation Statement
All persons exercising functions and powers under this Plan and all persons who use, develop or protect resources to which this Plan applies shall recognise that:

(i) Objectives 1 and 2 are fundamental to this plan, providing an overarching statement on the management of water and land, and all objectives are to be read together and considered in that context; and
(ii) the plan embodies ki uta ki tai and upholds Te Mana o Te Wai and they are at the forefront of all discussions and decisions about water and land.

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.*

Objective 3 *Water and land are recognised as enablers of the economic, social and cultural wellbeing of the region.*

Ngāi Tahu
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).*

Objective 4 *Tangata whenua values and interests are identified and reflected in the management of freshwater and associated ecosystems.*

Policy 1 *Enable Papatipua Runanga to effectively undertake their Kaitiaki responsibilities in freshwater and land management through the methods listed in the Policy*.

Policy 2 *Take into account Iwi Management Plans.*

Comment
Te Tangi a Tauira, and the views of Te Rūnanga o Ngāi Tahu and Hokonui Rūnanga have been taken into account in assessing the application. According to the applicant, Hokonui Rūnanga have been involved in the application process since it was publicly notified and have had subsequent discussions with the applicant to address the concerns raised in Hokonui Rūnanga's submission, including offering a site visit. Te Ao Marama Inc, on behalf of Hokonui Rūnanga, was also involved in the consultation phase and development of the pSWLP objectives and policies. It is noted in this context that Hokonui Rūnanga submitted and wishes to be heard in relation to this application.

Physiographic Zone
Policy 6 *In the Gleyed and Bedrock/Hill Country physiographic zones avoid, remedy or mitigate adverse effects on water quality from contaminants, by:*
1. *requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via artificial drainage and overland flow where relevant; and*
2. *having particular regard to adverse effects on water quality from contaminants transported via artificial drainage and overland flow*

where relevant when assessing resource consent applications and preparing or considering Farm Environmental Management Plans.

Policy 9 *In the Old Mataura physiographic zone avoid, remedy or mitigate adverse effects on water quality from contaminants, by:*

1. *requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via deep drainage;*
2. *having particular regard to adverse effects on water quality from contaminants transported via deep drainage when assessing resource consent applications and preparing or considering Farm Environmental Management Plans; and*
3. *decision makers generally not granting resource consents for additional dairy farming of cows or additional intensive winter grazing where contaminant losses will increase as a result of the proposed activity.*

Policy 10 *In the Oxidising physiographic zone avoid, remedy or mitigate adverse effects on water quality from contaminants, by:*

1. *requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via deep drainage, and overland flow and artificial drainage where relevant;*
2. *having particular regard to adverse effects on water quality from contaminants transported via deep drainage, and overland flow and artificial drainage where relevant when assessing resource consent applications and preparing or considering Farm Environmental Management Plans; and*
3. *decision makers generally not granting resource consents for additional dairy farming of cows or additional intensive winter grazing where contaminant losses will increase as a result of the proposed activity.*

Comment

The physiographic zones relate to the classification of land and risks to water quality based on factors including soil types, landscape classification, climate, topography and water chemistry. These have been developed to better understand Southland's water and why the quality is better in some areas than others. These policies are particularly relevant to land use activities such as farming.

The mitigations proposed by the applicant target both the overland flow and deep drainage contaminant pathways, such as riparian planting, protecting CSAs, utilising catch crops, reducing winter crop area below the permitted baseline and removing beef cattle from the property. Furthermore, consent conditions will require the applicant to reduce Olsen P to agronomic optimum and reduce synthetic nitrogen fertiliser to below the NES-F cap of 190 kg/ha/year, which both target the contaminant pathways mentioned in Policies 6, 9 and 10 above.

Water Quality

Objective 6 *Water quality in each freshwater body, coastal lagoon and estuary will be:*

(a) maintained where the water quality is not degraded; and

(b) improved where the water quality is degraded by human activities.

Objective 8

(a) The quality of groundwater that meets both the Drinking Water Standards for New Zealand 2005 (revised 2008) and any freshwater objectives, including for connected surface water bodies, established under Freshwater Management Unit processes is maintained; and

(b) The quality of groundwater that does not meet Objective 8(a) because of the effects of land use or discharge activities is progressively improved so that:

(1) groundwater (excluding aquifers where the ambient water quality is naturally less than the Drinking Water Standards for New Zealand 2005 (revised 2008)) meets the Drinking Water Standards for New Zealand 2005 (revised 2008); and

(2) groundwater meets any freshwater objectives and freshwater quality limits established under Freshwater Management Unit processes.

Policy 13

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.

Policy 14 *Prefer discharges of contaminants to land over discharges of contaminants to water, unless adverse effects associated with a discharge to land are greater than a discharge to water. Particular regard shall be given to any adverse effects on cultural values associated with a discharge to water*

Policy 15B *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 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 16

1. *Minimising the adverse environmental effects (including on the quality of water in rivers, coastal lakes, lagoons, tidal estuaries, salt marshes and coastal wetlands, and groundwater) from farming activities by:*
   - *(a) strongly discouraging the establishment of new dairy farming or new intensive winter grazing activities in close proximity to Regionally Significant Wetlands and Sensitive Waterbodies identified in Appendix A;*
   - *(b) ensuring that, in the interim period prior to the development of freshwater objectives under Freshwater Management Unit processes, applications to establish new, or further intensify existing, dairy farming of cows or intensive winter grazing activities will generally not be granted where:*
     - *i) the adverse effects, including cumulatively, on the quality of groundwater, or water in lakes, rivers, artificial or modified water courses, tidal estuaries, salt marshes and wetlands cannot be avoided or fully mitigated; or*
     - *ii) existing water quality is already degraded to the point of being over-allocated; or*
     - *iii) water quality does not meet the Appendix E Water Quality Standards or bed sediments do not meet Appendix C ANZECC sediment guidelines; and*
   - *(c) ensuring that, after the development of freshwater objectives under Freshwater Management Unit processes, applications to establish new, or further intensify existing, dairy farming of cows or intensive winter grazing activities:*
     - *i) will generally not be granted where freshwater objectives are not being met; and*
     - *ii) where freshwater objectives are being met, will generally not be granted unless the proposed activity will maintain the overall quality of groundwater and water in lakes, rivers, artificial and modified watercourses, wetlands, tidal estuaries and salt marches.*
2. *Requiring all farming activities, including existing activities, to:*
   - *(a) implement a Farm Environmental Management Plan, as set out in Appendix N;*
   - *(b) actively manage sediment run-off risk from farming and hill country development by identifying critical source areas and implementing practices including setbacks from waterbodies, wetlands, riparian planting, limits on areas or duration of exposed soils and the prevention of stock entering the beds of surface waterbodies;*
   - *(c) manage collected and diffuse run-off and leaching of nutrients, microbial contaminants and sediment through the identification and management of critical source areas within individual properties.*
3. *When considering a resource consent application for farming activities, consideration should be given to the following matters:*
   - *(a) whether multiple farming activities (such as cultivation, riparian setbacks, and winter grazing) can be addressed in a single resource consent; and*

(b) granting a consent duration of at least 5 years.

Effluent Management

Policy 17

1. Avoid significant adverse effects on water quality, and avoid, remedy or mitigate other adverse effects of the operation of, and discharges from, agricultural effluent management systems.

2. Manage agricultural effluent systems and discharges from them by:

(a) designing, constructing and locating systems appropriately and in accordance with best practice;
(b) maintaining and operating agricultural effluent systems in accordance with best practice guidelines;
(c) avoiding any surface run-off or overland flow, ponding or contamination of water, including sub-surface drainage, resulting from the application of agricultural effluent to pasture; and
(d) avoiding the discharge of untreated agricultural effluent to water.

Comment

The groundwater nitrate under the property and within the surrounding area do exceed the New Zealand Drinking Water standards according to results obtained from bore F45/0172 on the applicant's property and bore F45/0343 on the neighbouring property down gradient to the south east. However, I do not consider Cashmere Bay's discharge and land use activities the sole contributor to the groundwater nitrate levels detected from the neighbouring bore. This is because the neighbouring property and the property located in between are both dairy farms with discharge areas up gradient of bore F45/0343. Additionally, when the applicant's bore, F45/0172, is disregarded due to its close proximity down gradient to an existing domestic wastewater septic tank disposal field, the groundwater nitrate results on-farm, and down gradient for approximately 12 km to the township of Gore, show nitrate levels ranging from 1.0 mg/L to the New Zealand Drinking Water Standard limit of 11.3 mg/L. I consider the applicant's mitigation that target the deep drainage contaminant pathway (utilising catch crops, removing beef stock and reducing crop area) consistent with Objective 8.

The landholding is not located within close proximity of any Regionally Significant Wetlands or Sensitive Waterbodies. The applicant's nutrient budgets show an overall reduction in contaminants when the proposed scenario is compared to the current scenario. The applicant has proposed mitigations in order to avoid or mitigate any adverse effects on water quality such as riparian planting, protecting CSAs, utilising catch crops, reducing winter crop area below the permitted baseline and removing beef cattle from the property. The landholding has an up-to-date Farm Environmental Management Plan, which was prepared in accordance with Appendix N of the Southland Water and Land Plan (Decisions Version). The effluent storage facility is appropriately located, designed and constructed with a synthetic liner and leak detection system, is of appropriate capacity and has passed a pond drop test to prove it is not leaking. As a result of the above, I consider the proposal is consistent with Objective 6 and Policies 13, 14, 15B, 16 and 17.

Water Quantity

Objective 11 *The amount of water abstracted is shown to be reasonable for its intended use and water is allocated and used efficiently.*

Objective 12 *Groundwater quantity is sustainably managed, including safeguarding the life-supporting capacity, ecosystem processes and indigenous species of surface water bodies where their flow is, at least in part, derived from groundwater.*

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.

Policy 20 *Manage the taking, abstraction, use, damming or diversion of surface water and groundwater so as to:*

1A. recognise that the use and development of Southland's land and water resources, including for primary production, can have positive effects including enabling people and communities to provide for their social, economic and cultural wellbeing;

1. avoid, remedy or mitigate adverse effects from the use and development of surface water resources on:

(a) the quality and quantity of aquatic habitat, including the life supporting capacity and ecosystem health and processes of water bodies;

(b) natural character values, natural features, and amenity, aesthetic and landscape values;

(c) areas of significant indigenous vegetation and significant habitats of indigenous fauna;

(d) recreational values;

(e) the spiritual and cultural values and beliefs of tangata whenua;

(f) water quality, including temperature and oxygen content;

(g) the reliability of supply for lawful existing surface water users, including those with existing, but not yet implemented, resource consents;

(h) groundwater quality and quantity; and

(j) mātaitai, taiāpure and nohoanga;

2. avoid, remedy or mitigate significant adverse effects from the use and development of groundwater resources on:

(a) long-term aquifer storage volumes;

(b) the reliability of supply for lawful existing groundwater users, including those with existing, but not yet implemented, resource consents;

(c) surface water flows and levels, particularly in spring-fed streams, natural wetlands, lakes, aquatic ecosystems and

habitats (including life supporting capacity and ecosystem health and processes of water bodies) and their natural character; and

(d) water quality;

3. ensure water is used efficiently and reasonably by requiring that the rate and volume of abstraction specified on water permits to take and use water are no more than reasonable for the intended end use following the criteria established in Appendix O and Appendix L.4.

Policy 21 *Manage the allocation of surface water and groundwater by:*

1. determining the primary allocation for confined aquifers not identified in Appendix L.5, following the methodology established in Appendix L.6;

2. determining that a water body is fully allocated when the total volume of water allocated through current resource consents and permitted activities is equal to either:

(a) the maximum amount that may be allocated under the rules of this Plan, or

(b) the provisions of any water conservation order;

3. enabling secondary allocation of surface water and groundwater subject to appropriate surface water environmental flow regimes, minimum lake and wetland water levels, minimum groundwater level cutoffs or seasonal recovery triggers, to ensure:

(a) long-term aquifer storage volumes are maintained; and

(b) the reliability of supply for existing groundwater users (including those with existing resource consents for groundwater takes that have not yet been implemented) is not adversely affected.

Policy 22 *Manage the effects of surface and groundwater abstractions by:*

1. avoiding allocating water to the extent that the effects on surface water flow would not safeguard the mauri of that waterway and mahinga kai, taonga species or the habitat of trout and salmon, in accordance with Appendix K;

2. ensuring interference effects are acceptable, in accordance with Appendix L.3; and

3. utilising the methodology established in Appendix L.2 to: (a) manage the effects of consented groundwater abstractions on surface water bodies; and (b) assess and manage the effects of consented groundwater abstractions in groundwater management zones other than those specified in Appendix L.5.

Comment

The proposed water abstraction will not exceed 2 L/s, so is not expected to result in stream depletion. The aquifer has been identified in Appendix L.5 and the proposed abstraction will not result in full allocation or over-allocation of that aquifer. The volume of water the applicant is seeking is deemed a reasonable and efficient use of water at 120 L/cow/day. The water permit will include a condition relating to the installation of a water meter and a review condition.

Freshwater Management Unit Policies

Policy 44 *Te Mana o te Wai is recognised at a regional level by tangata whenua and the local community identifying values held for, and associations with, a particular water body and freshwater management unit.*

Particular regard will be given to the following values, alongside any additional regional and local values determined in the Freshwater Management Unit limit setting process:

- *Te Hauora o te Wai (the health and mauri of water);*
- *Te Hauora o te Tangata (the health and mauri of the people);*
- *Te Hauora o te Taiao (the health and mauri of the environment);*
- *Mahinga kai;*
- *Mahi māra (cultivation);*
- *Wai Tapu (Sacred Waters);*
- *Wai Māori (municipal and domestic water supply);*
- *Āu Putea (economic or commercial value);*
- *He ara haere (navigation).*

Policy 45 *In response to Ngāi Tahu and community aspirations and local water quality and quantity issues, FMU sections may include additional catchment-specific values, objectives, policies, attributes, rules and limits which will be read and considered together with the Region-wide Objectives and Region-wide Policies. Any provision on the same subject matter in the relevant FMU section of this Plan prevails over the relevant provision within the Region-wide Objectives and Region-wide Policy sections, unless it is explicitly stated to the contrary.*

As the FMU sections of this Plan are developed in a specific geographical area, FMU sections will not make any changes to the Region-wide Objectives or Region-wide Policies.

Policy 46 *The FMU Sections of this Plan are based on the following identified Freshwater Management Units for Southland, as shown on Map Series 6: Freshwater Management Units:*

- *Fiordland and Islands;*
- *Aparima and Pourakino – Jacobs River Estuary;*
- *Mataura – Toetoes Harbour;*
- *Ōreti and Waihopai – New River Estuary; and*
- *Waiau – Waiau Lagoon.*

Comment

The above provisions relate to the identification of Freshwater Management Units and the subsequent development of polices and rules. As part of this process, water quality and quantity limits will be set for each unit. This is part of the process of addressing water quality and the direction provided by the NPS for Freshwater Management 2020.

Term and Consideration of Consent

Policy 39 *When considering any application for resource consent for the use of land for a farming activity, the Southland Regional Council should consider all adverse effects of the proposed activity on water quality, whether or not this Plan permits an activity with that effect.*

Policy 39A *When considering the cumulative effects of land use and discharge activities within whole catchments, consider:*

1. *the integrated management of freshwater and the use and development of land including the interactions between freshwater, land and associated ecosystems (including estuaries); and*
2. *through the Freshwater Management Unit process, facilitating the collective management of nutrient losses, including through initiatives such as nutrient user groups and catchment management groups.*

Policy 40 *When determining the term of a resource consent consideration will be given to a range of factors, fully listed in the policy.*

Policy 41 *Consider the risk of adverse environmental effects occurring and their likely magnitude when determining requirements for auditing and supply of monitoring information on resource consents*

Policy 42 *When considering resource consent applications for water permits to take and use water:*

1. *except for non-consumptive uses, consent will not be granted if a water body is over allocated or fully allocated; or to grant consent would result in a water body becoming over allocated or would not allow an allocation target for a water body to be achieved within a time period defined in this Plan;*
2. *except for non-consumptive uses, consents replacing an expiring resource consent for an abstraction from an over-allocated water body will generally only be granted at a reduced rate, the reduction being proportional to the amount of over-allocation and previous use, using the method set out in Appendix O;*
3. *installation of water measuring devices will be required on all new permits to take and use water and on existing permits in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010;*
4. *where appropriate, minimum level or flow cut-offs and seasonal recovery triggers on resource consents for groundwater abstraction will be imposed; and*
5. *conditions will be specified relating to a minimum flow or level, or environmental flow or level regime (which may include flow sharing), in accordance with Appendix K, for all new or replacement resource consents (except for water permits for non-consumptive uses, community water supplies and water bodies subject to minimum flow and level regimes established under any water conservation order) for:*
   (a) surface water abstraction, damming, diversion and use; and
   (b) groundwater abstraction in accordance with Policy 23.

Comment
Term of consent, and in particular the full range of factors in Policy 40, is considered in Section 4.2 below.

Conclusion to Policy Assessment – Regional Plans
The activities have been considered against all relevant provisions of the RWP and the pSWLP. The key policies from the RWP relate to water quality, soil health and water quantity. I consider that the proposed activities are consistent with these provisions. The key policies in the pSWLP relate to the physiographic zones which the site is located in and directions around maintaining and/or improving water quality. I consider that the proposed activities are generally consistent with these provisions.

3.5 Relevant provisions of the Southland Regional Policy Statement (Section 104(1)(b)(v))

3.5.1 The Southland Regional Policy Statement 2017 became operative on 9 October 2017. It pre-dates the NPSFM 2020, so may not fully give effect to it. Therefore, regard should be given to the higher order document.

3.5.2 The following objectives and policies in the Regional Policy Statement are of particular relevance to this application:

Tangata Whenua

Objective TW.1 *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.*

Objective TW.2 *All local authority resource management processes and decisions take into account iwi management plans.*

Policy TW.1 *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.*

Policy TW.2 *Actively foster partnerships and relationship agreements between local authorities and tangata whenua.*

Policy TW.3 *Take iwi management plans into account within local authority resource management decision making processes.*

Policy TW.4 *When making resource management decisions, ensure that local authority functions and powers are exercised in a manner that:*

(a) recognises and provides for:

(i) traditional Māori uses and practices relating to natural resources (e.g. mātaitai, kaitiakitanga, manaakitanga, matauranga, rāhui, wāhi tapu, taonga raranga);

(ii) the ahi kā (manawhenua) relationship of tangata whenua with and their role as kaitiaki of natural resources;

(iii) *mahinga kai and access to areas of natural resources used for customary purposes; (iv) mauri and wairua of natural resources;*
(v) *places, sites and areas with significant spiritual or cultural historic heritage value to tangata whenua;*
(vi) *Māori environmental health and cultural wellbeing.*

(b) *recognises that only tangata whenua can identify their relationship and that of their culture and traditions with their ancestral lands, water, sites, wāhi tapu and other taonga.*

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.*

Policy WQUAL.1
(a) *Identify values of surface water, groundwater, and water in coastal lakes, lagoons, tidal estuaries, salt marshes and coastal wetlands, and formulate freshwater objectives in accordance with the National Policy Statement for Freshwater Management 2014; and*
(b) *Manage discharges and land use activities to maintain or improve water quality to ensure freshwater objectives in freshwater management units are met.*

Policy WQUAL.2 Maintain or improve water quality, having particular regard to the following contaminants:

(a) *nitrogen;*
(b) *phosphorus;*
(c) *sediment;*
(d) *microbiological contaminants.*

Policy WQUAL.3 Identify and protect the significant values of wetlands and outstanding freshwater bodies.

Policy WQUAL.5 Improve water quality by:

(a) *identifying water bodies that are not meeting freshwater objectives, including identifying priority freshwater management units;*
(b) *specifying targets to improve water quality within those water bodies within defined timeframes;*
(c) *implementing management frameworks to meet the targets taking into account;*
(i) *the values supported by the water body/ies;*
(ii) *national or legislative standards and requirements;*
(iii) *the benefits and costs associated with achieving improvement in water quality*

Policy WQUAL.7 *Recognise the social, economic and cultural benefits that may be derived from the use, development or protection of water resources.*

Policy WQUAL.8 *Prefer discharges of contaminants to land over discharges of contaminants to water, where*
- *(a) a discharge to land is practicable*
- *(b) the adverse effects associated with a discharge to land are less than a discharge to water.*

Policy WQUAL.11 *Avoid, as far as practicable, remedy or mitigate the risks that the adverse effects of land use activities and discharges of contaminants have on the sources of community water supplies.*

Policy WQUAL.13 *Continue to improve knowledge and understanding of water resources, and the relationship of land use activities with water quality values in water bodies, in Southland to promote the sustainable management of water.*

Water Quantity

Objective WQUAN.1 Flows, levels and allocation regimes of surface water and groundwater in the region are developed in accordance with the National Policy for Freshwater Management 2014 to:
- *(a) safeguard the life-supporting capacity of water, catchments and related ecosystems;*
- *(b) support the maintenance or improvement of water quality in accordance with Policy WQUAL.1;*
- *(c) meet the needs of a range of uses, including the reasonably foreseeable social, economic and cultural needs of future generations;*
- *(d) comply with limits or targets set to achieve freshwater objectives.*

Objective WQUAN.2 The allocation and use of Southland's water resources is efficient.

Policy WQUAN.2 *Avoid over-allocation of surface water and groundwater, and resolve any historical instances of over allocation, while recognising the special provisions made for the Waiau catchment.*

Policy WQUAN.6
- *(a) Ensure that any water taken from surface water or groundwater is used efficiently.*
- *(c) Where fresh water bodies are approaching full allocation, consider establishing management provisions to maximise the efficiency of using any available water.*

Rural Land and Soils

Objective RURAL.1 Sustainable use of rural land resource Achieve sustainable use of Southland's rural land resource, in respect of:
- *(a) agriculture and primary sector activities;*
- *(b) subdivision, use and development activities;*
- *(c) earthworks and vegetation clearance activities;*
- *(d) the use of soil resources;*
- *(e) mineral extraction activities; and*
- *(f) on-site wastewater systems.*

Objective RURAL.2 Life-supporting capacity of soils Safeguard the life-supporting capacity, mauri and health of soils in rural areas, and prevent or minimise soil erosion and sedimentation from land use soil disturbance.

Policy RURAL.1 Recognise that use and development of Southland's rural land resource enables people and communities to provide for their social, economic and cultural wellbeing.

Policy RURAL.2 Maintain land use change activities in rural areas of Southland, in a way that maintains or enhances rural amenity values and character.

Policy RURAL.4 Avoid the irreversible loss of high value soils from productive use, through inappropriate subdivision, use and development.

Policy RURAL.5 The effects of rural land development shall be sustainably managed and land management practices encouraged so that:

(a) soil properties are safeguarded;
(b) soil erosion is minimised;
(c) soil compaction and nutrient and sediment loss is minimised;
(d) soil disturbance is reduced;
(e) water quality is maintained or enhanced;
(f) indigenous biodiversity is maintained or enhanced;
(g) the mauri of water and soils is safeguarded.

Comment
The proposed activities are consistent with the policies in the Regional Policy Statement. Tangata whenua were first involved in the application post public notification and have had subsequent communication with the applicant since it was notified and subsequently submitted. Te Tangi a Tauira is considered in Section 3.9 below.

The proposed land use activity should not result in a reduction in water quality as long as mitigations offered in the application, such as riparian planting, protecting CSAs, utilising catch crops, reducing winter crop area below the permitted baseline and removing beef cattle from the property, are implemented correctly and in a timely manner. The discharge is to land, not water, and consent conditions will require the applicant reduce its Olsen P to agronomic optimum, reduce synthetic nitrogen fertiliser use to below the NES-F cap of 190 kg/ha/year and maintain and/or reduce their modelled nutrient losses to water which should, in theory, improve water quality. Low rate irrigation and sufficiently sized effluent storage also aids in the sustainable management of high value rural soils. The water abstraction volume sought will not result in over allocation and is calculated as 120 L/cow/day, which is considered efficient use for stock drinking and dairy shed wash down purposes.

3.6 Relevant provisions of National Policy Statements (Section 104(1)(b)(iii))

3.6.1 National Policy Statement for Freshwater Management (NPS-FM) 2020

3.6.1.1 The National Policy Statement for Freshwater Management 2020 came into force on 3 September 2020, replacing the earlier National Policy Statement for Freshwater Management 2014. The NPSFM supports improved freshwater management in New Zealand.

It does this by directing regional councils to establish objectives and set limits for freshwater in their regional plans.

3.6.1.2 The following provisions in the National Policy Statement for Freshwater Management (NPS-FM) 2020 are of particular relevance to this application:

Section 1.3 of the NPSFM refers to Te Mana o te Wai as a fundamental concept:

"Te Mana o te Wai is a concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community."

"Te Mana o te Wai encompasses 6 principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater, and these principles inform this National Policy Statement and its implementation."

3.6.1.3 The six principles are:

(a) Mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater;
(b) Kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations;
(c) Manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others;
(d) Governance: the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future;
(e) Stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations;
(f) Care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation.

3.6.1.4 The hierarchy of obligations in Te Mana o te Wai are:

(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.

3.6.1.5 The NPSFM contains the following objective and policies of relevance to the proposal:

Objective 1 *Seeks to ensure that natural and physical resources are managed in a way that prioritises first, the health and well-being of water bodies and freshwater ecosystems, second, the health needs of people, third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.*

Policy 1	*Freshwater is managed in a way that gives effect to Te Mana o te Wai.*
Policy 2	*Tangata Whenua are actively involved in freshwater management and Māori freshwater values are identified and provided for.*
Policy 3	*Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.*
Policy 8	*The significant values of outstanding water bodies are protected.*
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.*
Policy 11	*Freshwater is allocated and used efficiently, all existing over-allocation is phased out and future over-allocation avoided.*
Policy 12:	*The national target for water quality improvement is achieved.*
Policy 13:	*The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.*
Policy 15	*Communities are enabled to provide for their social, economic, and cultural well-being in a way that is consistent with the NPSFM.*

Comment

I consider that the proposed activities are consistent with the objective and policies in the National Policy Statement for Freshwater Management. I consider that the mitigations proposed, such as riparian planting, protecting CSAs, utilising catch crops, reducing winter crop area below the permitted baseline and removing beef cattle from the property, would avoid and mitigate any potential adverse effects on water quality which is consistent with Policies 1, 3, 8, 9 and 10. The volume of water the applicant is seeking will not cause over-allocation and it is deemed an efficient use of water at 120 L/cow/day, which is consistent with Policy 11. Consent conditions will require the applicant to maintain or reduce their modelled nutrient losses to water and report the modelled nutrient losses to Council which is consistent with Policies 12 and 13. Hokonui Rūnanga has submitted on the application and consideration of Te Tangi a Tauira and the involvement of Hokonui Rūnanga is not considered inconsistent with Policy 2, but I do note the concerns of Hokonui Rūnanga and its desire to be heard at the hearing.

3.8 Relevant provisions of National Environmental Standards and other regulations (Section 104(1)(b)(i) and (ii))

3.8.1 National Environmental Standard for Freshwater Management 2020

3.8.1.1 Section 104 requires consideration of any NES that is relevant. In this case the, the National Environmental Standards for Freshwater Management need to be considered. These regulations set requirements for carrying out certain activities that pose risks to the health of freshwater and freshwater ecosystems and came into force on 3 September 2020.

3.8.1.2 Regulation 13 of the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 is as follows:

"*The use of land on a farm for holding cattle in a stockholding area (other than a feedlot) is a permitted activity if it –*
(b) complies with the applicable condition or conditions in subclause (3) or (4) of this regulation.

…

Conditions
(4) In any other case, the conditions are that –
- *(a) The base area of the stockholding area must be sealed to a minimum permeability standard of 10^{-9} m/s; and*
- *(b) Effluent expelled in the stockholding area must be collected, stored, and disposed of in accordance with a rule in a regional or district plan, or a resource consent; and*
- (c) *The stockholding area must be at least 50 m away from any water body, any water abstraction bore, any drain, and the coastal marine area.*"

3.8.1.3 As the feed pad does not have a base that is sealed to a minimum permeability standard of 10^{-9} m/s the proposal moves to Regulation 14 which states:

"The use of land on a farm for holding cattle in a stockholding area (other than a feedlot) is a discretionary activity if it does not comply –
(a) the condition in regulation 12(3); and
(b) the applicable condition, or any of the applicable conditions, in regulation 13(3) or (4).

3.8.1.4 Liquid effluent expelled on the feed pad is collected, stored in the pond and discharged as per a resource consent and the feed pad is not located within 50 m of any water body, abstraction bore, drain or the CMA. However, as the feed pad does not have a base sealed to a minimum permeability standard of 10^{-9} m/s, the proposal triggers Regulation 14, which deems the use of land for holding cattle in a stockholding area[3] a discretionary activity.

[3] Defined in the NES-F as an area for holding cattle at a density that means pasture or other vegetative ground cover cannot be maintained but does not include an area used for pastoral purposes that is in the nature of a stockyard, milking shed, wintering barn or sacrifice paddock.

3.8.1.5 Regulation 18 of the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 is as follows:

"The conversion of land on a farm to dairy farm land is a permitted activity if it complies with the applicable condition.
…

Condition
If the farm included dairy farm land at the close of 2 September 2020, the condition is that, at all times, the area of the farm that is dairy farm land must be no greater than-
(a) the area of dairy farm land at the close of 2 September 2020; plus
(b) 10 ha."

3.8.1.6 As the parcel of land being incorporated into the dairy farm is 80 ha, the proposal triggers Regulation 19, which in turn means the proposal is subject to Regulation 24. Regulation 24 sets out conditions on granting resource consents for a discretionary activity, which states they may only be granted if they will not result in an increase in contaminant loads in the catchment, or concentrations of contaminants in freshwater, compared with the loads, or concentrations, as at the close of 2 September 2020. It also stipulates the consent must expire before 1 January 2031.

3.8.1.7 Regulation 24 is particularly crucial when considering the predicted increase in N losses for Support Block 1. However, when the N losses are looked at for the overall landholding (dairy platform + Support 1 + Support 2) there is a predicted reduction of 2,458 kg N/year and thus the conditions of regulation 24 restricting the Council's ability to grant consent are satisfied.

