Consents Hearing
21 February 2018

D E and V J Stafford – APP 20171375

Appendices

Application

Application for Resource Consent (PART A)

environment SOUTHLAND
Te Taiao Tonga

This application is made under Section 88 of the Resource Management Act 1991

The purpose of this Part A form and the relevant Part B form(s) is to provide applications with guidance on information that is required under the Resource Management Act 1991. Please note that these forms are to act as a guide only, and Environment Southland reserves the right to request additional information.

PAID
14 JUL 2017
ENVIRONMENT SOUTHLAND

To: Environment Southland
Private Bag 90116
Invercargill 9840

Full name, address and contact details of applicant ***(in whose name consent is to be issued)*** Cheque $1506 mo.

Name: DE & VJ STAFFORD.

Address: 86 CHARLTON SIDING ROAD
RD2 GORE.

Email:

Phone: _____ (*Preferred*) _____ (*Additional*) Fax: _____

Consultant contact details ***(if different from above)***

Contact name/agent: R. DAVIE.

Address: 64 QUINTIN DRIVE
TE ANAU 9600.

Email: inground@vodafone.co.nz
03 249 8826.

Please tick the box for the consent(s) you are applying for and complete the relevant Part B form(s) where available:

Land Use

- [ ] Bore/well
- [ ] Convert land to dairying
- [ ] Effluent pond construction
- [ ] Tree planting
- [ ] Gravel extraction
- [ ] Hill country burning
- [ ] Riverbed activity (incl streams/creeks and stopbanks)
- [ ] Bridges and culverts

Discharge

- [ ] To air
- [ ] To water
- [✓] To land

Water

- [ ] Take and use surface water
- [✓] Take and use groundwater
- [ ] Dam water
- [ ] Divert water

Coastal

- [ ] Whitebait stand
- [ ] Structures/occupation of space
- [ ] Removal of natural materials
- [ ] Disturb foreshore/seabed
- [ ] Discharge/deposit substances
- [ ] Commercial surface water activity
- [ ] Reclaim/drain foreshore/seabed
- [ ] Marine farming
- [ ] Other coastal activities

1 Are there any **current** or **expired** consents relating to this proposal? [✓] Yes [ ] No

If yes, please provide consent number(s) and description:

204546.

2 Are any other consents required from Environment Southland or **other authorities?** [ ] Yes [✓] No

If yes, please state the relevant authority and the type of consent(s) required:

3 For what **purpose** is this consent(s) required: (e.g. discharge of effluent, gravel extraction etc.)

Discharge of FDE & water Permit for Stock and Stock water.

4 **Location** of proposed activity

Address: 86 Charlton Sidings Road, RD 2 Gore.

Legal Description: Pt lot 39 and lot 40 DP 82, Lot 1 DP 11650 Block XIII Waimumu Hundred

Map Reference (NZTM 2000): _____ E _____ N

5 The name and address of the **owner /occupier:** (if other than the applicant)

Name: _____ Phone: _____

Address: _____

_____

6 **Please attach a map or a coloured aerial photograph, showing at a minimum, the location of the proposed activities.** See attached.

Checklist: Have you included the following?

- [✓] Payment of the required deposit *(see attached fee schedule)*
- [N/A] Written approval from all potentially affected parties *(forms available from the Environment Southland website)*
- [✓] Site plan/location map/sketch of the proposed activity
- [N/A] A copy of the Certificate of Incorporation (*where applicant is a company*)
- [✓] Part B form(s) specific to your activity and/or a separate assessment of environmental effects (AEE)

Notes:

(a) If your application does not contain the necessary information and the appropriate fee, Environment Southland must return the application.

(b) Council cannot accept electronic lodgement of applications at this time.

Signature of applicant

I hereby certify that to the best of my knowledge and belief, the information given in this application is true and correct.

I undertake to pay all actual and reasonable application processing costs incurred by Environment Southland.

Name (block capitals) Russell Davie

Signed _____ **Date** 30-3-2017

(Signature of applicant or person authorised to sign on behalf of applicant)

Dairy Green Ltd
Practical Engineering Solutions
Consents, Effluent, Stock water, Irrigation
Design through to Installation
Irrigation NZ Accredited Designer

D E & V J Stafford

Charlton Siding Road
Gore

30 March 2017

V3

Application for:

Discharge Permit Renewal
Water Permit

Contents

A: Background

1. Renewal

D E and V J Stafford own a dairy farm located on the Charlton Siding Road near Gore

The existing consents for this operation – 204546 (Discharge) and 204547 (Groundwater take) –expire on 19 July 2017.

This application therefore seeks to have the dairy farm discharge consent renewed for 500 cows. The groundwater consent does not need to be renewed under the proposed Southland Water and Land plan Rule 54 (a) (i) (1-3) ie 500 cows @ 120L/Cow/day = 60,000L/day.

The farm does not require any upgrade to the FDE collection, storage and irrigation systems. The storage pond has passed an "Appendix P" leakage test.

This application seeks to have the discharge renewed for a further 10 years.

B: Regulatory Considerations

1: Summary

Environment Southland must consider the following matters when they consider an application. The application is consistent with all of these relevant plans and policies because effects on water quality and quantity and the soil resource should be less than minor.

Resource Management Act 1991

- The provisions of section 104 of the Resource Management Act1991:
- Part 2 of the Resource Management Act;
- The applicant's assessment of effects on the environment
- The provisions of Sections 104B, 104C, 105 and 107 of the Resource Management Act 1991.

To avoid repetition of comments, the following documents have been grouped together under common headings in the sections that follow.

- National Policy Statement for Freshwater Management:
- Regional Policy Statement for Southland:
- Regional Effluent Land Application Plan:
- Regional Water Plan
- Southland Water and Land Plan 2016
- Te Tangi a Tauira:

2: Ngai Tahu Values

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management:	• Objectives C1, D1 • Policies C1, D1
Regional Policy Statement for Southland:	• Objectives 1.1,1.2,1.3,1.4 • Policy 1.2
Regional Effluent Land Application Plan:	• Objectives 4.1.4, 4.1.5 • Policies 4.2.4, 4.2.7,4.2.8, 4.2.9
Regional Water Plan	
Southland Water and Land Plan 2016	• Objectives 3, 4, 5, 15 • Policies 1, 2, 3
Te Tangi a Tauira:	• Whole Document

Tangata Whenua values have been considered when preparing this application including reference to Te Tangi a Tauira (Iwi Management Plan).

As stated in the Farm Environmental Management Plan the applicant's objective is:

"As good environmental stewards and responsible citizens, manage the farm dairying system so as to take all practical steps to preserve soil structures and avoid contamination of ground and surface water, nutrient leaching, and silting."

This reflects the principals of protection of the mauri of the water and mana of the land while minimising adverse effects on mahinga kai.

No known wahi tapu, ancestral sites, heritage sites or other taonga are associated with the property. Accidental discovery procedures will be issued by Environment Southland alongside the resource consent. These procedures will be followed should taonga be discovered during earth works.

The effects of the activity on mahinga kai and the customary use of water to Ngai Tahu are no more than minor and the effects on physical and natural resources are discussed further in the AEE.

3. Water Quality

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management:	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Regional Policy Statement for Southland:	• Objectives 5.1,5.2,5.3,5.4 • Policy 5.5, 5.8
Regional Effluent Land Application Plan:	• Objectives 4.1.2 • Policies 4.2.3, • Rule 5.4.5
Regional Water Plan	• Objectives 3,4,8 • Policies 1,4,6,7,13
Southland Water and Land Plan 2016	• Objectives 6, 7, 8, • Policies 13, 14, 15, 16, 17, 18
Te Tangi a Tauira:	• Policies 1, 4, 5, 6, 11, 16, 17, 18

The discharge is to land rather than water and is undertaken in a manner to minimise adverse effects on water quality.

The Beacon website shows that the property is in a zone where nitrate levels are below drinking water standards.

By following current good management practices in relation to effluent storage and discharge including deferred irrigation and appropriate buffer zones, the effects of the activity on groundwater quality and specific values (bathing, trout/native fish, stock drinking water, Ngai Tahu values and natural character) are expected to be no more than minor.

Good management practices for the management of the effluent system and mitigation measures have been included in the application and in the Farm Management Plan.

The system involves the discharge of effluent onto land at a rate where the soil can assimilate the nutrients in a form that the plants can utilise while avoiding any adverse effects on water quality.

Low rate irrigation, as discussed in the AEE, should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE.

Where recommended buffer zones from waterways are adhered to when applying effluent and effluent is not discharged over tiles, lines/moles where the soil is at or near field capacity.

4. Water Quantity

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management:	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Regional Policy Statement for Southland:	• Objectives 4.1, 4.2, 4.3, 4.4, 4.5 • Policies 4.3, 4.4, 4.5, 4
Regional Effluent Land Application Plan:	

Regional Water Plan	• Objectives 5,7,8 and 9 • Policies 21, 22 23, 28, 29, 30, 31, • Rules 16C, 23, 50
Southland Water and Land Plan 2016	• Objectives: 7, 9, 11, 12 • Policies 20, 21, 22, 23, 42 • Rules 54(a)
Te Tangi a Tauira:	• Policies 1, 4, 5, 6, 11, 16, 17, 18

The applicant will be abstracting groundwater in volumes not large enough to require consent.

The water take is a permitted activity under Rule 54(a) of the Southland Water and Land Plan and reflects standard volumes for a dairy farm. As such, it reflects efficient use of water.

The proposed volume of take is consistent with Environment Southland's guidelines of 120 litres per day per milked cow and 50 litres per dry stock unit, which is considered reasonable for the intended end use.

The rate of take does not exceed 2L/sec and should not result in more than minimal stream depletion and interference effects.

The taking of the water should not result in the over allocation of the groundwater zone allowing the resource to continue to be sustainably managed.

5. Soil Health and Effluent Management

Regulatory Document	Relevant Sections
Regional Policy Statement for Southland:	• Objectives 8.1, 8.2, 8.3, 8.4, 8.5 • Policies 8.1, 8.2, 8.4, 8.5
Regional Effluent Land Application Plan:	• Objectives 4.1.1 • Policies 4.2.1, 4.2.2
Regional Water Plan	• Policy 41 • Rule 49
Southland Water and Land Plan 2016	• Objectives 13, 14, 15 • Policies 6, 10 • Rules 21, 32
Te Tangi a Tauira:	• Policies 4, 7, 8, 9, 11, 13, 14, 15

The application seeks to ensure the life supporting capacity of the soil is safeguarded, along with the sustainability of the soil ecosystem by utilising land treatment of effluent without significant adverse effects.

An effluent storage pond has been built which allows for deferred storage until the soil moisture content is suitable for irrigation.

The pond was designed to meet the conditions of Rule 49 of the Regional Water Plan.

The soils are suitable for effluent irrigation and the discharge follows current good management practices.

The land disposal area meets the the best practise recommendation of 8ha per 100 cows. This assists in avoiding an excessive build-up of nutrients in pasture, including potassium concentrations, that can affect stock health.

The renewal application meets the requirements for Rule 21 of the Southland Land and Water Plan as it is for the renewal of a discharge permit for an existing dairy farm with no change in cow numbers. A Farm Management Plan is included as part of the application.

Good management practices are included in the Farm Management Plan. These include practices of a general nature and those specific to the transport pathways for the physiographic zones on the property.

The property is not in the Alpine Physiographic zone.

This system is sustainable in the long term and allows the effluent to be used as a both a fertiliser and a soil conditioner.

The system was designed resilient and flexible and allow the incorporation of new methods and technology as became available and proven.

C: Discharge Permit - Application details

1. Duration of Consent sought

10 years

2. Herd size

The milking herd will be not more than **500** cows.

3. Factory supply Number

Supplier number

4. Volume of effluent

Dairy shed effluent for 500 cows at 50l/cow per day is 25,000 litres per day.

5. Period of discharge

The Cowshed from 1 August to 31 May.

Irrigation to the discharge areas will be done between 1 August and 31 May when ground conditions permit.

6. Milking Frequency

Max of twice per day.

7. Winter Milking

None – and not anticipated.

8. Feedpad/Wintering Pad/Stand-off Pads

N/A

9. Other Sources of Effluent

Hardstands

Rainwater off 830m^2 of hard stands around the dairy shed: 850m^{2}x 0.08 x 3 months = 204m^3.

Underpass

N/A

Feed Pad

N/A

Wintering Shed

N/A

Silage Pad

N/A – use Balage

With rainfall, evaporation and daily irrigation allowances as per the Dairy Effluent Storage Calculator the volume of storage required is: max 1,704 m^3 and 1,508m^3 at the 90% probability storage volume.

The farm's existing pond is 2,013m^3 plus 0.5 m freeboard.

10. Area of land

The farm's total land area is 181.0 ha.

No effluent will be irrigated within:

i. 20 metres of any surface watercourse;
ii. 100 metres of any potable water abstraction point;
iii. 20 metres of any property boundary, (unless the adjoining landowner's consent is obtained to do otherwise);
iv. 100 metres of any residential dwelling other than residential dwellings on the property;

It is not proposed to increase the discharge area to include the new areas.

Legal Description
Pt Lot 39 and Pt Lot 40 DP 82, Lot 1 DP 11680 Bk XIII Waimumu Hundred.
Lot 2 DP 404063

11. Total Land area

Total Land area 181 ha

12. Stocking rate

500 cows on 181 ha gives a stocking rate of 2.76 cows per Ha.

13. Effluent collection and storage details

Dairy Shed

I. The effluent from the dairy shed flows by gravity to a stone trap and to a 10m^3 primary pump sump to the north of the dairy shed.
II. From this sump the whole effluent is pumped to the sludge bed further to the north where the solids are removed and the filtered effluent is pumped to the membrane lined 2,013 m^3 storage pond.
III. When field moisture conditions permit the stored effluent is pumped to the discharge area via an underground mainline system to a k/line pod set.

The client advises that in the eight years the storage system has been operating, there have been no issues with a lack of storage even given the two wet springs in the past four years.

Should storage become an issue there is an umbilical system available locally through a contractor. A condition to cover its operation should be included in the consent.

14. Effluent Irrigation method:

Renewal is for a low rate pod sets only plus the standard conditions to allow for the use of an umbilical cord system should that be ever required.

Any 'low rate pod' land disposal system will meet the following conditions:

- a maximum depth of application of 15 mm for each individual application, at a rate not exceeding 10 mm/hour;
- a minimum return period of 28 days between applications;
- a maximum combined depth of application of 25 mm per year to any land area; and
- a minimum land area of 8 hectares/100 cows for the dairy shed effluent.

Any low umbilical cord system will meet the following condition:

- a maximum depth of application of 5 mm for each individual application.

15. Calibration of Discharge Rate

It is submitted that a test of the system is not required as the low rate system lacks the capacity to apply at a rate of more than 5mm per hour.

The irrigation pump is a 7.5kw Alpha closed impellor pump. By using the pump curve the highest application rate can be calculated.

Head to operate K/line podset	23.0m
Static lift	3.0m
100m MDOD90mm, Friction loss	1.5m
100m MDOD63mm Draghose, Friction loss	2.7m
Total Head	30.2m

30m head is 2.94 or near enough to 3 bar.

Using the K/line pod manufacturer (RX Plastics Ltd) data a single k/line pod will deliver 1.030m³/hr for a depth of 2.3mm/hr at 3 bar.

The farm's Kline podset is fitted with the 4.0mm black nozzles.

Pressure and flows of the Naan 5022

Nozzle (mm)	P bar	Q m3 / hr	Application Depth (m)
3.2 Green	2.0	0.570	1.43
	3.0	0.700	1.43
	4.0	0.810	1.43
3.5 Blue	2.0	0.660	1.65
	3.0	0.810	1.65
	4.0	0.930	1.65
4.0 Black	2.0	0.850	2.13
	3.0	1.030	2.13
	4.0	1.180	2.13

Application table from the RX plastic technical manual

The farm's pod-set has 24 pods in the set. Hence in a continuous pumping scenario the volume irrigated will be 24.7m³ an hour. However the depth applied is completely dependent on the setting of the pulsing system with can be set to pulse irrigate depths less than 1mm/hr. eg a single pulse of 15 minutes duration in the hour would be 2.13mm/hr divided by 4 = 0.53mm/hr.

16. Effluent Testing

The nutrient content of the effluent has not been tested to date, however the nutrient content in a 10mm application depth of purely FDE is likely to be around 30 kg N /ha and 3 kg P/ha. A maximum application depth of 25mm per year to the effluent discharge area should result in

loadings of around 75 kg N/ha and 7.5kg P/ha which is well below the recommended restriction of 150 kg N typically placed on discharge permits by Environment Southland.

17. Buffer Zones

The applicant will to comply with all buffer zones as recommended by Environment Southland, i.e.

I. 20 metres from any surface watercourse;
II. 100 metres from any potable water abstraction point;
III. 20 metres from any property boundary, (unless the adjoining landowner's consent is obtained to do otherwise);
IV. 100 metres from any residential dwelling other than residential dwellings on the property;
V. Dairy shed effluent not be discharged onto any land area that has been grazed within the previous 10 days;
VI. Effluent shall not be discharged over tiles, lines/moles where the soil is at or near field capacity.

18. Other Discharges

No other discharges on property

19. Water Zones

Groundwater Zone: Middle Gore Lignite measures (ex Beacon)

Surface Water Catchment: Mid Mataura

20. Groundwater Depth

The groundwater depth will be variable but is in the vicinity of 8.0 m from ground level. (ex bore)

21. Slope of Disposal Area

The disposal area is largely flat but bisected with old meander depressions typical of the river plain.

22. Existing Environment

a. In stream life	No Effect
b. Food gathering from watercourses	No Effect
c. Wetlands/ bird nesting habitats	No Effect
d. Recreational activities	No Effect
e. Areas of aesthetic or scientific value	No Effect
f. Waste discharges	No Effect
g. Other water takes	No Effect

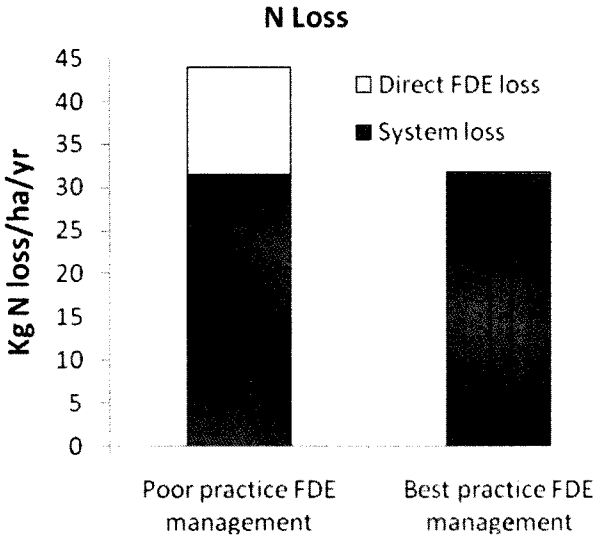
With the discharge to land only occurring when there is a sufficient soil moisture deficit there will be no effect as the nutrient applied will be held in the pasture root zone.

23. Assessment of the risk of Contaminant Transportation

The entire design of the effluent discharge system meets best practice by using buffer storage and low rate/depth effluent application. The use of best practice effluent application should avoid adverse effects on the environment. This principle is well documented in various scientific reports prepared for Environment Southland during the process of setting policies and rules around effluent discharge to land. The 2009 Houlbrooke and Monaghan report

provides context and background to the principle that low depth effluent application should not cause adverse effects on water quality.

The graph below is taken from the 2009 Houlbrooke and Monaghan report to illustrate that nutrient loss from FDE application is minor if undertaken using best practice. In this example, less than 1% of nutrients applied in effluent reached drainage water on tile and mole drained soil. The greatest lost being "system loss" which is a different expression for the grazing effect illustrated earlier in the report.



The applicant intends to apply effluent in accordance with best practice at all times.

Deferred Irrigation

Houlbrooke and Monaghan explain that if effluent is applied to soil when a soil moisture deficit exists then the effluent preferentially remains in the soil's root zone as plant available water. The soluble nutrients in the effluent can then be taken up by the plant and used in nutrient cycling. The applicant plans to use the closest Environment Southland soil moisture monitoring site on the website to determine whether a suitable soil moisture deficit exists. Effluent application will be deferred if soil moisture levels are too high to safely and correctly apply effluent. Effluent will be only applied when there is a ground moisture deficit-nil or little drainage.

The property has effluent storage capacity of 2,013 m^3 which provides for deferred irrigation.

The ability to defer irrigation during marginal times means that effluent is only applied when a soil moisture deficit occurs.