3.8.2 National Environmental Standard for Sources of Human Drinking Water Regulations 2007

3.8.2.1 This NES is relevant to any application for a discharge permit. These regulations aim to reduce the risk of drinking water sources being contaminated. Regulations 7 and 8 only apply to an activity that has the potential to affect a registered drinking-water supply that provides no fewer than 501 people with drinking water for not less than 60 days each calendar year.

3.8.2.2 The activity is 10 km upstream of a registered drinking-water supply that provides water to more than 501 people. The Gore District Council takes water from multiple bores at Gore for >501 people with this being the key municipal supply for the Gore township population currently. The Gore District Council also takes water from the Matura River at Mataura for >501 people with this being the key municipal supply for the Mataura township population.

3.8.2.3 Any potential effects on the water supply are likely to be negligible. The discharge is not directly to water and maintenance of buffer zones, along with other mitigation methods, will be required by consent conditions. Provided the conditions are adhered to, then the discharge is not likely to introduce or increase the concentrations of determinands at the drinking water abstraction point that would cause a breach of the standards.

3.8.3 Resource Management (Measurement and Reporting of Water Takes) Regulations 2010

3.8.3.1 Accurate, complete and current water information is a critical building block in establishing a water management system in which water is effectively allocated and efficiently used. The regulations apply to holders of water permits (resource consents) which allow fresh water to be taken at a rate of 5 L/s or more.

3.8.3.2 As the proposed take it less than 5 L/s then the regulations do not apply. However, if consent was granted metering would be required as a condition of consent to demonstrate compliance with the consent.

3.9 Any other matters considered relevant and reasonably necessary to determine the application (Section 104(1)(c))

3.9.1 *Te Tangi a Tauira*

3.9.1.1 Te Tangi a Tauira is the Iwi Management Plan for Murihiku. This plan is recognised in Policy 1.2 of the Regional Policy Statement, and is included as a matter considered relevant and necessary under Section 104(1)(c) of the Resource Management Act 1991. Policies from Te Tangi a Tauira, which are relevant to this application, are:

Farm Effluent Management (Section 3.5.1)

Policy 2	*Ensure that Ngāi Tahu ki Murihiku are provided with the opportunity to participate in the development of appropriate consent conditions for discharge consents, including monitoring conditions.*
Policy 4	*Sustain the life supporting capacity of soils for future generations.*
Policy 7	*Require soil risk assessments prior to consent for discharge to land, to assess the suitability and capability of the receiving environment. Effluent should be applied at rates that match the ability of land to absorb it.*
Policy 8	*Require best practice for land application of managing farm effluent by using the methods listed in the full policy*
Policy 9	*Require that farm plans include the location of tile drains on farm to ensure that farm workers know where drains are when irrigating.*
Policy 11	*Avoid any surface run-off/overland flow, ponding, or contamination of water resulting from the application of dairy shed effluent to pasture.*
Policy 13	*Appropriate buffer zones between discharge activities and waterways.*
Policy 14	*Buffer zones of at least 100m between discharge activities and bores.*
Policy 15	*Manage and contain all spray drift from irrigation of effluent.*

Water Quality (Section 3.5.13)

Policy 5 *Avoid the use of water as a receiving environment for the discharge of contaminants. Generally, all discharge must be first to land.*

Policy 6 *Avoid impacts on water as a result of inappropriate discharge to land activities.*

Policy 9 *Require the use of buffer zones, riparian areas, bunds and other mechanisms to prevent stormwater and other wastewater from entering waterways.*

Policy 11 *Require robust monitoring of discharge permits, to detect non-compliance with consent conditions. Non-compliance must result in appropriate enforcement action to discourage further non-compliance.*

Water Quantity - Abstractions (Section 3.5.14)

Policy 4 *In the Southland Plains region, the preference is for water takes from bores as opposed to surface water.*

Policy 16 *Encourage the installation of appropriate measuring devices on all water abstractions.*

Policy 17 *Advocate for durations not exceeding 25 years on resource consents related to water abstractions.*

Policy 18 *Require, where necessary, a consent condition providing for a review of the volume able to be abstracted from the bores.*

Comment

Issues raised by Hokonui Rūnanga in its submission include the lack of consultation with mana whenua, the current state of water quality and quantity in their takiwā and the implementation timeframe for proposed mitigations. The applicant has had subsequent discussions with tangata whenua to address the concerns raised and measures the applicant would commit to, to understand concerns of Ngāi Tahu and to find a path forward in which mahinga kai and other effects on cultural values, customs and their traditional relationship with the taiao may be able to be addressed.

As mentioned above, I am not a suitably qualified person with regard to cultural impact assessments, and this will be a matter to be addressed at the hearing. However, I have sought to assess the proposal against the direction in Te Tangi a Tauira as far as possible. The main discharge method of effluent is to land via low rate rain gun, centre pivots and low rate pods with other methods proposed as contingency measures, which is consistent with Farm Effluent Management Policies 4, 7, 8, 9 and water quality Polices 5 and 6. Conditions of consent relating to buffer distances, riparian planting, spray drift and ponding of effluent are included in the conditions of consent which is consistent with the Farm Effluent Management Policies 11, 13, 14, 15 and water quality Policy 9. The water take is from a bore, conditions relating to water meters and review of abstraction volume are also included in the water abstraction permit along with a consent duration of less than 25 years. Ngāi Tahu Murihiku has been involved in the application as Hokonui Rūnanga was considered an affected party. As a result, it has provided a submission, which is consistent with Policy 3.5.1.2. I note the Iwi Management Plan has very few policies relating to land use activities with regard to dairy farm expansions

and land intensification. This is presumably because Te Tangi a Tauira became operative in 2008 during the dairy boom in Southland.

3.10 Section 105 matters relevant to discharge or coastal permits

3.10.1 Section 105 matters need to be considered as the application is for a discharge that would contravene Section 15. Under Section 105, the consent authority must have regard to:

(a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects;
(b) the applicant's reasons for the proposed choice; and
(c) any possible alternative methods of discharge, including discharge into any other receiving environment.

3.10.2 The sensitivity of the receiving environment has been considered, being in particular the key risks to surface water quality through overland flow of contaminants and to groundwater quality through leaching of contaminants via deep draining soils. The main irrigation method is low rate discharge which is considered to be appropriate for the receiving environment. The proposal also includes discharge buffers to surface waterways and bores.

3.10.3 The alternatives considered by the applicant are summarised at paragraph 3.3.5 above. I have had regard to those alternative methods and receiving environments (discharge to water and "as required" discharge to land). I agree with the applicant that those alternatives would likely result in greater adverse effects. The application noted "*there are no other practicable environmentally acceptable alternatives to applying effluent to land*".

3.11 Section 107 restriction on grant of certain discharge permits

3.11.1 Section 107(1) states that a discharge permit should not be approved if, after reasonable mixing, the contaminant is likely to give rise to adverse effects.

3.11.2 With regard to s.107, the application noted "*There are no matters under Section 107(1) of the RMA that would require the consent authority to decline this application*."

3.11.3 If carefully managed, the proposed effluent discharge is not expected to give rise to the effects on surface water listed in Section 107.

3.12 Part 2 of the Resource Management Act 1991

3.12.1 All considerations are subject to Part 2 of the RMA, which sets out the purpose and principles that guide this legislation. Section 5 states the purpose of the RMA and Sections 6, 7 and 8 are principles intended to provide additional guidance as to the way in which the purpose is to be achieved.

3.12.2 The application of Section 5 involves consideration of a range of matters in assessing whether a proposal will promote the sustainable management of natural and physical resources. The enabling and managing functions found in s5(2) should be considered of equal importance and taken as a whole. Sections 6, 7 and 8 provide further context and guidance to the constraints found in s5(2)(a), (b) and (c). The commencing words to these sections differ, thereby establishing the relative weight to be given to each section.

3.12.3 In relation to the matters outlined in Section 5, I consider that this application is consistent with the purpose and the principles of the Act, as set out in Section 5. This is the promotion of the sustainable management of natural and physical resources. The proposed activities will have no more than minor adverse effects on the ability of the receiving environment to meet the reasonably foreseeable needs of future generations, or on the life-supporting capacity of the land or any ecosystem associated with it. The proposed consent conditions will ensure that any potential adverse effects of the activities will be avoided, remedied or mitigated.

3.12.4 All of the Part 6 matters have been covered within the various Council planning instruments, of which the application is generally consistent with. There is only one matter of national importance, as outlined in Section 6 of the Act, that needs to be recognised and provided for in the context of this application. This is the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu and other taonga. However, the landholding is not part of Statutory Acknowledgment Area under the Ngāi Tahu Claims Settlement Act 1996 and there are no known areas of cultural importance within the site. Consideration has also been given, as per Section 104(1) to the relevant Iwi Management Plan for Southland. The following parts of Section 6 have been recognised and provided for, but do not have a direct relationship to the application because:

- the natural character of the coastal environment, wetland, rivers and lakes and their margins will not be developed, used or subdivided as part of this application;
- there are no identified Outstanding Natural Features and/or Outstanding Natural Landscapes within the area;
- there are no known areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- the application does not relate to public access to and along the coastal marine area, lakes and/or rivers;
- there are no known sites of historic heritage within the farm and as such they will not be affected by inappropriate use, subdivision or development;
- the site is in the broader Mataura catchment but is not within a Statutory Acknowledgment Area and is not part of any customary rights.

3.12.5 In relation to the considerations under Section 7, I consider that the activity would not be detrimental to the matters listed in Section 7 (a)–(j). In particular, the efficient use of and development of resources, the maintenance and enhancement of the quality of the environment and the protection of the habitat of trout and salmon. It is considered that, as the application is generally consistent with the various Council planning documents, the application is also generally consistent with the aforementioned Section 7 matters. However, it should be noted Hokonui Rūnanga has raised concerns in its submission regarding kaitiakitanga and rangatiratanga, which are matters to be addressed at the hearing.

3.12.6 With regard to Section 8 of the Act, the principles of the Treaty of Waitangi have been taken into account. This is through the consideration of Te Tangi a Tauira (Iwi Management Plan) and the relevant policies in other planning documents. Again, it should be noted Hokonui Rūnanga has raised concerns in its submission regarding the applicant's uninformed position regarding the principles of the Treaty of Waitangi. This is a matter to be addressed at the hearing.

3.12.7 Overall, I consider that the application meets the relevant provisions of Part 2 of the RMA as the proposal achieves the purpose of the RMA, which is the sustainable management of natural and physical resources.

4. Recommendations

4.1 Whether to grant

4.1.1 The application is considered a **discretionary activity.** Under Section 104B the Council may grant or refuse consent for a discretionary activity, and if it grants the application, may impose conditions under Section 108 of the RMA.

4.1.2 I consider that it is appropriate to grant the application for the following reasons:

- the application is generally consistent with the objectives and policies of the relevant National Policy Statement, Regional Policy Statement, Iwi Management Plan and Regional Plans;
- any potential or actual adverse effects on the environment from the proposed activity are expected to be no more than minor if the mitigations are implemented correctly and in a timely manner and agreed conditions of consent are adhered to; and
- the mitigations the applicant has offered will avoid, remedy or mitigate any actual adverse effects that do arise from the proposed activity.

4.1.3 The proposed dairy farm expansion activity has appropriate mitigation measures proposed by the applicant, including riparian planting, protecting CSAs, utilising catch crops, reducing winter crop area below the permitted baseline and removing beef cattle from the property. Recommended conditions of consent include implementing a soil testing regime, restrictions on intensive winter grazing, maintaining a Farm Environmental Management Plan and ensuring proposed mitigation measures are implemented to improve water quality.

4.1.4 Overall, I recommend, that for the above reasons, the application be granted pursuant to Sections 104B and 108 of the Resource Management Act 1991, subject to the consent conditions.

4.2 Term of consent

4.2.1 The applicant has requested a consent term of 10 years due to:

- the financial investment involved in gaining a consent of this nature;
- certainty that the proposed mitigations and appropriate management techniques will address all potential adverse effects;
- consistency with the direction in Te Tangi a Tauira that consent terms should be less than 25 years; and
- The applicant's good compliance history for the existing resource consents.

4.2.2 Policies 14A and 43 of the Regional Water Plan set out factors to consider specifically in relation to the term of water and discharge permits but not land use consents. Policy 40 of the proposed Southland Water and Land Plan has requirements for term and should be given greater weighting over the RWP policies.

4.2.3 Policy 40 requires that determination of the term includes:

- granting a shorter duration than that sought by the applicant when there is uncertainty regarding the nature, scale, duration, and frequency of adverse effects from the activity or the capacity of the resource;
- relevant tāngata whenua values and Ngāi Tahu indicators of health;
- the duration sought by the applicant and reasons for the duration sought;
- the permanence and economic life of any capital investment;
- 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;
- the applicant's compliance with the conditions of any previous resource consent, and the applicant's adoption, particularly voluntarily, of good management practices; and
- the timing of development of FMU sections of this plan, and whether granting a shorter or longer duration will better enable implementation of any revised frameworks established in those sections.

4.2.4 Following consideration of the policies above, I consider that the 10-year period requested is appropriate. I consider there is some uncertainty around the nature and extent of potential effects on freshwater quality in the long-term, particularly with regard to the assumed reduction in microbes (e.g. *E.coli*) and sediment losses to freshwater, and especially if all mitigations are not implemented in a timely manner. I have taken into consideration the imminent implementation of FMU limit setting and that if the FMU limit setting requires significant reductions in contaminants losses, a review would be necessary to implement those reductions. I have also considered the applicant's significant investment in purchasing Support Block 2 as well as the generally good compliance history for the current discharge and water permits. Consequently, I recommend that the application is granted for a term of 10 years and all permits are given the common expiry date of 31 May 2032, to align with the end of the dairy milking season.

Jade McRae
Senior Consents Officer

Attached: Discharge permit AUTH-20211381-01, Water permit AUTH-20211381-02, Land Use Consent AUTH-20211381-03 and Land Use Consent AUTH 20211381-04

RECOMMENDATIONS IN COUNCIL REPORTS ARE NOT TO BE CONSTRUED
AS COUNCIL POLICY UNLESS ADOPTED BY COUNCIL

Attachment 1

Irricon Resource Solutions OVERSEER Nutrient Budget Report on behalf of Council

Irricon resource solutions

OVERSEER Nutrient Budget Review

For: Environment Southland – Cashmere Bay Dairies Ltd

Prepared by: Nicky Watt, CNMA

Date: 29th October 2021

www.irricon.co.nz

Introduction

1. Regarding the consent application for Cashmere Bay Dairies Ltd, I have reviewed the following OVERSEER ® Nutrient Budget (OVERSEER) files:
   a) Year Ending 2020
   b) Year End 20 Support 1
   c) Year End 20 Support 2
   d) Proposed Milking Platform
   e) Proposed Support 1

2. Along with the files I have reviewed the following accompany report: "OverseerFM farm system modelling to support a consent application for expanded dairy" prepared by Miranda Hunt, Roslin Consultancy Ltd and reviewed by Mo Topham, AgriAce. I have completed a robustness check on the file for sensibility based on data available and checked to ensure the modelling aligns with the OVERSEER Best Practice Data Input Standards for v6.4.1.

3. It must be assumed that the information provided in the OVERSEER files that the current farming system as modelled is a viable farming system, using actual stock and fertiliser inputs. Therefore, the actual and proposed scenario is also assumed to be appropriate for the location and climate.

4. A 'sensibility test' has been undertaken on the Cashmere Bay Dairies Ltd nutrient budgets with the following five output screens from OVERSEER forming the basis of the determination of the robustness of the nutrient budget:

   a) Is the nutrient loss consistent with what you would expect for an operation of this type and soils in this location?

   b) Does the summary of inputs and outputs make sense? Especially clover fixation and change in block pools?

   c) Check the 'Other values' block reports for rainfall, drainage, and PAW.

   d) Select the Scenario reports other values and check the production and stocking rate.

   e) Select the pasture production in the scenario report and check pasture growth.

5. Answers to each of these five points will be provided further in this report and then a final determination of the robustness of the nutrient loss to water will be provided at the end of this report.

OVERSEER AUDIT

Appropriateness of the Overseer inputs

1. The Overseer FM files submitted and stated in paragraph 1 of this report have been reviewed for consistency between the files and appropriateness of the inputs regarding the farming systems and the Overseer Best Practice Data Input Standard (BPDIS).

2. I concur that there are no deviations from the BPDIS

3. The YE 2020 models and Proposed models have a total area of 52.9 ha with 510.5 ha effective (459 ha in pasture and 51.5 ha in crop). The YE 2020 combined models have a revised stocking rate of 31.3 RSU/ha for dairy cows and the Proposed combined models have a revised stocking rate of 34.9 RSU/ha or a 10.3% increase in RSU/ha (see Table 1 and 1a below).

4. Reviewing the NZ Dairy statistics for the 2019/2020 season, shows the average milk solids production on this property for the YE 20 model at 470.9 kgMS/cow and 1354 kgMS/ha is respectively higher than the Southland Regional average of 418 kg MS/cow and higher than the Southland Regional average of 1133 kgMS/ha. The Prop MP model at 467.7 kgMS/cow and 1328 kgMS/ha is respectively higher than the Southland Regional average of 418 kg MS/cow and higher than the Southland Regional average of 1133 kgMS/ha.

5. The stocking rate for YE 20 and Prop MP models at 2.87 and 2.8 cows/ha are respectively greater than the Southland average for the 2019/2020 season of 2.76 cows/ha (Invercargill).

Table 1: Summary of Production and stocking rate

	YE 20[1]	YE 20 S1[2]	YE 20 S2[3]	Prop MP[4]	Prop S[5]
Total Ha	353	89.6	80.3	433.3	89.6
Effective Area (ha)	344.4	89.6	76.5	420.9	89.6
Effective Pasture Area (ha)	336.4	83.6	39.5	376.9	82.1
KgMS	466192	-	-	558600	-
MS kg/ha grazed	1354	-	-	1328	-
MS kg MS/cow	470.9	-	-	467.4	-
Dairy RSU	10515	-	-	13155	-
RSU/ha (effective pasture area)	31.3	-	-	34.9	-
Lactation Length	266	-	-	266	-
Cows/ha	2.87	-	-	2.8	-
Cows October	990	-	-	1140	-
Cows June	400	--	600	1195	
Cows July	400		600	1195	
Yearlings June	-	210	-	-	265
Yearlings July	-	210	-	-	265
Replacement RSU	67	-	-	183	-
Dairy Grazing RSU	-	1467	755	-	1676
Dairy Grazing RSU/ha (Eff past)	-	17.5	19.1	-	20.4
Irrigation Pivot (ha)	28.7	-	-	28.7	-
Irrigation LRR (ha)	122	-	-	122	-
Irrigation SRR (ha)	37	-	-	37	-
N lost kg/ha/yr	51	24	47	45	26

[1]Year Ending 2020 – YE 20
[2]Year End 20 Support 1- YE 20 S1
[3]Year End 20 Support 2 – YE 20 S2
[4]Proposed Milking Platform – Prop MP
[5]Proposed Support 1 – Prop S

Table 1a: Total Figures for Year End 2020 and Proposed

	Year end 2020	Proposed
Total Ha	522.9	522.9
Effective Area (ha)	510.5	510.5
Effective Pasture Area (ha)	459	459
KgMS	466192	558600
MS kg/ha grazed	1354	1328
MS kg MS/cow	470.9	467.4
Dairy RSU	10515	13155
RSU/ha (effective pasture area)	31.3	34.9
Lactation Length	266	266
Cows/ha	2.87	2.8
Cows October	990	1140
Cows June	1000	1195
Cows July	1000	1195
Yearlings June/July	210	265
N lost kg/ha/yr	45.9	41.9

6. During the YE 2020 models there was 14 ha of fodder beet 'rotation' and 37 ha of swede crop. There was 7.5 ha fodder beet 'rotation' with 44ha Swede 'rotation' in the Proposed models (see Table 2 and 2a below).

Table 2: Crop Details

	YE 20	YE S1	YE S2	Prop MP	Prop S1
Fodder Beet (ha)- Rotation	8	6	-		7.5
Fodder Beet Yield (tDM/ha)	25	25	-		25
When grazed	May to Aug	May to Aug	-		May to Aug
Grazed by	Dairy Cows	Dairy Grazing	-		Dairy Grazing
Swedes (ha) - Crop			37		
Swedes Yield (tDM/ha)			16		
When grazed			May to Sept		
Grazed by			Dairy grazing/Beef		
Swedes (ha) - Rotation		-	-	44	
Swedes Yield (tDM/ha)		-	-	16	
When grazed		-	-	May to Aug	
Grazed by		-	-	Dairy Cows	

Table 2a: Total Crop Details for Year End 2020 and Proposed

	YE 2020	Proposed
Fodder Beet (ha)- Rotation	14	7.5
Fodder Beet Yield (tDM/ha)	23-25	25
When grazed	May to Aug	May to Aug
Grazed by	Dairy Cows	Dairy Grazing
Swedes (ha) - Crop	37	
Swedes Yield (tDM/ha)	16	
When grazed	May to Sept	
Grazed by	Dairy grazing/Beef	
Swedes (ha) - Rotation		44
Swedes Yield (tDM/ha)		16
When grazed		May to Aug
Grazed by		Dairy Cows

7. The soils for YE 2020 and the Proposed models were compared as shown in Table 3 below. There is no difference between models

Table 3: Soil Details for Year End 2020 and Proposed

	YE 2020	Proposed
Selw_50a	163.9	163.9
Stew_7a	155.2	155.2
Eure_23a	52.9	52.9
Clar_33a	100.8	100.8
Balm_21a	23.1	23.1
Pyr2_2a	10.6	10.6
Eure_20a	4	4

8. Supplements imported to meet cow demand (see Table 4 below). Pasture silage has been made where there was a surplus of pasture.

9. The YE 2020 models have a combined pasture growth calculated at 17.1 tDM/ha for dairy area and 14.7 tDM/ha for the dairy support area and the Proposed models have a combined pasture growth of 16.3 tDM/ha for dairy pasture and 14.4 tDM/ha for the dairy support. This is a decrease of 4.7% decrease in pasture growth for the dairy pasture and 2.0 % decrease for dairy support pasture. The N used on all pasture blocks in the YE 2020 models combined was 270 kgN/ha for

dairy and 251 kgN/ha for the dairy support compared to 189 kgN/ha for the dairy and dairy support in the combined Proposed models (a respective 30% and 24.7% drop in N applied to pasture). There is expected to be 36% more supplement imported and 37% less silage harvested in the combined Proposed models compared to the combined YE 2020 models (see Table 4 and 4a below).

Table 4: Supplements imported and Harvested

	YE 20	YE S1	YE S2	Prop MP	Prop S1
Supplements Imported (tDM)	847	-	187	1615	-
Supplements Imported Effective Area (tDM/ha)	2.52	-	4.73	4.28	-
Silage Harvested (tDM)	120	178	62	-	120
Silage Harvested Pasture (tDM/ha)	0.36	2.13	1.57	-	1.46
Total Area (ha)	353	89.6	80.3	433.3	89.6
Effective Area (ha)	344.4	89.6	76.5	420.9	89.6
Effective Pasture Area (ha)	336.4	83.6	39.5	376.9	82.1
RSU/ha (effective pasture area)	31.3	-	-	34.9	-
Peak Cows/ha	2.87	-	-	2.8	-
Replacement RSU	67	-	-	183	-
Dairy Grazing RSU	-	1467	755	-	1676
Dairy Grazing RSU/ha (Eff past)	-	17.5	19.1	-	20.4
N Fertiliser applied non -effluent area(kgN/ha)	270	-	-	189	-
N Fertiliser applied effluent Area (kgN/ha)	270	-	-	189	-
N Fertiliser applied to support area (kgN/ha)	-	249	257	-	189
Pasture Growth support area (tDM/ha)	-	15.1	13.8	-	14.4
Pasture Growth dairy area (tDM/ha)	17.1	-	-	16.3	-

Table 4a: Total Supplement for Year End 2020 and Proposed

	YE 2020	Proposed
Supplements Imported (tDM)	1034	1615
Supplements Imported Effective Area (tDM/ha)	2.25	4.28
Silage Harvested (tDM)	360	120
Silage Harvested Pasture (tDM/ha)	0.78	1.46
Total Area (ha)	522.9	522.9
Effective Area (ha)	510.5	510.5
Effective Pasture Area (ha)	459	459
RSU/ha (effective pasture area)	31.3	34.9
Peak Cows/ha	2.87	2.8
Replacement RSU	67	183
Dairy Grazing RSU	2222	1676
Dairy Grazing RSU/ha (Eff past)	18.1	20.4
N Fertiliser applied non -effluent area(kgN/ha)	270	189
N Fertiliser applied effluent Area (kgN/ha)	270	189
N Fertiliser applied to support area (kgN/ha)	251	189
Pasture Growth support area (tDM/ha)	14.7	14.4
Pasture Growth dairy area (tDM/ha)	17.1	16.3

Overseer Outputs

10. The combined N lost to water for the YE 2020 models was 45.9 kgN/ha/yr (23999 kgN/annum) compared to 41.9 kgN/ha/yr (21907 kgN/annum) for the combined Proposed models which is an 8.7 % reduction in total N loss. The combined P lost for the YE 2020 models was 0.77 kgP/ha/yr (405 kgP/annum) compared to 0.73 kgP/ha/yr (384 kgP/annum) for the combined Proposed models which is a 5.2% reduction in total P loss. (see Table 5 below). It is assumed that the information provided in this farming system is modelled as a viable farming system, using actual stock and fertiliser inputs.

Table 5: OVERSEER outputs

Overseer v6.4.1	YE 20	YE S1	YE S2	Prop MP	Prop S1
N lost to water kg/ha/yr	51	24	47	45	26
Total N lost kg/farm	18053	2186	3760	19563	2344
P lost kg/ha/yr	0.9	0.3	0.5	0.8	0.3
Total P lost kg/farm	333	32	40	357	27
Other sources – N	319	14	15	355	14
Other sources – P	173	9	17	198	9

Table 5a: Total OVERSEER outputs between Year End 2020 and Proposed

Overseer v6.4.1	YE 2020	Proposed
N lost to water kg/ha/yr	45.9	41.9
Total N lost kg/farm	23999	21907
P lost kg/ha/yr	0.77	0.73
Total P lost kg/farm	405	384
Other sources – N	348	369
Other sources – P	199	207

Change in block pools

11. The organic pool for N indicates the amount of N that is being either immobilized as seen by a 'positive' Organic pool N value or being mineralized as seen by a 'negative' Organic pool N value. N being immobilized is being used for increased biological activity and temporarily locked up. Once the microorganisms die the organic N in their cells is converted by mineralization and nitrification to plant available nitrate. It appears N is potentially being immobilized in all models (see Table 6 below).

12. The inorganic soil pool for P indicates the amount P that exceeds soil P maintenance as seen by a 'positive' inorganic soil P value or is less than the soil P maintenance requirements as seen by a 'negative' inorganic soil P value. Above maintenance P was applied to YE models and slightly above maintenance levels for the Proposed model (see Table 6a below).

Table 6: Change in block pool (N)

	YE 20	YE S1	YE S2	Prop MP	Prop S1
Organic Pool	129	131	149	101	100
Inorganic Mineral	0	0	0	0	0
Inorganic Soil Pool	5	11	74	21	14

Table 6a: Change in block pool (P)

	YE 20	YE S1	YE S2	Prop MP	Prop S1
Organic Pool	13	13	-7	10	12
Inorganic Mineral	2	2	2	2	1
Inorganic Soil Pool	10	20	63	9	6

Rain/clover N Fixation

All plants, including forage crops, need relatively large amounts of nitrogen for growth and development. Biological nitrogen fixation is the term used for a process in which nitrogen gas (N2) from the atmosphere is incorporated into the tissue of certain plants. Only a select group of plants can obtain N this way, with the help of soil microorganisms. Among forage plants, the group of plants known as legumes (predominantly Clover in NZ pastures) are well known for being able to obtain N from air N2. The OVERSEER Technical Manual – Characteristics of Pasture, April 2015 indicates that biological N fixation is based on total pasture production and includes the fertiliser induced reduction in N fixation.

13. The Biological fixation for the combined YE Models is 48 compared to the combined Proposed models at 69 (see table 7a below).

14. The N added to pasture for the combined YE models was 265 kgN/ha compared to 189 kgN/ha for the combined Proposed models (a 28.7 % drop in N used).

15. The increase in biological fixation in the Proposed model can be explained by the almost 29% decrease in N fertiliser applied.

Table 7: Biological fixation

	YE 20	YE S1	YE S2	Prop MP	Prop S1
Biological Fixation (kg/ha/yr)	58	21	21	77	31
Average N applied to whole farm kg/ha/yr	262 (270 to all pasture)	242 (249 to all pasture)	178 (257 to all pasture)	184 (189 to all pasture)	186 (189 to all pasture)

Table 7a: Biological fixation between Year End 2020 and Proposed

	YE 20	Prop MP
Biological Fixation (kg/ha/yr)	48	69
Average N applied to pasture kg/ha/yr	265	189

Pasture Production

16. The average effluent N inputs for the YE 2020 models was 55kgN/ha from liquid to 187.7 ha of pasture/crop and 13 kgN/ha from solid effluent to 344.4 ha pasture/crop (see table 8 below). The average effluent N inputs for Proposed models was 49 kgN/ha from liquid to 264.2 ha of pasture/crop and 13 kgN/ha from solid effluent to 420.9 ha pasture/crop.

17. Fertiliser inputs of N, for the YE 2020 models combined, to effluent and non-effluent pasture was 270 kgN/ha. The combined fertiliser inputs of N to pasture onto effluent and non-effluent area was 189 kgN/ha pasture in the Proposed models.

18. Liquid effluent is applied onto pasture block for all the models was applied all year-round using a <12 mm application method. Solids effluent from pond is applied in Jan for all the models.

Table 8: Pasture production and N inputs (fertiliser and effluent)

	YE 2020	Proposed
Effluent Liquid Area (ha)	187.7	264.2
Effluent Solids Area (ha)	344.4	420.9
Pasture Growth (tDM/ha/yr)		
Effluent	17.1	16.3
Non-Effluent	17.1	16.3
Support	14.7	14.4
N Fertiliser inputs (kg/ha/yr)		
Effluent	270	189
Non-Effluent	270	189
N Effluent Inputs (kg/ha/yr)		
Effluent	55	49
Non-effluent (includes solids)	13	13
Total N Inputs (kgN/ha/yr)		
Effluent	325	238
Non-Effluent	283	202

19. The pasture production for all models has been modelled as varying based on topography, climate, and development status.

20. Fertiliser inputs of N are high for the YE 2020 models compared to moderate for the Proposed Model (see Table 8).

21. It is assumed the YE 2020 models represent the actual farm system with actual stock, crop area and fertiliser inputs, it is assumed that the pasture production is accurate and reasonable.

22. Long term pasture growth in Southland between 1979 and 2012 indicated that average pasture growth for newer pastures was 12.7T DM/ha/yr.

23. The dairy pasture production for the YE 20 model was 17.1 tDM/ha compared to 16.3 tDM/ha for the Proposed models which is respectively 25.7% and 22.1% higher than the Southland average (see Tables 4, 4a and 8 above).

24. YE 20 model: Allowing for the Overseer model assuming an average metabolisable energy (ME) value of 10.5 MJME/kgDM for pasture and South Island pastures have a ME value closer to 11 MJME/kgDM the models output of pasture growth would drop by 4.5%. Also, the YE 20 model has used actual data and have been rotating crops which means new pasture which can account for 15-20% improvement in pasture growth. Also 2.8 tDM/ha would come from the high N fertiliser applied (270 kgN/ha X 12 kgDM/kgN applied). This more than accounts for the high pasture growth.

25. Prop MP model: The drop in pasture growth can be accounted for in the large drop in N fertiliser applied and increase in supplement imported.

26. The animal distribution is modelled as 'No difference between blocks' and 'Same ratio of animal intake' with 'Default Grazing Months' for all models.

Mitigations Modelled

27. Reporting out lined the following: As described in the Nutrient Budget Report for Cashmere Bay Dairies Ltd prepared Miranda Hunt, Roslin Consultancy Ltd (page 13 of the 'OverseerFM farm consultancy modelling to support a consent application for expanded dairy' document), there are several mitigation measures indicated to mitigate N loss that have been included in the Proposed modelling. The below table details if the mitigation measures have been included in the proposed scenario and if they are accurately modelled.

Table 9: Mitigation option for Proposed scenario

Wintering spread over a larger area	Yes, if include just June and July as wintering, however intensive winter grazing is from May to end of September, so the area used for intensive winter grazing is over the combined effective area of 510.5ha for YE 2020 and Proposed Models. The numbers of animals wintered have increased from 1210 (1000 cows + 210 yearling heifers) in YE 2020 models to 1460 (1195 cows and 265 yearling heifers) in the Proposed models. This is a 17% increase in numbers over June/July

Decrease in N applied	Yes, N fertiliser applied to pasture decreased from 270 kgN/ha for the YE 20 model compared to 189 kgN/ha for the Prop MP model (a 30% decrease). Also, N applied to the support block pasture has decreased from 251 kgN/ha to 189 kgN/ha (a 24.7 % decrease in N applied).
Reducing the farm average Olsen P to 30	Yes, the drop in Olsen P to 30 has been modelled, however P applied is slightly above maintenance P levels in the Proposed models.
Change in fertiliser timing	*Removal of N fertiliser applied in May and P fertiliser no longer applied in September and moved to December in Prop MP and Prop 1.*
Removal of beef animals	Yes, the beef calves grazed November to end of March have gone from the YE 20 S1 model and just 9 bulls from October to January are in the Prop S1 model.
Imported supplement	*Imported supplement has increase from 2.25 tDM/ha to 4.28 tDM/ha, a 47.4% increase.*

28. All mitigations identified in the OverseerFM report have been mostly modelled correctly. The stocking rate (if use RSU/ha) has increased and there are 25% more wintered on farm.

29. I have added 'change in fertiliser timing' and 'imported supplement', which are mitigations I have added and not mentioned as mitigations in the OverseerFM Modelling Report, as they can have an impact on N loss.

30. It is important that these mitigation measures are measured and monitored as if they are not adhered to the N loss reductions proposed may not occur.

31. Some good management practices assumed in Overseer are maintain accurate and auditable records of annual farm inputs, outputs and management practices (Overseer output is only as good as the data entered); Fertiliser is being applied according to the Fertmark and Spreadmark Codes of Practice; Feed is stored to minimise leachate and soil damage; Compliant effluent systems as defined by DairyNZ; Stock exclusion from water ways; Irrigation efficiency greater than 80%; farm race and bridge/culvert nutrient runoff is directed to paddocks; grazing managed to minimise losses from critical source areas.

32. Overseer will account for bad practices such as nitrogen (N) applied that exceeds the plants' ability to absorb the excess N, application of N in the winter, high stocking rates, land left fallow between crops and irrigating high water application rates causing N drainage to name a few.

33. The Overseer modelling completed for this farm does not have any of the 'Bad Practices' as suggested in paragraph 31, and it would be assumed the FEMP would cover any good management practices (not limited to) outlined in paragraph 30.

CONCLUDING COMMENTS

Determination of the robustness of the nutrient loss to water

34. The questions below were described at Paragraph five of this report. Whilst these have been answered throughput this report, this section summarizes the answer to each question to make an overall conclusion about the robustness of the nutrient budgets.

Is the N loss consistent with what you would expect for an operation of this type and soils in this location?

35. Based on my experience, the N loss estimates are reasonably consistent with an operation of this scale and soil types present.

Does the summary of inputs and outputs make sense? Especially clover fixation and change in block pools?

36. The Biological fixation for the combined YE Models is 48 compared to the combined Proposed models at 69.

37. The N added to pasture for the combined YE models was 265 kgN/ha compared to 189 kgN/ha for the combined Proposed models (a 28.7 % drop in N used).

38. The increase in biological fixation in the Proposed model can be explained by the almost 29% decrease in N fertiliser applied.

Check the 'Other values' block reports for rainfall, drainage, and PAW.

39. The rainfall and soil information have been entered based on protocols for the location and soil type selected. YE 2020 model's soils areas are within 5% of Proposed models soils.

Production and stocking rate

40. The YE 2020 combined models have a revised stocking rate of 31.3 RSU/ha for dairy cows and the Proposed combined models have a revised stocking rate of 34.9 RSU/ha or a 10.3% increase in RSU/ha (see Table 1 and 1a below).

41. Based on my experience as well as reviewing NZ Dairy statistics for the 2019/2020 season, the average milk solids production on this property for the YE 20 model at 470.9 kgMS/cow and 1354 kgMS/ha is respectively higher than the Southland Regional average of 418 kg MS/cow and higher than the Southland Regional average of 1133 kgMS/ha. The Prop MP model at 467.7 kgMS/cow and 1328 kgMS/ha is respectively higher than the Southland Regional average of 418 kg MS/cow and higher than the Southland Regional average of 1133 kgMS/ha.

42. The stocking rate for YE 20 and Prop MP models at 2.87 and 2.8 cows/ha are respectively greater than the Southland average for the 2019/2020 season of 2.76 cows/ha (Invercargill).

43. It is assumed that the YE 2020 models are based on actual year end information.

Select the pasture production in the scenario report and check pasture growth.

44. Long term pasture growth in Southland between 1979 and 2012 indicated that average pasture growth for newer pastures was 12.7T DM/ha/yr.

45. The dairy pasture production for the YE 20 model was 17.1 tDM/ha compared to 16.3 tDM/ha for the Proposed models which is respectively 25.7% and 22.1% higher than the Southland average (see Tables 4, 4a and 8 above).

46. YE 20 model: Allowing for the Overseer model assuming an average metabolisable energy (ME) value of 10.5 MJME/kgDM for pasture and South Island pastures have a ME value closer to 11 MJME/kgDM the models output of pasture growth would drop by 4.5%. Also, the YE 20 model has used actual data and have been rotating crops which means new pasture which can account for 15-20% improvement in pasture growth. Also 2.8 tDM/ha would come from the high N fertiliser applied (270 kgN/ha X 12 kgDM/kgN applied). This more than accounts for the high pasture growth.

47. Prop MP model: The drop in pasture growth can be accounted for in the large drop in N fertiliser applied and increase in supplement imported.

48. I have assumed an adequate level of robustness around the YE 2020 Models of actual Overseer Modelling as it is based on an actual farming system, and with that, I have assumed actual stock and fertiliser inputs used.

    The data input protocols have been followed with no deviations. This leads to high level of robustness for the relevant input data for example, climate, soils, and pasture type. Based on this, I consider that the robustness of the nutrient loss estimates for the Proposed model to be **high,** this is due to the following:

<u>Summary of Mitigations to address:</u>

Please explain why:

- The numbers of animals wintered have increased from 1210 (1000 cows + 210 yearling heifers) in YE 2020 models to 1460 (1195 cows and 265 yearling heifers) in the Proposed models. This is a 17% increase in numbers over June/July.
- How the Olsen p levels will drop allowing the P fertiliser applied slightly exceeds maintenance P requirements.

References:

New Zealand Dairy Statistics 2019/2020. Produced by LIC and DairyNZ 2020.
https://www.dairynz.co.nz/publications/dairy-industry/new-zealand-dairy-statistics-2019-20/

Overseer Definition of Terms, previously Technical Note 6. May 2016
Overseer Technical Manual – Characteristics of Pasture, April 2015

Smith. L. C. 2012. Proceedings of the New Zealand Grassland Association 74: 147-152 (2012) *Long Term pasture growth patterns for Southland New Zealand: 1978-2012.* www.grassland.org.nz/publications/nzgrassland_publication_2284.pdf

https://www.dairynz.co.nz/media/5793235/average-pasture-growth-data-south-island-2020-v1.pdf

Attachment 2

S92(1) Further Information Response

LANDPRO
Make the most of your land

19 January 2022

Landpro Reference: 18106
Council Reference: APP-20211381

Environment Southland
Private Bag 90116
Invercargill, 9840

Dear Jade

Re: Request for Further Information under Section 92(1) of the Resource Management Act 1991 – Application for Cashmere Bay Dairies.

In reference to your request for further information dated 22nd November 2021, please find outlined below our response to this request.

1 Please provide a map of the discharge area.

Please see attached map of the discharge area.

2 Please detail the proposed rates for the umbilical and slurry tanker systems.

10mm/hr is the proposed rate for both the umbilical and slurry tanker systems.

3 Please provide any detail of nibbing on calving pad.

Gravel nibbing is present on the calving pad. The woodchip/bark base of 500mm ensures that there will be no runoff of effluent from the calving pad. This woodchip/bark soaks up any possible effluent. The woodchip/bark is replaced before it becomes saturated. It is spread as a solid waste in accordance with the permitted activity requirements of Rule 38 of the pSWLP.

0800 023 318
13 Pinot Noir Drive
PO Box 302
Cromwell 9342
Central Otago, NZ
info@landpro.co.nz
landpro.co.nz

Figure 1: Gravel nibbing around calving pad. 500mm of woodchip/bark will be put on the calving pad prior to the pad being used.

4 Please confirm the proposed max number of cows on the pad at any one time

At any one time there may be 150 cows on the pad.

5 Please confirm when the pad is to be used.

The pad is to be used in August and September and during adverse weather conditions.

6 Are the fertilizer recommendations in the modelling report adopted?

Yes.

7 Will the current and future actions proposed by the FEMP be adopted and implemented by the target dates?

Yes. A number of these have been completed please see table below.

Table 1: Actions and Proposed date.

Current Actions	Proposed date in FEMP	New Proposed date
Nitrogen – assess requirements before applying	1 Oct 2021	Completed
Calibrate Cobra Rain Gun	1 Feb 2022	1 March 2022 (to allow for back log with contractors)
Provide a winter grazing paddock plan	1 May 2022	1 May 2022
Recycle Farm Waste	1 Aug 2022	1 Aug 2022 – some already recycled. Upcoming requirement by Fonterra.
Culvert repairs	1 Aug 2023	Completed
Provide an Effluent Management Plan	1 Aug 2023	1 Aug 2023
Manage high-risk laneway areas	1 Aug 2023	Completed, along with culvert repairs.
Permanently fence/drain waterway sections	1 Sep 2023	Completed

Future Actions	Proposed date in FEMP	New Proposed date
Calibrate Pivots and Rotorainers	1 Oct 2023	1 Oct 2023 (discussions with contractors already being had so likely to be prior to this)
Develop a riparian plan	1 Jun 2024	1 Jun 2024. An informal plan has already been completed. (See appendix A)
Manage Critical Source areas	1 Aug 2024	1 Aug 2024. This is ongoing and work is currently being done/has been completed for a number of CSAs on farm.
Use spread mark accredited contractors	1 Aug 2024	Currently done.
Improve silage storage	1 Oct 2028	1 Oct 2028

8 Will the use of catch crops still be considered on an annual basis with the proposed land use change?

Yes – the applicant will continue to use catch crops on an as required/where practicable basis. The use of catch crops depends on the re-sowing ability and may not be practicable each year, and on all crop paddocks, as such these have not been included as part of the nutrient modelling.

9 Please confirm if the long term options for CSAs will be implemented and detail how each identified CSA will be managed in the long term.

The following long terms options will be implemented.

- Install drainage in paddocks 31 – 34. This work has been included in the list of upcoming work by the applicant and is planned to be completed by June 2023.
- Extend riparian margins where overland flow from Critical Source Areas enters waterways. It is planned to widen the riparian margins in Paddocks 4 & 13. Future riparian planting is detailed in the attached Riparian Plan and includes planting along the main waterway of the property, running from paddock 52 to paddock 13.
- The CSA identified in paddock 77, the blocked tile drain, has been fixed and this is no longer an issue.
- Paddock 76 will continue to be temporarily fenced off and stock excluded when wet as detailed in the FEMP. Future options will be looked at if necessary and will be detailed in future FEMPs, currently this area is not as high of a priority as other areas on farm as the risk is very low.

10 Future Riparian Planting Plan

Please see attached future riparian planting plan. The timing of this planting will be a staged approach and will be detailed in future iterations of the FEMP although is planned to be completed by 2025.

11 Is there to be further riparian planting of the pond/wetland area in paddock 69?

No. This area has been fenced and has naturally rejuvenated into red tussock, therefore future planting is deemed unnecessary at this stage and there are other areas of the farm where the applicant wishes to focus attention on with regards to further riparian planting. Figures 2, 3 and 4 below show this area and demonstrate the plant growth, and stage of establishment. It is anticipated that these plants will naturally expand further to fill the fenced area. These figures show that significant plant growth has already occurred, meaning that further riparian planting is not needed at this stage.

Figure 2: Natural rejuvenation of red tussock around the wetland/pond area in Paddock 69.

Figure 3: Natural rejuvenation of red tucks around the wetland/pond area in Paddock 69.

Figure 4: Natural rejuvenation of red tussock around the wetland/pond in Paddock 69.

12 Will the small section on the south side of paddock 69 be incorporated into the pond/wetland area of paddock 69?

Yes, this has already been done. Please see figures above showing the extent of the area.

13 Is there to be further riparian planting in the section below paddock 63?

Yes, this is to be in a staged approach and will be outlined in future FEMPs. The applicant's current priority is to plant the area between paddocks 53 and 13 that is currently not planted, and then will come back and widen where necessary.

14 Is there to be riparian planting along the main creek (paddock 53 and 13)

Yes – the plan is to shift the existing fences and widen the riparian area and allow for further planting. This area is planned to be widened by January 2025.

15 Estimated timelines for planting

As above, the main riparian planting in the upcoming years will be between paddocks 53 and 13. This is estimated to be completed by Jan 2025. Further riparian planting on the property is planned, but will be a staged approach and will be outlined in future FEMPs.

16 Groundwater elevation concentration details.

Bore F45/0172 has in the past had elevated readings of total oxidized nitrogen. The applicant has agreed to decommission this bore as it is no longer in use.

The bore is shallow, 4.6m, compared with other bores on the property and surrounds which measure between 10-20m depth.

The domestic waste from the property to the north of F45/0172 is treated in a septic tank, located next to the main house, with a disposal field located between bore F45/0172 and the house, as shown in Figure 5 below.

As seen in this figure the disposal field is within 100m of the bore.

It is likely that due to the shallow depth of the bore, that contaminants from the disposal field are contributing to the elevated contaminant levels recorded in F45/0172.

Figure 5: Disposal field (orange) in relation to F45/0172.

17 Details around fencing and riparian planting of the pond/wetland are below paddock 63 and 64.

Figure 6 below shows the area below paddock 63 in September 2018. The main waterway on the property runs in a northeast to southwest direction (right to left in the below photo), with the two laneways crossing over the waterway. The area in the northwest half of the image (to the left of the red circle), is elevated above the rest of the land. The area highlighted in red forms a CSA/swale where there is the potential for contaminants to flow via overland flow into the waterway.

Figure 6: Aerial image from September 2018. CSA shown in red. Overland flow path shown in blue.

Figure 7 below shows the same area in November 2019. The CSA highlighted above has been fenced off and left in pasture. This allows a significant vegetated buffer for contaminants, mitigating the effects of any possible overland flow entering the waterway. This can be further seen in Figure 8.

Figure 7: Aerial image from November 2019.

Figure 8: Fenced and retired area to the north of the waterway.

Significant riparian planting has occurred along the waterway between the two laneways. No aerial imagery is present post 2019 that shows this riparian planting, but the below photos demonstrate the extent of this planting. The waterway east of the main laneway is on average 20m from the laneway. This area is downgradient of the laneway and therefore, there is the possibility of contaminants from

the laneway travelling via overland flow into the waterway. This area has been planted to form a significant vegetative buffer between the laneway and the waterway.

Figure 9: Distance between the laneway and main waterway.

Figure 10: Laneway in the background, showing riparian planting between laneway and waterway.

Figure 11: Riparian planting along waterway.

At this stage, the applicant's main priority is to refence, plant and establish a vegetated buffer along the rest of the main waterway on farm from paddock 53 to paddock 14. This is likely to have further significant positive impact on contaminant loss reductions on farm, more so than further planting in the area below paddock 63. This area here has substantial buffers and riparian planting resources are better used elsewhere on farm. Once this area is completed, the applicant will widen areas below paddock 63 where necessary.

18 Discussion on how the proposed activity will affect the future state of the environment. In particular, with regard to N losses and comparison between the existing activity continuing (with required synthetic N cap) and the proposed activity occurring.

It has been suggested by Irricon (the reviewer) that the following modelling should be completed:

> ***The decrease in N applied (24.7 % in dairy support and 30% on dairy farm) could be the major reason for the decrease in N loss. It would be beneficial to look at dropping N applied (62 on support and 81 on dairy farm and replacing lost potential growth silage (76 tDM baleage for dairy support and 275 tDM for dairy farm). This would then compare the YE 2020 models with the Proposed models taking out the drop in N fertilizer factor. I could make these changes to the models to look or you could request the Applicant completes?***

A farm system is complex and interlinked, changes can not be treated in a singular manner. As an alternative to the suggestion of the reviewer, the modelling has been completed for the 20/21 season

for all blocks. The 20/21 season reflects a transition to lower nitrogen fertilizer use, as required of the NESF to reduce nitrogen fertiliser use to no more than 190 kg N/ha, thus taking into account the required reduction in nitrogen. The 20/21 season has a lower nitrogen fertilizer use reflecting the transition to the proposed system in which 189 kg N/ha will be applied, as required by the NESF.

Nitrogen usage in 20/21 has decreased from the 19/20 season as follows:	**19/20**	**20/21**	**Difference**
Average N applied on pastoral areas (kg N/ha)	265	201	-24%
Average N applied across landholding (effective area including crop) (kg N/ha)	252	197	-22%

Results from the 20/21 modelling as follows:

	Milking Platform 20/21	**Support 1 20/21**	**Support 2 20/21**	**Total**
Total Farm N loss (kg N/yr)	15,257	2,131	5,651	23,039
N Loss per ha (kg N/ha/yr)	43	24	70	
Total Farm P loss (kg P/yr	354	37	40	431
P loss her ha (kg P/ha/yr)	1	0.4	0.5	
Pasture Grown (kg DM/ha/yr	16.9	14.2	16.2	

The results from the 20/21 season compared with the 19/20 season:

Total Farm N loss (kg N/yr)	**Milking Platform**	**Support 1**	**Support 2**	**Total**
19/20	18,053	2,186	3,760	23,999
20/21	15,257	2,131	5,651	23,039
% difference				-4%

Total Farm P loss (kg P/yr)	**Milking Platform**	**Support 1**	**Support 2**	**Total**
19/20	333	32	40	405

20/21	354	37	40	431
% difference				6.4%

Overall, between the 20/21 and the 19/20 season, N loss decreased by 4% and P loss increased by 6%. Key drivers were:

- Decrease in crop area
- Decrease in nitrogen fertiliser use
- Increase in Olsen P
- Decrease in phosphate fertiliser applied

Note there was minimal change in milk production and stock numbers between the two years. As synthetic nitrogen reduces it is likely farmers are utilising nitrogen applications more strategically / efficiently. There is also more focus on biological fixation by clover plants.

At a block level the key changes between blocks related to crop areas, nitrogen use, and stock movements.

The results from the 20/21 season compared to the proposed farm system:

Total Farm N loss (kg N/yr)	Milking Platform	Support 1	Support 2	Total
20/21	15,257	2,131	5,651	23,039
Proposed Farm system	19,563	2,344	0	21,907
% difference				4.9%

Total Farm P loss (kg P/yr)	Milking Platform	Support 1	Support 2	Total
20/21	354	37	40	431
Proposed Farm system	357	27	0	384
% difference				10.9%

Overall, between the proposed farm system and the 20/21 season (that reflects a decrease in nitrogen fertilizer use), N loss decreased by 5% and P loss by 12%

Key drivers:

- Increase in cow numbers
- Removal of beef animals
- Increase in crop area

- Decrease in Olsen P
- Reduced P fertiliser use
- Reduced nitrogen fertiliser use

From the above comparison of the 20/21 season with the proposed system it is clear that the decrease in nitrogen fertilizer is not the sole driver of nutrient loss changes. With a decrease in nitrogen fertilizer, there is still a significant reduction in contaminant losses. It is important to note the complexity of farm system changes and that comparing one change in isolation will not fully explain changes to nutrient losses.

19 Assessment of the increasing N losses modelled for Support 1 block against the relevant regional plans, the NES and NPS.

It is important to note that the waterway originating on Support Block 1 travels off farm and re-enters the block at Support Block 2. It then travels through Support Block 2 and the dairy platform before meeting the main waterway of the property and exiting southwest of the property.

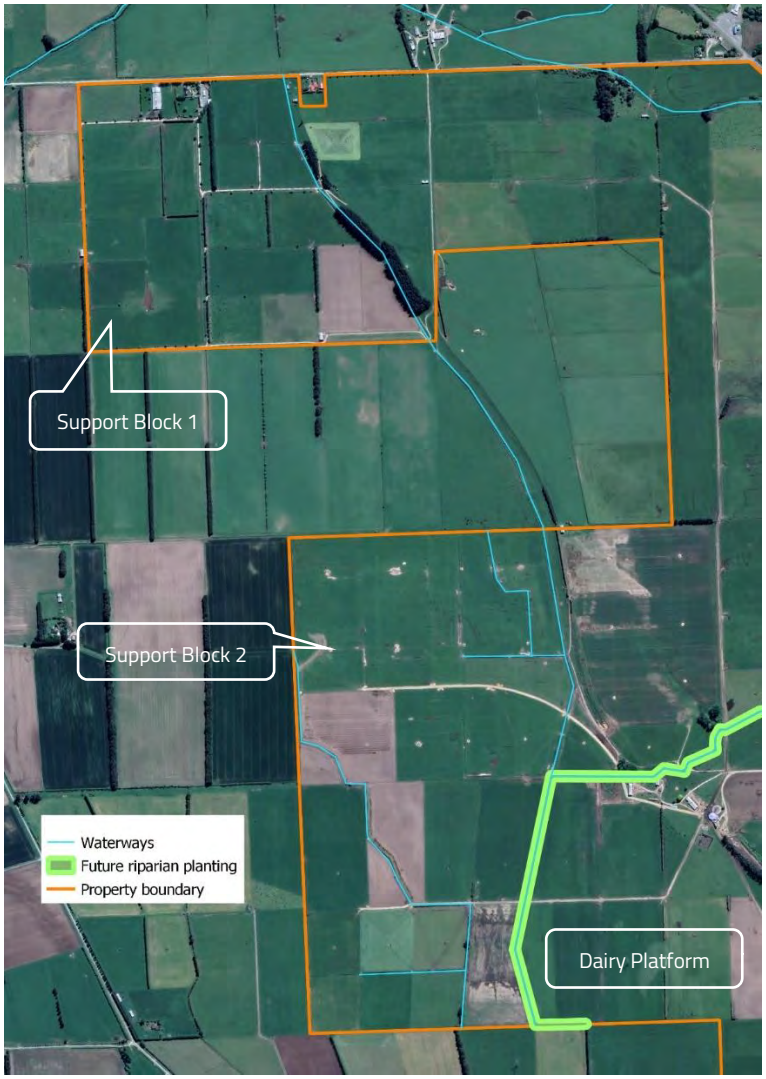


Figure 12: Waterways on Support Block 1.

Minimal effects from a possible increase in contaminants on Support Block 1 are in the same waterbody and same catchment as that on Support Block 2 and the milking platform where significant reductions in contaminants are proposed. Support Block 1 is upstream of Support Block 2 and the milking platform, indicating that a slight increase in contaminants upstream at Support Block 1 will be attenuated more than accounted for with a significant improvement 600m downstream at Support Block 2 and the dairy platform.

Breaking down Overseer results at a block level assumes a level of accuracy that Overseer does not offer. There is a 1.7 kg N/ha increase in N per year on the Support Block 1. There is a decrease in P contaminants.

For the proposed milking platform, we see a decrease of 5 kg N/ha and a further decrease in P contaminants.

The NES-FW stipulates that contaminant loads in the catchment compared with loads as at close 2 Sep 2020 must decrease. As Support Block 1 is in the same catchment as the remainder of the farm, we are seeing an improvement at a catchment level. There is no increase at a catchment level. It also stipulates that the activity must not result in an increase in concentrations of contaminants in freshwater or other receiving environments, compared with 2 Sep 2020. The waterway through Support Block 1 travels downstream through Support Block 2 and the milking platform, where a significant reduction in concentrations is being found. There is no net increase in concentration in the freshwater body or receiving environment, i.e., the main waterway travelling through the property or the Mataura River.

Similarly for both the PSWLP and NPS and improvement in waterway quality is being made in the receiving waterbodies and the catchment.

Furthermore, there is minimal opportunity for mitigation on Support Block 1 alone, but at the landholding perspective, and farm scale, and increase in contaminants on Support Block 1 are offset over the landholding, which is contained within the same catchment.

20 The application states that there is a decrease in (cow) stocking rate, however the nutrient budgets show that there is an overall increase in stocking rate (RSU) on both the proposed dairy platform and the Support Block 1, from the existing operation (dairy platform + support block 2, and support block 1, respectively) to the proposed activity. Please confirm if this is correct.

For information purposes only, RSU stands for revised stock units, and therefore is not only driven by stock units/ha, but also the energy/feed requirements of the type of stock. Therefore, a change in stock type typically results in a RSU change even if there is no increase in overs stock unit/ha. RSUs are typically useful for assessing and comparing farm carrying capacities.

The RSU increases from 13,985 to 15,030 (an increase of 7%) is driven by the increase in dairy cow numbers, and the removal of beef animals.

As covered in the original report overall nutrient loss reduction is driven by multiple factors:

- Increase in cow numbers
- Reduced nitrogen fertiliser use
- Removal of beef animals
- Reducing the farm average Olsen P to 30

21 Address the concerns regarding the Proposed model raised by the Nutrient Budget auditor in the attached Irricon review. Please note that this has been updated from the previous version sent through due to a couple of superficial corrections.

The numbers of animals wintered have increased from 1210 (1000 cows + 120 yearling heifers) in YE 2020 models to 1460 (1195 cows and 265 yearlings) in the proposed.

There are errors in the above calculation, it should read

~~1210~~ 1420 (1000 cows + ~~120~~ 210 yearling heifers + 120 yearling steers + 90 2 yr old steers) in YE 2020 models to 1460 (1195 cows and 265 yearlings) in the proposed.

How the Olsen p levels will drop allowing the P fertiliser applied slightly exceeds maintenance P requirements.

Phosphorus has been applied as per maintenance requirements:

Below in the Overseer estimated maintenance requirements for the milking platform followed by the applied – there are no differences.

Maintenance fertiliser

Check whether soil test values for the blocks are at the economic

NUTRIENTS REQUIRED (KG/HA/YR) [1]	P
MP EFFLUENT 53.1 HA	22
MP EFFLUENT 23.4 HA	20
MP EFFLUENT CENTRE PIVOT	20
MP EFFLUENT LARGE RR	21
MP EFFLUENT SMALL RR	20
MP NON EFFLUENT (LEASE)	22
MP NON EFFLUENT (LEASE) ROLLING	24
MP NON EFFLUENT 38.2 HA	22

Phosphorus summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)	FERTILISER (KG/HA)
MP EFFLUENT 53.1 HA	15	0.3	22
MP EFFLUENT 23.4 HA	5	0.2	20
MP EFFLUENT CENTRE PIVOT	11	0.4	20
MP EFFLUENT LARGE RR	64	0.6	21
MP EFFLUENT SMALL RR	12	0.4	20
MP NON EFFLUENT (LEASE)	15	0.2	22
MP NON EFFLUENT (LEASE) ROLLING	11	0.4	24
MP NON EFFLUENT 38.2 HA	7	0.2	22

There are also no differences between the Overseer estimated maintenance requirements and assumed applied in the Support 1 modelling.