The use of low rate irrigation increases the frequency when it is safe to apply effluent because a lower soil moisture deficit is required prior to irrigation. By deferring irrigation, losses to drainage water should be considerably less than the 1.1% of the total nutrients applied in the effluent experienced in the above trial.

Low rate irrigation

Low rate irrigation is defined as an application rate of less than 10mm/hr. The applicant's effluent system on the dairy farm can apply FDE at a rate of less than 10mm/hr at all times. The application rate can be further lowered when effluent is pulse irrigated.

Houlbrooke explains that the application of effluent in this manner (low rate/ low depth) should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. A lower application rate also increases the likelihood of retaining the applied nutrients in

the root zone. A low application rate decreases the likelihood of preferential flow and allows a greater volume of applied FDE to move through smaller soil pores via matrix flow, thus allowing for greater attenuation of effluent contaminants (Houlbrooke et al. 2006, McLeod et al. 1998).

24. Assessment of Environmental Affects

a. Neighbourhood and wider community

As the applicant will adhere to Environment Southlands buffer zones around boundaries, dwellings, bores etc., there will be no more than minor effects on the neighbourhood and wider community.

The farm is already a dairy farm, with a full set of dairying infrastructure in place. No issues have been raised (by neighbours or any other person) with the existing owner during their ownership.

b. Physical effect on the locality including landscape and visual effects

Discharge of effluent has minimal landscape and visual effects as a low rate system with pods is to be used. At times these may be visible from the Charlton Siding Road, however they do not have a large presence on the visual landscape.

With low rate application systems, there is little discoloration of pastures.

c. Plants and animals, habitats and ecosystems

The effluent discharge area covers the area of the property indicated in the existing consent graphic, excluding standard buffers from boundaries, dwellings, bores and waterways. The approximate size is 41 ha. The size of the effluent area is vital to ensure nitrogen, potassium and phosphate loadings are within expected limits to avoid environmental effects and animal health issues. The total area available is at the Council and Industry recommended size of 8 ha/100 cows.

As discussed above, the soluble nutrients in the effluent can then be taken up by the plant and used in nutrient cycling and are beneficial to the soil and pasture.

d. Natural and physical resources having special value

The applicant's property lies within part of the wider Mataura River Catchment. The Mataura River is subject to a Water Conservation Order which restricts the alteration of water quality in the river.

Cumulative effects on the receiving environment are a consideration under Rule 50 of the Regional Water Plan. Long term water quality trends can be used as an indication of cumulative effects on water quality. A long term deterioration trend has been established at the Gore site (the nearest current monitoring site on the river downstream of the applicant's property) in regards to total nitrogen and total oxidised nitrogen.

Given the distance from the subject property and the extent of the other catchments that are monitored at this site, it is submitted that the Gore data is of little relevance in discussing the effects of this operation on the ongoing water quality associated with the property..

Environment Southland testing over the last few years shows how sporadic the results can be when testing N levels in groundwater. There is no obvious trend in N levels in the groundwater under the property. Climatic influences will have the biggest impact on N losses annually.

Low rate irrigation, as discussed above, is utilised to reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. A lower application rate also increases the likelihood of retaining the applied nutrients in the root zone. A low application rate decreases the likelihood of preferential flow and allows a greater volume of applied FDE to move through smaller soil pores via matrix flow, thus allowing for greater attenuation of effluent contaminants (Houlbrooke et al. 2006, McLeod et al. 1998).

There are no known QEII covenant, historical places or sites of special significance to Maori on the property.

e. Discharge of contaminants into the environment.

Effluent itself may be considered a contaminant, however as discussed above, when applied according to best practice guidelines, it has minimal impact on the environment.

f. Natural hazards, hazardous substances or installations

The property does not suffer from extensive flooding, with even severe rainfall events all surface water is contained within a few meters of the banks of the stream along the northeast boundary. The effluent storage structure is not subject to any flooding with the ponds banks in excess of 2m above flood plain level.

25. Mitigation measures

Maintenance Details

The pump performance and need for maintenance will be monitored via a pressure gauge fitted at the pump. The pump and irrigation lines will be drained for the winter period.

The sludgebed will be cleaned/emptied as and when suitable field conditions permit.

Effluent Treatment Details

The effluent from the dairy shed and yards, gravity's to a larger stone trap before flowing to a pump sump where it is pumped to a sludgebed with the filtered effluent being pumped to the storage pond.

Effluent Storage Details

The liquid effluent storage is 2,013 m^3 in the storage pond.

This provides sufficient storage to enable deferred irrigation.

Effluent Irrigation Mitigation Methods

All buffer zones as recommended by Environment Southland will be adhered to.

Effluent will applied at the appropriate rate as prescribed by consent conditions.

Contingency details

Mechanical Breakdown

The key risk in the effluent collection system is the failure of the transfer pump at the stone trap 10m north of the shed. This risk is well known and the sump and pump is well monitored. Due to the design of the system the effluent will back flood into the dairy shed pit should the pump stop, making detection of any issue evident in real time.

This pump is set up with camlocks etc to allow another pump to be quickly installed into the system if required.

Should the irrigation pump fail there is adequate storage to allow time for the pump replacement.

The aim is to operate the irrigation system to always ensure that there is buffer storage available.

This allows a contingency for wet weather or irrigation pump failure.

Wet Weather

The storage structures contain enough storage for over 70 days of dairy shed effluent even after allowing for the rainwater and effluent runoff from the standoff areas.

The farm has had no storage capacity issues since the storage pond upgrades were completed about seven years ago.

Farm Effluent Management Plan

See attached FEMP Document

26. Alternative Locations or methods

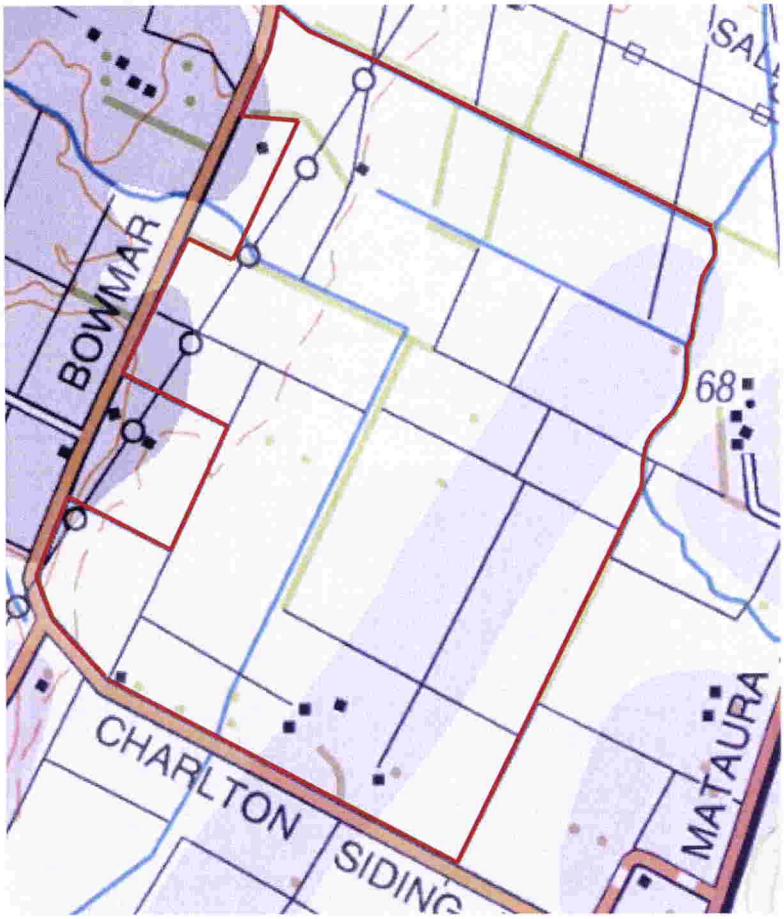
The low rate system has been installed over other possibilities (such as slurry tanker) as there are fewer adverse effects and it is consistent with Council policies.

There are lower operational costs and it has proven reliability.

Should there be issues with the pumping systems there are Umbilical Cord systems and vacuum tankers available in Edendale, Riversdale and Balfour. To permit the use of such system the standard relevant clause should be included in the consent.

27. Physiographic Zones

Physiographic Zone



The whole farm is in the Lignite/Marine Terraces zones

Risks and mitigations

Physiographic Zone	Variant	Key Transport Pathways
Lignite Marine Terraces		Overland Flows Drainage in those soils prone to waterlogging

Good management practices for these zones include:

- nutrient management
- riparian management
- effluent management

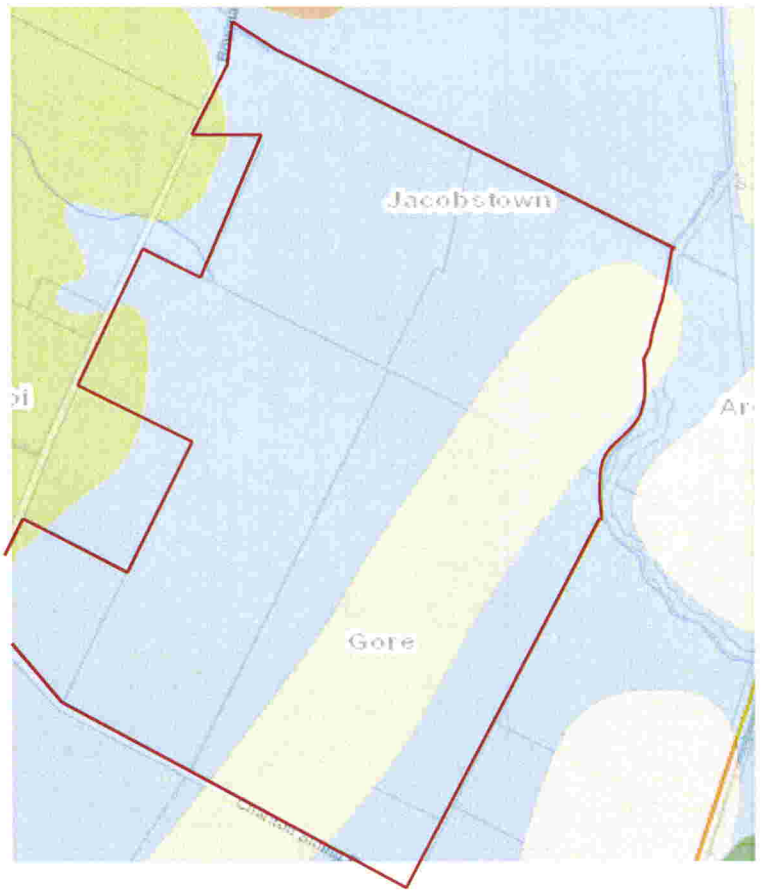
These are discussed in detail in the Farm Management Plan attached.

By adhering to best practice in irrigating effluent as above, the effects of artificial drainage and overland flow are reduced further by:

- protecting soil structure.
- reducing the accumulation of excess nitrogen in the soil during autumn and winter.
- avoiding preferential flow of effluent through drains.
- managing critical source areas.

28. Soil Types

As below farm consists of the Jacobstown and Gore types, although the distinction between the two is somewhat blurred in the field with profiles appearing very similar.



Type	Compaction	Nutrient Leaching	Erodibility	Organic matter loss	Waterlogging
Jacobstown	Severe	Slight	Slight	Slight	Severe
Gore	Moderate	Very Severe	Minimal	Moderate	Nil

29.Farm Maps

See FEMP for further detail

D: Use of Ground Water

Background

The farm has been taking groundwater for the dairy shed and stockwater from a bore as per the existing consent.

Current plan

1. Water Use

   Stock water and dairy shed use.

2. How and Where

Water is pumped from two bores to storage at the dairy shed.

3. Quantities

   The requirements for water are as follows.

1. The groundwater extraction rate will be less 2L/sec concurrent on both bores.

Average rate of take	0.69	litres per second
Maximum rate of take	1.90	litres per second
Maximum daily volume	60	cubic metres per day
Maximum weekly volume	420	cubic metres per week
Maximum monthly volume	1,800	cubic metres per month (30 day month)

4. Abstraction rates

I. Maximum Rate: 1.9 L/sec

III. Operating period

Days/week	Weeks/Month	Months/year
7	4	12

1. Rule 54

Under the proposed plan Rule 54, the existing water consent 204547 does need to be renewed as:

The total ground water and surface water extraction for the landholding will be more than 86,000 l/ per day, i.e. 60,000l/day summer

Summer

Dairy cows	500	Water required	70	litres/head/day
Drystock	50	Water required	40	litres/head/day

Winter (Stock Water only)

(ground water)

Dairy cows	Number	10	Water required	50	litres/head/day
Drystock	Number	10	Water required	40	litres/head/day

2. The groundwater extraction rate will be less 2L/sec.

Average rate of take	0.69	litres per second
Maximum daily volume	1.90	litres per second
Maximum daily volume	60	cubic metres per day
Maximum weekly volume	420	cubic metres per week
Maximum monthly volume	1,800	cubic metres per month (30 day month)

3. The points of extraction are not within 50 m of another bore. (1283308E, 4481561N)

   Effects on bore yields on neighbouring bores are expected to be no more than minor. No known issues have occurred over the term of the existing consent or since the farm was purchased in 2003.

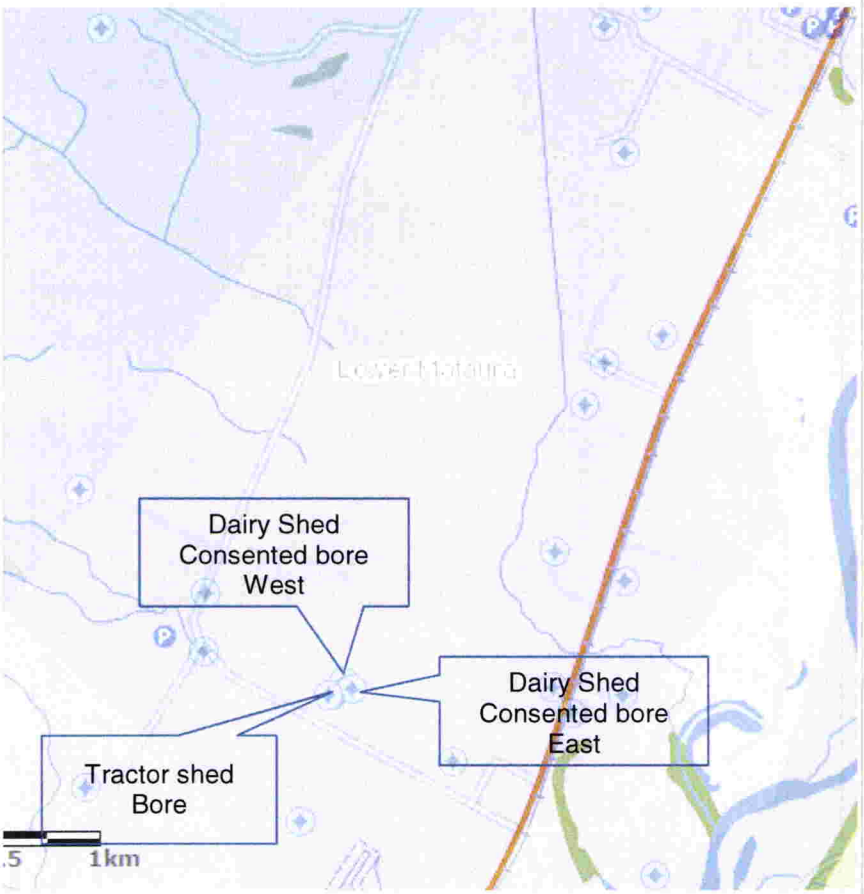
4. No surface water extraction.

Rule 54 (a) (iii) advice.

1. Farm type — Dairy farm
2. Stocking Rate — 2.76 Dairy cows per ha
3. Points of Extraction — F45/0512 NZTM 2000 1276713 E, 4881591 N
   F45/0465 NZTM 2000 1283269 E, 4881568N

2. Other information

a:. Aquifer Name



b:. Storage of water before use

Water is stored in 2 x 30,000 litre tanks at the dairy shed.

c: . Type of water meter installed

A mechanical meter is currently fitted that allows the cumulative flow to be recorded.

d: Other sources of water available

There is another bore on the farm that supplies the domestic water to the houses and to the calf shed. (Tractor shed bore) but this is low yield and not deemed suitable for supplying the dairy shed and stock drinking water requirements.

Historically it is believed that it was the bore that was used to supply stock water to the farm when it was a sheep and beef farm.

It could be used in an emergency (such as a bore pump failure) for the cowshed by laying piping from the bore to the cowshed.

e: Measures to minimise wastage and maximise efficient use

Procedure in place for checks

- Procedure in place for reporting/repairs
- Check water flowing into troughs when cows come in
- Regular check of troughs when driving past
- Periodic thorough maintenance of troughs
- Watch for leaky pipes/"weak" spots
- Floats in tanks set at a level to avoid waste
- Look out for tank/water cylinder overflows
- Check of water pressure in hand hoses
- Double check taps turned off after milking
- Regular maintenance of pumps, dispensers, etc

f: Associated discharges

See discharge permit (section C above).

g. Surrounding environment

a. In stream life	No Effect
b. Food gathering from watercourses	No Effect
c. Wetlands/ bird nesting habitats	No Effect
d. Recreational activities	No Effect
e. Areas of aesthetic or scientific value	No Effect

h. Effects on water source

a) Aquifer storage volumes

Environment Southland has adopted a staged management approach to groundwater allocation in Southland in order to address the uncertainty regarding sustainable allocation volumes for the region's aquifer systems. This approach maintains an appropriate level of management intervention to ensure adverse environmental effects remain within acceptable limits while allowing progressive development of the groundwater resource. The knowledge

that is gained by the progressive development of the resource will be built into its future management.

The applicant's current water take is already part of the current allocation total mentioned above.

b) River and stream flows, including minimum flows and allocation levels

There have been no known issues over the term of the existing consent related to river and stream flows.

The Charlton stream is 870 meters upgrade of the bore. The Charlton stream bed is perched and it is therefore unlikely that any downgrade extraction would have any immediate effect.

This renewal is not seeking an increase in annual volumes or rate of extraction.

c) Wetland and lake water levels

N/A

d) Groundwater quality

Nitrate is water soluble and can be leached from the soil profile into ground water and surface water environments. This can affect the quality of water for drinking and affect the ecology of surface water by promoting the growth of aquatic plants.

The area has a history of higher nitrate levels in the groundwater, with elevated levels being noted for over 25 years.

The current nutrient budget has calculated the losses of N to water to be 33kg/ha/yr which is about median for dairy farms in Southland.

This application is for no increase in volume of water take.

On farm practises to minimise localised contamination of groundwater include ensuring that any on farm spraying of water ways is always carried out using approved sprays for acquatic environments.

The bore is fitted with a collar to prevent surface water ingress down the bore casing.

The effects on water quality are expected to be no more than minor.

j: Assessment of environmental effects

a) Neighbourhood and wider community

As discussed above the water take is not expected to have adverse effects on neighbouring wells.

There are no actual or potential adverse social effects from the abstraction of the groundwater.

The existing water take has not had an impact on recreational fishing.

The provision of water for the dairy shed is a critical part of the production and economics of the property, which employs three people.

b) physical effects including landscape and visual effects

The water take infrastructure does not create adverse visual effects on the surrounding landscape.

c) ecosystems including plants, animals and habitats

Over the life of the existing permit, there has been no observed recreational fishing in the Charlton Stream waterway. The water take has had no known significant adverse effect on the Mataura River over the term of the existing consent.

There are expected to be no observable effects on animals or their associated habitats.

d) natural and physical resources having special value

The stream running through the property is a tributary of the Mataura River. The Mataura River has cultural, spiritual and historic significance to Ngai Tahu. The river was an important source of mahinga kai (gathering food) and Ngai Tahu tupuna (ancestors) have tikanga (protocol) for sustainable use of its resources.

The existing water take has not hindered this custom or had an impact on recreational fishing and the effects of the renewal should also be no more than minor.

e) discharge of contaminants

Associated effluent discharge – see section C above including AEE for the discharge.

f) natural hazards or hazardous substances/installations

According to Environment Southland's Beacon website, there are no areas of natural hazards in the vicinity of the applicant's property (including significant flood zones). The observations of the last 13 years by the current owners, is that flood event are largely contained within the steam banks.

i: Monitoring or mitigation measures

Water metering monitors the volume and rate of the water take. The bores are fitted with paddle type water meters currently. This will be upgraded with a data logger.

Water efficiency is a key focus on farm. Simple tasks such as keeping water reticulation systems and dairy shed plumbing in a good state of repair will prevent water leaks and reduce water wastage.

j: Alternative locations or methods

The bores have sufficient capacity and all infrastructure is already in place.