22 Summary

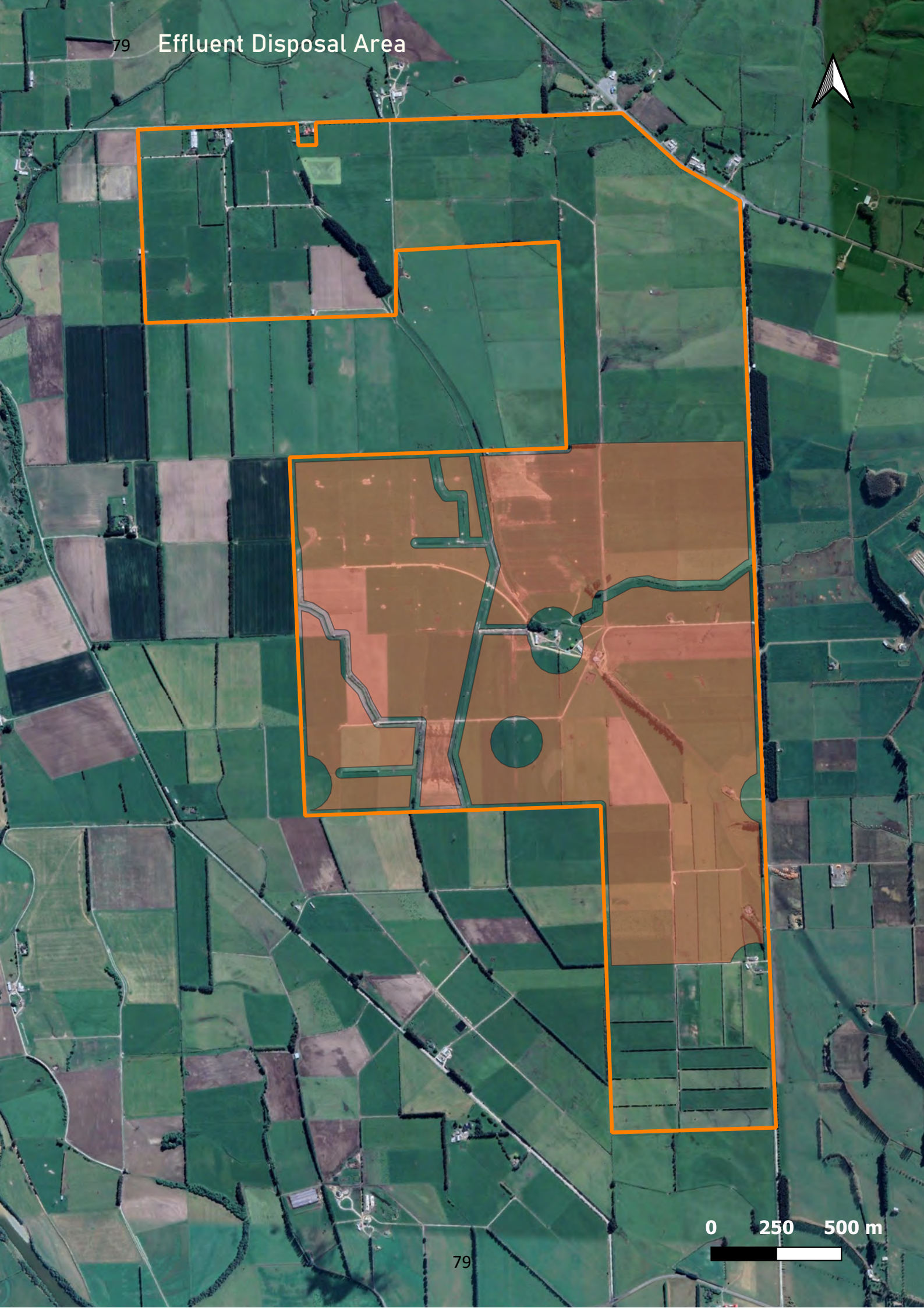
I trust the information provided here answers your questions. Please do not hesitate to contact me if you have any further questions.

Kind Regards,

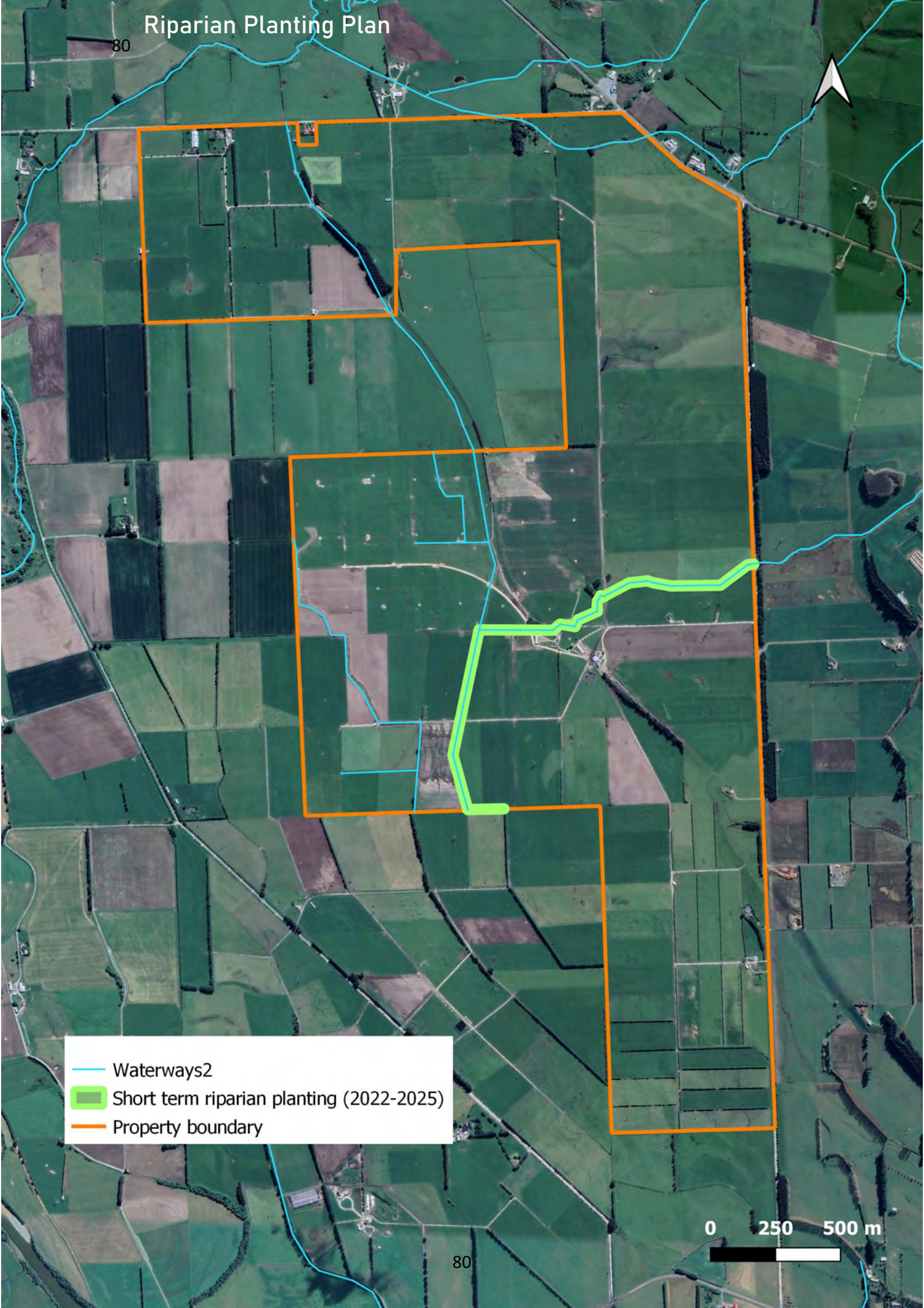
Matilda Ballinger

Matilda Ballinger
Planner

Effluent Disposal Area



Riparian Planting Plan



Cashmere Bay Dairy Limited - Otama Farms 33254

145 Jaffray Road, Otamita 9777, New Zealand

OverseerFM

Year ending 2021

Analysis type	Year end
Is publication	No
Application version	4.1.2.4
Printed date	20 Dec 2021, 3:53PM
Model version	6.4.1

Farm details

N 43 kg/ha | 15,257 kg P 1 kg/ha | 354 kg GHG 14,544 kg/ha | 5,134 tonnes NCE: 27 v6.4.1

Total area	353 ha
Productive block area	344.40 ha
Nitrogen conversion efficiency (NCE)	27%
N Surplus	245 kg/ha
Region	Southland

Total liveweight brought (kg/ha grazed)	509	Milking herd size (peak cows/ha grazed)	2.9
Total liveweight reared (kg/ha grazed)	70	Percent male beef animals	100
Total liveweight sold (kg/ha grazed)	351	Beef / dairy grazing stock rate (RSU)	75
Milk production per cow (kg milk solids / cow)	465.3	Dairy stock rate (RSU)	10369
Milk solids (kg/ha grazed)	1351	Dairy replacements stock rate (RSU)	67

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
MP Effluent Centre Pivot	Pasture	28.7	1,223	43.6	244	14	0.5
MP Effluent Large RR	Pasture	122	4,734	39.8	236	88	0.8
MP Effluent Small RR	Pasture	37	2,332	64.1	249	19	0.5
MP Non Effluent (lease) rolling	Pasture	36.7	1,479	41.2	204	17	0.5
MP Non effluent	Pasture	38.2	986	26.1	197	10	0.3
MP Non effluent (lease)	Pasture	81.8	3,497	43.7	205	17	0.2
MP fodderbeet	Fodder crop	6	684	114	230	2	0.4
Other sources	Other	-	322	-	-	186	-

Farm soils

S-MAP REF/NAME	GROUP/ORDER	DRAINAGE CLASS	MODIFIED	TOTAL AREA (HA)	% OF PROD. BLOCKS	BLOCKS
Balm_21a.1	Sedimentary/Brown	Well	No	23.1	6.7	2
Clar_33a.1	Recent/YGE/BGE/Pallic	Poor	No	27.7	8	3
Eure_20a.1	Sedimentary/Gley	Poor	No	4	1.2	1
Eure_23a.1	Sedimentary/Gley	Poor	No	45.6	13.3	3
Pyr2_2a.1	Recent/YGE/BGE/Pallic	Well	No	10.6	3.1	1
Selw_50a.1	Recent/YGE/BGE/Recent	Well	No	134.3	39	3
Stew_7a.1	Sedimentary/Brown	Well	No	99.1	28.8	3

Enterprises

STOCK NUMBERS

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	-	-	-	-	-	-	-	-	-	-	-	133
Dairy	400	650	850	1020	1020	1020	1010	980	970	950	880	-
Dairy replacements	-	310	310	-	-	-	-	-	-	-	-	-

RSU

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	0	0	0	0	0	0	0	0	0	0	0	74
Dairy	211	538	930	1219	1175	1284	1222	1023	1066	936	766	0
Dairy replacements	0	11	56	0	0	0	0	0	0	0	0	0

Irrigators

NAME	AREA COVERED	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
LINEAR AND CENTRE PIVOT Centre Pivot	28.2 ha												
TRAVELLING IRRIGATOR Large RR	119.9 ha												
TRAVELLING IRRIGATOR Small RR	36.4 ha												

Structures

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Milking Shed - Holding Pond | Solids: None | Pond: Spread On Blocks | Liquid: Spray Infrequently												
% of dairy animals	-	100	100	100	100	100	100	100	100	100	100	-
Uncovered Wintering Pad/Shelter - Use Farm System | Solids: Spread On Blocks | Pond: None | Liquid: None												
% of dairy animals	-	10	-	-	-	-	-	-	-	-	-	-
Hours on structure per day	-	undefined	-	-	-	-	-	-	-	-	-	-
Dairy Effluent System - Holding Pond | Solids: None | Pond: Spread On Blocks | Liquid: Spray Infrequently												

Supplements

CATEGORY	FEED	SOURCE	DRY WEIGHT?	AMOUNT	DESTINATION
Grains	Barley grain	Purchased (700)	No	700 tonnes	Dairy - Milking shed (700)
Baleage	-	MP Effluent Centre Pivot (5), MP Effluent Large RR (20), MP Effluent Small RR (5), MP Non Effluent (lease) rolling (8), MP Non effluent (8), MP Non effluent (lease) (10)	Yes	56 tonnes	Specified blocks (20), Dairy - Uncovered wintering pad/shelter (36)
Process byproducts	Palm kernel meal	Purchased (200)	No	200 tonnes	Dairy - Milking shed (200)
Silage	Baleage	Purchased (46)	Yes	46 tonnes	All pastoral blocks (46)

Crops

CROP/PASTURE	AREA (HA)	YIELD	GROWN (T/DM/YR)	INTAKE (T/DM/YR)	SUPPLEMENTS (T/DM/YR)
Ryegrass/white clover	338.4	-	5724	4808	56
Fodder beets	6.0	150 T dry matter	-	-	-

Fertiliser

MANUFACTURER/MATERIAL	NAME	TOTAL APPLIED (KG)	N	P	K	S	CA	MG	NA
Ballance	N-rich Urea	7,106	3,269	-	-	-	-	-	-
Ravensdown	Ammo 31	-	-	-	-	-	-	-	-
Ballance	Superten	6,091	-	548	-	640	1,340	-	-
Ravensdown	Potassium Chloride	24,468	-	-	12,234	-	-	-	294
Ravensdown	Sodium Chloride	-	-	-	-	-	-	-	-
Ravensdown	Esta Kieserite Granular	-	-	-	-	-	-	-	-
Ravensdown	Cropmaster DAP Boron Plus	-	-	-	-	-	-	-	-
Ravensdown	N-Protect	98,921	45,405	-	-	-	-	-	-
Ballance	PhaSed N QS	43,992	13,857	-	-	7,523	1,012	-	-
Ravensdown	DAP 13 S	-	-	-	-	-	-	-	-
Ballance	SustaiN	-	-	-	-	-	-	-	-
Ravensdown	Cropmaster DAP	37,651	6,627	7,530	-	377	-	-	-
Ravensdown	Granular Ammonium Sulphate	663	133	-	-	152	-	-	-
TOTAL		**218,893**	**69,290**	**8,078**	**12,234**	**8,691**	**2,352**	**-**	**294**

GHG - Total farm emissions

METHANE GHG EMISSIONS	N2O GHG EMISSIONS	CO2 GHG EMISSIONS	TOTAL GHG EMISSIONS
3364.8 eC02/tonnes/yr	1027.9 eC02/tonnes/yr	741.3 eC02/tonnes/yr	5134 eC02/tonnes/yr

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	15,257	43
Phosphorus	354	1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Foliar sprays	0	0	0	0	0	0	0
Fertiliser, lime and other	196	23	35	25	7	0	1
Irrigation	3	0	2	3	12	3	12
Supplements	49	10	17	6	2	4	2
Rain/clover fixation	89	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	43	1	13	36	55	3	11
As product	92	15	24	5	18	2	7
As prunings	0	0	0	0	0	0	0
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	81	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	117	14	-2	-6	-5	-2	0
Standing plant material	-3	0	-3	0	0	0	0
Inorganic mineral	0	3	-21	0	-8	-12	-14
Crop framework	0	0	0	0	0	0	0
Inorganic soil pool	4	0	43	0	-38	17	15
Change in supplement storage	0	0	0	0	0	0	0
Root and stover residuals	3	0	1	1	0	0	0

Effluent report

The report shows rates and target areas for farm liquid effluent only, assuming it is all applied to pastoral blocks. It excludes any farm solid effluent or imported effluent that may be added to effluent blocks. If this occurs, then target areas may need to be increased.

CURRENT AREA RECEIVING LIQUID EFFLUENT	
Total area including crops	185 ha
Pastoral area receiving liquid	185 ha
% of farm pastoral area	55%
Average liquid effluent	43 kg N/ha/yr
Average fertiliser	201 kg N/ha/yr
Average other	19 kg N/ha/yr
AREA OF FARM TO APPLY ALL EFFLUENT TO ACHIEVE RATES OF	
150 kg N/ha/yr - Liquid	53 ha - based on the amount of effluent generated on the the farm and sprayed from sump.
150 kg N/ha/yr - Solid	30 ha
150 kg N/ha/yr - Total	83 ha
Maintenance K	1332 ha
100 kg K/ha/yr	119 ha
Maintenance K Warning	* Average K maintenance rates were less than 20 kg K/ha/yr - use with caution.
SOURCE OF N IN EFFLUENT BLOCK(S)	
Effluent from farm dairy	74%
Effluent from Feed pad	0%
Effluent from Standoff pad	0%
Effluent from wintering pad(s)	0%
Solids	26%
Exported	0%

Blocks

MP Effluent Centre Pivot

Pasture - Flat, 28.7 ha

N	43.6 kg/ha | 1,223 kg	P	0.5 kg/ha | 14 kg

BLOCK DETAILS

Area	28.7 ha	Average temp	10.1℃	Average rainfall	839 mm/yr	Annual PET	754 mm
Distance from coast	85 km						

SOILS

88%	EURE_23A.1	12%	STEW_7A.1
25.26 ha	Gley	3.44 ha	Brown

FODDER CROP ROTATIONS

MP fodderbeet

PASTURE

Pasture growth	16,915 kg DM/ha/yr	Dairy replacements	0.19 rsu/ha
Utilisation	85 %	Beef	0.16 rsu/ha
Intake	14,199 kg DM/ha/yr	Dairy	25.26 rsu/ha
Removed	178 kg DM/ha/yr		

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

SUPPLEMENTS

Harvested (DM)	5 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Dairy replacements	-	0.03	0.16	-	-	-	-	-	-	-	-	-
Beef	-	-	-	-	-	-	-	-	-	-	-	0.16
Dairy	0.44	0.83	2.32	3.03	2.93	3.2	3.04	2.55	2.65	2.35	1.92	-
FERTILISER APPLIED (KG/HA)												
N	-	41	8	39	15	15	13	29	42	-	-	-
P	-	-	9	13	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	-	1	-	-	-	-	2	-	-	-
IRRIGATION APPLIED (MM)												
Avg applied (mm)	-	-	-	-	62	63	69	53	-	-	-	-
CENTRE PIVOT (LINEAR AND CENTRE PIVOT): OVERSEER DEFAULT (FIXED) | N:2.5 P:0.1 K:1.6 S:2.5 CA:9.3 MG:2.2 NA:9.5												
Supplied (mm)	-	-	-	-	64	66	72	56	-	-	-	-
Applied (mm)	-	-	-	-	62	63	69	53	-	-	-	-
Depth (mm)	-	-	-	-	5	5	5	5	-	-	-	-
Return (days)	-	-	-	-	4	4	4	4	-	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Eure_23a.1	Centre Pivot	25.26 ha (88%)	971 kg	39 kg/ha	10.2 ppm	243 kg/ha	258 kg/ha	13 kg	0.5 kg/ha	Low	Low	Low
Stew_7a.1	Centre Pivot	3.44 ha (12%)	252 kg	77 kg/ha	18.7 ppm	250 kg/ha	258 kg/ha	1 kg	0.4 kg/ha	Low	Low	Low

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Eure_23a.1	Centre Pivot	25.26 ha (88%)	201 mm	0 mm	711 mm	231 mm	105 mm	291 mm	126 mm	-	-	-	-
Stew_7a.1	Centre Pivot	3.44 ha (12%)	220 mm	0 mm	711 mm	126 mm	57 mm	198 mm	69 mm	-	-	-	-

MODEL NOTES

Overview

Maintenance nutrient requirements for this block take account of nutrients added in effluent.

Total P inputs of fertiliser, imported effluent and on-farm effluent (33 kg P/ha/yr) should be lower than maintenance P (22 kg P/ha/yr) when Olsen P (39) is above that required for near maximum pasture production (30). Note that on high producing dairy farms, target Olsen P levels are higher.

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss and 1.5 kg P/ha/yr - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Increase in QT K test of 1 units
- Increase in QT Mg test of 1 units

Stew_7a.1/Centre Pivot - 3.44 ha (12%)

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 250 kg/ha/yr pure lime. Review soil pH and lime requirement.

Eure_23a.1/Centre Pivot - 25.26 ha (88%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 120 kg/ha/yr pure lime. Review soil pH and lime requirement.

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	1,223	43.6
Phosphorus	14	0.5

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	57	9	59	5	12	6	2
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	6.12	0	4.12	6.12	24.36	6	24.36
Supplements fed on blocks	2	0	2	0	1	0	0
Rain/clover fixation	91.72	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	43.56	0.49	12.88	40.12	55.6	4.12	16.24
As product	95	16	24	5	19	2	7
Transfer	15	-3	29	-2	6	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	83.12	0	0	0	0	0	0
As supplements and crop residues	3.12	1	4	0	1	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	117.16	14.88	0	-5	0	0	0
Inorganic mineral	0	4.12	-14	0	-4	-7	-8
Inorganic soil pool	0	0.12	46	0	-33.24	13	16.24

MP Effluent Large RR

Pasture - Flat, 122 ha

N	39.8 kg/ha | 4,734 kg	P	0.8 kg/ha | 88 kg

BLOCK DETAILS

Area	122 ha	Average temp	10.2℃	Average rainfall	847 mm/yr	Annual PET	756 mm
Distance from coast	85 km						

SOILS

76%	SELW_50A.1	14%	CLAR_33A.1	10%	EURE_23A.1
92.72 ha	Recent	17.08 ha	Pallic	12.2 ha	Gley

FODDER CROP ROTATIONS

MP fodderbeet

PASTURE

Pasture growth	16,915 kg DM/ha/yr	Dairy replacements	0.19 rsu/ha
Utilisation	85 %	Beef	0.16 rsu/ha
Intake	14,208 kg DM/ha/yr	Dairy	25.26 rsu/ha
Removed	167 kg DM/ha/yr		

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

SUPPLEMENTS

Harvested (DM)	20 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Dairy replacements	-	0.02	0.17	-	-	-	-	-	-	-	-	-
Beef	-	-	-	-	-	-	-	-	-	-	-	0.16
Dairy	0.43	0.83	2.31	3.04	2.93	3.2	3.04	2.55	2.65	2.36	1.92	-
FERTILISER APPLIED (KG/HA)												
N	-	41	8	39	15	15	13	29	42	-	-	-
P	-	-	9	13	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	-	1	-	-	-	-	2	-	-	-
IRRIGATION APPLIED (MM)												
Avg applied (mm)	-	-	-	-	48	60	39	64	-	-	-	-
LARGE RR (TRAVELLING IRRIGATOR): OVERSEER DEFAULT (FIXED) | N:2.5 P:0.1 K:1.6 S:2.5 CA:9.3 MG:2.2 NA:9.5												
Supplied (mm)	-	-	-	-	51	63	39	67	-	-	-	-
Applied (mm)	-	-	-	-	48	60	39	64	-	-	-	-
Depth (mm)	-	-	-	-	10	10	10	10	-	-	-	-
Return (days)	-	-	-	-	11	11	11	11	-	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Selw_50a.1	Large RR	92.72 ha (76%)	3,527 kg	39 kg/ha	10.8 ppm	235 kg/ha	258 kg/ha	70 kg	0.8 kg/ha	Low	Low	Low
Clar_33a.1	Large RR	17.08 ha (14%)	768 kg	46 kg/ha	12.8 ppm	240 kg/ha	258 kg/ha	12 kg	0.7 kg/ha	Low	Low	Low
Eure_23a.1	Large RR	12.2 ha (10%)	439 kg	37 kg/ha	10.2 ppm	240 kg/ha	258 kg/ha	6 kg	0.5 kg/ha	Low	Low	Low

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Selw_50a.1	Large RR	92.72 ha (76%)	189 mm	0 mm	710 mm	219 mm	81 mm	309 mm	138 mm	-	-	-	-
Clar_33a.1	Large RR	17.08 ha (14%)	189 mm	0 mm	710 mm	198 mm	102 mm	270 mm	96 mm	-	-	-	-
Eure_23a.1	Large RR	12.2 ha (10%)	191 mm	0 mm	710 mm	231 mm	105 mm	291 mm	126 mm	-	-	-	-

MODEL NOTES

Overview

Maintenance nutrient requirements for this block take account of nutrients added in effluent.

Total P inputs of fertiliser, imported effluent and on-farm effluent (33 kg P/ha/yr) should be lower than maintenance P (22 kg P/ha/yr) when Olsen P (39) is above that required for near maximum pasture production (30). Note that on high producing dairy farms, target Olsen P levels are higher.

Soil P loss status is high. Consider reducing Olsen P levels.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

Eure_23a.1/Large RR - 12.2 ha (10%)

Fertiliser P loss is greater than 10% of total P loss and 1.5 kg P/ha/yr - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Increase in QT K test of 1 units
- Increase in QT Mg test of 1 units

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 120 kg/ha/yr pure lime. Review soil pH and lime requirement.

Clar_33a.1/Large RR - 17.08 ha (14%)

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Increase in QT K test of 1 units
- Increase in QT Mg test of 1 units

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 150 kg/ha/yr pure lime. Review soil pH and lime requirement.

Selw_50a.1/Large RR - 92.72 ha (76%)

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K, Na

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Increase in QT K test of 1 units
- Increase in QT Mg test of 3 units

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 120 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	4,734	39.8
Phosphorus	88	0.8

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	57	9	59	5	12	6	2
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	5.24	0	4	5.24	20.1	5	21
Supplements fed on blocks	2	0	2	0	1	0	0
Rain/clover fixation	85.2	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	39.78	0.76	13	39.1	52.5	4	14
As product	95	16	24	5	19	2	7
Transfer	15	-3	29	-2	6	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	73.48	0	0	0	0	0	0
As supplements and crop residues	3	0	3	0	1	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	123.8	18.46	0	-5	0	0	0
Inorganic mineral	0	1.3	-15.8	0	-10.84	-17.64	-20.16
Inorganic soil pool	0	0	46.94	0	-26.8	22.88	27.16

MP Effluent Small RR

Pasture - Flat, 37 ha

N 64.1 kg/ha | 2,332 kg

P 0.5 kg/ha | 19 kg

BLOCK DETAILS

Area	37 ha	Average temp	10.2℃	Average rainfall	850 mm/yr	Annual PET	758 mm
Distance from coast	85 km						

SOILS

52% BALM_21A.1	38% SELW_50A.1	10% CLAR_33A.1
19.24 ha Brown	14.06 ha Recent	3.7 ha Pallic

FODDER CROP ROTATIONS

MP fodderbeet

PASTURE

Pasture growth	16,915 kg DM/ha/yr	Dairy replacements	0.2 rsu/ha
Utilisation	85 %	Beef	0.16 rsu/ha
Intake	14,232 kg DM/ha/yr	Dairy	25.29 rsu/ha
Removed	138 kg DM/ha/yr		

SUPPLEMENTS

Harvested (DM)	5 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Dairy replacements	-	0.03	0.17	-	-	-	-	-	-	-	-	-
Beef	-	-	-	-	-	-	-	-	-	-	-	0.16
Dairy	0.44	0.83	2.32	3.04	2.92	3.2	3.06	2.56	2.66	2.34	1.92	-
FERTILISER APPLIED (KG/HA)												
N	-	41	8	39	15	15	13	29	42	-	-	-
P	-	-	9	13	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	-	1	-	-	-	-	2	-	-	-
IRRIGATION APPLIED (MM)												
Avg applied (mm)	-	-	-	-	87	75	74	69	-	-	-	-
SMALL RR (TRAVELLING IRRIGATOR): OVERSEER DEFAULT (FIXED) | N:2.5 P:0.1 K:1.6 S:2.5 CA:9.3 MG:2.2 NA:9.5												
Supplied (mm)	-	-	-	-	91	79	78	72	-	-	-	-
Applied (mm)	-	-	-	-	87	75	74	69	-	-	-	-
Depth (mm)	-	-	-	-	10	10	10	10	-	-	-	-
Return (days)	-	-	-	-	5	5	5	5	-	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Balm_21a.1	Small RR	19.24 ha (52%)	1,519 kg	80 kg/ha	16.7 ppm	255 kg/ha	258 kg/ha	5 kg	0.2 kg/ha	Low	Low	Low
Selw_50a.1	Small RR	14.06 ha (38%)	620 kg	45 kg/ha	10.9 ppm	240 kg/ha	258 kg/ha	10 kg	0.7 kg/ha	Low	Medium	Low
Clar_33a.1	Small RR	3.7 ha (10%)	193 kg	54 kg/ha	12.5 ppm	248 kg/ha	258 kg/ha	4 kg	1.2 kg/ha	Medium	Medium	Low

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Balm_21a.1	Small RR	19.24 ha (52%)	491 mm	0 mm	714 mm	129 mm	57 mm	198 mm	72 mm	-	-	-	-
Selw_50a.1	Small RR	14.06 ha (38%)	414 mm	0 mm	713 mm	219 mm	81 mm	309 mm	138 mm	-	-	-	-
Clar_33a.1	Small RR	3.7 ha (10%)	435 mm	0 mm	713 mm	198 mm	102 mm	270 mm	96 mm	-	-	-	-

MODEL NOTES

Overview

Maintenance nutrient requirements for this block take account of nutrients added in effluent.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

Clar_33a.1/Small RR - 3.7 ha (10%)

Olsen P (39) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Increase in QT K test of 1 units
- Increase in QT Mg test of 1 units

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 180 kg/ha/yr pure lime. Review soil pH and lime requirement.

Selw_50a.1/Small RR - 14.06 ha (38%)

Total P inputs of fertiliser, imported effluent and on-farm effluent (33 kg P/ha/yr) should be lower than maintenance P (22 kg P/ha/yr) when Olsen P (39) is above that required for near maximum pasture production (30). Note that on high producing dairy farms, target Olsen P levels are higher.

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K, Na

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Increase in QT K test of 1 units
- Increase in QT Mg test of 3 units

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 140 kg/ha/yr pure lime. Review soil pH and lime requirement.