E: Effluent Pond

1. Location of the pond

2. Liner

   Synthetic membrane

   As the pond is sited in gravels no underfloor leak detection system has been installed. The pond leak test is attached.

3. Construction Details

   Name of Designer: Dairy Green Ltd

   Name of Builder: Croyden Contracting Ltd

   Built

4. Construction Standards

   The pond was designed and installed to the Environment Southland Code of Practice for Design and Construction of Agricultural Effluent Ponds. (Rule 49)

5. Pond Capacity

   The pond has a capacity of 2,013m^3.

Dairy Green Ltd

Practical Engineering Solutions
Consents, Effluent, Stock water, Irrigation
Design through to Installation
Irrigation NZ Accredited Designer

DE & VJ STAFFORD

October 2016

FARM MANAGEMENT PLAN

VER 1.0

A: PROPERTY DETAILS

Entity Name:	D E and V J Stafford
Contact Person:	David Stafford
Address:	Charlton Siding Road
Legal Description	Pt Lot 39 and Pt Lot 40 DP 82, Lot 1 DP 11680 Bk XIII Waimumu Hundred. Lot 2 DP 404063
Land Area	181 Ha (total)

Resource Consents: Discharge only

Discharge Consent: Renewal # TBA

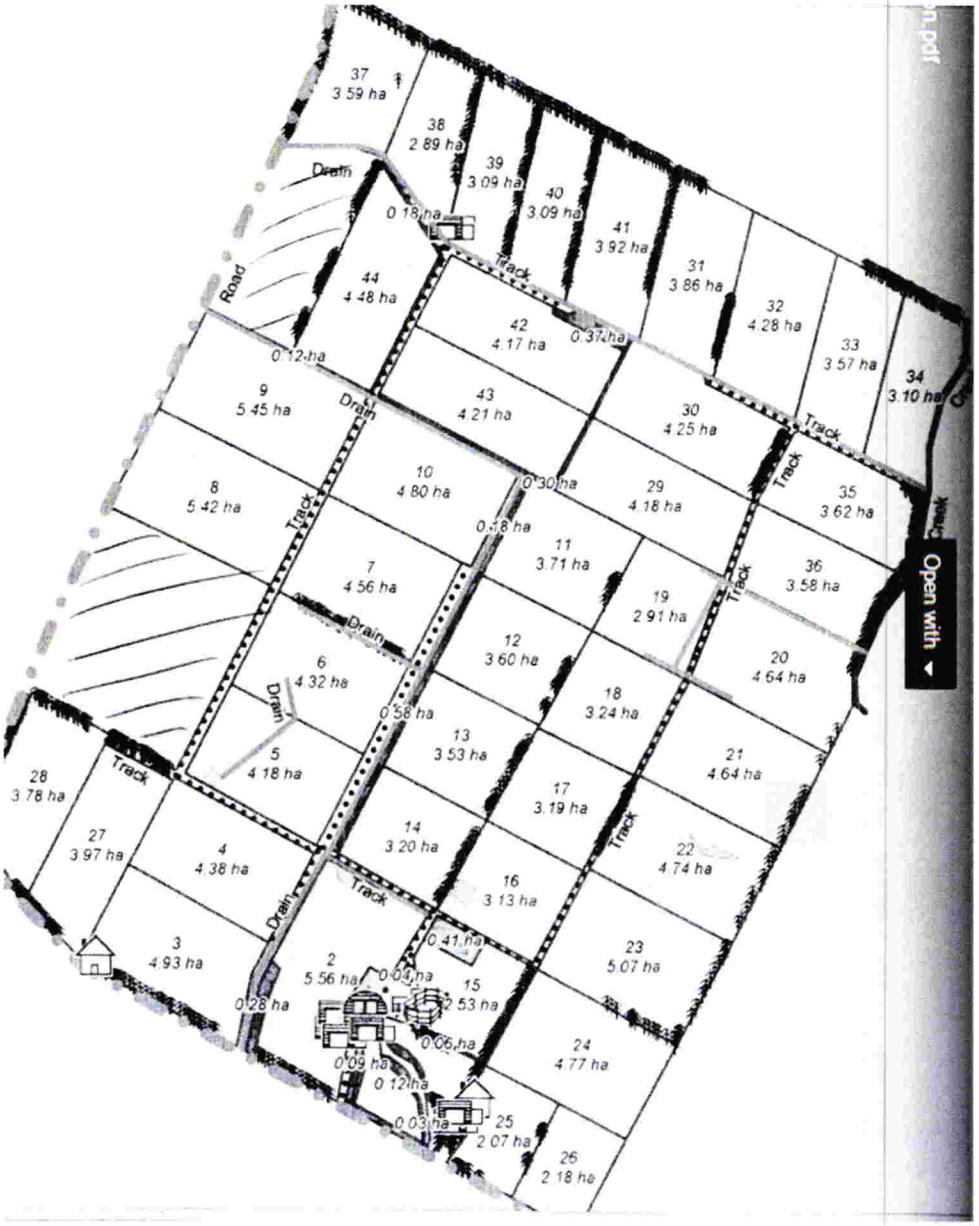
This document is designed to be a living document.

The plan should be updated at least yearly – at the end of the season is often the best.

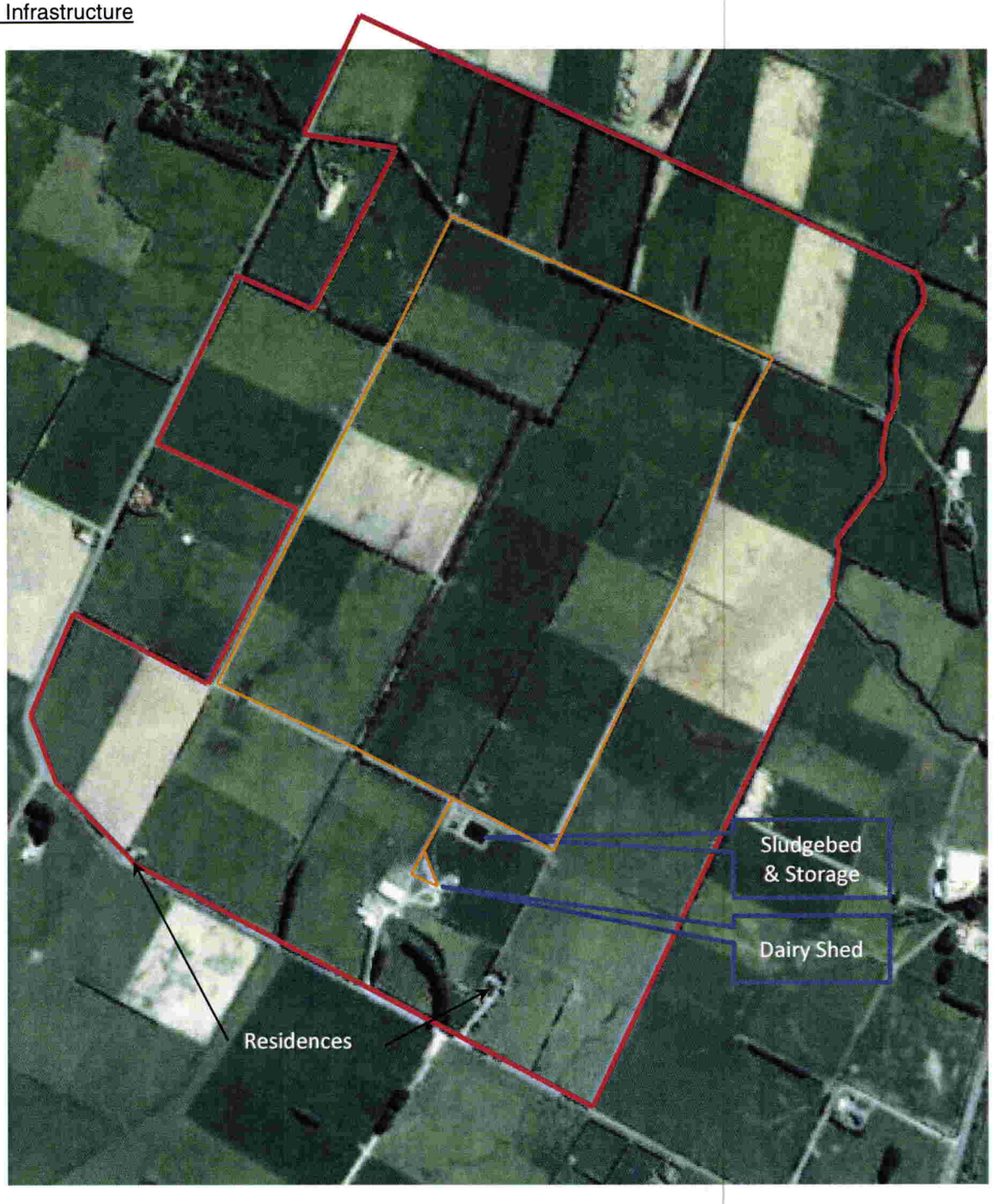
B: MAPS

1. Boundaries

Paddocks and areas.

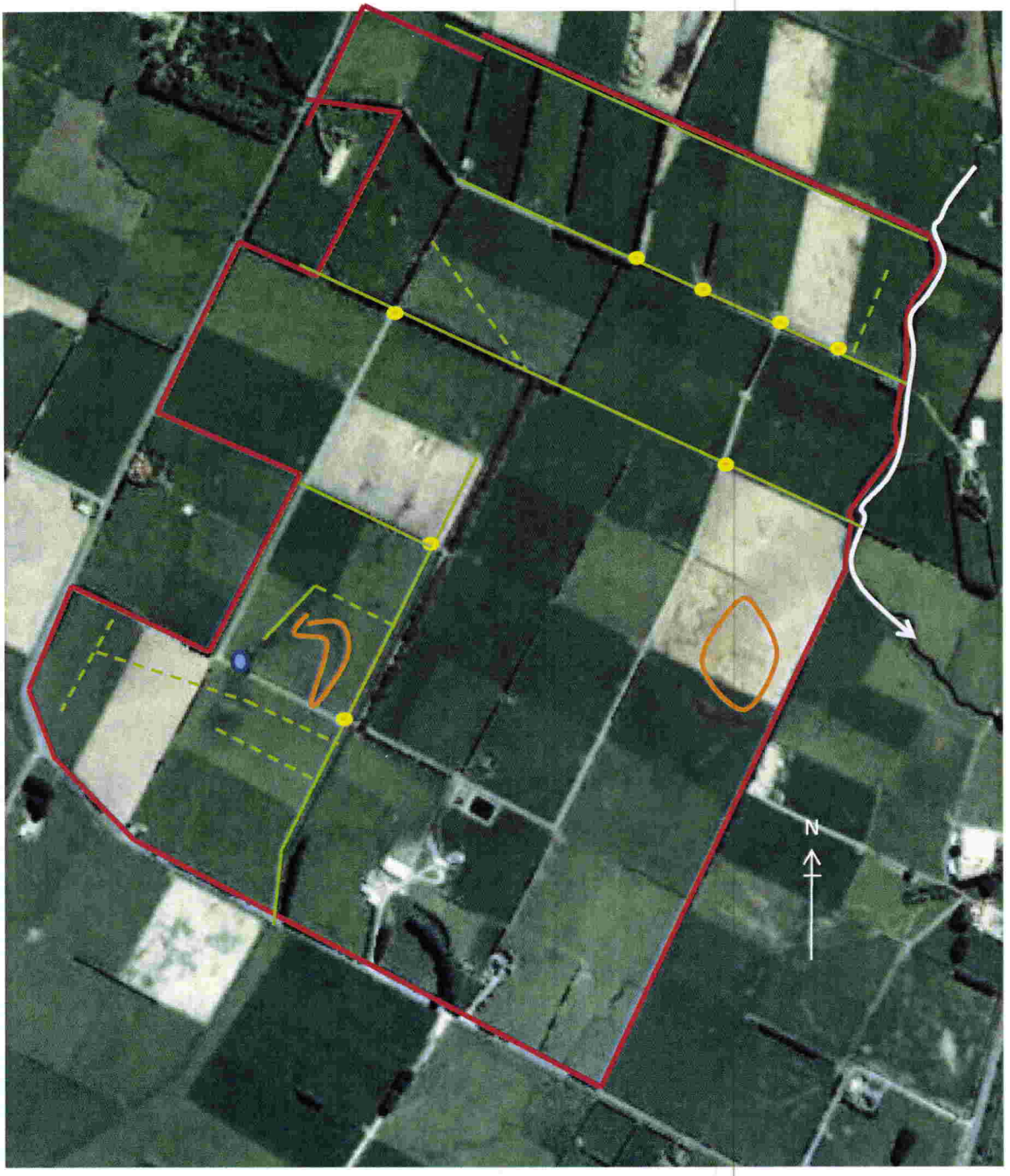


2. Infrastructure



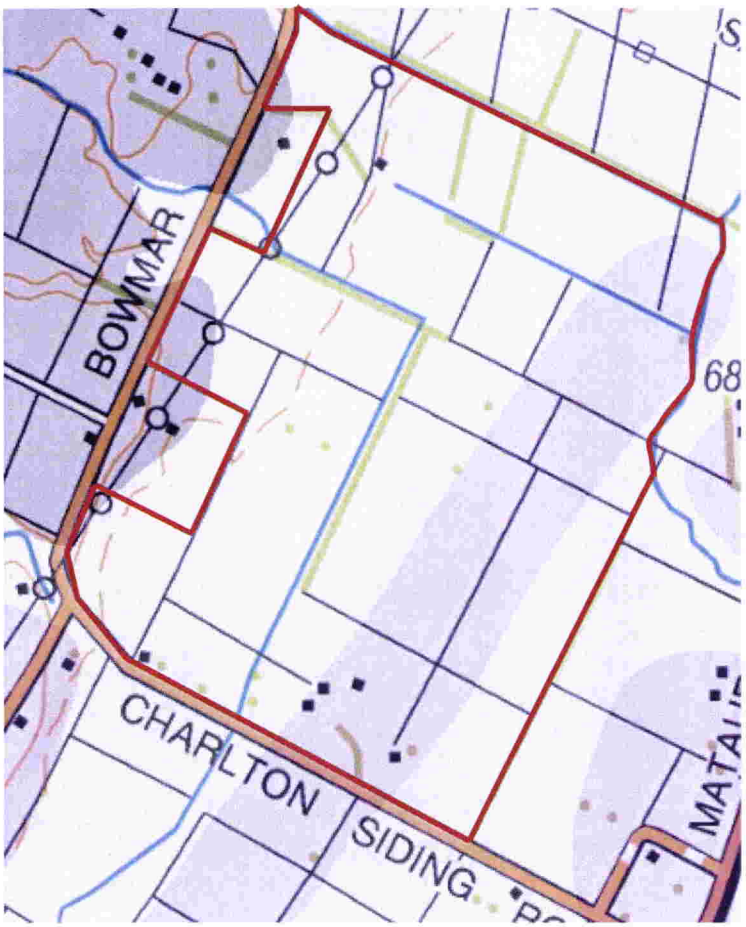
10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Invercargill 03 215 4381, Gore 03 208 8443
Email: dairygreenltd@xtra.co.nz

3. Waterways, Stock Crossings and Critical Source Areas.



Charlton Stream Creek which flows along the north east boundary.
Duckpond
Drain
Tile
Crossings/culverts
Critical Source areas

4. Physiographic Zones.



Mataura Lignite terraces

Risks and mitigations

The whole farm is in the Lignite/Marine Terraces zones

Risks and mitigations

Physiographic Zone	Variant	Key Transport Pathways
Lignite Marine Terraces		Overland Flows Drainage in those soils prone to waterlogging

Good management practices for these zones include:

- nutrient management
- riparian management
- effluent management

By adhering to best practice in irrigating effluent as above, the effects of artificial drainage and overland flow are reduced further by:

- protecting soil structure.
- reducing the accumulation of excess nitrogen in the soil during autumn and winter.
- avoiding preferential flow of effluent through drains.
- managing critical source areas to ensure that discharges from such area are mitigated by fencing off or not grazing these areas when risk of overland flows from them are high due to ground conditions and/or weather - condition (or forecasted adverse weather conditions - .

The Environment Southland Fact Sheets and best management practices documentation form part of this FEMP and are in Section O.

5. Riparian Vegetation and Fencing

All water ways are fenced both sides.

Main south drain

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Invercargill 03 215 4381, Gore 03 208 8443
Email: dairygreenltd@xtra.co.nz

6. Effluent Mainlines.

——— MDOD 90mm Mainline

With the use of drag hoses the entire consented disposal area can be irrigated.

7. Heritage

There are no known or recorded heritage sites on the property.

8. Significant Indigenous Biodiversity

There are no known or apparently recorded Significant Indigenous Biodiversity sites on the property.

C: NUTRIENT BUDGET

1. Plan Objective

This section considers all factors that may influence nutrient use and details the strategies appropriate to achieve good sustainable nutrient management. Of particular interest are P & N for environmental reasons but potassium and magnesium are also important for stock health.

2. Plan Goals

The aim of management is to use nutrients efficiently to achieve good per head performance at a modest stocking rate for the betterment and sustainability of the soils, pastures and water source.

3. Farm System Details

The following assumptions have been made.

I. The farm will milk a maximum of 500 cows on a total 181 hectares.
II. Surplus feed will be conserved as balage and will be fed back out on the property.
III. A low rate and depth effluent application k/line podset system is used on farm, along with deferred effluent application using a buffer storage pond.
IV. The milking season will be between 1st August and 31st May.

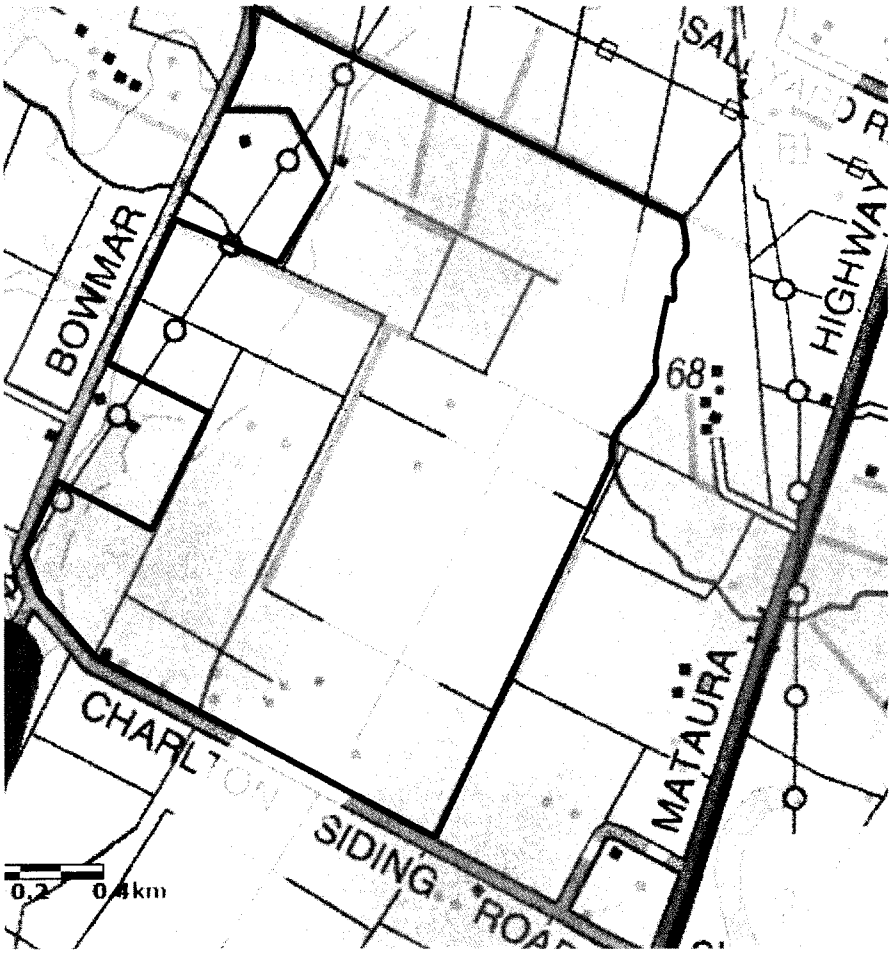
4. Optimum Soil Test Values

As a guide the following soil test values or ranges are recommended.

pH	*Ca*	*P*	*S*	*K*
6-6.2	12+	22-25	10-12	6-8

5. Soils and Properties

As below the farm consists of the Jacobstown and Gore types, although the distinction between the two is somewhat blurred in the field with profiles appearing very similar.



Type	Compaction	Nutrient Leaching	Erodibility	Organic matter loss	Waterlogging
Jaccobtown	Severe	Slight	Slight	Slight	Severe
Gore - Yellow	Moderate	Very Severe	Minimal	Moderate	Nil

i. Infiltration Rates

The infiltration rates for effluent on these soils will vary widely depending on recent compaction and grazing history, ground cover, contour etc.

6. Environmental Management Actions Recommended

To mitigate the potential loss of nutrients the following actions will be adopted as far as practical.

I. Soil and herbage testing to monitor soil chemistry and manage fertiliser and lime application to maintain optimum soil fertility levels. Testing is done annually.

II. Fertiliser management plan prepared for each soil type with guidance from Overseer output reports.
III. Stock are excluded stock from streams.(since 2002).
IV. Tracks and lanes are sited away from streams. Lanes constructed to divert run off away from potential waterway ingress. Lanes and race water tables are be designed to shed water to pasture for riparian treatment where practical.
V. Effluent concentration will be measured and effluent application depth managed for optimum use of nutrients.
VI. Stock will be managed in a placid manner to reduce the collection of effluent at the dairy shed.
VII. Wintering most cows off the property.

7. Fertiliser Application Best Management Practices

The following practices are recognised as being most desirable and will be followed as much as is practical.

I. The spreaders used to apply fertiliser to be 'spread mark' accredited and ideally have tracmap or a similar recording system to show proof of placement.
II. Buffer distances are maintained such that there is no direct contamination of waterways from the application of fertiliser.
III. Best practice is to have a 20m buffer between fertiliser placement and waterways. Fertiliser is not applied to saturated soils.
IV. Nitrogen containing fertilisers are only applied to actively growing pastures.
V. Fertiliser not be applied when air drift can occur beyond the farm boundaries.
VI. Large fertiliser dressings should be achieved through split dressings rather than a single application.

Less soluble phosphate fertilisers, i.e. reverted super phosphate fertilisers, are less likely to leach or run off particularly if heavy rain occurs after application.

Note: The application of fertilisers is deemed a permitted activity by Environment Southland provided:

- Application must not occur within 30m of a neighbouring residential unit without approval. Spray drift must also be minimised elsewhere.

- There must be no direct discharge to water and no discharge when soil moisture exceeds field capacity. For permanently flowing waterbodies (including artificial drains), fertiliser in riparian plantings where stock are excluded can only be applied to establish the planting. If there is no riparian planting, a setback of 10m is required.

8. Effluent Best Management Practices

Test effluent strength; apply a depth that corresponds with nutrient content of the effluent. The soil test values for the paddocks receiving effluent will be considered and the depth of application adjusted to suit. At all times the management of the effluent system will comply with the discharge consent conditions.

- Buffer distances as required in the discharge consent will be followed.

- 8 ha/100 cows land area. It is recognised that for typical farm dairy effluent a minimum of 8ha per 100 cows is required as an effluent receiving area. In practice the area available will be in excess of this i.e. a minimum of 40ha is recommended for 500 cows and a minimum of 41ha will be available.

- 10 days post grazing before effluent application.

- Application of sludge – less than 7mm thick to suitable ground, with climate conditions permitting

- Apply maintenance rates of nutrient to as much of the farm as possible rather than load up smaller areas with all the effluent/nutrient.

9. Potential Nutrient Loss Effects of Dairying

Indices	*Average NZ Farm*	*Dairy Farm*	*Average NZ Dairy Farm*
N/loss to water, kg N/ha/yr	5-20	33	24-42
P loss to water, kg/ha/yr	-	1.0	-

Nitrogen and phosphate losses are at the low median end of the typical dairy farm losses range due to the low stocking rate and low importation of nutrients.

10. The effect of effluent Application

Effluent will be applied to the Jacobstown and Gore soil types. Most of the area in the designated discharge area is in the Gore type.

The total effluent disposal field as per the above graphic is a minimum of 41ha hectares.

11. Nutrient Management Fact Sheets

The following factsheets are included in Appendix B

- Stop your nutrients going underground

D: GOOD MANAGEMENT PRACTICES

1. Objectives

"As good environmental stewards and responsible citizens, manage the farm dairying system so as to take all practical steps to preserve soil structures and avoid contamination of ground and surface water, nutrient leaching, and silting."

a: Land

Key strategies to achieve this objective:

- Fencing of all waterways.
- Excluding stock from high risk critical collection source areas and attendant transport swales and when the ground is near or at field capacity.
- Maintain adequate buffer zones from waterways during tillage.
- Implementation of Intensive Winter Grazing plan.
- Stock management to avoid excessive pugging.

b: Effluent and Nutrients

Key strategies to achieve this objective:

- Prepare, implement and monitor a Nutrient Management Budget to maximise the returns and minimise losses from the resource particularly N, P & K.
- Subject to soil moisture and weather conditions, irrigate at every practical opportunity to keep the storage pond as empty as possible.
- Ensure that all staff are trained and competent in the system operation, and are aware of the need to be vigilant in operation the effluent system and the farm's drainage networks.
- Document each day the system operational details to ensure the system is monitored to maximise the use of the nutrients and minimise risk of nutrient losses.
- Ensure by regular and programmed checks that the supporting effluent infrastructure is in good condition, is inspected regularly and maintained.
- Ensure by regular inspection (that coincides with effluent application) that the farm's drainage does not contain any obvious signs of dairy effluent contamination.
- Stay abreast of new and emerging technologies for incorporation into the system that will improve, environmental and farm outcomes, whilst reducing input effort and costs.
- Controlled, judicious and justifiable use of fertiliser and other imported nutrients including nutrients in imported feed.

2. Key risks

a. Environmental

i. Leaching of nutrients

Once in waterways the nitrogen, phosphorus and potassium can have an adverse effect on aquatic life through eutrophic effects.

ii. Silting

Streams and waterways can become blocked with silt as a result of water transporting soils by overland flow to drainage as a result of cultivation or excessive pugging. This soil not only blocks drains, impeding drainage but also conveys to waterways the nutrients resident in it.

iii. Farm Dairy Effluent

Over application of Farm Dairy Effluent or high point discharges to land can have a serious effect not only on soil properties but can also leach through the soil profile into ground water or enter ditches or water ways via overland flows.

There are also other potential adverse effects, such as odour, which can be the result of result of poor or incomplete management.

Excess application of effluent over moled soil and tile lines can result in the rapid transport of effluent to waterway.

Other sources can be from feed pads, leachate from silage bunkers, etc

b. Animal health

Over application of effluent to the soil will result, in time, of a buildup of excess levels of various nutrients especially potassium. Potassium will have an adverse effect on the uptake of magnesium and can have a serious effect on cow health.

c. Legal

The illegal discharge of effluent to land e.g. to a non-consented area, irrespective of if it pollutes waterways or wetlands can result in legal action and severe penalties have been imposed by courts.

Discharges of only a few cubic metres have resulted in fines of tens of thousands of dollars for farm owners, or sharemilkers, contract milkers, farm workers (or a combination of all) per incident where effluent is discharged in a manner that it reaches a waterway or has the potential to reach a waterway.

All staff need to be aware of the farm's consent conditions – as ignorance of them is no defense in law – and understand how they relate to the use of the farm's effluent collection transport, storage and irrigation system.

d. Personal

Carelessness in dealing with effluent can result in pathogens being transferred to staff resulting in illness and infection.

3. Physiographic Zones and Transport pathways

These zones are shown on a map in Section B(4) **Physiographic Zones**

See also Section B(4) Waterways, Stock Crossings and Critical Source Areas.

This zones and especially the Gore soil; type within it, has have the potential for N and P to leach to waterways through overland flows or through the soil profile or both.

Good Management Practices for these transport pathways are listed in section 6 below.

4. Review

General good management practices and those specific to the transport pathways to be implemented in the current year are contained in the tables in the sections below.

These good management practices will be reviewed annually as part of the overall review of the Farm Management Plan.

5. General Good Management Practices
1 June 2016 – 31 May 2017

Strategy Type	Summary of Management Practices	Relevant section in Farm Management Plan	For Review June 2017
Capital	Fencing and enhancing riparian areas according to an agreed riparian enhancement plan.	E: Riparian Management	
	Look to copsing or creating wetlands in discharge critical source areas where there are risks of point discharges to water.	E: Riparian Management	
	Upgrading FDE handling equipment as new technology improves the utility and risks of these systems.	H(1): Overview of Effluent Collection, Storage and Irrigation system	
	Culverts or bridges at stock crossings	E: Riparian Management	
Operational	Utilising a nutrient management plan	C: Nutrient Budget	
	Stock exclusion from streams and wetlands	E: Riparian Management	
	Tracks and lanes sited away from streams and lane runoff diverted to land	K: Other Environmental Issues	
	Grass buffer strips	F(2) Cultivation	
	Cows will be wintered off the milking platform as a permitted activity.	G: Intensive Winter Grazing	
	Restricted grazing of draining pastures in autumn/spring	G: Intensive Winter Grazing	
	Strategic placement of winter grazing of forage crops. Adhere to winter grazing plans using best practices,	G: Intensive Winter Grazing	
	Restricted grazing of cropland	G: Intensive Winter Grazing	
	Not grazing stock in Critical Source Areas (these may have to be temporarily fenced off) when the ground is near or at field capacity or when these areas are flowing to drainage.	G: Intensive Winter Grazing	
	Care in irrigation of FDE, especially when the ground is near or at field capacity.	I: Effluent System Management	
	Increased land application area to ensure N & K returns are not excessive	I: Effluent System Management	
	Minimise effluent volumes at source	I: Effluent System Management	
	Low depth FDE irrigation	H(1): Overview of Effluent Collection, Storage and Irrigation system	
	Appropriate FDE storage volume to allow for deferred irrigation	H(2): Volumes	

	Ensure all data and maps are kept up to date and available and all staff are trained and informed of any changes.	I: Effluent System Management	
	Ensure programmed maintenance is done in and around FDE and silage leachate collection and piping infrastructure around the dairy shed silage bunkers, cow yards etc.	J: Monitoring, Maintenance & Operating procedures	
	All fencing around riparian areas is maintained, (or replace as required) with stock excluded from the riparian areas.	E Riparian Management	
	Reduce runoff- cutoffs and shaping of lanes, move troughs and gateways from water flow paths	K: Other Environmental Issues	

6. Good management Practices for Key Transport Pathways

1 June 2016 – 31 May 2017

Transport Pathway	Mitigation Measure	Summary of Management Practices	Relevant section in Farm Management Plan	Review June 2017
Artificial Drainage	Reduce P use or loss	• Use low solubility P fertiliser forms • Nutrient Budget • Keep soil Olsen P levels at biological optimum • Soil test regularly • Use proof of placement for fertiliser	C: Nutrient Budget	
Artificial Drainage, Deep Drainage	Reduce accumulation of surplus N in the soil, particularly during autumn and winter	• Milking Stock wintered off milking platform • control the duration of grazing of pasture and fodder crops especially in the shoulders of the season. • optimize timing and amounts of irrigation input • resow bare areas as soon as possible • Check following application of FDE	G Intensive Winter Grazing I: Effluent System Management	
Artificial Drainage	Avoid preferential flow of effluent through drains	• Deferred irrigation • low rate application • observe buffer zones and placement guidelines eg not over tile drains • observe discharge consent conditions	I: Effluent System Management A: attached Discharge Consent	
Artificial Drainage	Capture contaminants at drainage outflows		n/a	

7. Good Management Practices Fact Sheets:

The following fact Environment Southland sheets are included in Appendix B

- General Good Management Practices
- Physiographic Zone: Martaura Lignite measures
- Artificial Subsurface Drainage

- Deep Drainage of Nitrogen
- Critical Source Areas

E. RIPARIAN MANAGEMENT

1. Streams, Creeks and Ditches.

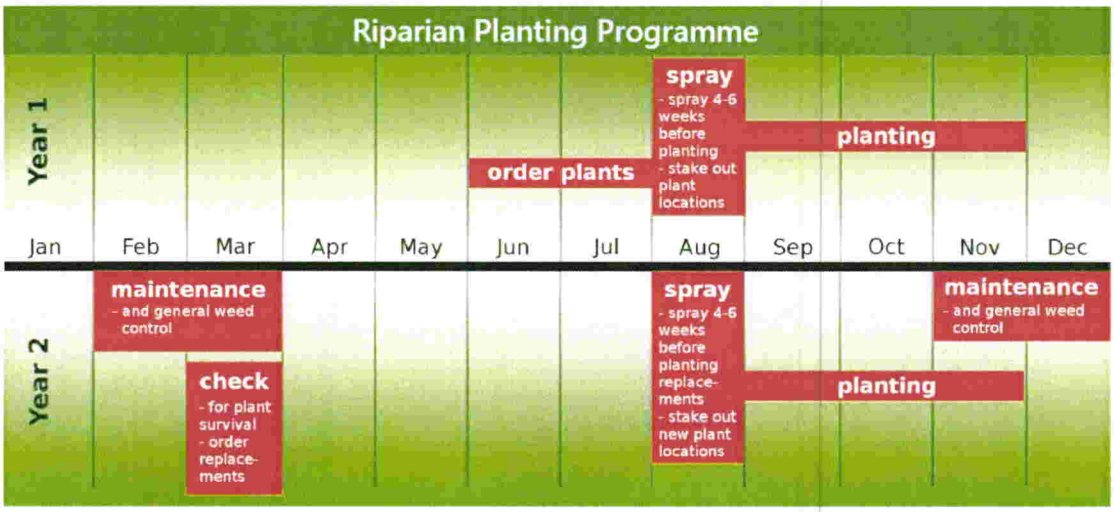
- Both sides of all waterways are riparian fenced. Fences will be replaced where damaged.
- Regular riparian fencing checks are to be completed and any breakages/breaches are to be repaired immediately.
- Calves or any other stock that are found in the riparian areas are to be removed immediately.
- Weed spray in early (November) or late summer (February/March).
- Repair or prevent any bank erosion to protect fencing and plants.
- Check all crossings are contoured to channel silt and manure onto pasture.
- Remove drainage cleanings and spread over paddocks to utilize the nutrients and to prevent material returning to the water way.

2. Weeds and Pests

a: Plant Pests

I. Thistles – especially Nodding – destroy plants prior to them seeding.

- Where sprays are to be used in riparian strips ensure they are proven and certified aquatic safe.



Extract from Environment Southland Fact Sheet: Maintaining Riparian Zones

3. Riparian Management Fact Sheets

The following Environment Southland Fact sheets are included in Appendix B

- Maintaining Riparian Zones

- Techniques for Weed Control
- Pest Animals in Riparian Zones

F: CULTIVATION

1. Area of Cultivation

Up to 15ha of crop may be sown on the milking platform each year as a spring supplement for the cows returning from off farm wintering. It is also possible that an area of 15ha area may be sown in summer turnips as mitigation against dry summers.

In both cases the areas selected will be part of the usual re-grassing rotation. The intention is to re-grass the whole property over the next 8-10 years.

2. Cultivation Good Management Practices

I. Where drainage depressions in crop paddocks are likely to channel sediments and nutrients to drainage these will be left uncultivated to act as sediment traps.

II. Choose paddocks away from waterways to plant winter feed crops.

III. Plough lines will be kept at least 3 metres back from the top of banks.

3. Cultivation Areas 2016/17

Paddocks

Paddock 3

G: INTENSIVE WINTER GRAZING

1. Stock Grazing Management

The Environment Southland Winter Grazing Rule covers the period from 1 May until 30 September.

It is intended that less than 10 cows will be wintered on the farm during June and July. All other cows q will be will be wintered off.

In the case of all grazing within the Environment Southland defined winter period, the following management will be employed.

I. Paddock Selection

Judicious paddock selection based on the soil moisture content is the key tool. This is important not only to avoid overland flow, pugging, etc but to ensure that the pasture and soils are not damaged to any extent that would inhibit spring pasture growth.

The farm contour gives the flexibility of being able to move away from waterways to better draining soils during wet weather.

Budget nutrients to help reduce loss of valuable fertiliser to surface water.

Use nitrification inhibitors on pasture to reduce nitrate loss over the winter and early spring months.

II. Back Fencing

The eating off of the excess feed will not (for spring growth reasons) result in the paddocks being eaten down hard, or pugged.

- If break fencing is to be used, the breaks, once eaten off, will be back fenced.
- Breaks should be sequenced to insure that grazing is towards the watercourse.
- If practical place baleage in the paddock before soil becomes too wet thereby preventing heavy vehicles from damaging the ground.

III. Water

Where breaks do not encompass a trough, a portable trough will be used to avoid pug lanes between the water troughs and the feed breaks.

IV. Buffer Zones

There will be the fenced buffer zones along the water ways, but higher risk areas over tiles or drainage depressions (swales) will be temporarily fenced off and not grazed.

VI. Wet Weather

In wet weather, where there is risk of pasture and soil damage, care must be taking to avoid grazing, supplement feeding and pugging within 10 metres of a waterway or drain.

2. Supplementary Crop Feeding

- Keep stock back at least 3 metres back from the top of stream banks – steeper ground will require a wider buffer zone – a buffer of 10 to 15 metres may be needed.
- Identify swales in the paddock that will carry overland flow when it rains heavily. Temporarily fence them off during winter grazing.
- Break feed towards the water way.
- Provide transportable troughs for stock drinking water.
- Back fence stock off land that has been already been grazed.
- Exclude all stock from surface water where possible.
- Place baleage in paddock before soil becomes too wet thereby preventing heavy vehicles from damaging the ground.
- Minimise use of heavy vehicles when feeding out hay/silage etc.

3. Intensive Winter Grazing Fact Sheets

The following Environment Southland fact sheets are included in Appendix B

- Preparing for Winter
- Stop your farm going down the drain

H: COLLECTED AGRICULTURAL EFFLUENT

1. Overview of effluent collection, storage and irrigation system

I. The effluent from the dairy shed flows by gravity to a stone trap and to a 10m³ primary pump sump to the north of the dairy shed.
II. From this sump the whole effluent is pumped to the sludge bed further to the north where the solids are removed and the filtered effluent gravities is pumped to the concrete lined 1550 m³ storage pond.
III. When field moisture conditions permit the stored effluent is pumped to the discharge area via an underground mainline system to a k/line pod set.

2. Volumes

a: Sources

I. Cowshed - 500 cows x 50l/cow per day 25.0m³.
Cow-yards, and hardstands around the dairy shed – 830m². (undiverted)
830m²x 950mm =788m³

b: Amount

I. Total effluent generated per day is estimated at not more than 25.0 m³ per day. (500 cows @ ~50L/Cow per day). ie, 7600m³ per 304 day season.
II. To this must be added water off the hardstands of around 788m³ per season.
III. Water collected on the ponds etc will add another 1,330m³ a season
IV. Over the season this will result in around ~9,718m³ to be irrigated.

At average 18m³ hr pumping rate this will require ~540hrs per season to irrigate to pasture.

See section 3(b) below

Farm irrigation days by year

Given that there is between 140 and 256 of irrigable days in a milking season irrigation of between 3.8 and 2 hours every irrigable day would be required.

c: Storage Volumes

The volume of the effluent storage pond is 2,013m³.

3. Application Rate and Depth

The application rate, separation distances, depth, uniformity and intensity are to be checked annually in accordance with section 4: Land Application of the guideline "A Farmer's Guide to Managing Farm Dairy Effluent – A Good Practice Guide for Land Application Systems" (2013).

a: Depth of Application:

The depth of application will be determined by analysing the effluent annually for N, P & K content. A nutrient budget will then be completed (updated) so as to determine the appropriate volume of effluent to apply.

Example:

The effluent is found to contain 300 mg/l potassium.

Applying 10 mm depth of effluent over 1 ha will apply 30 kg of potassium per hectare.

Estimate

Where the composition of the effluent is not known, use the following conservative figures as a guide.

1 mm of irrigated effluent depth equals

3kg per hectare of N,
3.5 kg per hectare of K
0.2 kg per hectare of P

So if 15mm of effluent is irrigated over 1 ha, the nutrient application will be:

45.0 kg per hectare of N,
52.5 kg per hectare of K
3.0 kg per hectare of P

It is advised that not more than half the annual potassium requirement be applied per application of effluent i.e. the annual requirement of potassium (often around 60kg per hectare per annum) should be applied in two increments of not more than 30kg of effluent per hectare or as per the above application 10mm depth of effluent per application.

b. Application Rate

The irrigation pump is a 7.5kw Alpha closed impellor pump. By using the pump curve the following can highest application rate can be calculated.

Head loss due operate K/line podset	23.0m
Static lift	3.0m
100m MDOD90mm Friction loss	1.5m
100m MDOP63mm Draghose	2.7m
Total Head	30.2m

30m head is 2.94 or near enough to 3 bar.

Using the K/line pod manufacturer (RX Plastics Ltd) data, a single k/line pod will deliver 1.030m³/hr for a depth of 2.3mm/hr at 3 bar.