Balm_21a.1/Small RR - 19.24 ha (52%)

Total P inputs of fertiliser, imported effluent and on-farm effluent (33 kg P/ha/yr) should be lower than maintenance P (22 kg P/ha/yr) when Olsen P (39) is above that required for near maximum pasture production (30). Note that on high producing dairy farms, target Olsen P levels are higher.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Increase in QT K test of 1 units
- Increase in QT Mg test of 1 units

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 270 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	2,332	64.1
Phosphorus	19	0.5

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	57	9	59	5	12	6	2
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	8.04	0	5.14	8.04	29.84	7.14	30.36
Supplements fed on blocks	2	0	2	0	1	0	0
Rain/clover fixation	94.46	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	64.1	0.55	12	42.04	72.78	6.04	20.18
As product	96	16	24	5	19	2	7
Transfer	15	-3	29	-2	6	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	71.06	0	0	0	0	0	0
As supplements and crop residues	3	0	3	0	1	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	113.54	16.82	0	-5	0	0	0
Inorganic mineral	0	2.56	-14.44	0	-7.42	-12.32	-14.08
Inorganic soil pool	0	0.52	48.58	0	-41	18.32	24.74

MP Non effluent

Pasture - Flat, 38.2 ha

N 26.1 kg/ha | 986 kg

P 0.3 kg/ha | 10 kg

BLOCK DETAILS

Area	38.2 ha	Average temp	10.2℃	Average rainfall	859 mm/yr	Annual PET	759 mm
Distance from coast	85 km						

SOILS

72% SELW_50A.1	18% CLAR_33A.1	10% BALM_21A.1
27.5 ha Recent	6.88 ha Pallic	3.82 ha Brown

FODDER CROP ROTATIONS

MP fodderbeet

PASTURE

Pasture growth	16,915 kg DM/ha/yr	Dairy replacements	0.2 rsu/ha
Utilisation	85 %	Beef	0.17 rsu/ha
Intake	14,168 kg DM/ha/yr	Dairy	25.2 rsu/ha
Removed	213 kg DM/ha/yr		

SUPPLEMENTS

Harvested (DM)	8 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Dairy replacements	-	0.03	0.17	-	-	-	-	-	-	-	-	-
Beef	-	-	-	-	-	-	-	-	-	-	-	0.17
Dairy	0.44	0.83	2.31	3.03	2.92	3.19	3.03	2.54	2.66	2.33	1.92	-
FERTILISER APPLIED (KG/HA)												
N	-	41	8	39	15	15	13	29	42	-	-	-
P	-	-	9	13	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	-	1	-	-	-	-	2	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Selw_50a.1	-	27.5 ha (72%)	605 kg	22 kg/ha	11.2 ppm	195 kg/ha	215 kg/ha	7 kg	0.3 kg/ha	Low	Low	Low
Clar_33a.1	-	6.88 ha (18%)	222 kg	33 kg/ha	14.3 ppm	201 kg/ha	215 kg/ha	3 kg	0.4 kg/ha	Low	Low	Low
Balm_21a.1	-	3.82 ha (10%)	159 kg	43 kg/ha	17.5 ppm	205 kg/ha	215 kg/ha	0 kg	0.1 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Selw_50a.1	-	27.5 ha (72%)	201 mm	0 mm	659 mm	219 mm	81 mm	309 mm	138 mm	-	-	-	-
Clar_33a.1	-	6.88 ha (18%)	228 mm	0 mm	631 mm	198 mm	102 mm	270 mm	96 mm	-	-	-	-
Balm_21a.1	-	3.82 ha (10%)	247 mm	0 mm	612 mm	129 mm	57 mm	198 mm	72 mm	-	-	-	-

MODEL NOTES

Overview

Maintenance nutrient requirements for this block take account of nutrients added in effluent.

Olsen P (39) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

Balm_21a.1/No irrigation - 3.82 ha (10%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 1 units

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 170 kg/ha/yr pure lime. Review soil pH and lime requirement.

Clar_33a.1/No irrigation - 6.88 ha (18%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 1 units

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 130 kg/ha/yr pure lime. Review soil pH and lime requirement.

Selw_50a.1/No irrigation - 27.5 ha (72%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 3 units

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 100 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	986	26.1
Phosphorus	10	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	13	7	6	3	11	5	1
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	2	0	2	0	1	0	0
Rain/clover fixation	94.26	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	26.08	0.3	12	32	42.04	1.1	4.66
As product	95	16	24	5	19	2	7
Transfer	15	-3	29	-2	6	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	63.98	0	0	0	0	0	0
As supplements and crop residues	4	1	4	0	1	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	107.02	18.42	0	-5	0	0	0
Inorganic mineral	0	1.3	-29.9	0	-10.48	-17.08	-19.52
Inorganic soil pool	0	-2	5.9	0	-37.66	19.98	13.86

MP Non effluent (lease)

Pasture - Flat, 81.8 ha

N	43.7 kg/ha | 3,497 kg	P	0.2 kg/ha | 17 kg

BLOCK DETAILS

Area	81.8 ha	Average temp	10.1℃	Average rainfall	834 mm/yr	Annual PET	753 mm
Distance from coast	85 km						

SOILS

90%	STEW_7A.1	10%	EURE_23A.1
73.62 ha	Brown	8.18 ha	Gley

FODDER CROP ROTATIONS

MP fodderbeet

PASTURE

Pasture growth	16,915 kg DM/ha/yr	Dairy replacements	0.2 rsu/ha
Utilisation	85 %	Beef	0.16 rsu/ha
Intake	14,244 kg DM/ha/yr	Dairy	25.35 rsu/ha
Removed	124 kg DM/ha/yr		

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

SUPPLEMENTS

Harvested (DM)	10 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Dairy replacements	-	0.03	0.17	-	-	-	-	-	-	-	-	-
Beef	-	-	-	-	-	-	-	-	-	-	-	0.16
Dairy	0.44	0.83	2.32	3.04	2.94	3.21	3.06	2.56	2.66	2.36	1.93	-
FERTILISER APPLIED (KG/HA)												
N	-	41	8	39	15	15	13	29	42	-	-	-
P	-	-	9	13	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	-	1	-	-	-	-	2	-	-	-

SOIL/IRRIGATION - RESULTS

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			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Stew_7a.1	-	73.62 ha (90%)	3,309 kg	46 kg/ha	19.5 ppm	206 kg/ha	215 kg/ha	15 kg	0.2 kg/ha	Low	Low	Low
Eure_23a.1	-	8.18 ha (10%)	188 kg	23 kg/ha	12.1 ppm	198 kg/ha	215 kg/ha	2 kg	0.3 kg/ha	Low	Low	Low

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Stew_7a.1	-	73.62 ha (90%)	122 mm	0 mm	599 mm	126 mm	57 mm	198 mm	69 mm	-	-	-	-
Eure_23a.1	-	8.18 ha (10%)	100 mm	0 mm	643 mm	231 mm	105 mm	291 mm	126 mm	-	-	-	-

MODEL NOTES

Overview

Maintenance nutrient requirements for this block take account of nutrients added in effluent.

Olsen P (39) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 1 units

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Eure_23a.1/No irrigation - 8.18 ha (10%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss and 1.5 kg P/ha/yr - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 100 kg/ha/yr pure lime. Review soil pH and lime requirement.

Stew_7a.1/No irrigation - 73.62 ha (90%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 180 kg/ha/yr pure lime. Review soil pH and lime requirement.

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	3,497	43.7
Phosphorus	17	0.2

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	13	7	6	3	11	5	1
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	2	0	2	0	1	0	0
Rain/clover fixation	101.2	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	43.7	0.21	12	32	56.2	1	6.7
As product	96	16	24	5	19	2	7
Transfer	15	-3	29	-2	6	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	61.6	0	0	0	0	0	0
As supplements and crop residues	2	0	2	0	1	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	99.8	14.1	0	-5	0	0	0
Inorganic mineral	0	4.9	-28	0	-4	-7	-8
Inorganic soil pool	0	-2	5	0	-58.2	9.1	0.3

MP Non Effluent (lease) rolling

Pasture - Rolling, 36.7 ha

N	41.2 kg/ha | 1,479 kg	P	0.5 kg/ha | 17 kg

BLOCK DETAILS

Area	36.7 ha	Average temp	10℃	Average rainfall	836 mm/yr	Annual PET	750 mm
Distance from coast	85 km						

SOILS

60%	STEW_7A.1	29%	PYR2_2A.1	11%	EURE_20A.1
22.02 ha	Brown	10.64 ha	Pallic	4.04 ha	Gley

FODDER CROP ROTATIONS

MP fodderbeet

PASTURE

Pasture growth	16,915 kg DM/ha/yr	Dairy replacements	0.2 rsu/ha
Utilisation	85 %	Beef	0.17 rsu/ha
Intake	14,160 kg DM/ha/yr	Dairy	25.19 rsu/ha
Removed	223 kg DM/ha/yr		

SUPPLEMENTS

Harvested (DM)	8 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Rolling	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Dairy replacements	-	0.03	0.17	-	-	-	-	-	-	-	-	-
Beef	-	-	-	-	-	-	-	-	-	-	-	0.17
Dairy	0.44	0.83	2.31	3.03	2.92	3.19	3.03	2.54	2.65	2.34	1.91	-
FERTILISER APPLIED (KG/HA)												
N	-	41	8	39	15	15	13	29	42	-	-	-
P	-	-	9	13	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	-	1	-	-	-	-	2	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Stew_7a.1	-	22.02 ha (60%)	994 kg	46 kg/ha	19.4 ppm	205 kg/ha	215 kg/ha	5 kg	0.2 kg/ha	Low	Low	Low
Pyr2_2a.1	-	10.64 ha (29%)	394 kg	38 kg/ha	16.6 ppm	205 kg/ha	215 kg/ha	9 kg	0.9 kg/ha	Medium	Medium	Low
Eure_20a.1	-	4.04 ha (11%)	91 kg	23 kg/ha	12.1 ppm	198 kg/ha	215 kg/ha	3 kg	0.7 kg/ha	Low	Medium	Low

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Stew_7a.1	-	22.02 ha (60%)	237 mm	0 mm	599 mm	126 mm	57 mm	198 mm	69 mm	-	-	-	-
Pyr2_2a.1	-	10.64 ha (29%)	228 mm	0 mm	609 mm	210 mm	132 mm	270 mm	78 mm	-	-	-	-
Eure_20a.1	-	4.04 ha (11%)	194 mm	0 mm	643 mm	243 mm	117 mm	297 mm	126 mm	-	-	-	-

MODEL NOTES

Overview

Maintenance nutrient requirements for this block take account of nutrients added in effluent.

Olsen P (39) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 1 units

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Eure_20a.1/No irrigation - 4.04 ha (11%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 100 kg/ha/yr pure lime. Review soil pH and lime requirement.

Pyr2_2a.1/No irrigation - 10.64 ha (29%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 150 kg/ha/yr pure lime. Review soil pH and lime requirement. 103

Stew_7a.1/No irrigation - 22.02 ha (60%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 180 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	1,479	41.2
Phosphorus	17	0.5

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	13	7	6	3	11	5	1
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	2	0	2	0	1	0	0
Rain/clover fixation	101.94	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	41.15	0.46	12	32	53.99	1	6.38
As product	95	16	24	5	19	2	7
Transfer	15	-3	29	-2	6	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	63.02	0	0	0	0	0	0
As supplements and crop residues	4	1	4	0	1	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	99.77	15.56	0	-5	0	0	0
Inorganic mineral	0	3.73	-29.29	0	-4	-7	-8
Inorganic soil pool	0	-2.4	5.29	0	-56.28	9.11	0.33

MP fodderbeet

Fodder crop - 6 ha (rotation)

N	114 kg/ha | 684 kg	P	0.4 kg/ha | 2 kg

BLOCK DETAILS

Area	6 ha

ROTATES THROUGH

MP Effluent Centre Pivot, MP Effluent Large RR, MP Effluent Small RR, MP Non Effluent (lease) rolling, MP Non effluent, MP Non effluent (lease)

ARTIFICIAL DRAINAGE

Drainage method	**None**

CROP MANAGEMENT

Block type	**Fodder crop**	Low N mineralisation capacity	**No**
Rotation name	**MP fodderbeet**	Month resown in pasture	**October**
Area	**6ha**	Months since fertiliser applied to pasture	**0**

CROPS

Fodder beets

Category	Fodder
Crop type	Fodder beets
Sown	November - Reporting year
Yield	150T
Cultivation practice at sowing	Conventional

Pasture

Category	Permanent pasture
Crop type	Pasture
Sown	October - Reporting year
Cultivation practice at sowing	Conventional
Defoliation management	Grazing only

	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
	Fodder beets											Pasture
FERTILISER APPLIED (KG/HA)												
N	54	69	-	-	69	-	-	-	-	-	-	-
P	37	-	-	-	-	-	-	-	-	-	-	-
K	37	-	-	-	-	-	-	-	-	-	-	-
S	27	-	-	-	-	-	-	-	-	-	-	-

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	684	114
Phosphorus	2	0.4

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	192	37	37	27	0	0	1
Irrigation	0	0	0	0	0	0	0
Supplements	57	8	59	5	15	4	3
Rain/clover fixation	2	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	114	0.5	6	47	112	4	11
As product	23	-3	21	-4	-20	1	5
Transfer	-1	-2	13	-1	6	0	2
Effluent exported	0	0	0	0	0	0	0
To atmosphere	71	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-168	-24	0	-39	0	0	0
Standing plant material	-169	-20	-161	-11	-17	-12	-8
Inorganic mineral	0	1	-13	0	-13	-20	-24
Inorganic plant available	215	68	181	0	-79	27	0
Root and stover residuals	167	25	49	42	27	5	21

Cashmere Bay Dairy Limited - Otama Farms 33254

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YR END 21 SUPPORT 1

Analysis type	Predictive
Is publication	No
Application version	4.1.2.4
Printed date	20 Dec 2021, 3:54PM
Model version	6.4.1

Farm details

N 24 kg/ha | 2,131 kg P 0.4 kg/ha | 37 kg GHG 8,658 kg/ha | 779.2 tonnes NCE: 17 v6.4.1

Total area	89.6 ha
Productive block area	89.60 ha
Nitrogen conversion efficiency (NCE)	17%
N Surplus	189 kg/ha
Region	Southland

Total liveweight brought (kg/ha grazed)	612
Total liveweight reared (kg/ha grazed)	1007
Total liveweight sold (kg/ha grazed)	1547

Percent male beef animals	100
Dairy grazing stock rate (RSU)	1467

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
Pasture	Pasture	89.6	1,542	18.3	178	25	0.3
Support 1 fodderbeet	Fodder crop	6	576	96	293	3	0.5
Other sources	Other	-	14	-	-	9	-

Farm soils

S-MAP REF/NAME	GROUP/ORDER	DRAINAGE CLASS	MODIFIED	TOTAL AREA (HA)	% OF PROD. BLOCKS	BLOCKS
Clar_33a.1	Recent/YGE/BGE/Pallic	Poor	No	43.9	49	1
Selw_50a.1	Recent/YGE/BGE/Recent	Well	No	20.6	23	1
Stew_7a.1	Sedimentary/Brown	Well	No	25.1	28	1

Enterprises

STOCK NUMBERS

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	-	-	-	6	126	126	126	120	120	-	-	-
Dairy grazing	210	210	210	520	420	420	420	420	420	411	411	210

RSU

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	0	0	0	1	14	39	43	41	41	0	0	0
Dairy grazing	46	65	73	168	171	160	155	137	147	144	152	47

Irrigators

There is no irrigation on this farm.

Structures

No structures exist.

Supplements

CATEGORY	FEED	SOURCE	DRY WEIGHT?	AMOUNT	DESTINATION
Baleage	-	Pasture (58)	Yes	58 tonnes	Specified blocks (58)
Baleage	-	Pasture (46)	Yes	46 tonnes	Off farm (46)

Crops

CROP/PASTURE	AREA (HA)	YIELD	GROWN (T/DM/YR)	INTAKE (T/DM/YR)	SUPPLEMENTS (T/DM/YR)
Ryegrass/white clover	83.6	-	1191	761	104
Fodder beets	6.0	150 T dry matter	-	-	-

Fertiliser[108]

MANUFACTURER/MATERIAL	NAME	TOTAL APPLIED (KG)	N	P	K	S	CA	MG	NA
Ravensdown	Potassium Chloride	14,378	-	-	7,189	-	-	-	173
Ravensdown	Superphosphate	1,505	-	135	-	166	301	-	-
Ravensdown	Sodium Chloride	-	-	-	-	-	-	-	-
Ravensdown	Esta Kieserite Granular	-	-	-	-	-	-	-	-
Ravensdown	N-Protect	25,793	11,839	-	-	-	-	-	-
Ravensdown	Cropmaster DAP Boron Plus	-	-	-	-	-	-	-	-
Ballance	PhaSed N QS	10,868	3,423	-	-	1,858	250	-	-
Ravensdown	Ammo 31	-	-	-	-	-	-	-	-
Ravensdown	DAP 13 S	-	-	-	-	-	-	-	-
Ballance	SustaiN	-	-	-	-	-	-	-	-
Ravensdown	Flexi-N	-	-	-	-	-	-	-	-
Ravensdown	Granular Ammonium Sulphate	663	133	-	-	152	-	-	-
Ravensdown	Cropmaster DAP	10,133	1,783	2,027	-	101	-	-	-
Ravensdown	Urea	1,756	808	-	-	-	-	-	-
TOTAL		**65,095**	**17,986**	**2,162**	**7,189**	**2,278**	**551**	**-**	**173**

GHG - Total farm emissions

METHANE GHG EMISSIONS	N20 GHG EMISSIONS	C02 GHG EMISSIONS	TOTAL GHG EMISSIONS
492.7 eC02/tonnes/yr	190.3 eC02/tonnes/yr	96.3 eC02/tonnes/yr	779.2 eC02/tonnes/yr

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	2,131	24
Phosphorus	37	0.4

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Foliar sprays	0	0	0	0	0	0	0
Fertiliser, lime and other	199	24	79	25	6	0	2
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	29	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	24	0.4	12	27	40	1	5
As product	30	7	2	4	15	0	1
As prunings	0	0	0	0	0	0	0
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	46	0	0	0	0	0	0
As supplements and crop residues	9	2	10	1	2	1	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	111	17	1	-6	0	0	0
Standing plant material	-11	-1	-13	-1	-1	0	-1
Inorganic mineral	0	3	-19	0	-6	-9	-11
Crop framework	0	0	0	0	0	0	0
Inorganic soil pool	11	-6	86	0	-45	9	10
Change in supplement storage	0	0	0	0	0	0	0
Root and stover residuals	9	1	2	2	1	0	1

Blocks

Pasture

Pasture - Flat, 89.6 ha

N	18.3 kg/ha | 1,542 kg	P	0.3 kg/ha | 25 kg

BLOCK DETAILS

Area	89.6 ha	Average temp	10.2℃	Average rainfall	829 mm/yr	Annual PET	754 mm
Distance from coast	85 km						

SOILS

49% CLAR_33A.1	23% SELW_50A.1	28% STEW_7A.1
43.9 ha Pallic	20.61 ha Recent	25.09 ha Brown

FODDER CROP ROTATIONS

Support 1 fodderbeet

PASTURE

Pasture growth	14,244 kg DM/ha/yr	Removed	1244 kg DM/ha/yr
Utilisation	70 %	Beef	2.13 rsu/ha
Intake	9,100 kg DM/ha/yr	Dairy grazing	14.2 rsu/ha

SUPPLEMENTS

Harvested (DM)	104 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Beef	-	-	-	-	0.17	0.47	0.51	0.49	0.49	-	-	-
Dairy grazing	0.06	0.08	0.87	2.02	2.04	1.92	1.86	1.64	1.75	1.72	0.18	0.06
FERTILISER APPLIED (KG/HA)												
N	-	41	8	39	15	15	13	29	32	10	-	-
P	-	-	9	13	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	-	1	-	-	-	-	2	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Clar_33a.1	-	43.9 ha (49%)	739 kg	18 kg/ha	8.6 ppm	178 kg/ha	201 kg/ha	18 kg	0.4 kg/ha	Low	Low	N/A
Selw_50a.1	-	20.61 ha (23%)	233 kg	12 kg/ha	6.7 ppm	178 kg/ha	201 kg/ha	5 kg	0.3 kg/ha	Low	Low	N/A
Stew_7a.1	-	25.09 ha (28%)	570 kg	24 kg/ha	10.5 ppm	178 kg/ha	201 kg/ha	2 kg	0.1 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Clar_33a.1	-	43.9 ha (49%)	209 mm	0 mm	621 mm	198 mm	102 mm	270 mm	96 mm	-	-	-	-
Selw_50a.1	-	20.61 ha (23%)	181 mm	0 mm	648 mm	219 mm	81 mm	309 mm	138 mm	-	-	-	-
Stew_7a.1	-	25.09 ha (28%)	231 mm	0 mm	598 mm	126 mm	57 mm	198 mm	69 mm	-	-	-	-

MODEL NOTES

Overview

Olsen P (51) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

K input as supplements is contributing to increased soil K. Consider reducing other K inputs (see maintenance fertiliser requirements).

Stew_7a.1/No irrigation - 25.09 ha (28%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 2 units
- No change in QT K test
- No change in QT Mg test

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 120 kg/ha/yr pure lime. Review soil pH and lime requirement.

Selw_50a.1/No irrigation - 20.61 ha (23%)

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K, Na

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 3 units
- No change in QT K test
- Increase in QT Mg test of 2 units

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 80 kg/ha/yr pure lime. Review soil pH and lime requirement.

Clar_33a.1/No irrigation - 43.9 ha (49%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for K

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 3 units
- No change in QT K test
- No change in QT Mg test

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 100 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	1,542	18.3
Phosphorus	25	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	31.77	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	18.3	0.3	9	26	36.25	1	4.82
As product	29	7	2	3	15	0	1
Transfer	3	0	3	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	46.21	0	0	0	0	0	0
As supplements and crop residues	22.77	4	23	2	6	2	1

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	113.98	19.83	0	-4	0	0	0
Inorganic mineral	0	3.17	-20.93	0	-6.07	-9.99	-11.45
Inorganic soil pool	0	-11	20.44	0	-43.41	7.99	8.63

Support 1 fodderbeet

Fodder crop - 6 ha (rotation)

N	96 kg/ha | 576 kg	P	0.5 kg/ha | 3 kg

BLOCK DETAILS

Area	6 ha

ROTATES THROUGH

Pasture

ARTIFICIAL DRAINAGE

Drainage method	None

CROP MANAGEMENT

Block type	Fodder crop	Low N mineralisation capacity	No
Rotation name	Support 1 fodderbeet	Month resown in pasture	October
Area	6ha	Months since fertiliser applied to pasture	0

CROPS

Fodder beets

Category	Fodder
Crop type	Fodder beets
Sown	November - Reporting year
Yield	150T
Cultivation practice at sowing	Conventional

Pasture

Category	Permanent pasture
Crop type	Pasture
Sown	October - Reporting year
Cultivation practice at sowing	Conventional
Defoliation management	Grazing only

	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
	Fodder beets											Pasture
FERTILISER APPLIED (KG/HA)												
N	54	69	-	-	69	-	-	-	-	-	-	-
P	37	-	-	-	-	-	-	-	-	-	-	-
K	704	-	-	-	-	-	-	-	-	-	-	-
S	27	-	-	-	-	-	-	-	-	-	-	-

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OverseerFM

YR END 21 SUPPORT 2

Analysis type	Predictive
Is publication	No
Application version	4.1.2.4
Printed date	20 Dec 2021, 3:55PM
Model version	6.4.1

Farm details

N 70 kg/ha | 5,651 kg P 0.5 kg/ha | 40 kg GHG 9,552 kg/ha | 764.2 tonnes NCE: 7 v6.4.1

Total area	80.3 ha
Productive block area	76.50 ha
Nitrogen conversion efficiency (NCE)	7%
N Surplus	176 kg/ha
Region	Southland

Total liveweight brought (kg/ha grazed)	24382
Total liveweight reared (kg/ha grazed)	1161
Total liveweight sold (kg/ha grazed)	25246

Percent male beef animals	100
Dairy grazing stock rate (RSU)	853

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
Pasture	Pasture	10.4	287	27.4	176	3	0.2
Pasture	Pasture	29.1	703	24.1	180	10	0.3
Kale Winter 21 (ex swedes)	Crop	17	2,141	125.2	264	9	0.5
Kale Winter 21 (ex swedes)	Crop	13	1,857	142.2	265	3	0.2
Swedes Winter 20 (into grass)	Crop	7	646	90.7	18	2	0.3
Other sources	Other	-	17	-	-	14	-

Farm soils

S-MAP REF/NAME	GROUP/ORDER	DRAINAGE CLASS	MODIFIED	TOTAL AREA (HA)	% OF PROD. BLOCKS	BLOCKS
Clar_33a.1	Recent/YGE/BGE/Pallic	Poor	No	29.2	38.2	3
Eure_23a.1	Sedimentary/Gley	Poor	No	7.3	9.5	2
Selw_50a.1	Recent/YGE/BGE/Recent	Well	No	9	11.8	3
Stew_7a.1	Sedimentary/Brown	Well	No	31	40.5	5

Enterprises

STOCK NUMBERS

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	210	210	108	108	108	108	108	108	108	228	253	120
Dairy grazing	600	350	150	-	-	-	-	-	-	-	-	1000

RSU

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	129	127	86	58	60	64	61	57	59	100	110	48
Dairy grazing	244	154	76	0	0	0	0	0	0	0	0	383

Irrigators

There is no irrigation on this farm.

Structures

No structures exist.

Supplements

CATEGORY	FEED	SOURCE	DRY WEIGHT?	AMOUNT	DESTINATION
Baleage	-	From storage (90)	No	90 tonnes	Specified blocks (90)
Baleage	-	Pasture (24), Pasture (59)	Yes	83 tonnes	Specified blocks (83)

Crops

CROP/PASTURE	AREA (HA)	YIELD	GROWN (T/DM/YR)	INTAKE (T/DM/YR)	SUPPLEMENTS (T/DM/YR)
Ryegrass/white clover	39.5	-	638	419	83
Kale	30.0	390 T dry matter	-	-	-
Pasture	7.0	-	-	-	-

Fertiliser

MANUFACTURER/MATERIAL	NAME	TOTAL APPLIED (KG)	N	P	K	S	CA	MG	NA
Ballance	N-rich Urea	830	382	-	-	-	-	-	-
Ballance	Superten	711	-	64	-	75	156	-	-
Ravensdown	Potassium Chloride	2,805	-	-	1,402	-	-	-	34
Ravensdown	N-Protect	20,336	9,334	-	-	-	-	-	-
Lime	Lime (good quality)	-	-	-	-	-	-	-	-
Ravensdown	Cropmaster DAP	13,266	2,335	2,653	-	133	-	-	-
Ballance	PhaSed N QS	5,135	1,618	-	-	878	118	-	-
Ravensdown	Ammo 31	-	-	-	-	-	-	-	-
Ravensdown	DAP 13 S	-	-	-	-	-	-	-	-
Ballance	SustaiN	-	-	-	-	-	-	-	-
TOTAL		43,083	13,668	2,717	1,402	1,085	275	-	34

GHG - Total farm emissions

METHANE GHG EMISSIONS	N20 GHG EMISSIONS	C02 GHG EMISSIONS	TOTAL GHG EMISSIONS
514.6 eC02/tonnes/yr	167.2 eC02/tonnes/yr	82.3 eC02/tonnes/yr	764.2 eC02/tonnes/yr

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	5,651	70
Phosphorus	40	0.5

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Foliar sprays	0	0	0	0	0	0	0
Fertiliser, lime and other	170	34	17	13	3	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	20	0	1	2	1	2	5

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	70	0.5	7	56	76	3	9
As product	14	3	1	2	7	0	0
As prunings	0	0	0	0	0	0	0
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	51	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	145	-2	2	-29	1	0	0
Standing plant material	-71	-9	-40	-14	-51	-7	-5
Inorganic mineral	0	3	-19	0	-5	-7	-8
Crop framework	0	0	0	0	0	0	0
Inorganic soil pool	7	43	88	0	-20	15	11
Change in supplement storage	-18	-3	-22	-3	-6	-2	-2
Root and stover residuals	-8	-1	2	2	2	0	0

Blocks

Pasture

Pasture - Flat, 29.1 ha

N 24.1 kg/ha | 703 kg

P 0.3 kg/ha | 10 kg

BLOCK DETAILS

Area	29.1 ha	Average temp	10.2℃	Average rainfall	842 mm/yr	Annual PET	755 mm
Distance from coast	85 km						

SOILS

55% CLAR_33A.1	28% STEW_7A.1	17% SELW_50A.1
16.01 ha Pallic	8.15 ha Brown	4.95 ha Recent

PASTURE

Pasture growth	16,155 kg DM/ha/yr	Removed	2034 kg DM/ha/yr
Utilisation	76 %	Beef	12.64 rsu/ha
Intake	10,661 kg DM/ha/yr	Dairy grazing	6.63 rsu/ha

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

SUPPLEMENTS

Harvested (DM)	59 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Beef	-	0.6	0.69	1.47	1.54	1.64	1.15	1.06	1.11	1.89	1.07	0.42
Dairy grazing	1.32	0.3	-	-	-	-	-	-	-	-	-	5.01
FERTILISER APPLIED (KG/HA)												
N	-	41	19	28	15	15	13	29	32	10	-	-
P	-	-	22	-	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	1	-	-	-	-	-	2	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Clar_33a.1	-	16 ha (55%)	357 kg	22 kg/ha	10.2 ppm	180 kg/ha	201 kg/ha	6 kg	0.4 kg/ha	Low	Low	N/A
Stew_7a.1	-	8.15 ha (28%)	268 kg	33 kg/ha	13.7 ppm	180 kg/ha	201 kg/ha	2 kg	0.2 kg/ha	Low	Low	N/A
Selw_50a.1	-	4.95 ha (17%)	78 kg	16 kg/ha	8.3 ppm	180 kg/ha	201 kg/ha	2 kg	0.4 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Clar_33a.1	-	16 ha (55%)	114 mm	0 mm	624 mm	198 mm	102 mm	270 mm	96 mm	-	-	-	-
Stew_7a.1	-	8.15 ha (28%)	125 mm	0 mm	601 mm	126 mm	57 mm	198 mm	69 mm	-	-	-	-
Selw_50a.1	-	4.95 ha (17%)	99 mm	0 mm	652 mm	219 mm	81 mm	309 mm	138 mm	-	-	-	-

MODEL NOTES

Overview

Olsen P (39) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

K input as supplements is contributing to increased soil K. Consider reducing other K inputs (see maintenance fertiliser requirements).

Selw_50a.1/No irrigation - 4.95 ha (17%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for Na

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 2 units

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 120 kg/ha/yr pure lime. Review soil pH and lime requirement.

Stew_7a.1/No irrigation - 8.15 ha (28%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- No change in QT Mg test

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 170 kg/ha/yr pure lime. Review soil pH and lime requirement. 119

Clar_33a.1/No irrigation - 16 ha (55%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- No change in QT Mg test

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 140 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	703	24.1
Phosphorus	10	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	38	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	24.06	0.35	9	27	40.67	1.28	5.94
As product	19	5	1	2	10	0	1
Transfer	4	0	3	0	1	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	42.98	0	0	0	0	0	0
As supplements and crop residues	37	6	38	4	10	3	2

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	112.96	15.05	0	-6	0	0	0
Inorganic mineral	0	2.12	-25.72	0	-5.53	-9.21	-10.72
Inorganic soil pool	0	-5	10.27	0	-47.03	6.38	7.61

Pasture

Pasture - Flat, 10.4 ha

N	27.4 kg/ha | 287 kg	P	0.2 kg/ha | 3 kg

BLOCK DETAILS

Area	10.4 ha	Average temp	10.2℃	Average rainfall	842 mm/yr	Annual PET	755 mm
Distance from coast	85 km						

SOILS

69%	STEW_7A.1	31%	EURE_23A.1
7.18 ha	Brown	3.22 ha	Gley

PASTURE

Pasture growth	16,155 kg DM/ha/yr	Removed	2308 kg DM/ha/yr
Utilisation	76 %	Beef	12.38 rsu/ha
Intake	10,454 kg DM/ha/yr	Dairy grazing	6.49 rsu/ha

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

SUPPLEMENTS

Harvested (DM)	24 tonnes

CROP MANAGEMENT

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA												
Beef	-	0.59	0.68	1.44	1.51	1.61	1.12	1.04	1.08	1.85	1.05	0.41
Dairy grazing	1.29	0.29	-	-	-	-	-	-	-	-	-	4.91
FERTILISER APPLIED (KG/HA)												
N	-	41	19	28	15	15	13	29	32	10	-	-
P	-	-	22	-	-	-	-	-	2	-	-	-
K	-	-	-	-	16	16	-	-	4	-	-	-
S	-	22	1	-	-	-	-	-	2	-	-	-

SOIL/IRRIGATION - RESULTS

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SOIL	IRRIGATOR	AREA	NITROGEN					PHOSPHORUS				
			TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Stew_7a.1	-	**7.18 ha (69%)**	234 kg	32 kg/ha	13.5 ppm	177 kg/ha	201 kg/ha	2 kg	0.2 kg/ha	Low	Low	N/A
Eure_23a.1	-	**3.22 ha (31%)**	53 kg	17 kg/ha	8.4 ppm	175 kg/ha	201 kg/ha	1 kg	0.3 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

SOIL	IRRIGATOR	AREA				TO 60CM				TO 150CM			
			DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Stew_7a.1	-	**7.18 ha (69%)**	125 mm	0 mm	602 mm	126 mm	57 mm	198 mm	69 mm	-	-	-	-
Eure_23a.1	-	**3.22 ha (31%)**	102 mm	0 mm	645 mm	231 mm	105 mm	291 mm	126 mm	-	-	-	-

MODEL NOTES

Overview

Olsen P (39) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for Ca

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 2 units
- No change in QT K test
- No change in QT Mg test

K input as supplements is contributing to increased soil K. Consider reducing other K inputs (see maintenance fertiliser requirements).

Eure_23a.1/No irrigation - 3.22 ha (31%)

Soil P loss status is high. Consider reducing Olsen P levels.

Fertiliser P loss is greater than 10% of total P loss - this is outside the range of data available for New Zealand and P loss data should be used with caution. Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 120 kg/ha/yr pure lime. Review soil pH and lime requirement.

Stew_7a.1/No irrigation - 7.18 ha (69%)

N losses from the root zone from this block exceed 11.3 ppm. This could contribute to high drinking water levels. The drinking water standard is 11.3 ppm. Note that the drinking water standard is not a environmental water quality standard, which is usually lower than the drinking water standard or a regulatory standard.Consider mitigation options to reduce this loss

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 180 kg/ha/yr pure lime. Review soil pH and lime requirement.

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	287	27.4
Phosphorus	3	0.2

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	201	23	36	25	7	0	1
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	38.69	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	27.35	0.23	9	26	43.28	1.69	6.07
As product	19	5	1	2	9	0	1
Transfer	4	0	3	0	1	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	41.48	0	0	0	0	0	0
As supplements and crop residues	42	7	43.31	4	11	3	2

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	107.86	12.31	0	-6	0	0	0
Inorganic mineral	0	4.69	-27	0	-4	-7	-8
Inorganic soil pool	0	-6	6	0	-51.97	3.31	3.93

Kale Winter 21 (ex swedes)

Crop - 13 ha

N	142.2 kg/ha | 1,857 kg	P	0.2 kg/ha | 3 kg

BLOCK DETAILS

Area	13 ha	Average temp	10.2°C	Average rainfall	842 mm/yr	Annual PET	755 mm
Distance from coast	85 km						

SOILS

69%	STEW_7A.1	31%	EURE_23A.1
8.97 ha	Brown	4.03 ha	Gley

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

CROP MANAGEMENT

Block type	Crop	Crop rotation final month	June
Cultivated area	100 %	Years in pasture	10
Headlands and tracks	0 %	Prior land use	Grazed pasture
Other areas	0 %		

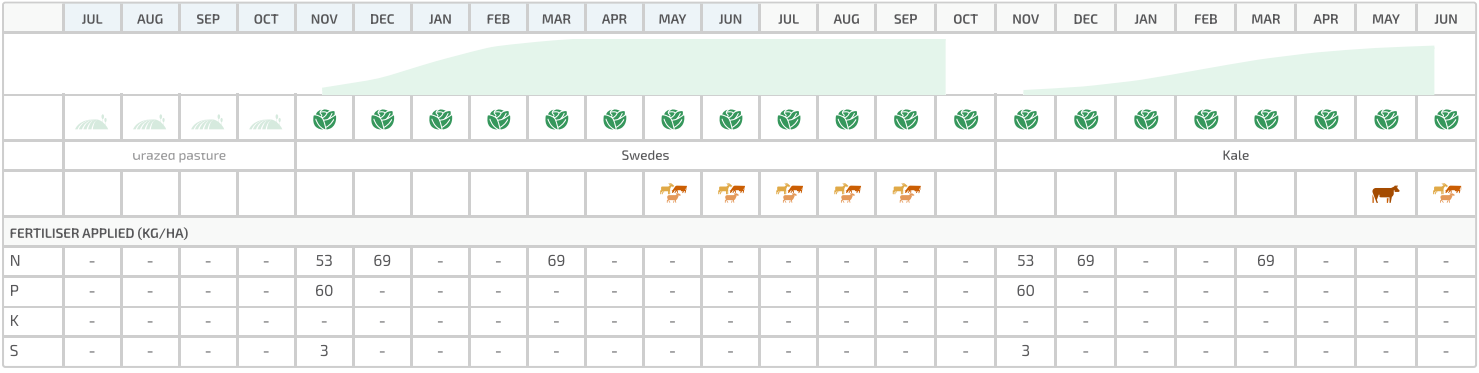
CROPS

Swedes

Category	Fodder
Crop type	Swedes
Sown	November - Year 1
Yield	182T
Cultivation practice at sowing	Conventional

Kale

Category	Fodder
Crop type	Kale
Sown	November - Reporting year
Yield	169T
Cultivation practice at sowing	Conventional



FERTILISER APPLIED (KG/HA)																							
N	-	-	-	-	53	69	-	-	69	-	-	-	-	-	-	-	53	69	-	-	69	-	-	-
P	-	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	60	-	-	-	-	-	-	-
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-

SOIL/IRRIGATION - RESULTS

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SOIL	IRRIGATOR	AREA	NITROGEN					PHOSPHORUS				
			TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Stew_7a.1	-	**8.97 ha (69%)**	1,507 kg	167 kg/ha	53.7 ppm	265 kg/ha	190 kg/ha	1 kg	0.1 kg/ha	N/A	N/A	N/A
Eure_23a.1	-	**4.03 ha (31%)**	350 kg	87 kg/ha	33.6 ppm	265 kg/ha	190 kg/ha	2 kg	0.5 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

SOIL	IRRIGATOR	AREA				TO 60CM				TO 150CM			
			DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Stew_7a.1	-	**8.97 ha (69%)**	162 mm	0 mm	530 mm	126 mm	57 mm	198 mm	69 mm	144 mm	66 mm	225 mm	78 mm
Eure_23a.1	-	**4.03 ha (31%)**	135 mm	0 mm	581 mm	231 mm	105 mm	291 mm	126 mm	591 mm	267 mm	705 mm	324 mm

MODEL NOTES

Eure_23a.1/No irrigation - 4.03 ha (31%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 12 units
- Increase in QT K test of 2 units
- Increase in QT Mg test of 2 units

Stew_7a.1/No irrigation - 8.97 ha (69%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 11 units
- Increase in QT K test of 2 units
- Increase in QT Mg test of 1 units

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	1,857	142.2
Phosphorus	3	0.2

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	190	60	0	3	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	82	14	93	10	24	7	5
Rain/clover fixation	2	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	142.2	0.4	4	94.31	136.47	4.69	13.07
As product	7	2	0	1	4	0	0
Transfer	3	0	2	0	1	0	0
To atmosphere	59.13	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	228.24	-22	0	-56	0	0	0
Standing plant material	-189	-23	-108	-30	-113	-16	-10
Inorganic mineral	0	4.69	-12	0	-4	-7	-8
Inorganic soil pool	49.74	115.31	203	0	-5.47	26.31	13.93
Root and stover residuals	-26.31	-3	4	5	6	0	0

Kale Winter 21 (ex swedes)

Crop - 17 ha

N	125.2 kg/ha | 2,141 kg	P	0.5 kg/ha | 9 kg

BLOCK DETAILS

Area	17 ha	Average temp	10.2℃	Average rainfall	838 mm/yr	Annual PET	755 mm
Distance from coast	60 km						

SOILS

55%	CLAR_33A.1	28%	STEW_7A.1	17%	SELW_50A.1
9.35 ha	Pallic	4.76 ha	Brown	2.89 ha	Recent

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

CROP MANAGEMENT

Block type	Crop	Crop rotation final month	June
Cultivated area	100 %	Years in pasture	10
Headlands and tracks	0 %	Prior land use	Grazed pasture
Other areas	0 %		

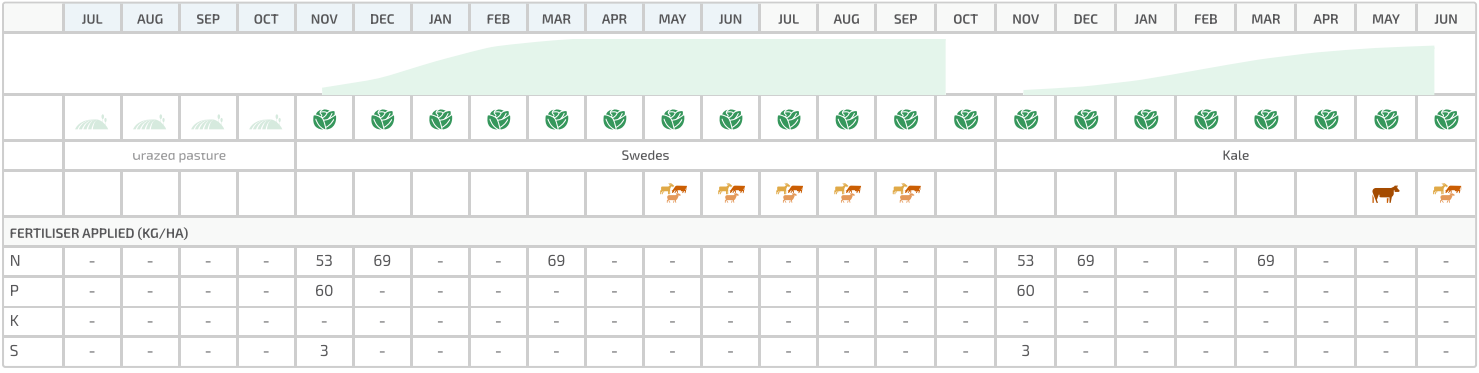
CROPS

Swedes

Category	Fodder
Crop type	Swedes
Sown	November - Year 1
Yield	238T
Cultivation practice at sowing	Conventional

Kale

Category	Fodder
Crop type	Kale
Sown	November - Reporting year
Yield	221T
Cultivation practice at sowing	Conventional



FERTILISER APPLIED (KG/HA)																							
N	-	-	-	-	53	69	-	-	69	-	-	-	-	-	-	-	53	69	-	-	69	-	-	-
P	-	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	60	-	-	-	-	-	-	-
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Clar_33a.1	-	9.35 ha (55%)	1,119 kg	119 kg/ha	42.3 ppm	264 kg/ha	190 kg/ha	7 kg	0.7 kg/ha	N/A	N/A	N/A
Stew_7a.1	-	4.76 ha (28%)	796 kg	166 kg/ha	53.8 ppm	264 kg/ha	190 kg/ha	1 kg	0.1 kg/ha	N/A	N/A	N/A
Selw_50a.1	-	2.89 ha (17%)	226 kg	78 kg/ha	31.1 ppm	264 kg/ha	190 kg/ha	1 kg	0.3 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Clar_33a.1	-	9.35 ha (55%)	146 mm	0 mm	556 mm	198 mm	102 mm	270 mm	96 mm	198 mm	102 mm	270 mm	96 mm
Stew_7a.1	-	4.76 ha (28%)	160 mm	0 mm	530 mm	126 mm	57 mm	198 mm	69 mm	144 mm	66 mm	225 mm	78 mm
Selw_50a.1	-	2.89 ha (17%)	130 mm	0 mm	588 mm	219 mm	81 mm	309 mm	138 mm	534 mm	198 mm	759 mm	336 mm

MODEL NOTES

Selw_50a.1/No irrigation - 2.89 ha (17%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 12 units
- Increase in QT K test of 2 units
- Increase in QT Mg test of 2 units

Stew_7a.1/No irrigation - 4.76 ha (28%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 11 units
- Increase in QT K test of 2 units
- Increase in QT Mg test of 1 units

Clar_33a.1/No irrigation - 9.35 ha (55%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 12 units
- Increase in QT K test of 2 units
- Increase in QT Mg test of 1 units

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	2,141	125.2
Phosphorus	9	0.5

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	190	60	0	3	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	82	14	93	10	23	7	5
Rain/clover fixation	2	0	1	3	1	3	9

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	125.19	0.67	4	95.55	122.75	4.28	12.22
As product	7	2	0	1	4	0	0
Transfer	3	0	2	0	1	0	0
To atmosphere	65.38	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	229.17	-22.55	0	-56	0	0	0
Standing plant material	-189	-23	-108	-30	-113	-16	-10
Inorganic mineral	0	1.95	-14.71	0	-4.02	-5.53	-6.7
Inorganic soil pool	60.43	117.33	205.71	0	8.1	27.25	17.93
Root and stover residuals	-26.17	-3	4	5	6	0	0

Swedes Winter 20 (into grass)

Crop - 7 ha

N	90.7 kg/ha | 646 kg	P	0.3 kg/ha | 2 kg

BLOCK DETAILS

Area	7 ha	Average temp	10.2℃	Average rainfall	842 mm/yr	Annual PET	755 mm
Distance from coast	85 km						

SOILS

55%	CLAR_33A.1	28%	STEW_7A.1	17%	SELW_50A.1
3.85 ha	Pallic	1.96 ha	Brown	1.19 ha	Recent

PASTURE

Pasture growth	10,404 kg DM/ha/yr	Removed	0 kg DM/ha/yr
Utilisation	70 %	Beef	12.63 rsu/ha
Intake	7,282 kg DM/ha/yr	Dairy grazing	0.55 rsu/ha

ARTIFICIAL DRAINAGE

Percentage drained	60%
Drainage method	Mole/tile system

CROP MANAGEMENT

Block type	Crop	Crop rotation final month	June
Cultivated area	100 %	Years in pasture	10
Headlands and tracks	0 %	Prior land use	Grazed pasture
Other areas	0 %		

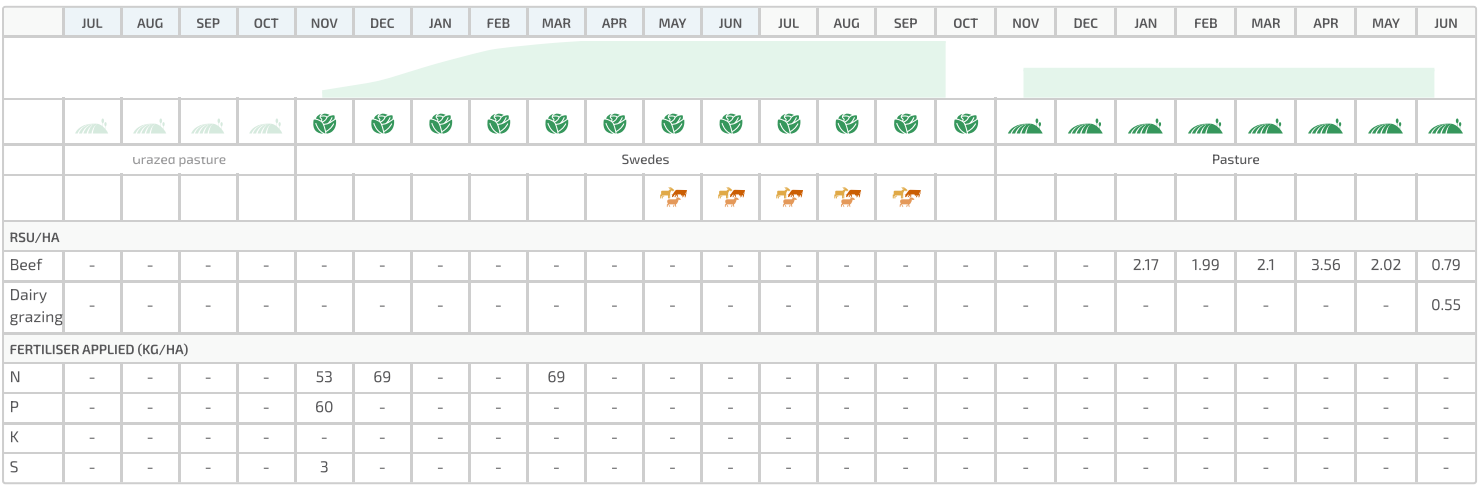
CROPS

Swedes

Category	Fodder
Crop type	Swedes
Sown	November - Year 1
Yield	98T
Cultivation practice at sowing	Conventional

Pasture

Category	Permanent pasture
Crop type	Pasture
Sown	November - Reporting year
Cultivation practice at sowing	Conventional
Defoliation management	Grazing only



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
RSU/HA																								
Beef	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.17	1.99	2.1	3.56	2.02	0.79
Dairy grazing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.55
FERTILISER APPLIED (KG/HA)																								
N	-	-	-	-	53	69	-	-	69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P	-	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL/IRRIGATION - RESULTS

130

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Clar_33a.1	-	3.85 ha (55%)	328 kg	84 kg/ha	32.1 ppm	18 kg/ha	0 kg/ha	2 kg	0.4 kg/ha	N/A	N/A	N/A
Stew_7a.1	-	1.96 ha (28%)	247 kg	123 kg/ha	43.1 ppm	17 kg/ha	0 kg/ha	0 kg	0.1 kg/ha	N/A	N/A	N/A
Selw_50a.1	-	1.19 ha (17%)	71 kg	59 kg/ha	24.7 ppm	18 kg/ha	0 kg/ha	0 kg	0.2 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Clar_33a.1	-	3.85 ha (55%)	136 mm	0 mm	580 mm	198 mm	102 mm	270 mm	96 mm	198 mm	102 mm	270 mm	96 mm
Stew_7a.1	-	1.96 ha (28%)	149 mm	0 mm	556 mm	126 mm	57 mm	198 mm	69 mm	144 mm	66 mm	225 mm	78 mm
Selw_50a.1	-	1.19 ha (17%)	124 mm	0 mm	605 mm	219 mm	81 mm	309 mm	138 mm	534 mm	198 mm	759 mm	336 mm

MODEL NOTES

Selw_50a.1/No irrigation - 1.19 ha (17%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 2 units
- No change in QT K test
- Increase in QT Mg test of 2 units

Stew_7a.1/No irrigation - 1.96 ha (28%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 2 units
- No change in QT K test
- Increase in QT Mg test of 1 units

Clar_33a.1/No irrigation - 3.85 ha (55%)

Estimated change in soil test values for samples taken to 15cm:

- Increase in Olsen P test of 2 units
- No change in QT K test
- Increase in QT Mg test of 1 units

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	646	90.7
Phosphorus	2	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	42	8	53	6	13	4	4
Rain/clover fixation	2	0	1	2	1	2	4

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	90.67	0.44	4	82.28	84.28	1.83	9.94
As product	21.28	5	1	2.83	10.83	0	1
Transfer	5	1	4	1	2	0	0
To atmosphere	70.46	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-8.5	-17	0	-58	0	0	0
Standing plant material	4	-4	0	-26	-104.28	-7.28	-14.28
Inorganic mineral	0	0.84	-17.16	0	-5.53	-9.21	-10.72
Inorganic soil pool	-154.18	19.44	50.16	0	25.81	18.83	21.06
Root and stover residuals	14.44	2.17	10.72	6	2	1	0

Attachment 3

Submission – Clare W Ryan

Resource Consent submission

To: The Chief Executive
Environment Southland
Private Bag 90116
DX20175
Invercargill

Date	06/03/2022 16:19
Online reference number	RC220307003

Full name of submitter	Clare Winifred Ryan
Postal address	2011 Waimea Valley Road, RD 6, Gore 9776
Contact phone number	0272099264
Email	crosshillfishing@gmail.com

Applicant details

Name of applicant	Cashmere Bay Dairy Ltd
Activity location	145 Jaffray Road, RD 7, Gore 9777
Application number	APP-20211381

Submission details

My submission relates to the whole application	Yes
Details of my submission	I wish this application to be declined. My reason is that nitrate levels in the ground water in that district are already above the limit Otago University's Dr Tim Chambers says is safe. Dr Chambers says New Zealand should take a precautionary approach and reduce the maximum level from 11.3mg/L to 1mg/L to protect against colon cancer and

	miscarriage in humans. Dr Chambers has found evidence of increased levels of colon cancer in communities with nitrate levels in drinking water above 5mg/L. Extract below from page 5 of s95-95G Recommending Report APP-20211381 "There are two groundwater monitoring bore on the property, F45/0422 and F45/0172. F45/0422 (16.75m deep) was tested 20 times between Nov 2011 and Nov 2021 with groundwater nitrate levels ranging between 6.6mg/L and 9.2mg/L. Monitoring bore F45/0172 (4.6m deep) was tested 35 times between Dec 2010 and Dec 2019 and showed nitrate levels ranging between 8.8mg/L and 24mg/L. Of the 35 samples, the groundwater nitrate levels exceeding New Zealand Drinking Water Standards (NZDWS) 32 times. The applicant has confirmed it no longer uses F45/0172 and will decommission this bore. It also provided potential reasons for the elevated nitrate levels detected which include the bore being shallow and being located approximately 80m south of a domestic wastewater septic tank disposal field." This ought to be enough to decline the application. Those existing nitrate levels will not be improved by the addition of another 124 cows on the property, removing 124 cows would be helpful I imagine. Nitrate in ground water does not magically disappear, it moves through the acquifer until eventually it makes its way to the sea. Cashmere Bay Dairy's nitrates are already impacting ground water from Otama down the Mataura catchment, why would we consent to increase that impact? That is not sustainable in a finite world.
Submission uploaded	No
I am a trade competitor of the applicant (for the purposes of section 308B of the Resource Management Act 1991)	No

Outcome sought

I wish Environment Southland to make the following decision	To oppose the application.
Why I wish Environment Southland to make this decision	My reason is that nitrate levels in the ground water in that district are already above the limit Otago University's Dr Tim Chambers says is safe. I assisted in a water testing workshop in Riversdale in 2021 where the average nitrate levels of drinking water bores were between 4-8mg/L. Dr Chambers says New Zealand should take a precautionary approach and reduce the

maximum level from 11.3mg/L to 1mg/L to protect against colon cancer and miscarriage in humans. Dr Chambers has found evidence of increased levels of colon cancer in communities with nitrate levels in drinking water above 5mg/L. Extract below from page 5 of s95-95G Recommending Report APP-20211381
"There are two groundwater monitoring bore on the property, F45/0422 and F45/0172. F45/0422 (16.75m deep) was tested 20 times between Nov 2011 and Nov 2021 with groundwater nitrate levels ranging between 6.6mg/L and 9.2mg/L. Monitoring bore F45/0172 (4.6m deep) was tested 35 times between Dec 2010 and Dec 2019 and showed nitrate levels ranging between 8.8mg/L and 24mg/L. Of the 35 samples, the groundwater nitrate levels exceeding New Zealand Drinking Water Standards (NZDWS) 32 times. The applicant has confirmed it no longer uses F45/0172 and will decommission this bore. It also provided potential reasons for the elevated nitrate levels detected which include the bore being shallow and being located approximately 80m south of a domestic wastewater septic tank disposal field."

This ought to be enough to decline the application. Those existing nitrate levels will not be improved by the addition of another 124 cows on the property, removing 124 cows would be helpful I imagine. Nitrate in ground water does not magically disappear, it moves through the acquifer until eventually it makes its way to the sea. Cashmere Bay Dairy's nitrates are already impacting ground water from Otama down the Mataura catchment, why would we consent to increase that impact? Why should people down stream from Cashmere Bay Dairy have to drill deeper bores because of nitrate poisoning in their wells.

Hearing details

I wish to be heard in support of my submission	No
I wish to be involved in any pre-hearing meeting that may be held for this application	No

Confirmation

I will serve a copy of my submission on the applicant and I confirm all of the above information is correct

Attachment 4

Submission – Hokonui Rūnanga

Hokonui Rūnanga Taiao
140 Charlton Road, GORE – 9774
PŌ Box 114, GORE – 9740
hokonui.office@ngaitahu.iwi.nz

RESPONSE TO APP-20211381
Cashmere Bay Dairy Limited

21 March 2022

To: Environment Southland
Private Bay 90116
Invercargill

Submission lodged by email – service@es.govt.nz; esconsents@es.govt.nz

1 Executive Summary

1.1 Hokonui Rūnanga welcomes the opportunity to respond to the publicly notified resource consent APP-20211381, lodged on behalf of Cashmere Bay Dairy Limited.

1.2 Hokonui Rūnanga is deeply invested in the future of Murihiku, its environment, residents, and the many taonga and culturally significant areas within its boundaries. Their key aspirations are to ensure that these taonga are managed "mō tatou, ā, mō kā uri a muri ake nei" (for us all and our children after us), and that the rights and interests of Hokonui Rūnanga are heard, respected, and realised.

1.3 Hokonui Rūnanga **opposes** the granting of consents within APP-20211381. This is for the following reasons:

- The applicant has chosen not to engage with mana whenua in the preparation of this application, resulting in no actions being proposed to avoid, remedy, or mitigate effects on cultural values
- The application is inconsistent with Te Mana o te Wai, as defined in the National Policy Statement for Freshwater Management
- The mitigation proposed within the application, including actions within the attached Farm Environment Plan, have inappropriate timeframes

1.4 If others are making a similar submission, Hokonui Rūnanga will consider presenting a joint case with them at a hearing.

1.5 Hokonui Rūnanga is not a trade competitor for the purposes of section 308B of the Resource Management Act 1991.

1.6 A copy of this submission has been sent to the applicant.

2 Ngāi Tahu and Hokonui Rūnanga

2.1 Ngāi Tahu are mana whenua within the area APP-20211381 applies to. Ngāi Tahu means "people of Tahu", and is the iwi comprised of Ngāi Tahu whānui: the collective of individuals who descend from five primary hapū of Kāti Kurī, Ngāti Irakehu, Kāti Huirapa, Ngāi Tūāhuriri, and Ngāi Te Ruahikihiki. In the Murihiku (Southland) context, other hapū also have links into Ngāi Tahu whānui, such as Rapuwai and Hawea. Ngāi Tahu whānui hold mana whenua status for large tracts of Te Waipounamu, from Te Parinui o Whiti (White Bluffs) and Kahurangi Point in the north through to Rakiura (Stewart Island), the Tītī Islands, and a selection of other sub-Antarctic islands in the south.

2.2 Te Rūnanga o Ngāi Tahu is statutorily recognised as the representative tribal body of Ngāi Tahu whānui under section 6 of Te Rūnanga o Ngāi Tahu Act 1996 (the Act). Hokonui Rūnanga is one of the 18 Papatipu Rūnanga that make up Te Rūnanga o Ngāi Tahu. Hokonui Rūnanga is mandated to represent Ngāi Tahu whānui individuals who whakapapa to the takiwā of Hokonui Rūnanga, as set out in the Act. This takiwā centres on the Māruawai region, which includes the entirety of the area covered by APP-20211381.

2.3 There are currently over 15,000 Hokonui Rūnanga whānau members, and over 55,000 registered Ngāi Tahu individuals. Hokonui Rūnanga therefore notes that response should not be treated as a single comment, but should be afforded an appropriate status and weight that recognises the collective that it represents.

3 Treaty Partnership

3.1 Hokonui Rūnanga would like to highlight their status as a Treaty Partner - not just to Crown entities at a Central Government level, but also directly to Local Authorities such as Environment Southland. It is understood that the process of regulatory responsibility delegation to Local Authorities (via the Local Government Act 2002, and the Resource Management Act 1991) brings with it an associated transfer of Treaty partnership responsibilities to district and regional councils.

3.2 The outcomes sought by Hokonui Rūnanga through this response are indeed those that are considered by Hokonui Rūnanga as being the most appropriate use of their lands and waters.

4 Hokonui Rūnanga Interests in APP-20211381

4.1 Hokonui Rūnanga highlight the following overarching values/matters of interest as underpinning their response to APP-20211381:

4.2 **Kaitiakitanga**

Kaitiakitanga governs the way humans interact with ecosystems. The notions of reciprocity and maintaining balance within nature underpin uses and practices in a Māori worldview. Balance requires respect to be shown when interacting with the environment, and use of the resource (within limits) afforded by healthy ecosystems. We continue to have a duty to protect the natural world that we are part of. Hokonui Rūnanga, in our role as environmental

kaitiaki, work actively to ensure that spiritual, cultural, and mahinga kai values of our takiwā are upheld and sustained for future generations.

4.3 **Rangatiratanga**

Rangatiratanga is having the right to make decisions impacting the taonga and resources within our takiwā. This means determining what, from Ngāi Tahu perspectives, represents satisfactory environmental conditions and appropriate use for Hokonui Rūnanga.

4.4 **Ki uta ki tai**

Ki uta ki tai is an environmental philosophy that recognises that everything is connected and must be managed as such. Ki uta ki tai reflects that mana whenua belong to the environment and are only borrowing the resources from our generations that are yet to come. Ki uta ki tai is the basis of Ngāi Tahu Iwi Management Plans, and is recognised in the Southland Regional Policy Statement 2017 and National Policy Statement for Freshwater Management 2020. The adoption of ki uta ki tai is an opportunity for all resource users to enhance their holistic management practices.