Pressure and flows of the Naan 5022

Nozzle (mm)	P bar	Q m3 / hr	Application Depth (m)
3.2 Green	2.0	0.570	1.43
	3.0	0.700	1.43
	4.0	0.810	1.43
3.5 Blue	2.0	0.660	1.65
	3.0	0.810	1.65
	4.0	0.930	1.65
4.0 Black	2.0	0.850	2.13
	3.0	1.030	2.13
	4.0	1.180	2.13

Application table from the RX plastic technical manual

The farm's Kline podsets are fitted with the 4.0mm black nozzles.

The farm's podsets have 24 pods per set. Hence in a continuous pumping scenario the volume irrigated will be 24.7m³ an hour. However the minimum volume as depth is completely dependent on the setting of the pulsing system with can be set to pulse irrigate volumes less than 1mm/hr. eg a single pulse of 15 minutes duration in the hour would be 2.13mm/hr divided by 4 = 0.53mm/hr.

4. Records

Each paddock irrigated will be recorded. This will also provide an annual record of the total depth of effluent applied.

a: Application Log book

A log book is to be maintained setting out what paddocks were irrigated when, at what rate (including settings) and to what depth.

For example

Date	Paddock	Soils/comments	Settings	Time/depth	Staff
12/09/20xx	B43 - boundary end	dry	Nozzle 6 in	1 pass at 10km/hr	RXD
13/09/20xx	B44 - Road end	2mm Rain overnight			Pete
13/09/20xx	B44 - mid section	Heavy dew			Pete

This log can be used not only in any discussions with compliance authorities, but as data for use in nutrient/fertiliser application planning.

b: Drainage Monitoring Log Book

Date	Paddock/outfall #	Soils/comments	Staff ID	Comments
12/04/20xx	23/a	Running clear.	John	Did not irrigate in swale or CSA

13/04/20xx	24/a/c - Road end	No discharge	Bob	
13/04/20xx	26/a	No discharge	Bob	

c: Maintenance Log Book

Exercise book with a page for each of the following recording the relevant date, time, person responsible and action taken.

I: EFFLUENT SYSTEM MANAGEMENT

1. Person In charge

The person in charge of the Effluent Management system will be ?????? (sharemilker)

2. System Training

a: Training

I. All new staff will be trained in the operation of the system as and when employed. Details are to be recorded in the staff training log.

b: Resources – shed operations manual.

I. Effluents system Operational tip sheets. - also displayed in the Dairy Shed.
II. Irrigation map marked up with drainage outfalls, irrigation areas, etc
III. Copies of Environment Southland consents.

3. Effluent minimisation.

There are management practices and operational methodologies that can be used to minimise effluent voided on lanes, tracks and hardstands and around gateways. These include:

- Allowing the herd to walk in rather than be driven.
- Splitting the herds into small herds for faster movement.
- Not using tracks and lanes as standoffs.
- Do not supplement feed cows on or along the edges of lanes.
- Wet the yard before the cows arrive.
- Minimisation of freshwater shed water use in yard hose down.
- Ensure there are no excessive volumes lost through the D gate platform washer.

4. Discharge area.

Only a portion of the farm platform is consented for effluent disposal, less the usual margins along waterways, boundaries etc. The total area will be not less than 41 ha.

See attached Environment Southland discharge consent and map for details.

5. Paddock Selection

Paddocks will be selected according to their moisture status and grazing management history. A sequence of paddocks can be pre-planned for irrigation. As each is grazed and then spelled for the required period it can then be irrigated. Prior to irrigation occurring a visual assessment of the soil will be made along with data from the Environment Southland soils moisture irrigation site at www.es.govt.nz/. If paddocks are pugged or are likely to have very low infiltration rates the irrigation depth will be reduced or the paddock rescheduled for irrigation after the soil conditions have improved.

The critical factor is that paddocks should not be irrigated when, or where, irrigation will result in the moisture levels reaching field capacity. Field capacity is the point at which drainage starts either by passing down through the soil profile or flowing over the surface (overland flow).

Irrigation is to be avoided when the soil temperature is less than 5° C.

The following will be marked up on the shed map. These will be updated each year as crop/regrassing rotations, drainage, fencing changes, etc affect the relative risks.

a: Tile lines

These, where known, are marked on the irrigation plan, and irrigation should not be done directly over them if there is any risk of irrigation creating drainage.

b. Wind

Consideration needs to be given when high winds are predicted for example in the equinox seasons to ensure that spray drift does not end up in unintended places such as within minimum distances from water ways or outside the farm boundary.

The most obvious odour risk area is the drift or irrigation upwind of Charlton Siding Road or Bowman Road.

6. Coverage area

There shall not be any discharge of dairy shed effluent onto land within:

i. 20 metres of any surface watercourse;
ii. 100 metres of any potable water abstraction point;
iii. 20 metres of any property boundary, (unless the adjoining landowner's consent is obtained to do otherwise);
iv. 100 metres of any residential dwelling other than residential dwellings on the property;
v. Dairy shed effluent shall not be discharged onto any land area that has been grazed within the previous 10 days;
vi. Effluent shall not be discharged over tile lines/moles where the soil is at or near field capacity.

7. Irrigation

a: Field moisture conditions

i. Visual survey

Paddocks to which effluent is to be applied should be visually inspected, prior to irrigation to gain an understanding of any high traffic areas to be avoided, location of water trough, moles, drains etc.

b: Near Field capacity

When soils are near field capacity, the depth of application limited to 10 mm

During operation of the system the irrigated area will be checked to ensure there is no ponding.

Should irrigation be necessary when soils are fully moist, the 10 cm soil temperature shall be a minimum of 7°C before irrigation commences and a maximum of 5.0mm applied.

8. Drainage Monitoring

a: Map

i. There will be a map in the cowshed that shows all known tile lines on the property along with their outfalls (and any open inlets).
ii. This is to be updated as the tile network is expanded or unknown installations are located.
iii. It is to be updated when paddocks are re-moled.

b: Tile end marks

i. All tile outfalls are marked on the watercourse banks with a yellow painted stake.
ii. Each has a unique identifier.

c: Monitoring

i. Tile outfalls should be regularly monitored when effluent FDE irrigation is done in their vicinity or when it is possible that there may be moles that run to the tiles when the ground moisture conditions plus the proposed irrigation volumes are approaching field capacity.
ii. If there is any discolouration irrigation should stop immediately.

9. Sludges Removal

a: Timing

i. Screenings bins emptying is best done when there are crop paddocks or lea awaiting cultivation.
ii. Emptying will only be done when ground moisture conditions are suitable.

10. Off Season Water Diversion

All the sources of effluent are fitted with "not in use" clean water/rainwater diversion systems. (These are separate from the roof water systems)

The areas from which the rainwater is to be diverted should be well washed with clean water and inspected for any effluent residues prior to the diversion being enacted.

12. Irrigation pump

Irrigation Pump

J: MONITORING, MAINTENANCE AND OPERATING PROCEDURES

1. Daily

I. Minimise water use at the cow shed;
II. Check the storage and irrigation system for operating faults during and following use;
III. Evaluate the soil moisture situation and calculate the optimum settings for the next application;
IV. Check and record in log any tile outfalls draining from the irrigation area after irrigation;
V. Update the effluent irrigation log with settings, location, depth and method of application.
VI. Check lane/track edge cutouts to ensure they are not blocked and there is no risk of large single point discharges. (especially after heavy rainfall events).
VII. Check the trough in the paddock the cows are leaving to ensure it has not been leaking due to animal activity.
VIII. Ensure TIMS/KIMS has sufficient battery power for the days operation.

2. Weekly

a: Storage Facilities

I. Clean out shed yard traps weekly or more frequently as required and during wet periods;
II. Remove solids and spread on land when dry;
III. Check inlet and outlet pipes are clear of blockages;
IV. Check and clean grates and sumps in dairy shed and yard as required.
V. Check galleries/floor drainage around storage structures.

b: Pumps

I. Check pumps grease /oil if required;
II. Note operating pressure during irrigation and confirm it is in the 'normal' range;

c: Pipelines

I. Check for leaks and blockages in pipes and joiners.

d: Safety

I. Guards and fittings
II. Signage
III. Equipment

3. Annual Maintenance

I. Check pumps and motors and have them serviced as required.
II. Assess condition of pipeline, repair and replace parts as necessary.
III. Update irrigation maps for new fences, tiling, moling etc;
IV. Training of new staff in system operation;
V. Refresher and training of all staff on the location, purpose and use of safety equipment and fittings.

4. End of Season

I. Ensure the storage ponds are pumped down as far as is practical.
II. Turn on rainwater diversion.
III. Check the pond lining membrane for damage.

5. Beginning of Season

I. Turn off rainwater diversion
II. Prime pumps and check their operation

6. Breakdowns

I. In the event of power failure, vacuum pump or motor breakdown:

- Contact repairer immediately to assess problem;
- Limit or cease water use in the dairy yard and scrape effluent where possible;

II. In the event of pipe blockages:

- For underground pipes: Clear if possible or if too difficult, contact blocked drain repairer to water blast.
- If not able to clear blockages, replace the blocked section.

7. General:

I. Under no circumstances are storage facilities to be allowed to overflow;
II. There shall be no ponding of effluent in the discharge area;
III. Make full use of the discharge area;
IV. There shall be no discharge of effluent to frozen or snow covered ground;
V. The discharge will be managed to ensure aerosols, spray drift and odour do not travel past the property boundary.
VI. The general state of the property is to be monitored, particularly areas where environmental contamination with effluent could be a problem. This includes races and silage storage areas. Preventative action should be taken before problems arise.

K: OTHER ENVIRONMENTAL ISSUES

1. Lanes and Races

Run off from races can in some situations constitute an illegal discharge to land. These can be mitigated by:

- Ensuring that lanes and races are not used as feed pads, cow yards, or herd holding areas or that riparian vegetation is adequate to treat storm water.
- Cuts and divots are checked every time they are used, to ensure that there are no high point discharging to land.
- Checking after heavy rain that lane/track edge cutouts, to ensure they are not blocked and there is no risk of large single point discharges.
- Gateway – to avoid compaction around the gateways and reduce lane edge wear, where possible bring the cows out of the paddock at a different gate to which they were let in.
- Ensure that swales away from culverts are kept clear, and discharge is directed away from the waterway.

Annual maintenance to races can often result in the "run back" shaping over culverts and lane edge discharge divot/cutouts not being restored. All lane edges and culverts should be checked after lane maintenance.

2. Animal Pests

I. Rabbits, hares, possums – regular culls using night shooting, poisoning etc.
II. Magpies – trap, shoot whatever!

L: EMERGENCY RESPONSES.

1. Storage Overflow

Where the storage is approaching full and rain events plus continued use could risk overflow, it is recommended that some low rate pulsed pumping be carried out on the driest part of the farm available. Spreading the effluent very thinly over a larger area over a time is preferable to a point source discharge from the pond.

In emergencies or when overtopping is treated due to the soil moisture conditions not being conductive to irrigation, Environment Southland should be contracted for advice.

2. Ponding

Should light ponding be detected immediately stop irrigation.

I. Checks should be made to ensure that there is no overland flow or that the ponding is not draining into tile lines etc.
II. If practical pump out and disburse with pod sets over a wide area or use a vacuum tanker.

3. Drainage

a: Overland Flow

See ponding above.

b: Discharge ex Tile

see c: below

c: Effluent in Open Drains

III. Attempt to immediately contain the contaminants by damming the drain if practical. This can be done by dumping a bale(s) of baleage or hay in the drain and pressing down with either the front end loader, depending on drain size.
IV. Alternately earth and silage wrap can often be used to help seal or form the required plug.
V. If practical pump out and disburse with pod sets over a wide area or use a vacuum tanker.

3. General Procedures

I. Follow consent conditions/notes, mitigate where possible.
II. Advise Regional Council where the consent if and when required by the consent.
III. Seek help.
IV. Advise authorities.

4. Emergency Contacts

Sharemilker		
Environment Southland	0800 768 845	

M: REVIEW

Review whole farm management plan and update by 1 June each year – and complete the version control below.

I. Development targets for coming season/plan.
II. Nutrient Management
    - Overseer Inputs
    - New Overseer report if applicable
III. Good Management Practices
IV. Cultivation Areas
V. Intensive Winter Grazing
VI. Effluent System
    - High risk/low risk irrigation areas due to new moling, tiling etc
    - Any developments in infrastructure – i.e. new/more irrigators, extensions to system, fencing changes
    - Training/retraining, etc.
VII. Emergency Contacts

Ver	Date		Distribution List
1.0			

N: APPENDIX A Farmers Rough Guide to Environment Southland Rules

(8 pages)

O: APPENDIX B Environment Southland Fact Sheets

Nutrient Management

- Stop your nutrients going underground

Good Management Practices

- General Good Management Practices
- Physiographic Zone: Gleyed
- Physiographic Zone: Oxidising
- Artificial Subsurface Drainage
- Deep Drainage of Nitrogen
- Critical Source Areas

Riparian Management

- Maintaining Riparian Zones
- Techniques for Weed Control
- Pest Animals in Riparian Zones

Intensive Winter Grazing

- Preparing for Winter
- Stop your farm going down the drain

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20 March 2017

DE & VJ Stafford,
278 Grange Road,
Papamoa 3118

Dear David

Drop Test Results: DE & VJ Stafford Effluent Pond, 8 – 11 March 2017

1. Background
The current discharge consent for the property is 204546.

As requirement of the regional authority we have carried out a drop test of your existing effluent pond. This was undertaken to assess seepage rates from the pond. The testing was carried out between the 8 and 11 March 2017.

Site and Set Up
The farm is located at Charlton Siding Road, Gore.

Effluent is pumped to a sludge bed and then the filtered liquid is pumped to the irrigation pond. The pond was isolated by not allowing any inflow and by not pumping out during the test period.

The dimensions of the storage pond at the water level during the test period were:
North 37.8m
East 28.3m
South 38.5m
West 29.8m

The dimensions of the storage pond at the top bank level during the test period were:
North 40.2m
East 31.3m
South 41.2m
West 32.5m

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone 03 215 4381, Fax 03 215 4391
Email: scandrettrural@xtra.co.nz
22/05/2017 10:11:00 AM

The total pond surface area was 17 % greater than the wetted area during the test.

The irrigation pond depth was 3.0m including 0.5m freeboard.

At the time of the test the liquid level was 0.5m below top bank height, i.e. 100% full.

Below is an aerial photo that shows the sludge bed and pond, dairy shed and yard. The laser drop test unit was installed at the middle of the west bank, as marked.

3. Test Methodology

You were notified when the test was to be run and confirmation was received that there would be no liquid inflow or outflow during the test period.
The monitoring equipment was set up at the pond by Evan Sanderson, as described below. The NIWA Neon website was checked to confirm that data was being recorded and sent to the website.

3.1. Water Level Monitoring Unit

A laser distance measuring unit was set up vertically over the pond surface. A reflective disc was placed on the pond surface to ensure constant, repeatable readings.
The laser was set up within a PVC pipe which acts as a stilling well.
Distance readings to the pond surface were taken at 10 second time intervals and sent to NIWA's Neon logging system.

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3.2. Meteorological Station

A Vaisala weather station orientated to the North was also set up and the data it collected sent to NIWA's Neon system at 10 second intervals. It measured:

- Air Temperature
- Wind speed
- Wind direction
- Rainfall

3.3 Evaporation Loss Monitoring

A 10 litre bucket (evaporation pan) with a diameter of 250mm was installed in the pond to measure evaporation. The bucket was rinsed and then accurately filled with 9 litres of effluent and the volume monitored to determine evaporation.

4. Results Recording

Recording of results was carried out to comply with the Appendix P of the Environment Southland Land and Water Plan, recording details are summarised below:

- The minimum test period has to be 48 hours.
- Readings are to be taken every 10 seconds.
- For maximum accuracy the wind velocity has to be less than 1.0m/sec. This limit has been set because wind at the test site has been observed to have two affects, the first being to cause waves and the second to push water to one side of the pond from the other, (a seiche effect). The accuracy of the laser distance recorder is such it will detect changes as small as 0.2mm. To accurately determine the true pond level requires calm conditions at the start and end of the test period.
- Rainfall and the evaporation bucket liquid volume was measured at the start and end of the test period, the measurement cylinder was rinsed prior to the volume being measured.
- When a period of 48 hours or more has elapsed the information is down loaded and the results interpreted.
- The GPS location of the pond and equipment setup is recorded. For this test the equipment was located at **E**1283340, **N**4881695, in the middle of the west bank.

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Laser set up at the West bank.

5. Results Summary

The results for the test are summarised in Table 1 and discussed below.

The plot of wind speed and pond height shows that at times wind caused significant waves on the pond surface, particularly during the 9th and 10th.
However a period was identified at the start and end of the test period when the pond surface was stable and accurate height readings were established.

The start time was assumed to be at 14:47:50 hours on the 8 March 2017.
The distance from the laser to the reflective disc on the pond surface was 352.1mm and the wind speed 0.5m/sec.

The finish time was assumed to be at 06:01:00 hours on the 11 March 2017.
The distance reading was 356.6mm and the wind speed 0.9m/sec.

The total time elapsed was 63 hours and 13 minutes, 10 seconds.

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The laser measured a change in distance to the pond surface of a 4.5mm increase. Therefore the pond surface fell 4.5mm over the test period.

There was no rainfall recorded by the Vaisala rain gauge during the test period.
The evaporation calculated for the test period was 5.0mm.

The pond should have lost 5.0mm depth due to evaporation. The pond level decreased by 4.5mm, 0.5mm less than expected. The pond is synthetically lined and the fluid level is above the surrounding ground level. There is no expectation of groundwater ingress.

TABLE 1 : DROP TEST RESULTS SUMMARY, DE & VJ Stafford.

Start Time	8 March, 14:47:50
Finish Time	11 March, 06:01:00
Total Time	63hrs, 13 minutes, 0 seconds
Start Depth (mm)	352.1
Finish depth (mm)	356.6
Change in depth (mm)	-4.5
Rainfall (mm)	+0
Evaporation (mm)	-5.0
Net Change in Depth After	
Rain and Evaporation (mm)	0.5
Net Change per 24 Hours (mm)	0.2
Pond Level, % of Design Depth	100
Net Change if Pond at 75% of	
Design Height. (mm/24hrs)	

6. Conclusion

A discrepancy of 0.2mm per 24 hours is within measuring error. No leakage was detected.
The pond complies with the requirement of the Environment Southland Land and Water Regional Plan for effluent discharge (Rule 35 b. iii.), with a leakage rate of less than 2 mm / day.

The pond is suitable for storing effluent as the infiltration rate from the pond is less than 2.0mm per 24 hours.

Yours faithfully

JOHN SCANDRETT
Agricultural & Engineering Consultant

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Phone 03 215 4381, Fax 03 215 4391
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Cameron Hall (REVIEWER)
Review Date: 22/05/20117
Chartered Geotechnical Engineer.
CPEng Number: 1018157
MIPENZ, CPEng, BE (Civil) Hons, Dip (Civil)
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Appended

Depth and wind speed graph for the test period.
Depth and wind speed for the start of the test period.
Depth and wind speed for the end of the test period.

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Amend Application – Additional Application

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D.E. and V.J. Stafford

28/7/2017

Supplementary Information

- Water Permit – **Replacement of 204547**

Farm Location: Charlton Siding Road, Gore

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Inv 03 215 4381
Email: dairygreenltdl@xtra.co.nz

Table of Contents:

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A. Overview

This application is for resource consent under Rule 35(b) of the Proposed Southland Water and Land Plan 2016 (hereafter referred to as "the Proposed Plan"), for the ongoing discharge of agricultural effluent to land, and under Rule 23(d) of the Regional Water Plan 2010 for the ongoing abstraction of up to 60,000 litres of groundwater per day for stock water and dairy shed use.

Groundwater abstraction:

- Under Rule 54 of the Proposed Southland Water and Land Plan, groundwater abstraction for 500 cows on the property is a permitted activity provided 120 L maximum per cow per day is abstracted; resource consent is not required for this activity.
- Under Rule 23 of the Regional Water Plan, a groundwater take of 60,000 L per day is a discretionary activity and requires resource consent.

Council policy directs that the highest activity level must be used, therefore Rule 23 of the Regional Water Plan applies and resource consent for groundwater abstraction is required.

Consent details:

- Replace water permit **204547** to allow for groundwater abstraction for 500 cows.

An existing groundwater take consent (204547) provides for the abstraction of 60,000 litres per day of groundwater for the dairy operation. No change to this volume is required. Resource consent is required as the abstraction is considered a discretionary activity under Rule 23 of the Southland Regional Water Plan 2010.

B. Consent Required

The Proposed Southland Water and Land Plan 2016 was notified on 3 June 2016. In accordance with Section 86B(1)(a) and (3) of the Resource Management Act 1991, all provisions of the Proposed Plan have had legal effect since this date.

The accepted convention for activities where more than one consent category applies is to treat the application as one requiring overall assessment on the basis of the most restrictive activity.

Rule 54 of the Proposed Plan manages the abstraction and use of groundwater. Under this rule groundwater abstraction for 500 cows on the property is a permitted activity provided only a 120 L maximum per cow per day is abstracted; resource consent is not required for this activity. However, under Rule 23 of the Regional Water Plan, a groundwater take over 20,000 L per day is a discretionary activity and requires resource consent. Applying the accepted convention discussed above, the abstraction and use of groundwater is considered a discretionary activity.

Consent durations of 10 years are proposed for both the applications for replacement Discharge and Water Permits.

C. Statutory Considerations

Schedule 4 of the RMA requires that an assessment of the activity against the matters set out in Part 2 and any documents referred to Section 104. Sections 104B and 104D of the Act set out the matters that, subject to Part 2, the consent authority must have regard to when considering an application for discretionary and non-complying activities. Sections 105 and 107 set out additional matters the consent authority must have regard to when considering applications for discharge permits to do something that would otherwise contravene Section 15. An assessment of each of these matters follows:

Part 2 of the RMA

The activity is considered to represent an efficient use of a natural resource that will give rise to significant positive benefits in terms of providing for the social and economic wellbeing of the applicants and the wider regional economy. There is, however, the potential for adverse effects on the environment to arise, including on water quality. However, it is considered that the effects of the activities have been adequately identified and assessed in the Assessment of Environmental Effects in Section 7 below and that such effects will be no more than minor.

Section 6 of the RMA lists the matters of national importance that a consent authority shall recognise and provide for when considering applications for resource consent. The relevant matters under Section 6 to this proposal are considered to be:

(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:

(b) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wai tapu, and other taonga:

It is considered that the proposed activities do not impact directly on the coastal environment, wetlands, and lakes and rivers and their margins, although there is potential for adverse effects on the wider receiving environment which is inclusive of some of these features. However, as is discussed in Section 7 below, the actual and potential adverse effects of the activities are considered to be no more than minor.

Section 7 of the Act lists a number of other matters that a consent authority must have particular regard to when considering applications for resource consent. The matters in Section 7 that are considered relevant to this application are:

(a) kaitiakitanga:

(aa) the ethic of stewardship:

(b) the efficient use and development of natural and physical resources:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:

(e) maintenance and enhancement of the quality of the environment:

(f) any finite characteristics of natural and physical resources:

(g) the protection of the habitat of trout and salmon:

For the reasons discussed in Section 7 of this report below, the proposal is considered consistent with relevant provisions of Section 7 of the RMA.

Section 8 sets out a consent authority's responsibilities in relation to the Treaty of Waitangi. The proposal is considered consistent with the provisions of all regional planning documents, including Te Tangi oTauira, and Sections 6(c) and 7(a) of the Act. Therefore the proposal can also be considered consistent with Section 8 of the Act.

Section 104 Assessment

Section 104(1)(b) of the Act requires the consent authority to have regard to the relevant provisions of the following documents which are assessed under specific topic headings below:

- National Policy Statement for Freshwater Management
- Regional Policy Statement for Southland 1997
- Proposed Southland Regional Policy Statement 2012
- Regional Effluent Land Application Plan 1998
- Regional Water Plan for Southland 2010
- Proposed Southland Water and Land Plan 2016
- Te Tangi a Tauira (Iwi Management Plan)

Ngai Tahu Values:

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives C1, D1 • Policies C1, D1
Regional Policy Statement for Southland 1997	• Objectives 1.1,1.2,1.3,1.4, 4.5 and 5.4 • Policies 1.2, 4.6 and 5.8
Proposed Southland Regional Policy Statement 2012	• Objectives TW.2, TW.3, TW.4 and TW.5 • Policies TW.3, TW.4 and TW.5
Regional Water Plan 2010	• Objective 9C • Policy 1A
Regional Effluent Land Application Plan 1998	• Objectives 4.1.4, 4.1.5 • Policies 4.2.4, 4.2.7,4.2.8, 4.2.9
Proposed Southland Water and Land Plan 2016	• Objectives 3, 4, 5, 15 • Policies 1, 2, 3
Te Tangi a Tauira:	• Whole Document

Tangata Whenua values have been considered when preparing this application including reference to Te Tangi a Tauira (Iwi Management Plan). The principals of protection of the mauri of the water and mana of the land while minimising adverse effects on mahinga kai will continue to be recognised and will have regard to in the exercise of the consents and the operation of the dairying activity. There are no known wahi tapu, ancestral sites, heritage sites or other taonga associated with the property.

Water Quality:

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Regional Policy Statement for Southland 1997	• Objectives 5.1,5.2,5.3,5.4 • Policies 5.5, 5.8

Proposed Southland Regional Policy Statement 2012	• Objectives WQUAL.1 and WQUAL.2 • Policies WQUAL.1, WQUAL.2, WQUAL.6 and WQUAL.7
Regional Effluent Land Application Plan 1998	• Objectives 4.1.2 • Policies 4.2.3, • Rule 5.4.5
Regional Water Plan 2010	• Objectives 3,4,8 • Policies 1, 4, 6, 7,13
Proposed Southland Water and Land Plan 2016	• Objectives 6, 7, 8, • Policies 8, 10, 11, 14, 15, 16, 17, 18
Te Tangi a Tauira	• Policies 1, 4, 5, 6, 11, 16, 17, 18

Water Quantity:

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Regional Policy Statement for Southland 1997	• Objectives 4.1, 4.2, 4.3, 4.4, 4.5 • Policies 4.3, 4.4, 4.5, 4
Proposed Southland Regional Policy Statement 2012	• Objectives WQUAN.1 and WQUAN.2 • Policies WQUAN.1, WQUAN.2, WQUAN.5, WQUAN.6, WQUAN.7 and WQUAN.8
Regional Water Plan 2010	• Objectives 5,7,8 and 9 • Policies 21, 22 23, 28, 29, 30, 31, • Rules 16C, 23, 50
Proposed Southland Water and Land Plan 2016	• Objectives: 7, 9, 11, 12 • Policies 20, 21, 22, 23, 42 • Rule 54
Te Tangi a Tauira:	• Policies 1, 4, 5, 6, 11, 16, 17, 18

The groundwater take is a permitted activity under Rule 54(a) of the Southland Water and Land Plan and reflects standard volumes for a dairy farm. As such, it reflects efficient use of water. Under Rule 23 of the Regional Water Plan, the groundwater take is a restricted discretionary activity and requires resource consent.

The proposed volume of take is consistent with Environment Southland's guidelines of 120 litres per day per cow for dairy shed use, which is considered reasonable for the intended end use.

The rate of take does not exceed 2L/sec and should not result in any stream depletion and interference effects due to the perching of the streams and ditches at least 3m above the water table.

There are not considered to be any matters under Section 107 of the Act that would require the consent authority to decline the application for discharge permit.

Having assessed all of the matters above it is considered that the application both the discharge permit and the water permit are generally in accordance with the relevant policies and objectives of the documents set out above, and having regard to Section 104, the proposal achieves the purpose of the RMA.

D. Notification

Section 95A of the Act requires that the consent authority must publicly notify an application if it decides under Section 95D of the Act that the activity will have or is likely to have adverse effects on the environment that are more than minor. The only exception to this is when a rule or NES precludes public notification of the application and that there are no special circumstances in relation to the application that would warrant such a rule or NES to be dispensed with. However, in this instance there is no rule or NES that precludes public notification of the application and therefore the 'more than minor effect on the environment' test provided by Section 95D of the Act applies.

In deciding whether an activity will have adverse effects on the environment that are more than minor, Section 95D of the Act states that a consent authority must disregard:

- Any effects on persons who own or occupy the site or adjacent land;
- Trade competition and its effects;
- Any effects on persons who had given written approval of the application;
- Any adverse effect that does not relate to a matter which a rule or NES reserves control or restricts discretion.

Section 95D also states that a consent authority may disregard any adverse effect if a rule or NES permits an activity with that effect.

In our view and for the reasons described in the Assessment of Environmental Effects in Section 7 below, the adverse effects of this proposal are considered no more than minor and as a consequence we believe that application should not be publicly notified.

Section 95A(1) of the Resource Management Act provides that a consent authority may, in its discretion, decide whether or not to publicly notify an application for resource consent. Section 95A(2) states that the consent authority must publicly notify an application if the applicant requests public notification or if a rule or National Environmental Standard (NES) requires public notification of the application. In this instance the applicant has not requested public notification, nor is there any rule or NES requiring notification of the application.

If a consent authority does not notify an application for resource consent, Section 95B of the Act states that is must decide whether there are any affected persons or affected order holders in relation to the activity. The exception to this is that if there is a rule or NES that precludes limited notification of the application. In this instance, there is no rule or NES that precludes limited notification of the application.

Section 95E states that a person is 'affected' if the adverse effects of an activity on a person are minor or more than minor (but not less than minor). In deciding this, Section 95E(2) of the Act states that a consent authority:

- May disregard any adverse effect if a rule or NES permits an activity with that effect;
- Must disregard any adverse effect that does not relate to a matter which a rule or NES reserves control or restricts discretion;
- Must have regard to any relevant statutory acknowledgement;
- Must disregard any effects on persons who have given written approval of the application.

Our Assessment of Environmental Effects concludes that the adverse effects of the proposal are no more than minor.

Section 95A(4) of the Act gives the consent authority discretion to notify an application if it decides that special circumstances exist. The Courts have held that special circumstances are unusual or exceptional but may be less than extraordinary or unique. Furthermore, it is not mandatory to consider whether special circumstances exist.

In our view as there are no significant adverse effects, and the integrity of any of the Regional Plans are not under any threat. Therefore we do not believe there are any special circumstances that would warrant any form of notification.

The applicant seeks to continue the existing groundwater take from well F46/0404 established under Water Permit 301481. The current water take provides for the abstraction of 71880 litres per day for dairy shed use and stock drinking. This equates to 120L per cow per day and is in line with the Council's standard estimate for water usage.

E Use of Ground Water – Part B

Background

The farm has been taking groundwater for the dairy shed and stock water from a bore as per the existing consent.

The groundwater take is classified as a discretionary activity under Rule 23 of the Regional Water Plan because the take is from the Lower Mataura Groundwater Zone, which is classified as a lowland aquifer, and the abstraction is less than 15 percent of mean annual land surface recharge.

The aquifer has a low allocation status according to the Environment Southland factsheet. Recharge of the Lower Mataura groundwater zone is principally derived from rainfall infiltration with some local flow loss from streams crossing lower terrace surfaces. Annual land surface recharge is estimated at 476 mm/year.

The abstraction should have a less than minor effect on aquifer sustainability and current allocation because the proposed take is less than the applicant's existing take. The applicant seeks a maximum abstraction of 60,000 litres of groundwater per day.

The take is considered reasonable in terms of Policy 21 of the Regional Water Plan.

The rate of take will be less than 2 L/sec and should not cause stream depletion effects on adjacent water bodies. Water storage tanks are utilised at the dairy shed which ensures that the rate of take is less than 2 L/sec and to facilitate the separate storage of stock water. One of these tanks stores recycled wash down water which increases water use efficiency. The nearest neighbouring bore is over 1,100 m from the abstraction point and should not experience drawdown effects.

Water efficiency will be a key focus on farm. Simple tasks such as keeping water reticulation systems and dairy shed plumbing in a good state of repair will prevent water leaks and reduce water wastage. Water metering devices have been installed to ensure the water use is monitored via a standard cumulative water meter and will allow the data to be supplied to Council as per the consent conditions.

Overall the groundwater abstraction should have a less than minor effect on aquifer sustainability, current allocation and stream depletion.

1. Application is for: Renewal of existing consent no:

204547

2. Duration sought:

Consent durations of 10 years are proposed for both the replacement Discharge and Water Permits. Special consideration is given to Policies 14A and 43 of the Regional Water Plan in terms of determining the duration. The duration sought is considered consistent with these policies given the replacement nature of the consents for an activity that is already well established, benefited from a significant degree of capital investment and is operating within limits established by its existing consents and associated conditions. This provides a high degree of certainty about its actual and potential effects on the environment, including the Lower Mataura Groundwater Management Zone.

3. For what purpose:

Stock water and dairy shed use.

4. Bore details

F45/0512 NZTM 2000 1276713 E, 4881591 N

F45/0465 NZTM 2000 1283269 E, 4881568 N

There has been no change to the structure of these bores over the lifetime of the current consents. Data as per the Beacon website is probably accurate.

5. Proposed Take

The groundwater extraction rate will be less 2L/sec concurrent on both bores.

Average rate of take	0.69	litres per second
Maximum rate of take	1.90	litres per second
Maximum daily volume	60	cubic metres per day
Maximum weekly volume	420	cubic metres per week
Maximum monthly volume	1,800	cubic metres per month (30 day month)

6. Frequency

Hour per day Max: 8.7hrs
Days per week Max: 7
Days per month: 30

The water can be taken at any time of the day, up to the max of 60m^3 per day for a lactation season not exceeding 304 days a year.

7. Aquifer:

Lower Mataura

8. Storage

Water is stored in 2 x 30,000 litre tanks at the dairy shed.

9. Water metering

Paddle meters are fitted to the bores. Data Loggers to be fitted.

10. Stock water and dairy shed use

The total ground water and surface water extraction for the landholding will be more than day, i.e. 60,000l/day summer

Summer

Dairy cows		500	Water required	70	litres/head/day
Drystock		50	Water required	40	litres/head/day
Dairy shed wash water	500	Water required	40	litres/head/day	

Winter (Stock Water only)

Dairy cows	Number	10	Water required	50	litres/head/day
Drystock	Number	10	Water required	40	litres/head/day

Effects on bore yields on neighbouring bores are expected to be no more than minor. No known issues have occurred over the term of the existing consent or since the farm was purchased in 2003.

11. Irrigation to land: N/R – see FDE discharge consent

12. Industrial use: N/R

13. Commercial/domestic supply: N/R

14. Any other purpose: N/R

15. Other sources

a) Groundwater

There is another bore/well on the farm that supplies the domestic water to the houses and to the calf shed. (Tractor shed bore) but this is low yield and not deemed suitable for supplying the dairy shed and stock drinking water requirements.

Historically it is believed that it was the bore that was used to supply stock water to the farm when it was a sheep and beef farm.

It could be used in an emergency (such as a bore pump failure) for the cowshed by laying piping from the bore to the cowshed.

b) Surface water

There are several streams that could be used but it is considered that ground water is the preferred option especially as the infrastructure is already in place.

16. Wastage minimisation

Water metering monitors the volume and rate of the water take. The bores are fitted with paddle type water meters currently. This will be upgraded with a data logger.

Water efficiency is a key focus on farm. Simple tasks such as keeping water reticulation systems and dairy shed plumbing in a good state of repair will prevent water leaks and reduce water wastage.

Procedure in place for checks
- Procedure in place for reporting/repairs
- Check water flowing into troughs when cows come in
- Regular check of troughs when driving past
- Periodic thorough maintenance of troughs
- Watch for leaky pipes/“weak” spots
- Floats in tanks set at a level to avoid waste
- Look out for tank/water cylinder overflows
- Check of water pressure in hand hoses
- Double check taps turned off after milking
- Regular maintenance of pumps, dispensers, etc

17. Associated discharges

See attached Discharge consent renewal application of Farm Dairy effluent.

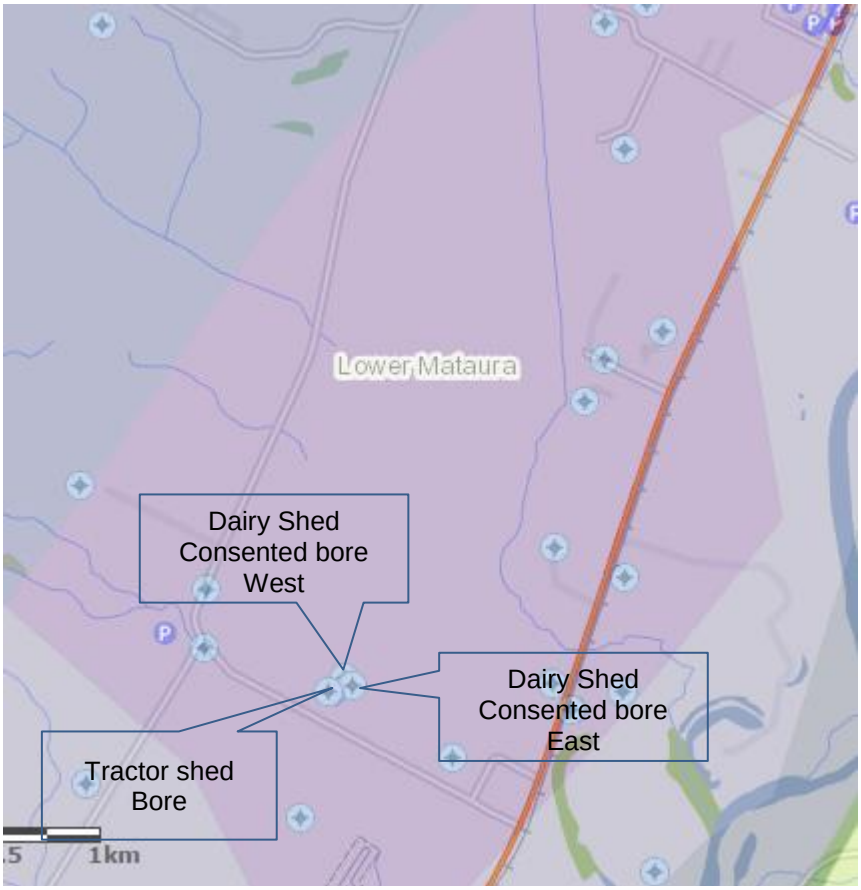
18. Existing environment

a. In stream life	No Effect
b. Food gathering from watercourses	No Effect
c. Wetlands/ bird nesting habitats	No Effect
d. Recreational activities	No Effect
e. Areas of aesthetic or scientific value	No Effect

f. Waste discharges	No Effect
g. Other water takes	No Effect
h. surface water bodies	No Effect

Given that the watercourses are perched some 3-5 meters above the water table the take will have no adverse effect on the streams.

Map



- Location of measuring devices At the boreheads
- Dairy shed located within meters of the boreheads
- No adjacent wetlands.
- For boundary details see accompanying Discharge consent application and FEMP

19. Effects of take and use

Environment Southland has adopted a staged management approach to groundwater allocation in Southland to address the uncertainty regarding sustainable allocation volumes for the region's aquifer systems. This approach maintains an appropriate level of management intervention to ensure adverse environmental effects remain within acceptable limits while allowing progressive development of the groundwater resource. The knowledge that is gained by the progressive development of the resource will be built into its future management.

The applicant's current water take is already part of the current allocation total mentioned above.

b) River and stream flows, including minimum flows and allocation levels

There have been no known issues over the term of the existing consent related to river and stream flows.

The Charlton stream is 870 meters upgrade of the bore. The Charlton stream bed is perched and it is therefore unlikely that any downgrade extraction would have any immediate effect.

This renewal is not seeking an increase in annual volumes or rate of extraction.

c) Wetland and lake water levels

N/A

d) Groundwater quality

Nitrate is water soluble and can be leached from the soil profile into ground water and surface water environments. This can affect the quality of water for drinking and affect the ecology of surface water by promoting the growth of aquatic plants.

The area has a history of higher nitrate levels in the groundwater, with elevated levels being noted for over 25 years.

The current nutrient budget has calculated the losses of N to water to be 33kg/ha/yr which is about median for dairy farms in Southland.

This application is for no increase in volume of water take.

On farm practises to minimise localised contamination of groundwater include ensuring that any on farm spraying of water ways is always carried out using approved sprays for acquatic environments.

The bore is fitted with a collar to prevent surface water ingress down the bore casing.

The effects on water quality are expected to be no more than minor.

20. Schedule 4

a) Neighbourhood and wider community

As discussed above the water take is not expected to have adverse effects on neighbouring wells.

There are no actual or potential adverse social effects from the abstraction of the groundwater.

The existing water take has not had an impact on recreational fishing.

The provision of water for the dairy shed is a critical part of the production and economics of the property, which employs three people.

b) physical effects including landscape and visual effects

The water take infrastructure does not create adverse visual effects on the surrounding landscape.

c) ecosystems including plants, animals and habitats

Over the life of the existing permit, there has been no observed recreational fishing in the Charlton Stream waterway. The water take has had no known significant adverse effect on the Mataura River over the term of the existing consent.