4.5 **Mahinga kai**

Mahinga kai is central to the identity of Ngāi Tahu, and was a pillar of Te Kerēme – the historical Ngāi Tahu Treaty Claim. Mahinga kai practices rely on thriving and abundant biodiversity, safe and aesthetically pleasing places to practice, and the active transfer of knowledge between people. Biodiversity and aesthetics are dependent on the sustainable management of many other natural resources in the takiwā, especially waterbodies. Hokonui Rūnanga expect to be able to practice mahinga kai in our takiwā at multiple locations that are deliberately selected for the quality of the resource and its ability to sustain itself. In undertaking these practices, whānau will have the opportunity to experience the landscape as our tīpuna did, and where lost, the opportunity to rekindle the traditional practices of gathering food and other natural resources.

4.6 **Wai**

Hokonui Rūnanga primary concerns relate to water quality and quantity in our takiwā, and the current and historic mismanagement, discharge, and loss of pollutants into groundwater, waterways, and wetlands. Hokonui Rūnanga expect transformational improvement to the management of water in our takiwā to recognise the paramount importance of water. Te Mana o Te Wai is the fundamental concept for freshwater management in New Zealand, and provides a framework for the hauora (wellbeing) of water, people, and the environment to be protected.

4.7 **Whenua**

The land sustains and maintains all life, and holds stories that enable us as Ngāi Tahu to connect with our heritage, identity, and cultural practices. As such, we do not recognise any one location or landscape as being more or less significant than any other. All land is a taonga, and should be treated accordingly. Hokonui Rūnanga supports the coupling of land use with land capability to reduce the negative effects on soils from compaction, pollution/contaminants, biodiversity loss, and erosion. It is also expected that improvements will be made across our takiwā in land management practices to restore soil health, with these improvements also having flow on effects for water and biodiversity.

4.8 Hokonui Rūnanga also highlight the following relevant sections of Te Tangi a Tauira:

- 3.5.1 - Farm Effluent Management
- 3.5.10 - General Water Policy

- 3.5.11 - Rivers
- 3.5.13 - Water Quality
- 3.5.16 – Mahinga Kai

5 Hokonui Rūnanga Position and Response

5.1 **Our response to APP-20211381 is:**

Hokonui Rūnanga **opposes** the granting of consents included in APP-20211381 due to its inconsistencies with the National Policy Statement for Freshwater Management 2020 (NPS-FM), Te Tangi a Tauira, and the values and matters of interest for Hokonui Rūnanga (as described above in Section 4).

5.2 As correctly noted in the s95-95(g) report prepared by Environment Southland, the applicant has chosen not to engage with mana whenua via either Hokonui Rūnanga or Te Ao Marama Inc, which is inconsistent with Policy 2 of the NPS-FM and multiple policies within the Te Tangi a Tauira. This has resulted in APP-20211381 incorrectly understating the impacts of their proposed activities on mana whenua and cultural values. These inaccuracies are highlighted in the applicants AEE, which incorrectly states in section 7.1 that, "*There are no matters of national importance under Section 6 of the RMA that will be affected by the proposal*" and "*Regarding Section 8, the proposed activity is not inconsistent with the principles of the Treaty of Waitangi*". These uninformed positions have resulted in a number of oversights and assumptions by the applicant that have caused in the impacts of proposed activities on mana whenua, cultural values, Te Mana o Te Wai, and relevant Statutory Acknowledgement Areas to not be adequately avoided, remedied, or mitigated.

5.3 For example, no actions have been proposed by the applicant to protect or enhance mahinga kai, and proposed actions relating to protecting on-farm waterways do not protect cultural values. In many cases, this is due to the extended timeframe that the applicant has proposed for completing such works. These are matters of particular concern to mana whenua due to the proximity of these activities to the Mataura River and its tributaries. The Mataura River is recognised as a Statutory Acknowledgement Area due to is importance to Ngāi Tahu under the Ngāi Tahu Claims Settlement Act 1998.

5.4 In addition to this, Environment Southland also correctly highlights that the mitigation measures proposed by the applicant do not enable compliance with the NPS-FM – specifically upholding Te Mana o Te Wai. Again, from the perspectives of mana whenua, the long lead-in times for some proposed mitigation measures are a significant contributor to this non-compliance. As noted by Environment Southland, additional actions would also be required as part of this application to meet the relevant responsibilities for upholding Te Mana o Te Wai.

5.5 **Decisions sought:**

Hokonui Rūnanga are supportive of development within its takiwā, provided activities are undertaken in a way that respects the environment where the activity is to be undertaken, and where activities do not adversely affect Ngāi Tahu cultural values, customs and their traditional relationship with the taiao (environment). Based on the information provided in APP-20211381, the activities proposed do not reflect the type of development Hokonui Rūnanga can support. Therefore, it is sought that Environment Southland **do not grant the consents** included within APP-20211381.

Dated: 21/03/2022

5.6 Whilst Hokonui Rūnanga recommend that APP-20211381 is declined, if Environment Southland was of the mind to approve the application, we would support the inclusion of consent conditions that better incorporate the overarching values of Hokonui Rūnanga as they relate to the taiao (environment), and more appropriate actions to uphold Te Mana o Te Wai. Proposed conditions include:

- Permanently fencing all waterway sections on farm to exclude stock by 1 Dec 2022
- Riparian planting plan must be developed, and implementation begun, by 1 Jun 2023
- Manage critical source areas and high-risk laneways by 1 Jun 2023
- Work with Hokonui Rūnanga to develop a mahinga kai plan to improve mahinga kai values on farm

5.7 It is also expected that Environment Southland would closely monitor the applicant to ensure compliance with the above consent conditions, along with any other conditions imposed.

5.8 Hokonui Rūnanga **DO** wish to be heard in support of this response.

Nāhaku noa, nā

Courtney Bennett
Environmental Planner
Hokonui Rūnanga Kaupapa Taiao

Date: 21/03/2022

Address for service:

Courtney Bennett
Hokonui Rūnanga Kaupapa Taiao
PO Box 114
Gore
9740

Email: Courtney.Bennett@hokonuirunanga.org.nz

Attachment 5

Submission –
J Campbell & D Kennedy

Submission re Cashmere Bay Dairy Ltd

From:

Coal Action Murihiku

c/- Co- convenors Jenny Campbell, Dave Kennedy

c/-P O Box 71, 72 Devon St.

Mossburn 9747

03 248 6398

027 351 0180

jennycam@xtra.co.nz

21 March 2022

He iti, He pounamu
It may be small but it is very precious

Ko Oreti tōku awa
Ko Takitimu tōku maunga,
Ko Takitimu tōku waka
Ko Ngaitahu tōku iwi
Ko Te Rau Aroha tōku marae
No Mossburn tōku kainga
Ko Jenny Campbell ahau

He waka eke noa - We are all in this together.

Submitted online esconsents@es.govt.nz

The application **[reference APP-20211381]** is for resource consents to authorise proposed activities at 145 Jaffray Road, Otamita:

Degraded waterways in Murihiku

In light of this application I am very concerned about the current state of degraded waterbodies in Murihiku Southland including the Mataura River which the streams from the site drain into. The degraded state of the Murihiku waterways impacts negatively on the habitats of threatened native fish and is in urgent need of improvement.

Recent research shows the need for significant reductions in contaminant losses of nitrogen (N) phosphorus (P) and sediment are needed to improve the health of degraded waterways throughout Murihiku. Relevant science reports commissioned recently by Environment Southland for the People, Water and Land programme - Te Mana o te Tangata, te Wai, te Whenua indicate that N & P need to reduce by 70% to meet the freshwater objectives in the next 25 years.

Mitigation

The Section 95 report (s95) demonstrates that the proposed activities will result in more than minor in parts and the mitigations proposed are not sufficient to mitigate the negative effects on freshwater quality.

Inappropriate dairying is known to have significant negative effects on freshwater quality with any intensification of such activity at odds with efforts to improve freshwater quality in Southland.

Climate Change

I recognise that the impact on climate change is not directly able to be assessed under the current RMA process, but I remain concerned that expanding dairy cow numbers will have a detrimental impact on the ability to reduce methane emissions to meet what is required under domestic and international agreements to keep warming below 1.5 degrees.

The resulting climate change if this is goal is not meet will have significant detrimental effects on Murihiku Southland, with effects such as increasing severity of storms and flooding impacting the ongoing viability of activities such as farming.

Allowing an increase in dairy cow numbers will contribute more greenhouse gas emissions via methane emissions and nitrous oxide emissions. This will contribute to climate change which is known to have a detrimental effect on Murihiku and ongoing viability of activities such as farming in the region.

The effects of these have not been addressed by the application and are at odds with Environment Southland's Draft Climate Action Plan 2020-2022 goal to support the Government's goal of net zero greenhouse gas emissions by 2050 and Local Government Leaders' Climate Change Declaration.

Inconsistent with the Act, NPS-FM, RPS, and pSWLP

Contaminant Mitigation

I consider the inadequate mitigation measures will not be able to deal with the additional effluent, N & P being produced by these extra animals. The adjacent wetland is likely to be affected negatively by seepage in to that area.

It will be years before new plantings of vegetation are established. During this time, increased losses of contaminants will continue to degrade the catchments adding cumulative effects to an already stressed ecosystem.

From s 95 report 'The benefits to water quality that will arise from enhancing the planting around the wetland/pond area adjacent to the main dairy lane will be delayed while the land use activity will have commenced.'

Wetlands are very special habitats and this enhanced vegetation needs to be in the ground now and well established before these proposed extra stock units are introduced and are using the main access to the milking shed. How efficient would this wetland be in dealing with rising contaminants with it only being a future proposal.

Groundwater quality

From s95 report 'There are two groundwater monitoring bore on the property, F45/0422 and F45/0172. F45/0422 (16.75m deep) was tested 20 times between Nov 2011 and Nov 2021 with groundwater nitrate levels ranging between 6.6mg/L and 9.2mg/L. Monitoring bore F45/0172 (4.6m deep) was tested 35 times between Dec 2010 and Dec 2019 and showed nitrate levels ranging between 8.8mg/L and 24mg/L. Of the 35 samples, the groundwater nitrate levels exceeding New Zealand Drinking Water Standards (NZDWS) 32 times. '

NZDWS nitrate levels are approx. 11mg/L at present but it is recommended that much lower nitrate levels, as occurs in eg Scandinavian countries approx. < 2 mg/L, are needed in light of recent research.

This information about the bores on this property is shocking where recent research has shown the connection between high nitrate levels in drinking water causing an increase in 'blue babies' and colo-rectal cancer. Murihiku has one of the highest rates of colo-rectal cancer in Aotearoa which reflects our high levels of artificial nitrogenous fertiliser use, especially on dairy farms.

Policy Analysis

I agree with the policy analysis laid out in the s 95 report. The application is inconsistent with several aspects of the National Policy Statement on Freshwater..

The proposed activities do not support the objectives in the Southland Regional Policy Statement in particular Objectives WQUAL.1 and WQUAL.2 which aim to halt the decline in water quality and improve water quality in Southland generally and in lowland areas specifically. The application does not meet the requirements of related Policies WQUAL.1 or WQUAL.2.

The s 95 report has detailed where the application does not meet the objectives and policies of the proposed Southland Water and Land Plan (pSWLP). I agree with this analysis.

Allowing more discharges of pollution into waterways is at odds with several parts of the Resource Management Act, such as s7.

These aspects of s95 Report highlight the concerns I have and the lack of appropriate mitigation :-

'With regard to the dairy farm expansion, in my opinion the mitigations provided either do not adequately avoid, remedy or mitigate all the potential and/or actual adverse effects that may arise from the change in land use, or the applicant has not committed to, or provided a deadline for, implementing them on farm.

Lastly, no consultation has been undertaken with iwi who hold mana whenua of the area. This is inconsistent with Policy 2 of the NPS-FM and multiple policies within the Te Tangi a Tauira plan. In the absence of detail in the application and lack of assessment by a suitably qualified person of the potential cultural effects of the proposal I am unable to conclude on the scale of potential effects on cultural values. However, in light of my conclusions above, I consider that there is risk of more than minor adverse effects on cultural values.

I consider the adverse effects from the discharge of agricultural effluent to land, the daily abstraction of groundwater and the use of land for a calving pad will be less than minor. However, as a result of the above, I consider that the adverse effects from the proposed expansion of a dairy farm will be or are likely to be more than minor.'

Consultation with Tangata Whenua, local Iwi

Consultation with Tangata Whenua, local Iwi appears not to have been undertaken. This is a statutory requirement and needs to be remedied. Māori values around fresh water need to be ascertained related to this application and possibly other aspects rectified.

Relief sought:

I seek that the application is declined.

If the application is not declined then improved mitigation measures must be put in place that independent experts verify will not result in any increase in contaminants in the receiving waterbodies and the mitigation measures contribute to a reduction in existing contaminants by the time the increased dairying activities commence.

Hearing:-

I do wish to be heard

Nāu te rourou, nāku te rourou, ka ora te iwi.

From your food basket and my food basket there is plenty for everyone.

Rangimarie e hoa.

J A Campbell

QSM for the Environment,

Attachment 6

Submission – Ministry of Education

MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

FORM 13

Submission on a publicly notified application concerning a resource consent under section 96, Resource Management Act 1991

To:	Environment Southland
Name of submitter:	**Ministry of Education ('the Ministry')**
Address for service:	C/- Beca Ltd ANZ Centre 267 High Street, Christchurch Central City, Christchurch 8011
Attention:	Lucy Sanson
Phone:	+64 6-952 0296
Email:	lucy.sanson@beca.com

This is a submission by the Ministry of Education ('the Ministry') on the notified resource consent located at 145 Jaffray Road, Otamita.

The specific parts of the application that the Ministry of Education's submission relates to are:

The potential contamination and drawdown effects on the drinking water supply at Otama School. The Ministry of Education has an interest in ensuring that any effects on the school resulting from the application are appropriately addressed.

Background:

The Ministry of Education ("the Ministry") is the Government's lead advisor on the New Zealand education system, shaping direction for education agencies and providers and contributing to the Government's goals for education. The Ministry assesses population changes, school roll fluctuations and other trends and challenges impacting on education provision at all levels of the education network to identify changing needs within the network so the Ministry can respond effectively.

The Ministry has responsibility for all education property owned by the Crown. This involves managing the existing property portfolio, upgrading and improving the portfolio, purchasing and constructing new property to meet increased demand, identifying and disposing of surplus State school sector property and managing teacher and caretaker housing. The Ministry is therefore a considerable stakeholder in terms of activities that may impact on educational facilities and assets in the Environment Southland Region.

The Ministry's submission on the application by Cashmere Bay Dairy Limited:

Environment Southland (as the Consent Authority) has received an application for resource consents from Cashmere Bay Dairy Limited (the Applicant) for:

- Discharge agricultural effluent to land from 1,140 cows (increase from previous consent);
- Take and use 136,800L/day of groundwater (increase from previous consent);
- Use land for a feed pad; and
- Expand an existing dairy farm by 80.3ha (Support Block 2).

The dairy farming operation is located adjacent to Otama Primary School which is designated (D17) by the Minister of Education with the surrounding area zoned Rural in the Gore District Planning Maps. The dairy farming activity is located adjacent to Otama School and the groundwater bore (F45/0173) to be used is located approximately 2.0km from Otama School. The proposal is shown on Figure 1.

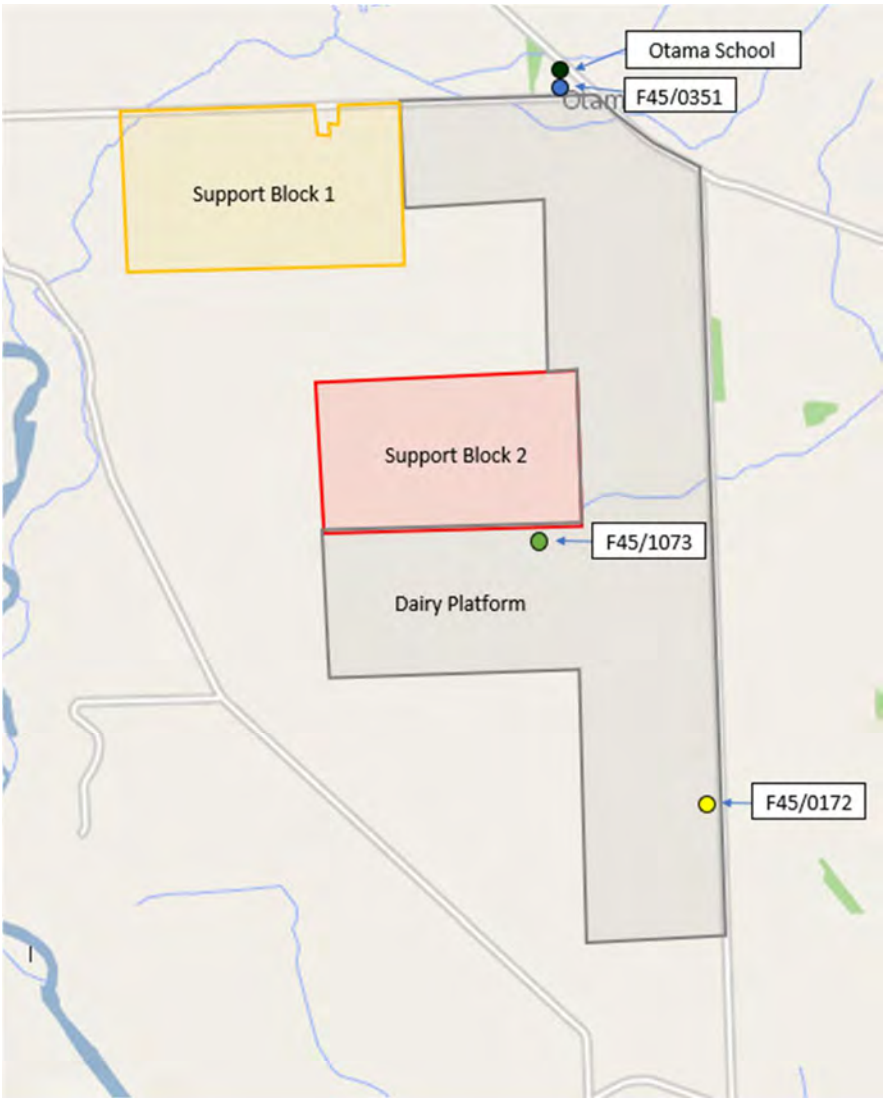


Figure 1: Location of the proposed dairy farm expansion Support Block 1 (red), the proposed increased water take and use of ground water bore F45/1073 (green), the groundwater bore to be decommissioned

F45/0172 (yellow), the current dairy platform (grey) and the current Support Block 1 (orange), in relation to Otama School (black) and Otama School groundwater bore (blue).

The Ministry wish to highlight the following potential issues:

Increased water take effects

The Ministry advise that Otama School has a drilled bore (F45/0351) although currently it is not used to provide drinking water for the staff and students.

The application does not clearly establish the drawdown effects on the school bore by the increased water take from Bore F45/0173 and if the school's supply is likely to be affected.

Discharge of contaminant effects

The Ministry has concerns about the actual and potential adverse effects on the quality of the drinking water supply of the school given that past groundwater sampling has shown elevated contaminant concentrations from bore F45/0172 located at the southeast of the existing dairy platform. The proposed activity has potential to increase the discharge of contaminants, including nitrogen and E.coli, which will affect the health and safety of pupils and staff.

While it appears the school water supply is not affected at present the application does not appear to address potential future adverse effects on the water quality of the school bore, including any detailed monitoring of groundwater quality.

The Ministry of Education seeks the following decision from the consent authority:

The Ministry seeks the following:

The applicant establishes that the proposed operation described in the application will not adversely affect or likely to adversely affect Bore F45/0351 in terms of water quantity or water quality by decreased water quantity and the discharge of contaminants from the proposed operation.

If consent is to be granted an appropriate monitoring of the effects on water quantity and water quality including depth and frequency of sampling and testing and proposed trigger levels, should be specified as a condition of consent.

The Ministry wishes to be heard in support of its submission.

_____

Lucy Sanson
Planner – Beca Ltd

(Consultant to the Ministry of Education)

Date: 21 March 2022

Attachment 7

Draft Consent Conditions

1. **Discharge Permit – Farm Dairy Effluent**
2. **Water Permit - Groundwater**
3. **Land Use Consent - Feed Pad**
4. **Land Use Consent - Farming**

AUTH-20211381-01

environment SOUTHLAND REGIONAL COUNCIL
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Invercargill

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Southland Freephone No. 0800 76 88 45

Discharge Permit

Under Section 104B of the Resource Management Act 1991, a resource consent is granted by the Southland Regional Council to **Cashmere Bay Dairy Limited** of **145 Jaffray Road, RD 7, Otamita, Gore 9777** from **Date Granted 2022.**

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 agricultural effluent to land from up to 1,140 cows via low rate pod system, travelling rain gun, centre pivots, umbilical system and slurry tanker.
Location	- site locality	145 Jaffray Road, Otamita
	- map reference	NZTM2000 1279780E 4900030N
	- physiographic zones	Oxidising, Gleyed, Old Mataura and Bedrock/Hill Country
	- groundwater zones	Knapdale (RWP), Croydon (pSWLP)
	- catchments	Mataura River and Okapua Stream
	- FMU	Mataura
Legal description of land at the site:		Section 2 Block II Otama SD, Section 4 Block II Otama SD, Section 5 Block II Otama SD and Section 4 Block I Otama SD.
Expiry date:		**31 May 2033**

Schedule of Conditions

General conditions

1. This resource consent shall not be exercised until Discharge Permit AUTH-301811-V2 is surrendered or has expired.

2. This consent shall be exercised in conjunction with Land Use Consent AUTH-20211381-04.

3. This consent authorises the discharge of dairy shed effluent and feed pad effluent ("agricultural effluent") onto land, via a land disposal system consisting of a stone trap, sump and a synthetically lined effluent storage pond to low rate pods, travelling rain gun, two centre pivots, umbilical system and slurry tanker, as described in the application (APP-20211381) for resource consent dated 7 October 2021[1] and further information dated 19 January 2022[2]. The activity shall be limited to:

   (a) the discharge to land of agricultural effluent generated from milking of up to 1,140 cows up to twice per day;
   (b) the discharge to land of agricultural effluent via a centre pivot, low rate rain gun or low rate pod system;
   (c) the discharge to land of agricultural effluent via a high rate umbilical system and slurry tanker as contingency measures;
   (d) the discharge of agricultural effluent to an area of 236 hectares as per the plan attached as Appendix 1;
   (e) the discharge to land of feed pad effluent generated from the use of a feed pad between 1 August and 30 September (inclusive) and during adverse weather conditions.

   Advice Note: *Routine monitoring inspections of this consent may occur up 2 times a year. This number does not include any other inspections required by other resource consents.*

4. Notwithstanding these conditions, this permit shall be exercised in accordance with the Collected Agricultural Effluent Management Plan. Where there is inconsistency between the Collected Agricultural Effluent Management Plan and the conditions of this consent, the conditions of this consent shall prevail.

5. The discharge shall not exceed:

   (a) a depth of application of 10 millimetres for each individual application, and an instantaneous rate of 10 millimetres per hour via a low rate pod system, low rate rain gun or centre pivot; and
   (b) a depth of application of 5 millimetres for each individual application via an umbilical system or slurry tanker.

6. The minimum return period for the discharge of agricultural effluent to land shall be 28 days.

7. The discharge shall not occur when the moisture content of the soils is at or above field capacity.

8. Nitrogen loading onto any land area as a result of the exercise of this consent shall not exceed 150 kilograms of nitrogen per hectare per year.

Exclusions

9. This consent does not authorise the discharge of:

   (a) dairy shed effluent collected during 1 June to 31 July; and
   (b) effluent collected by a winter barn, silage storage facility or underpass.

[1] Environment Southland Document ID: A702723
[2] Environment Southland Document ID: A736532

10. No discharge shall occur within:

    (a) 20 metres of any surface watercourse;
    (b) 100 metres of any water abstraction point;
    (c) 200 metres of any place of assembly or dwelling not on the subject property; and
    (d) 20 metres from any property boundaries.

    Where there is inconsistency between the plan attached as Appendix 1 and the conditions of this consent, the conditions of this consent shall prevail.

11. The stored or discharged agricultural effluent shall not enter any surface watercourse in any way, including:

    (a) directly;
    (b) indirectly;
    (c) by overland flow;
    (d) via entrainment by stormwater or run-off; or
    (e) via a pipe.

12. The stored or discharged agricultural effluent shall not:

    (a) form ponds or flow on the land surface, or
    (b) cause contamination of water.

13. The stored or discharged agricultural effluent shall not cause any odour beyond the boundary of the site (see Appendix 1) that is offensive or objectionable in the opinion of the Council's Compliance Officer.

14. Spray drift beyond the boundary of the site shall not occur.

Effluent storage

15. The discharge shall occur via an agricultural effluent storage facility of between 893 cubic metres and 1,943 cubic metres capacity.

16. The Consent Holder must maintain at least 500 mm of freeboard in the agricultural effluent storage facility at all times.

System management

17. The Consent Holder shall notify the Consent Authority the identity of the Person in Charge of the agricultural effluent disposal system:

    (a) prior to the first exercise of this consent, and
    (b) no more than five working days following the appointment of any new Person in Charge.

18. The Consent Holder shall install and maintain:

    (a) an operational alarm that alerts the Person in Charge to any system failure that could cause the over-application, overflow or spilling of agricultural effluent (e.g. sudden pressure drop, irrigator stoppage); and / or
    (b) an operational automatic switch-off system that prevents any over-application or spilling of agricultural effluent.

19. Where the agricultural effluent reticulation system is installed in such a way that effluent can be siphoned when pumping ceases, the Consent Holder shall install and maintain an anti-siphon device in the agricultural effluent pipeline.

20. In the event of the failure or mismanagement of the agricultural effluent disposal system, or any other event that may result in a discharge of agricultural effluent that may have significant adverse effect on water quality, particularly in the region of the abstraction point of a registered drinking-water supply, the Consent Holder shall notify, as soon as reasonably practicable, the following:

    (a) the Consent Authority (ph 03 211 5115 or 03 211 5225 after hours); and
    (b) Southland District Council (ph 0800 732 732).

Collected Agricultural Effluent Management Plan

21. Prior to the first exercise of this consent, the Consent Holder shall prepare and submit to the Consent Authority a Collected Agricultural Effluent Management Plan. The Collected Agricultural Effluent Management Plan shall:

    (a) provide concise and clear direction to the Person in Charge and other staff on the operation of the agricultural effluent system;
    (b) identify environmental risks of agricultural effluent discharges specific to the farm including, but not limited to, locations of drains, surface waterways, sub-surface drainage and critical source areas in the agricultural effluent disposal area;
    (c) identify how the above environmental risks are avoided;
    (d) describe how each component of the agricultural effluent system is maintained and have regard to the information provided in the pond storage calculations provided in the application;
    (e) describe how agricultural effluent in storage is managed;
    (f) describe how agricultural effluent is managed when soils are at or above field capacity and/or during adverse weather conditions; and
    (g) describe how the stormwater diversion on the system is set up and managed.

22. Annually or more frequently, the Collected Agricultural Effluent Management Plan shall be reviewed and the outcome of the review provided to the Consent Authority within one month.

23. If amended at any time, the most recent version of the Collected Agricultural Effluent Management Plan shall be provided to the Consent Authority within one month of the amendment.

    Advice note: *The Collected Agricultural Effluent Management Plan required by Condition 22 may be incorporated into the Operational Management Plan required by Land Use Consent AUTH-20211381-04 and/or the Farm Environmental Management Plan required by Rule 20, and prepared in accordance with Appendix N, of the proposed Southland Water and Land Plan (Decisions Version) (or any updated version of the plan).*

Monitoring

24. Prior to the exercise of this consent, the Consent Holder shall confirm that bore F45/0422 to be used for the groundwater quality monitoring:

    (a) is screened appropriately;
    (b) intercepts the top of the water table;
    (c) is sealed at the wellhead; and
    (d) it is secured in accordance with NZS 4411:2001 Environmental standard for drilling of soil and rock.

Review of consent

25. 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, 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;
    (e) ensuring the Mataura Freshwater Management Unit meets the freshwater objectives and freshwater quality limits set in an operative regional plan or National Policy Statement for Freshwater Management; and
    (f) 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**

Allan Cubitt
Independent Hearing Commissioner

Notes:

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, payable in advance on 1 July each year.*

2. *In accordance with Section 125(1)(a) of the Resource Management Act, this consent will lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.*

3. *In accordance with section 126 of the Resource Management Act, 1991, this consent may be cancelled by the Consent Authority if not exercised for a continuous period of 5 years or more.*

4. *The Consent Holder is reminded that they may apply at any time under Section 127 of the Act to have any condition of this consent changed except that which specifies the expiry date of this consent.*

5. *If you require a replacement permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*

6. *Dairy shed effluent should not be discharged onto any land area that has been grazed within the previous 5-10 days. Where there has been significant damage to soil during grazing, it is recommended that effluent not be applied until that damage has been repaired.*

7. *Measuring the moisture content of the soil to determine when the soils are at or above field capacity can be done by either actual monitoring on site or by reference to the appropriate Council monitoring site. The Council's soil moisture monitoring sites can be viewed at* http://gis.es.govt.nz/ *and following the "Soil Moisture Map" link.*

8. *Ponding is the accumulation of effluent on the soil surface resulting from the application of effluent to saturated soils, or the application of effluent inducing saturated soil conditions.*

9. *Extreme caution should be taken when applying nitrogen fertiliser to the effluent disposal area. It is recommended that a nutrient budget is used to check that nitrogen and potassium application rates to the effluent disposal area are not excessive.*

10. *The Consent Holder should display, in a prominent place in the dairy shed, a copy of the resource consent and relevant limits about the operation of the effluent disposal system that must be complied with.*

11. *Storage systems should be operated at low levels when conditions for effluent disposal are suitable in order to maintain storage for wet weather periods. In particular, storage systems should be emptied in late summer/early autumn to ensure sufficient storage capacity for the following late winter/early spring period.*

12. *Representative samples from the bore referred to in Condition xx shall be taken no less than once every six months and analysed for:*
    - *(a) chloride;*
    - *(b) pH;*
    - *(c) ammoniacal nitrogen;*
    - *(d) nitrate nitrogen;*
    - *(e) dissolved reactive phosphorus;*
    - *(f) E. coli.*


Appendix 1
Discharge Area
Discharge Area
Discharge Area
Farm Boundaries
N
1:21,000
environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga
While every effort has been made to ensure the content is correct, Environment Southland cannot guarantee the accuracy of the data. This information should not be reused in any manner without consultation.
DATA SOURCE: ES GIS 2022

AUTH-20211381-02

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Southland Freephone No. 0800 76 88 45

Water Permit

Under Section 104B of the Resource Management Act 1991, a resource consent is granted by the Southland Regional Council to **Cashmere Bay Dairy Limited** of **145 Jaffray Road, RD 7, Otamita, Gore 9777** from **Date Granted 2022.**

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 take and use groundwater for the purpose of stock drinking water and dairy shed wash down
Location	- site locality	145 Jaffray Raod, Otamita
	- map reference	NZTM2000 1279596E 4899976N
	- well number	F45/0422
	- groundwater zone(s)	Knapdale (RWP), Croydon (pSWLP)
	- catchment	Mataura River
	- Physiographic zone	Oxidising
Legal description of land at the site:		Section 2 Block II Otama SD
Expiry date:		**31 May 2033**

Schedule of Conditions

1. This consent shall not be exercised until Water Permit AUTH-301812-V1 is surrendered or has expired.

2. This permit authorises the taking of groundwater at the location specified above. The rate of abstraction shall not exceed:

   (a) 2 litres per second;
   (b) 136,800 litres per day; and
   (c) 49,932,000 litres per year.