There are expected to be no observable effects on animals or their associated habitats.

d) natural and physical resources having special value

The stream running through the property is a tributary of the Mataura River. The Mataura River has cultural, spiritual and historic significance to Ngai Tahu. The river was an important source of mahinga kai (gathering food) and Ngai Tahu tupuna (ancestors) have tikanga (protocol) for sustainable use of its resources.

The existing water take has not hindered this custom or had an impact on recreational fishing and the effects of the renewal should also be no more than minor.

e) discharge of contaminants

Associated effluent discharge – see section C above including AEE for the discharge.

f) natural hazards or hazardous substances/installations

According to Environment Southland's Beacon website, there are no areas of natural hazards near the applicant's property (including significant flood zones). The observations of the last 13 years by the current owners, is that flood events are largely contained within the steam banks.

21. Monitoring and mitigation measures

Water metering monitors the volume and rate of the water take. The bores are fitted with paddle type water meters currently. This will be upgraded with a data logger.

22. Alternative locations or methods

See 15 above

23. Consultation

The property has operated as a dairy farm for twenty five years The dairy enterprise and land use is not proposed to be changed from what it has been used for over the last ten years, and the farm system is not proposed to change significantly from what has been implemented under the existing consents. For this reason, no consultation is deemed to be necessary.

24. Appendix A

Exiting take -Renewal only.

25. Appendix L

Existing take – Renewal only

Summary

The groundwater take is within the preliminary allocation for the groundwater zone, and should have little adverse effect on neighbors' bores, and a less than minor effect on aquifer sustainability, current allocation and stream depletion. (The portion of the surface water take for stock water is a permitted activity).

Overall the proposal is considered consistent with the purpose of the Resource Management Act 1991, and does not conflict with the purpose of the Act, or with Council policy. The adverse effects of the water take should be no more than minor provided that the applicants adhere to the attached Farm Environmental Management Plan.

Further Information Request

Our reference: APP-20171375
Enquiries to: Courtney Guise
Email: Courtney.Guise@es.govt.nz

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

25 July 2017

DE & VJ Stafford
64 Quintin Drive
Te Anau 9600
ATTN: Mr Russell Davie

Dear Russell

Request for Further Information under Section 92(1) of the Resource Management Act 1991 - Application for a discharge permit and a water permit.

Thank you for lodging an application to discharge dairy shed effluent to land from 500 cows for a dairy operation at Charlton Siding Road, Gore.

I require further information before a recommendation on the notification of the application can be made.

Please provide[1], in accordance with Section 92(1) of the Resource Management Act, the following information:

- Identify the groundwater quality, including nitrate levels, underneath the proposed discharge area.
- Identify, and assess and discuss the adverse effects of the proposal on the groundwater quality, including nitrate levels.
- Identify if there will be measures put in place to avoid, remedy or mitigate these adverse effects; and
    - Discuss what these measures will be and identify if they are good management practices or mitigation measures; and
    - Discuss how effective these measures are likely to be at avoiding, remedying or mitigating the adverse effects.

This assessment is required because the discharge area is directly over top of a 'nitrate hotspot' where the groundwater nitrate levels are above the NZ Drinking Water Standards.

I require this information to:

- Fully understand the potential and actual adverse effects of the proposed activity; and
- Make a recommendation on notification.

A recommendation on the notification of the application is postponed until receipt of this information.

Under Section 92A of the RMA you have until 15 working days from the date of this request,

which we calculate to be 15 August 2017, to either provide the information, tell the Council, in writing, either that you agree to provide the information or that you refuse to provide the information.

If you refuse to provide the information requested, or if you do not respond to this request, the Council may decline the application on the grounds that it has inadequate information to determine the application.

Please contact me if you have any questions regarding this request.

Yours sincerely

Courtney Guise
Consents Officer

[1] Under Section 92(1) of the Resource Management Act 1991 (RMA) the Council may, at any time before the hearing of an application, or if no hearing is to be held, before the decision to grant or refuse the application is made, request in writing that the applicant provide further information relating to the application.

Further Information Responses

Dairy Green Ltd

Practical Engineering Solutions
Consents, Effluent, Stock water, Irrigation
Design through to Installation
Irrigation NZ Accredited Designer

12 August 2017

Courtney Guise
Consents Officer
Environment Southland.

Dear Courtney,

RE: D & V Stafford – RFI request

I refer to your memo 25 July in respect of the above mutual client's dairy consents renewals.

Further information -Assessment of Environmental Effects and Mitigations

Sensitivity of the groundwater resource:

The physiographic zones in the vicinity of the farm (Lignite & Marine Terraces) suggest there is some risk to surface water. For a detailed description of the relevant physiographic zones and their associated contaminant pathways, please refer to the supplied Farm Environmental Management Plan.

Furthermore, the property overlies the Lower Mataura Groundwater Zone, which is classified as a lowland aquifer type according to Environment Southland's Information Sheet, and has low allocation status. The diagrams below give schematic geologic cross sections of the Lower Mataura Groundwater Zone. According to Environment Southland's Information Sheet groundwater quality within this zone is generally good, although it may be susceptible to nutrient enrichment. Recharge to aquifers in the Lower Mataura groundwater zone is principally derived from rainfall infiltration with an estimated mean annual land surface recharge of 476 mm/year.

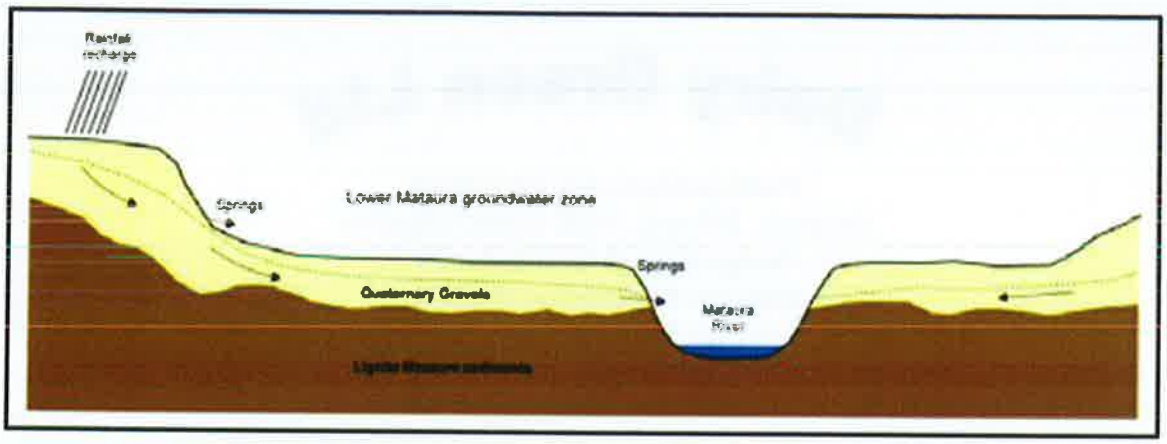


Figure 1. Schematic cross-section of the Lower Mataura Groundwater Zone (Lower Mataura Groundwater Zone Information Sheet, n.d.)

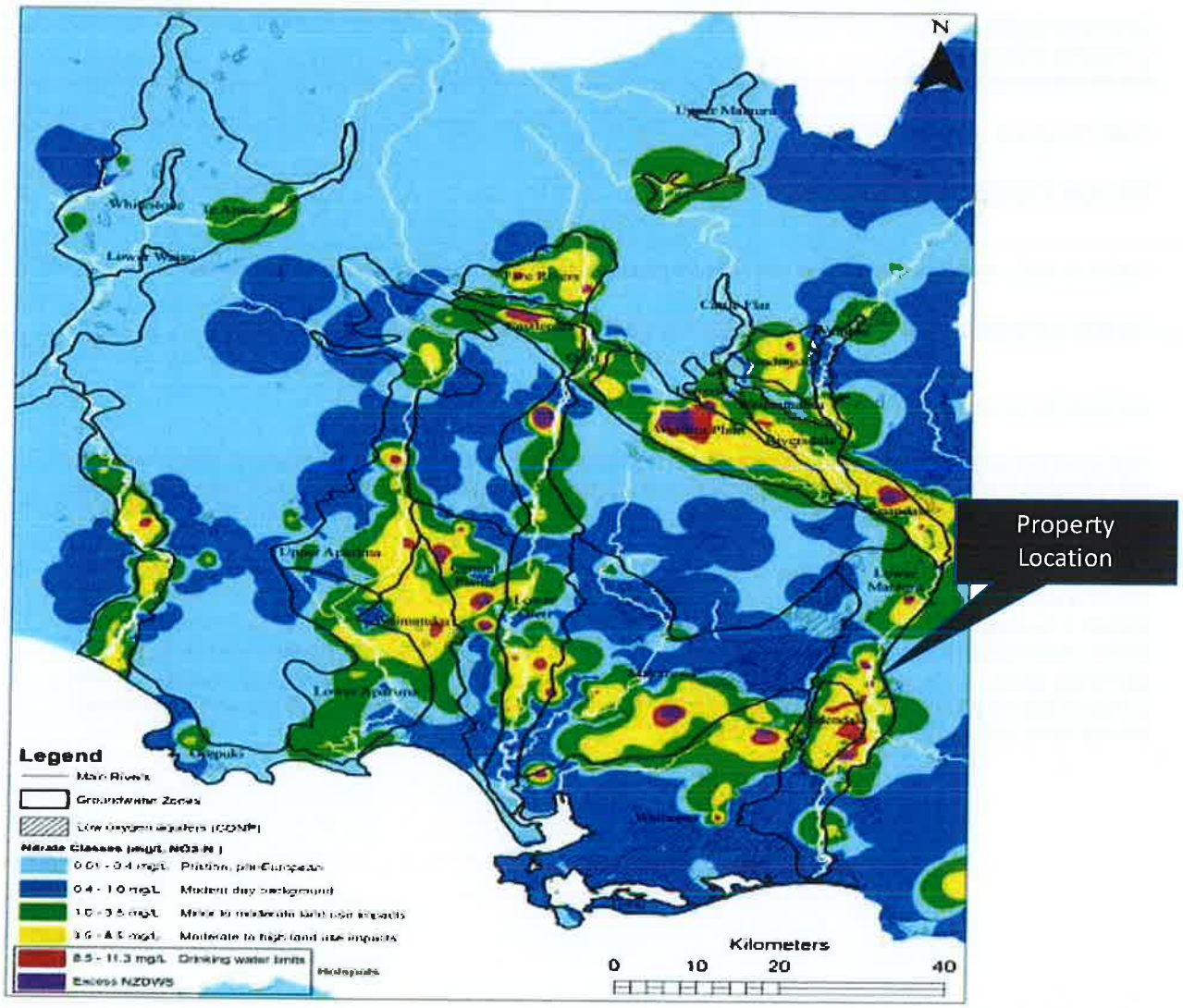


Figure 2: Classed NO3-N map for Southland's managed groundwater zones (Rissmann, 2012)

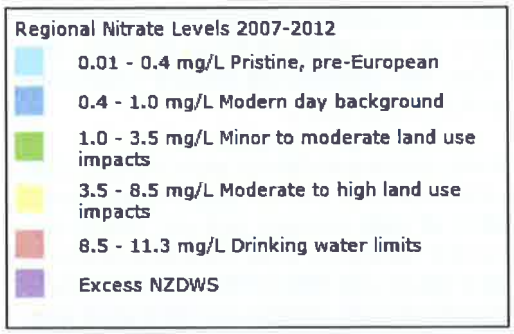


Figure 3. Key to groundwater nitrate levels

Groundwater nitrate in the vicinity of the property up to 2012 is classified as reflecting "minor to high land use impacts" in the range of 1.0 – 8.5 mg/L. This mapping is model based and there is no specific data on nitrate levels for groundwater underlying this property. The modelling suggests there may be some uncertainty in likely nitrate levels underlying this property as there is quite a range in nitrate levels modelled across the spread of the farm, but the 3.5 to 8.5 mg/L range, classified as "moderate to high land use impacts", appears to be most prevalent.

A number of factors will influence the sensitivity of the groundwater resource in the vicinity of the property, namely location in the groundwater zone, soil type, rainfall recharge, the physiographic zones and the level of mixing of aquifer and river waters. Where free draining soils are found there is some risk of nitrate loss to groundwater. This risk will be mitigated by the use of good practice land and effluent management on farm; these methods are described in detail in the Farm Environmental Management Plan. As aquifer recharge is via rainfall there will be flushing and dilution of nutrients, which may have reached the groundwater resource. Short recharge rates generally experienced in the Southland region mean that land use effects appear in water quality testing within 1-2 years.

With no substantive change in the dairy operation in terms of stocking rates, effluent system, land area etc., it is reasonable to conclude that there will be little to no change in risk to groundwater by granting replacement of the existing discharge permit. Average N loss to water annually should remain unchanged. Likewise, any N leached to groundwater in both physiographic zones will be no different than under the existing consent.

Overall the replacement consent is not considered to result in adverse effects on other users of groundwater such as other farms, small industries, schools or settlements/domestic users; values of bore users in the groundwater zone will not be adversely affected. Values of the wider community, such as the protection of human health, animal health, sustainable farming and economic wellbeing will not be adversely affected. Values associated with the Mataura River and downstream coastal waters will also not be adversely affected. These values are many and include recreation, the landscape, biodiversity, history and people living in the catchment. Iwi/cultural values will not be adversely affected. These values also include the principals of protection or kaitiakitanga of the mauri of the water and mana of the land, while minimising adverse effects on taonga and mahinga ka.

Sensitivity of the surface water resource:

The farm features a mixture of well drained Gore soils and poorly drained Jacobstown soils, and has only one natural surface waterway within the property and one main open drain plus low value subsidiary open drains. The surface waterway runs south and then east through the boundary into the farm and then south and eventually drains to the Mataura River. The open drain network and tile lines within the farm discharge to open drains. (see FEMP for details). The farm is located within the Lower Mataura catchment.

According to LAWA, the majority of the Mataura catchment has been developed for agriculture, which is particularly intensive in the middle to lower reaches. The catchment contains a variety of land uses including heavy industry, dairy farming, and dry stock farming. Some tributaries of the Mataura River are known to have poor water quality.

Long term SOE water quality trends can be used as an indication of cumulative effects on water quality. The closest SOE water quality monitoring sites are upstream on the Mataura River at Gore and downstream at the Mataura Bridge. These SOE monitoring sites are classified as lowland rural sites with a gravel bed and are the lowest SOE sites in the Mataura River catchment.

As is evident on LAWA's website, key SOE indicators for the two above mentioned sites indicate that the lower catchment river is in moderate health. The trend for each indicator over ten years is assessed with no changes in key indicators occurring, with the exception of total nitrogen and pH, which are degrading. Median turbidity and black disc visibility values are in the "best 25% of all lowland rural sites" with meaningful improvement over ten years. The median *E. coli* value was 280 n/100 ml, in the "worst 25% of all lowland rural sites" and there was no trend. Ammoniacal nitrogen median concentration was 0.005 g/m^3, a value that puts this site in the "best 25% of all lowland rural sites" with no trend. The median total phosphorous concentration was 0.016 g/m^3, which is below the ANZECC Guideline value of 0.033 g/m^3. It is in the "best 50% of all lowland rural sites" and there was no trend. Dissolved reactive phosphorous (DRP) median concentration was 0.008 g/m^3, below the ANZECC Guideline value of 0.01 g/m^3. It is in the "best 50% of all lowland rural sites" with no trend. The median total nitrogen concentration was 0.99 g/m^3 putting it in the "worst 50% of all lowland rural sites" with a degrading trend and slightly above the ANZECC Guideline value of 0.641 g/m^3 for this indicator. Total oxidised nitrogen median concentration was 0.7 g/m^3 putting it in the "worst 50% of lowland rural sites" with no ten year trend. It is slightly above the ANZECC Guideline value of 0.444 g/m^3 for nitrate-nitrogen but well below New Zealand Drinking Standards Maximum Acceptable Level of 11.3 g/m^3.

The Mataura River is part of the Toetoes Estuary catchment, which is considered a sensitive environment due to the potential accumulation of nutrients and sediment. Reports commissioned by Environment Southland on the Estuary have identified that the estuary is threatened by excess nutrients, bacteria and sediment. Council recommend protection of riparian margins by land owners in the catchment to reduce diffuse source nutrient and sediment inputs. Properties within the catchment are advised to adopt best management practice to reduce diffuse source contamination by doing the following:

- Excluding stock from waterways
- Protection of vulnerable areas such as erosion prone banks
- Improving nutrient management on farms
- Improving management of winter grazing
- Monitoring Nutrient loss to groundwater by active use of the Overseer predictive program

The applicant has already taken steps to implement these mitigation practices where appropriate and effective on farm. All waterways are fenced off from stock and a nutrient budget for the farm is undertaken annually. Cultivation and Spring/Autumn/wintering practices are undertaken according to best management practice.

See the Farm Environmental Plan for a detailed description of the range of good management practices implemented on farm.

The continued use of land for dairy farming and the discharge of agricultural effluent on the property is unlikely to give rise to further adverse effects, or contribute negatively to existing cumulative effects on water quality. The stocking rate of 2.76 cows/ha is a moderate stocking rate. The risk of N loss is well managed on the farm, (see overseer summary submitted with original application) including through the implementation of good management of the few animals wintered. This will allow for the capture of N in the soil profile and reduce its loss via subsurface drainage to receiving surface waters. The ratio of at least 41 ha of effluent discharge area per 100 cows is greater than the Council and Industry recommended size of 8ha/100 cows, therefore the quantity of N spread from effluent under the 500 cow operation over the proposed discharge area is well below the recommended restriction of 150 kg N/ha typically placed on discharge permits by Environment Southland. The use of best practice effluent application (including the use of low rate k/line irrigation system) will also ensure that the nutrients applied in the effluent are utilized and retained in the root zone. The full utilization of these nutrients should mean that no nutrients are lost to surface water bodies as a result of the discharge activity.

Odour:

Adverse effects of odour can occur from the discharge of farm dairy effluent where it may be encountered beyond the boundary of the site. The applicant has proposed the continued use of low rate application technology which coupled with the proposed effluent discharge buffers means there is little risk of adverse effects from odour and spray drift on surrounding land owners and occupiers. As such the effects of odour are avoided.

The source of the N in the problematic bore.

The specific groundwater resource under the effluent irrigation area is unknown and unknowable without drilling and testing, however there has been an issue with high nitrates in groundwater sampled from a bore on the property. This has been an issue for an extended period.

When the current owners become increasingly concerned about the issue in 2010, strenuous efforts were made to find what was probably a local point source of contamination. This included the use of an endoscope to check underground effluent drainage in and around the shed. This exercise located an issue in the primary dairy yard pump sump. This was fixed and it initially appeared that this damaged sump probable was the point source.

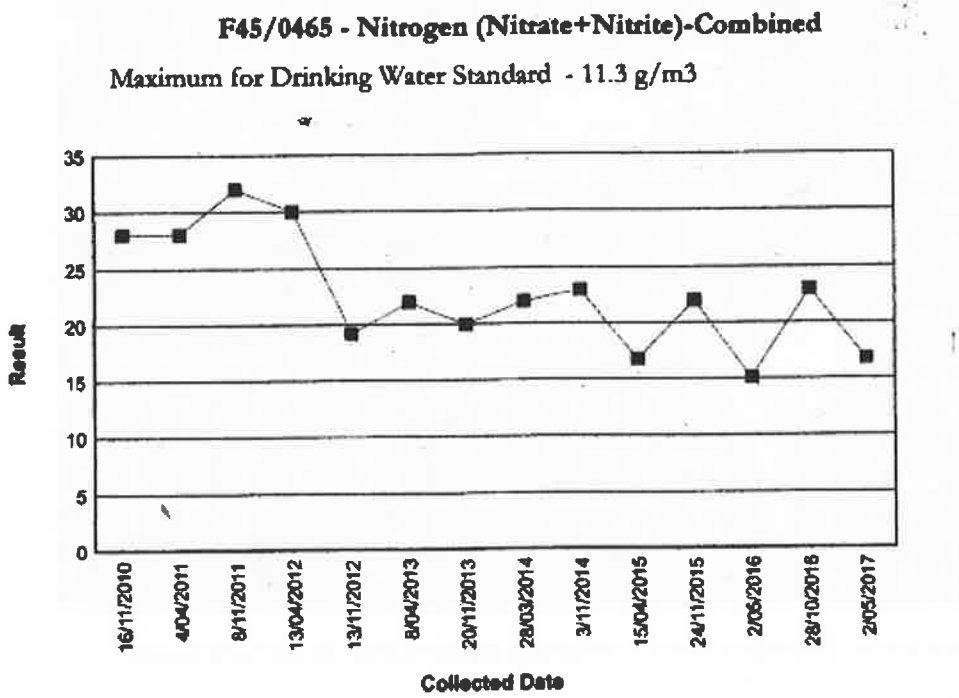


Figure 4. Updated trend map including the May 2017 Environment Southland testing.