Advice Note
The Consent Holder must ensure that the bore that water abstraction occurs from can meet the following conditions:

(a) The bore or well design and headwork's prevent:
(i) the infiltration of contaminants; and
(ii) the uncontrolled discharge or leakage of water to the ground surface or between aquifers.

Should the bore not meet the above conditions, the Consent Holder shall apply to the Consent Authority for a Resource Consent for the use and maintenance of the bore.

3. Prior to the first exercise of this consent, the Consent Holder shall install a backflow prevention device or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.

4.

(a) The Consent Holder shall have and maintain a water meter to record the water take, within an error accuracy range of +/-5% over the meter's nominal flow range. The Consent Holder shall forward a copy of the installation certificate to the Consent Authority within one month of installing the water meter.

(b) The water meter shall be installed in a straight length of pipe, before any diversion of water occurs. The straight length of pipe shall be part of the pump outlet plumbing, easily accessible, have no fittings and obstructions in it. There shall be a straight length of pipe on either side of the water meter, on the upstream side there shall be a distance that is 10 times the diameter of the pipe and on the downstream side there shall be a distance of five times the diameter of the pipe.

(c) The Consent Holder shall ensure the full operation of the water meter at all times during the exercise of this consent. All malfunctions of the water meter during the exercise of this consent shall be reported to the Consent Authority within five working days of observation and appropriate repairs shall be performed within five working days. Once the malfunction has been remedied, a Water Measuring Device Verification Form completed with photographic evidence must be submitted to the Consent Authority within five working days of the completion of repairs.

(d)

(i) If a mechanical insert water meter is installed it shall be verified for accuracy each and every year from the first exercise of this consent.
(ii) Any electromagnetic or ultrasonic flow meter shall be verified for accuracy every five years from the first exercise of this consent.
(iii) Each verification shall be undertaken by a Consent Authority approved operator and a Water Measuring Device Verification Form shall be completed and supplied to the Consent Authority with receipts of service. These shall be supplied within five working days of the verification, and at any time upon request.

(e) The Consent Holder shall maintain a record of the total volume of water abstracted each month. The Consent Holder shall provide this record to the Consent Authority by 31 May each year and at any other time on request.

5. Prior to the exercise of this consent, the Consent Holder shall notify the Consent Authority of the person who is in charge of the operation this consent. If the person in charge changes during the term of this consent, the Consent Holder shall notify the Consent Authority of the new operator no later than five working days after that person takes responsibility.

6. 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) adjusting the consented rate or volume of water under Condition 2, should future changes in water use indicate that the consented rate or volume is not able to be fully utilised;
   (b) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage;
   (c) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, National Policy Statement, Water Conservation Order, relevant plans and/or any relevant Regional Policy Statement; or
   (d) adjusting or altering the method of water take data recording and transmission.

for the **Southland Regional Council**

Allan Cubitt
Independent Hearing Commissioner

Notes:

1. *In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.*
2. *Section 126 of the Resource Management Act provides for this resource consent to be cancelled if the consent has been exercised in the past but has not been exercised during the preceding five years.*
3. *If you require a replacement permit upon the expiry date of this permit, any new application should be lodged at least six months prior to the expiry date of this permit. Applying at least six months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*
4. *The Consent Holder shall pay an administration charge to the Consent Authority collected in accordance with Section 36 of the Resource Management Act, payable in advance on 1 July each year.*

AUTH-20211381-03

environment SOUTHLAND
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Land Use Consent

Under Section 104B of the Resource Management Act 1991, a resource consent is granted by the Southland Regional Council to **Cashmere Bay Dairy Limited** of **145 Jaffray Road, RD 7, Otamita, Gore 9777** from **Date Granted 2022.**

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 Consent

Purpose for which permit is granted:		Use of land for a feed pad
Location	- groundwater zones	Knapdale (RWP), Croydon (pSWLP)
	- FMU	Mataura
	- physiographic zone	Oxidising
	- catchments	Mataura River and Okapua Stream
Expiry date:		**31 May 2033**

Schedule of Conditions

1. This resource consent authorises the use of land for a feed pad as described in the application for resource consent dated 7 October 2021[1]. The activity shall be limited to:

   (a) the use of land for a feed pad for up to 150 cows between 1 August and 30 September (inclusive); and
   (b) the use of the land for a feed pad during adverse weather conditions.

2. This consent shall be exercised in conjunction with Discharge Permit AUTH-20211381-01 (or any subsequent variation versions) and Land Use Consent AUTH-20211381-04 (or any subsequent variation versions).

[1] Environment Southland Document ID: A702723

3. The feed pad shall be located as described in the table below:

Legal description	Section 5 Block II Otama SD
Map Reference of Feed Pad (NZTM 2000)	1279816E 4899851
Property address	145 Jaffray Road

4. The feed pad shall not be located within:

   (a) 50 metres of any surface watercourse;
   (b) 70 metres of any water abstraction point;
   (c) 200 metres of any place of assembly or dwelling not on the subject property;
   (d) 20 metres of any mapped tile drains; and
   (e) 20 metres from any property boundaries.

5. The feed pad shall be:

   (a) no greater than 1,500 m² in area;
   (b) constructed with drains under the base to capture effluent generated on the feed pad; and
   (c) constructed with a minimum depth of 500mm of wood-based material across the base and nibbed edges to prevent overland flow beyond the perimeter of the feed pad.

6. Liquid effluent generated on the feed pad shall be captured by the subsurface drainage and drain to the effluent system authorised by Discharge Permit AUTH-20211381-01.

7. This consent does not authorise the discharge of any liquid effluent or animal and vegetative waste produced as a result of the activity authorised by this consent being undertaken.

   Advice Note: *The Consent Holder shall discharge:*
   (a) the feed pad sludge and associated vegetative matter in accordance with Rule 38 of the Proposed Southland Water and Land Plan (Decisions Version) or any subsequent versions; and
   (b) the liquid effluent generated from the feed pad in accordance with the conditions of Discharge Permit AUTH-20211381-01 (or any subsequent variation versions).

8. 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; or

(c) ensuring the Mataura Freshwater Management Unit meets the freshwater objectives and freshwater quality limits set in an operative regional plan pursuant to Policy A1 of the National Policy Statement for Freshwater Management.

for the **Southland Regional Council**

Allan Cubitt
Independent Hearing Commissioner

Notes

1. *In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.*

2. *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 up to one time each year (or otherwise as set by the Consent Authority's Annual Plan).*

AUTH-20211381-04

environment SOUTHLAND REGIONAL COUNCIL
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Land Use Consent

Under Section 104B of the Resource Management Act 1991, a resource consent is granted by the Southland Regional Council to **Cashmere Bay Dairy Limited** of **145 Jaffray Road, RD 7, Otamita, Gore 9777** from **Date Granted 2022.**

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 Consent

Purpose for which permit is granted:		Use of land for farming
Location	- groundwater zones	Knapdale (RWP), Croydon (pSWLP)
	- FMU	Mataura
	- physiographic zones	Oxidising, Gleyed, Old Mataura & Bedrock/Hill Country
	- catchments	Mataura River and Okapua Stream
Expiry date:		**31 May 2033**

Schedule of Conditions

1. Except as modified by conditions of resource consent, the activities authorised by this resource consent shall be carried out in general accordance with the application for resource consent (APP-20211381)[1] and all subsequent information provided during the application and the Farm Environmental Management Plan required by this consent.

2. For the avoidance of doubt, in the event that any inconsistency between the conditions of resource consent and the information and plans, including the Farm Environmental Management Plan (FEMP), submitted as part of the application, the conditions of resource consent shall prevail.

[1] Environment Southland Document ID: A702723

3. The use of land for farming shall occur on the landholding at 145 Jaffray Road, Otamita, as shown on the plan attached as Appendix 1, and consisting of:

   (a) a block of land referred to as the "dairy platform", at or about map reference (NZTM 2000) 1279780E 4899930N and comprising Part Section 9 Block II Otama SD, Part Section 10 Block II Otama SD, Section 2 Block II Otama SD, Section 4 Block II Otama SD, Section 5 Block II Otama SD and Section 4 Block I Otama SD.; and

   (b) a block of land referred to as the "Support Block 1", at or about map reference (NZTM 2000) 1278329E 4901666N and comprising Lot 2 DP 12628 and Lot 2 DP 324253.

4. The farming activities shall be limited as follows:

   (a) a maximum milking herd of no more than 1,140 mature age cows;
   (b) trazing 265 R1 heifers, 265 R2 heifers and nine mating bulls on Support Block 1;
   (c) intensive winter grazing of a maximum of 1,195 mature age cows, 265 R1 heifers and 265 R2 heifers on a maximum of 51.5 ha of crop.

   Advice Note
   Routine monitoring inspections of this property may occur up to once a year. This number does not include any other inspections required by other resource consents.

5. When intensive winter grazing is occurring on any part of the landholding, the Consent Holder shall:

   (a) maintain a 5 metre buffer at all times between any surface water way (river, artificial watercourse, modified watercourse and natural wetland) and the area being grazed;
   (b) progressively graze stock from the top to the bottom of any slope, where this is not possible a 20 metre "last bite" strip shall be left at the bottom of the slope to be grazed last;
   (c) back fence cattle at all times to prevent the stock re-entering previously grazed areas;
   (d) provide transportable water trough(s) in or near the areas being grazed;
   (e) place supplementary feed (including silage, baleage or hay) in portable feeders in the area being grazed;
   (f) critical source areas (including swales) within the area being grazed, shall be uncultivated and ungrazed; and
   (g) graze cattle in mobs of no more than 120.

   Advice Note:
   Intensive winter grazing is defined as the grazing of stock between 1 May and 30 September (inclusive) on forage crops (including brassica, beet and root vegetable crops), excluding pasture and cereal crops.

6. The Consent Holder shall notify the Consent Authority the identity of the Person in Charge of the landholding:

   (a) prior to the first exercise of this consent, and
   (b) no more than five working days following the appointment of any new Person in Charge.

Exclusions

7. Intensive winter grazing shall not occur on any slope over 10 degrees.

8. The landholding must not be grazed by mature age female beef cows at any time of the year.

Nutrient Management

9. From the first exercise of this Consent, the Consent Holder shall implement a soil testing regime to determine the soil fertility status over the landholding and to develop fertiliser recommendations based on the soil testing results.

10. The Consent Holder shall maintain a record of their soil testing regime, soil testing results and fertiliser recommendations required by Condition 9 and provide this record to the Consent Authority (ESCompliance@es.govt.nz) by 30 September each year.

11. The Consent Holder shall:

    (a) manage the application of fertiliser in accordance with:
        (i) the Code of Practice for Nutrient Management (With Emphasis of Fertiliser Use) Fertiliser Association, 2013, ISBN 978-0-47328345-2"; or
        (iii) any subsequent updates;

    (b) not apply fertiliser:
        (i) to land during the period 1 June - 31 July inclusive;
        (ii) within 10 m of a surface water body;
        (iii) within 10 m of any wetland boundary;
        (iv) within 20 m of any bore;
        (v) when soil temperature is at or below six degrees Celsius;
        (vi) when soil moisture capacity is exceeded; and
        (vii) directly to land within a riparian strip/margin.

12. The Consent Holder shall:

    (a) take representative soil samples at least once every two years and have those samples analysed for Olsen P by a laboratory with IANZ accreditation;
    (b) by 30 September each year in 2024, 2026, 2028, 2030 and 2032 provide the results to the Consent Authority (ESCompliance@es.govt.nz); and
    (c) if Olsen P levels exceed a range of 26 - 32 the Consent Holder must reduce the amount of P fertiliser being applied to the landholding to ensure the risk of P loss is reduced. This reduction in P fertiliser shall be noted in the records required by Condition 29(a).

Nutrient Modelling

13. The Consent Holder must ensure that nitrogen and phosphorus losses to water from farming activities undertaken on the land are maintained at, or below the baseline contaminant loss rates of:

    (a) 46 kilograms per hectare per year nitrogen for the dairy platform; and
    (b) 27 kilograms per hectare per year nitrogen for Support Block 1;

as estimated by the four-year rolling average loss rates using OVERSEER FM® version 6.4.3, undertaken in accordance with the generally accepted best practice modelling including the applicable Best Practice Data Input Standards/Overseer FM User Guide;

(c) 0.8 kilogram per hectare per year phosphorus for the dairy platform; and

(d) 0.3 kilogram per hectare per year phosphorus for Support Block 1;

(i) as estimated by the four-year rolling average loss rates using OVERSEERFM® version 6.4.3, undertaken in accordance with the generally accepted best practice modelling including the applicable Best Practice Data Input Standards/Overseer FM User Guide; and

(ii) information from published New Zealand and Overseas research to estimate the additional phosphorus loss mitigation, beyond that modelled in Overseer, that is likely to occur as a result of the mitigation being implemented in accordance with the FEMP required under this resource consent.

For the purposes of this resource consent, the four-year rolling average is defined as the average of the most recent four consecutive years' results starting from 1 July 2022.

14. Each and every year for the duration of this consent, using the current version of OverseerFM and in accordance with the generally accepted best practice modelling and the current Best Practice Data Input Standards, the Consent Holder shall:

(a) model the nitrogen and phosphorus loss rates for the previous year from 1 July to 30 June inclusive;

(b) calculate the four-year rolling average of nitrogen and phosphorus loss rates; and

(c) re-model the baseline contaminant loss rates specified in Condition 13 in the current version of Overseer.

15. The re-modelled baseline contaminant loss rates, modelled in accordance with Condition 14(c) shall supersede and replace the baseline contaminant loss rates specified in Condition 13.

16. A report must be provided to the Consent Authority by 30 September each year summarising the results of Overseer nitrogen and phosphorus loss modelling required by Condition 14. The report must include:

(a) a review of the Overseer input data to ensure that the annual nutrient budget reflects the farming system;

(b) an explanation of any differences between that nutrient budget and the annual nutrient budget of all previous years of farming undertaken under this consent;

(c) a comparison of the four-year rolling average nitrogen and phosphorus losses with the applicable baseline contaminant loss rates; and

(d) the names and summaries of the relevant qualifications and experience of the person(s) who prepared and (if relevant) reviewed the nutrient budget.

17. All nutrient loss modelling required by this consent must be undertaken by a person who is a Certified Nutrient Management Advisor (CNMA) under the Nutrient Management Advisor Certification Programme (NMACP).

18. The Consent Holder may use an alternative model that has been demonstrated to be equivalent to Overseer provided:

    (a) the evidence to demonstrate equivalence is provided to the Consent Authority at least six months prior to submitting the relevant annual report as required by Condition 16; and
    (b) the use of the alternative model is approved by the Chief Executive of the Consent Authority.

Mitigation Measures

19. The Consent Holder shall:

    (a) decommission bore F45/0172, located at or about NZTM2000 1280360E 4898745N, in accordance with NZS 4411:2001 Environmental Standard for Drilling of Rock and Soil; and
    (b) provide written confirmation, along with the drilling log, of the decommissioned bore to the Consent Authority (EScompliance@es.govt.nz) by 1 June 2023.

20. Prior to the exercise of this consent, the Consent Holder shall inspect all bridges and culverts and, where necessary, undertake improvements to the structures to ensure that there is no runoff of agricultural effluent to surface water.

21. The Consent Holder shall undertake maintenance of the existing and any new dairy lanes to ensure they are contoured to ensure that any run-off occurs onto vegetated areas where it will not enter any surface water body.

22. Except for crossings of surface waterways, the Consent Holder shall not construct any new dairy lanes within 20 metres of a surface waterbody.

23. The Consent holder shall prepare and implement a Riparian Planting Plan for the farm that includes the use of native plants. This plan shall be prepared within 12 months of the consent being granted and be incorporated into the Consent Holder's Farm Environmental Management Plan required by Condition 31. The plan required by this condition shall be provided to Hokonui Rūnanga (hokonui.office@ngaitahu.iwi.nz).

24. The Riparian Planting Plan required by Condition 23 shall include, but not be limited to:

    (a) the planting of both sides of the waterway that runs from Jaffray Road at paddocks 52/53 to paddocks 12/13, as detailed in the application, beginning at or about NZTM 1280338E 4900292N and finishing at or about 1279251E 4899364N;

    (b) the planting of the wetland/pond area north of the milking shed and adjacent to the main dairy lane, as detailed in the application, at or about NZTM 1279764E 4900156N; and

    (c) the planting of both sides of the waterway that runs from McBain Road at Run off paddock 26 to paddocks 62/South West Block, beginning at or about NZTM 1278550E 4901978N and finishing at or about 1279298E 4900057N.

25. The Consent Holder shall:

    (a) provide written confirmation, along with date stamped photos, of the planting required by condition 24(a) to the Consent Authority by 1 June 2023;
    (b) provide written confirmation, along with date stamped photos, of the planting required by condition 24(b) to the Consent Authority by 1 June 2024; and
    (c) provide written confirmation, along with date stamped photos, of the planting required by condition 24(c) to the Consent Authority by 1 June 2025.

26. The Consent Holder shall utilise catch crops in their winter grazing program. The suitability for a catch crop shall be assessed by a suitably qualified agronomist on an annual basis and shall be detailed in the Farm Environmental Management Plan required by condition 31.

27. Following intensive winter grazing on all areas of the landholding, the Consent Holder shall re-sow at the earliest opportunity based on paddock suitable conditions and as soon as practicable to minimise the amount of time that bare ground is exposed.

28. The Consent Holder shall cultivate;

    (a) with the contour of the land being used for cultivation and shall not cultivate up and down the slope; and
    (b) no less than 5 metres from the outer edge of any surface water body or natural wetland unless for the purpose of renewing or establishing pasture in accordance with Rule 25(b) of the Proposed Southland Water and Land Plan (Decisions Version), or any subsequent replacement versions.

Records and Reporting

29. The Consent Holder must have and maintain a record of the following practices undertaken on-farm for each year between 1 July and 30 June:

    (a) fertiliser application, including rates and dates of application;
    (b) types of crops and total area of cropping, including winter feed/forage crops;
    (c) cultivation methods;
    (d) stock units with references to type, age and breed;
    (e) effluent application areas; and
    (f) all other inputs to the OVERSEER® nutrient budgeting model.

30. These records required by Condition 29 shall be provided to the Consent Authority (EScompliance@es.govt.nz) by 31 July each year.

Farm Environmental Management Plan

31. The Consent Holder shall have and maintain a Farm Environmental Management Plan (FEMP). The FEMP shall, in accordance with Appendix N of (Decisions Version) the Southland Water and Land Plan (or any replacement Appendix in an updated version of the plan), demonstrate how the following outcomes are to be achieved:

    (a) nutrients are used efficiently and nutrient loss to water is minimised;
    (b) contaminant losses from critical source areas are reduced;
    (c) cultivation is undertaken in a manner that minimises the movement of sediment and phosphorus to waterways;

(d) intensive winter grazing occurs in a way that minimises the loss of sediment, phosphorus and microbiological contaminants to waterways;
(e) agricultural effluent and other discharges are managed in a way that avoids or minimises the loss of contaminants to water; and
(f) Irrigation water is applied to meet plant demands and minimises the risk of leaching and run-off.

32. The FEMP required by Condition 31 shall also include, but not be limited to:

(a) a site map showing the location of critical source areas; physiographic zones; permanent or intermittent rivers, streams, lake, drains, ponds or wetlands; where known the location and depth of any subsurface drainage systems including outlets, riparian vegetation and fences adjacent to waterways and stock access points across waterways;
(b) details of the implementation and maintenance of mitigation measures required by the conditions of this consent and any mitigations voluntarily implemented including new riparian planting;
(c) details of the implementation and maintenance of Good Management Practices, including adoption of changing industry good management practices. This includes where the implementation of these is to avoid, remedy or mitigate any farm specific environmental risks to water quality shown through any monitoring undertaken on the property voluntarily or as required by the conditions of this consent;
(d) a review of the data obtained from the monitoring undertaken in accordance with the Farm Environmental Management Plan and any changes made, or to be made, as a consequence of that monitoring.

***Advice Note**:*
Should the use of a Freshwater Farm Plan be required or available, on the basis that it is certified under Section 217G of the Resource Management Act 1991 (as amended from time to time in accordance with section 217E(2) or (3)) and available for use, the Consent Holder may elect to use such plan.

33. The FEMP shall be reviewed at least once a year and can be modified at any time by the Consent Holder; and either:

(a) an updated version shall be provided to the Consent Authority by 30 September each year; **or**
(b) the Consent Holder must notify the Consent Authority in writing that no changes have been made by 30 September each year.

Advice Note:
The results from the review of the FEMP will be assessed by the Consent Authority to ensure that the FEMP will still achieve the objectives specified in the FEMP and the FEMP has been prepared in accordance with Appendix N of the Southland Water and Land Plan (Decisions Version) (or any updated version of the plan).

34. The Consent Holder shall operate in accordance with the FEMP at all times. Where there is inconsistency between the FEMP and the conditions of the consent, the conditions of this consent shall prevail.

Auditing

35. The Consent Authority may require the Consent Holder to have the farming activity as authorised by this consent independently audited by a person who is a Certified Nutrient Management Advisor or Farm Environmental Plan Auditor or a Suitably Qualified Person who has demonstrated an equivalent level of expertise.

36. The audit shall assess the performance of the farming activity occurring on the property against:

    (a) the objectives and good management practices specified in the FEMP;
    (b) any additional mitigation measures implemented on the property either voluntarily or as required by the conditions of this consent; and
    (c) the baseline contaminant loss rates specified in Condition 13 and 15.

37. The audit must determine the level of confidence of achieving each objective set out in the FEMP. This level of confidence shall be categorised into the following:

    - **High** - the objective is probably being achieved
    - **Medium** - the objective is possibly being achieved
    - **Low** - it is unlikely that the objective is being achieved.

38. The audit shall record the justification for each level of confidence assessment, including noting the evidence, or lack of, used to make the determination.

39. Where an objective has received a Medium or Low level of confidence, the audit shall include the actions required for the farm to meet the objective and a timeframe whereby these actions need to be undertaken.

40. Where an objective has received a Medium level of confidence (and the farm has received no Lows), the audit shall also determine whether or not the farm is on-track to achieve the objectives.

41. The audit report shall be provided to the Consent Authority within three months of the date of the Consent Authority issuing a requirement to undertake the audit.

42. The frequency of audit requirements may be annually except where, for two consecutive years, an audit report has concluded that all objectives are probably being achieved (received a high level of confidence). In that situation no further audit will be required for at least three years.

43. Where the audit identifies actions required to be undertaken for the farm to meet the objective the Consent Holder must implement these actions within the timeframes stated in the audit.

44. Upon completion of any changes made and/or mitigations implemented as required by the audit, the Consent Holder shall confirm in writing, including photographs (date and time stamped) to the Consent Authority that these actions have been completed and implemented.

45. Upon completion of all the changes made and/or mitigations implemented as identified in the audit, the Consent Holder must ensure the measures are properly maintained, continue to function and are not removed or altered for the duration of this consent (and any subsequent variation versions).

Lapse and Review

46. 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 cultural effects on the tangata whenua and/or 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;
    (c) Amending the auditing/monitoring/recording/reporting/modelling programme to be undertaken;
    (d) Adding or adjusting compliance limits;
    (e) Ensuring the Mataura Freshwater Management Units meets the freshwater objectives and freshwater quality limits set in an operative regional plan or National Policy Statement for Freshwater Management; and
    (f) Requiring the Consent Holder to adopt the best practicable option to remove or reduce any adverse effect on the environment as a result of the exercise of this permit.

for the **Southland Regional Council**

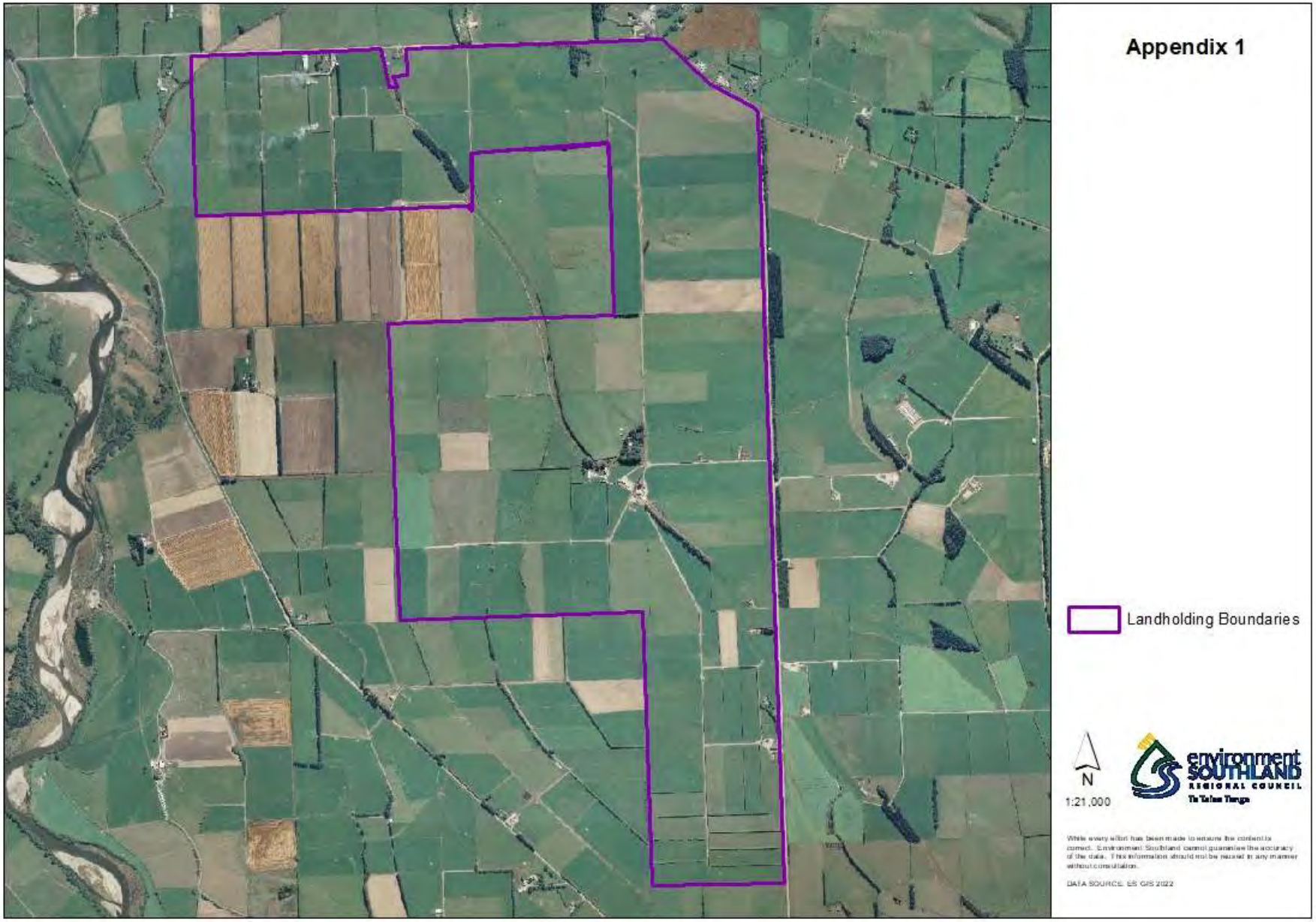
Allan Cubitt
Independent Hearing Commissioner

Notes:

1. *Reporting to Council is required by conditions of your consent. The key dates for you to meet are listed below in table 1:*

Due date	Condition number	Requirement
30 Sept each year	10	Provide record of soil testing regime, soil testing results and fertiliser recommendations
30 Sept 2024, 2026, 2028, 2030 & 2032	12	Provide Olsen P results
30 Sept each year	16	Report summarising results of Overseer modelling
1 June 2023	19	Confirmation of bore F45/0172 decommission
Once complete	23	Riparian planting plan to Hokonui Rūnanga
1 June 2023, 2024 & 2025	25	Confirmation of riparian planting
30 Sept each year	30	Provide record of farming practices
30 Sept each year	33	Provide updated version of FEMP if changes were made due to review or confirm no changes were made due to review

2. *In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.*
3. *In accordance with Section 138 of the Resource Management Act, this consent may be surrendered by providing written notice to the Consent Authority. This written notice must be accompanied with evidence to demonstrate that the conversion is complete and that all of the conditions of this permit have been satisfied in full.*
4. *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, payable in advance on 1 July each year. This charge may include the costs of inspecting the site up to two times each year (or otherwise as set by the Consent Authority's Annual Plan)*
5. *The FEMP, supporting evidence and on-site practices may be audited by the Consent Authority at any time for compliance and enforcement purposes.*


Appendix 1
Landholding Boundaries
N
1:21,000
environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tūroa
While every effort has been made to ensure the content is correct, Environment Southland cannot guarantee the accuracy of the data. This information should not be reused in any manner without consultation.
DATA SOURCE: ES GIS 2022