As discussed, an (off season) test of the water in the bores around the cowshed has just been completed and in the Watercare Lab results for 7 August 2017 the N level in the ES tested bore appear to have dropped considerably. In roughly five weeks the total N has halved. (see attached results)

The N levels in the other two bores are high and are possiblly down grade of the ES tested bore (especially the east bore).

While there was some initial suspicion that there may have been some leaching from an old effluent storage structure to the west and potentially upgrade of the bore, it would be unlikely that the N concentration would fluctuate as above. The only other obvious possible source could be a silage

bunker north of the pond structure but it has not been used for a decade to store silage. It has stored baleage and again the fluctuation would probably preclude it from being the source of the problem.

The problem existed before the installation of the new pond system. The results have improved since the installation of the pond – which may not be as relevant as the repair of the sump (see below), but the pond was lined before use and has been successfully leak tested.

This recent water test is suggestive of some very local point source type contamination. One possibility is a crack in concrete in the shed floor (the pit is about 5 metres away) or from off nearby lanes and/or tracks. There is nothing obvious in the shed itself and the bore is well protected from surface/overland flow ingress.

With no other bores directly upgrade or down grade on the property and with all other bores over 800m away the extent of the issue is somewhat hard to gauge.

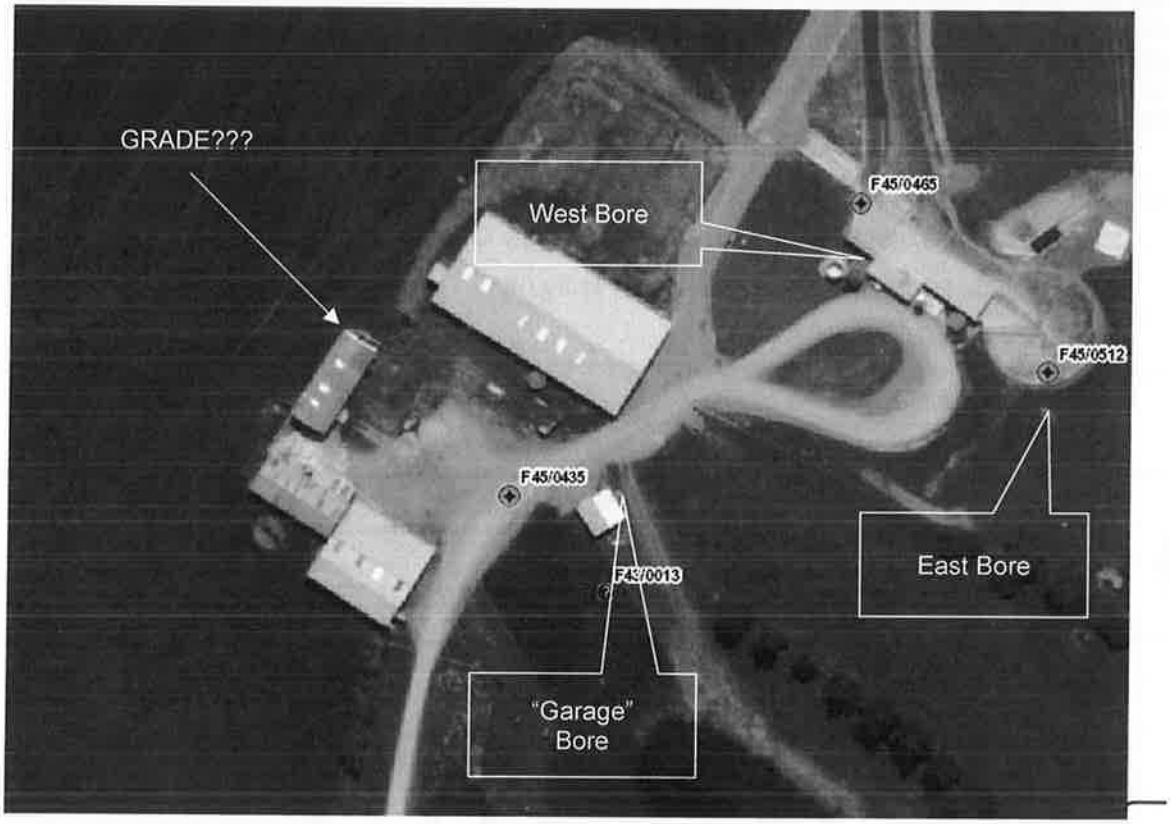


Figure 5: Layout of the bores. The box pointers indicate the exact location of the bore heads.

Sump replacement.

I can confirm that Dairy Green Ltd was involved with an exercise to identify a possible source of high nitrates in the bore located on the west of the milk room. After a thorough inspection of the yards, pit and drainage (with an endoscope) it was found that the primary pump sump which was made of fiberglass had been damaged when the effluent pump's drafting tube had become uncoupled from the pump and had worn serval holes in the fiberglass lining.

Figure 6. damaged sump.

As this was the primary sump from the cowshed it was temporarily repaired with concrete and fiberglass until a new one could be delivered. The new sump was installed but this time externally backed with concrete. Modifications were also made to the pump to reduce the likelihood of a repeat of the drafting tube separating from the pump impellor casing. I understand that the sump and pump is being regularly checked with the pump being lifted and sump checked each off season.

At the same time, a new stone trap and solids pad were installed.

Figure 7. Upgraded sump and solids pad.

Left to right – new solids pad, stone trap and repaired pump sump. Arrowed is the power controller over the affected bore.

Summary

The farm has implemented best practice in respect of riparian care, nutrient monitoring and FDE collection storage and irrigation.

The acknowledged issues with the high N levels in the test bore appears to be local in source. Efforts are underway to identify the source.

Should you require any further information please do not hesitate to contact me.

Yours faithfully,

Russell Davie
Dairy Green Ltd

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Certificate of Analysis
Laboratory Reference 170731-107

Attention:	John Scandrett	*Final Report:*	**236855-0**
Client:	**JOHN.SCANDRETT**	*Report Issue Date:*	**07-Aug-2017**
Address:	**PO Box 5003, Invercargill, 9840**	*Received Date:*	**31-Jul-2017**
Client Reference:	**Ground Water**	*Sampled By:*	**ES**
Purchase Order:	**Not Supplied**	*Quote Reference:*	**4446**

Sample Details		WATERS	WATERS	WATERS
Lab Sample ID:		**170731-107-1**	**170731-107-2**	**170731-107-3**
Client Sample ID:		Garage 435	West 465	East 512
Sample Date/Time:		31/07/2017 11:00	31/07/2017 11:00	31/07/2017 11:00
Description:		Ground water	Ground water	Ground water
General Testing				
Ammoniacal Nitrogen (as N)	mg/L	<0.01	0.01	0.03
Total Oxidised Nitrogen (as N)	mg/L	16	7.7	21
Microbiology				
Escherichia coli by MPN(Colilert-18)				
Escherichia coli (Colilert-18)	MPN/100 mL	<1.0	<1.0	<1.0

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	ISBN 0117516139 (modified)	0.010 mg/L	All	Invercargill
Total Oxidised Nitrogen (as N) by Colorimetry/Discrete Analyser	APHA (online edition) 4500-NO3 H	0.010 mg/L	All	Invercargill
Microbiology				
Escherichia coli by MPN(Colilert-18)				
Escherichia coli (Colilert-18)	APHA (online edition) 9223 B Colilert Quantitray	1 MPN/100 mL	All	Invercargill

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

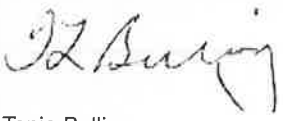
For more information please contact the Operations Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 07/06/2017



Tonia Bulling
KTP Signatory

Technical Comment – Water Quality

Technical Comment

To: Courtney Guise

Fax No:

From: Ewen Rodway

Date: 3/11/2017

File Reference: Memo template - Environment Southland

Subject: ***Stafford – Groundwater Quality***

environment SOUTHLAND
Te Taiao Tonga

Environment Southland is the brand name of Southland Regional Council

Cnr North Rd & Price St, Private Bag 90116 Invercargill New Zealand
Phone 03 211 5115 Fax 03 211 5252
Tollfree (Southland only) 0800 76 88 45
Email service@es.govt.nz
Web site www.es.govt.nz

Request

I have an application:

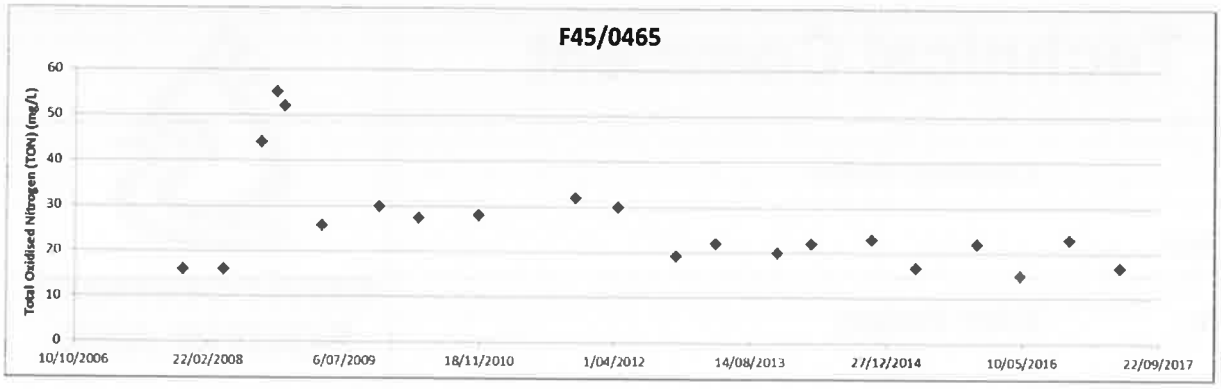
1. To replace expired existing discharge permit 204546 and to for a new water permit.
2. To discharge effluent to land via a low rate pods and high rate umbilical system from 500 cows.
3. To abstract up to 60m^3 of groundwater per day.
4. No increase in cow numbers, farm boundary, discharge area or water abstraction volume.

at 86 Charlton Siding Road, Gore.

Soils	Soil Type	Vulnerability Factors		
		Structural Compaction	**Nutrient Leaching**	**Waterlogging**
	Jacobstown (50%)	Severe	Slight	Severe
	Gore (50%)	Moderate	Very Severe	Nil
Physiographic Zone	50% Lignite Marine Terraces (artificial drainage variant) – overlays with Jacobstown Soil 50% Lignite Marine Terraces (no variant) – overlays with Gore soil			
Land Category	50% Category A; Artificial drainage or coarse soil structure – overlays with Jacobstown & Lignite Marine with artificial drainage variant 50% Category E; other well-drained but very stony flat land – Overlays with Gore and no variant			

Reason for request:

The discharge area is over top of a high groundwater nitrate area, evidenced by groundwater quality monitoring results. A preliminary technical comment was sought, in which, the following graph was included.



Further information with regard to the sensitivity of the receiving environment and mitigation measures for the activity was sought. This has now been provided and the application requires a full technical comment.

Please provide the following information:

1. Identify if groundwater quality monitoring is suitable for this property;
    a. identify if there are any existing bores which are suitable for groundwater monitoring;
    b. if none, identify on a map where a dedicated groundwater monitoring bore should be constructed;
2. If groundwater monitoring is suitable, identify:
    a. the frequency sampling should occur per year;
    b. parameters to be sampled for;
3. Comment on the merits and disadvantages restricting effluent discharge during winter months, or when soils are below a certain temperature;
4. Comment on whether or not you agree with the comment in the further information response: "With no substantive change in the dairy operation in terms of stocking rates, effluent system, land area etc., it is reasonable to conclude that there will be little to no change in risk to groundwater..." in terms of granting consent to discharge effluent to land.
5. Comment on whether or not the mitigation measures proposed for the discharge activity are practical.

If you feel uncomfortable commenting on some of the above points, please outline this in the response.

I have included a copy of the previous consent, which has now expired. Please feel free to comment if the existing monitoring condition(s) are suitable to be used for this application.

Please provide the information by:
29 August 2017, but before then would be preferable.

Charge code: *(Note: Please advise if you charge time to this code)*
W3890.6.940

Thank you,

Courtney Guise
Consent Officer

Any email correspondence unless otherwise stated will not be treated as the formal response.

Previous Discharge Permit Conditions

1. This consent is granted for a period of 10 years, commencing upon the surrender, expiry or lapse of resource consent 202213.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity).

2. (a) This consent authorises the discharge of dairy shed effluent onto land, via a land disposal system, as described in the application, on land known as Pt Lot 39 and Pt Lot 40 DP 82, Lot 1 DP 386615 and Lot 1 DP 11680

   (b) The land within the property to which effluent can be applied is shown in Appendix 1. Subject to the approval of the Director of Environmental Management, the effluent disposal area shown in Appendix 1 can be altered and/or extended if the consent holder submits a new plan showing the new effluent disposal area, and providing the written approvals(s) of any person whose property boundary will be closer to that area. (*Note: in the event that written approval cannot be obtained, the effluent disposal area can only be amended by way of an application to amend the consent pursuant to Section 127 of the Act*)

3. No dairy shed effluent shall be discharged to any surface watercourse by overland flow, runoff, or via a pipe.

4. The land disposal system is limited to the following:

   (i) a maximum depth of application of 15 mm for each individual application;
   (ii) a maximum rate of application of 10 mm/hour;
   (iii) a minimum return period of 28 days between applications;
   (iv) a maximum combined depth of application of 50 mm per year to any land area; and,
   (v) a minimum land area of 4.0 hectares/100 cows.

5. There shall not be any discharge of dairy shed effluent onto land within:

   (i) 20 metres of any surface watercourse;
   (ii) 100 metres of any potable water abstraction point;
   (iii) 20 metres of any property boundary (unless the adjoining landowner's consent is obtained to do otherwise);
   (iv) 100 metres of any residential dwelling other than residential dwellings on the property.

Where there is conflict between Appendix 1 and these specified buffers, the latter shall apply.

6. Dairy shed effluent shall not be discharged onto any land area that has been grazed within the previous 10 days.

7. The amount of dairy shed effluent disposed of onto land shall not exceed that from 500 cows.

8. (a) There shall be no surface run-off/overland flow, ponding or contamination of water resulting from the application of the dairy shed effluent to pasture.

   (b) The land disposal system shall be operated and maintained to ensure that no offensive smells or any other nuisance is created beyond the property boundary.

   (c) The maximum loading rate of nitrogen onto any land area shall not exceed 150 kg of nitrogen per hectare per year from dairy shed effluent and nitrogen fertiliser combined.

9. The consent holder shall notify the Council, by 1 August 2007, of the person who is in charge of the operation of the effluent disposal system. If the person in charge of the effluent system changes during the term of this consent, the consent holder shall notify the Council of the new operator no later than 5 working days after that person takes responsibility.

10. The consent holder shall display, in a prominent place in the dairy shed, a copy of this resource consent and relevant limits about the operation of the effluent disposal operation that must be complied with.

11. The consent holder shall install sufficient storage capacity to provide for a minimum of two days storage (70,000 litres) by 1 August 2008. Effluent storage ponds must be constructed of suitable materials, and in such a manner, that for all practical purposes they do not leak when in use and are structurally sound.

12. The consent holder shall install an anti-siphon device in the effluent disposal pipeline

13. The Southland Regional Council may serve notice of its intention to review the conditions of this consent, in accordance with the conditions of this resource consent and Sections 128 and 129 of the Resource Management Act 1991, during the period May to July each year, for the purposes of:

   (i) dealing with any adverse or cumulative effects on the environment which may arise from the exercise of this consent;
   (ii) considering any changes to information on the effects of land disposal of dairy shed effluent;
   (iii) or complying with the requirements of a regional plan.

14. The consent holder shall pay an annual administration and monitoring charge to the Southland Regional Council, collected in accordance with Section 36 of the Resource Management Act, payable in advance on the first day of July each year. This charge shall include the costs of inspecting the site once each year (or otherwise as set by the Council's Annual Plan), and of monitoring the effects of the discharge on groundwater by taking representative samples of the bore water, from Bore F45/0465 once every six months and analysing for:

    - electrical conductivity
    - nitrate nitrogen concentration
    - E. coli concentration

    Except that the first sample shall also be analysed for Total Iron concentration.

Comment:

Please provide the following information:

1. Identify if groundwater quality monitoring is suitable for this property;
    a. identify if there are any existing bores which are suitable for groundwater monitoring;
    b. if none, identify on a map where a dedicated groundwater monitoring bore should be constructed;
2. If groundwater monitoring is suitable, identify:
    a. the frequency sampling should occur per year;
    b. parameters to be sampled for;
3. Comment on the merits and disadvantages restricting effluent discharge during winter months, or when soils are below a certain temperature;
4. Comment on whether or not you agree with the comment in the further information response: "With no substantive change in the dairy operation in terms of stocking rates, effluent system, land area etc., it is reasonable to conclude that there will be little to no change in risk to groundwater…" in terms of granting consent to discharge effluent to land.
5. Comment on whether or not the mitigation measures proposed for the discharge activity are practical.

Response

Dear Courtney

As requested, please find outlined below technical input from myself and Michael Killick. This comment is limited to the points below:

1. Some background information on the ground and surface water quality within the vicinity of the Stafford property at Charlton Siding Road.
2. The suitability and potential location of ongoing groundwater monitoring.
3. The merits and/or implications of restricting effluent discharge during winter months, or when soils are below a certain temperature and the practicality of mitigation measures proposed by the applicant.
4. Comments on the applicants' assessment of risk to groundwater.
5. Summary and Conclusions

The response is broken into sections as per the above points. I have reviewed the application and supporting documents in order to make many of the statements below.

Summary of Qualifications and Experience

Ewen Rodway (Environmental Scientist (Chemistry and Groundwater)

I hold the qualifications of BSc (Geology), MSc (Geology and Geochemistry). I have completed the Advanced Sustainable Nutrient Management course offered by Massey University. I have 5 years' experience working in Groundwater quality, contaminant transport, hydrogeology and geochemistry. My experience began initially in Australia but I have spent the last 4 years in Southland working on local water quality and environmental science projects. My current role is Environmental Scientist (Chemistry and Groundwater).

Michael Killick (Technical Specialist (Groundwater Quantity and Soils)

I hold the qualifications of BSc (Environmental Science) and MPhil (Soil Science). I have twenty years' experience in soil and water technical roles at Massey University and Victoria University of Wellington and most recently at Environment Southland (4 years) where my current role is Technical Specialist (Groundwater Quantity and Soils).

1. Background Information

In 2009 a technical comment was written in regard to groundwater and surface water contamination at the Stafford property. The contamination concerns were related to a suspected leaking wash water settling pond and failure of an effluent storage sump (Elliotte, 2009). The technical comment from 2009 outlines the historical compliance, land-use and groundwater contamination issues on the Stafford Farm at Charlton Siding Road. Results from the investigation into contamination from the leaky storage pond were inconclusive but identified that the pond appeared to be below standard and not sufficiently lined. The report concluded that the leaking pond sump caused a localised spike (up to 55 mg/L) in groundwater nitrate concentrations in the late 2008 to 2009 period (measured in bore F45/0465). Monitoring of groundwater quality in bore F45/0465 was recommended to continue monthly until nitrate concentrations reduced below the drinking water standard of 11.3 mg/L (MOH, 2008).

Groundwater quality monitoring of bore F45/0465 was continued and is ongoing at a 6 monthly frequency. The last total oxidised nitrogen (TON) values from F45/0465 have been 22 mg/L, 15.1 mg/L, 23 mg/L, 16.8 mg/L and 22.0 mg/L in Nov '15, May '16, Oct '16, May '17 and Dec '17 respectively (Table 1). This indicates values are still significantly elevated above the drinking water standard of 11.3 mg/L for nitrate-nitrogen but have decreased from those measured in 2008 (see Figure 1). Note: TON values are the sum of nitrate and nitrite nitrogen but in this case nitrite does not contribute significantly to the total in any of the samples.

Table 1: TON monitoring data from November 2015 for F45/0465, this subset of data gives a representation of the present day nitrate concentrations in bore F45/0465. This bore is recorded as 7.5m deep and screened in the 5 – 7.5m interval and therefore deemed representative of shallow groundwater in the area.

Date Sampled	TON Concentration (mg/L)
24/11/2015	22.2
02/5/2016	15.1
28/10/2016	22.6
2/5/2017	16.8
5/12/2017	22.5

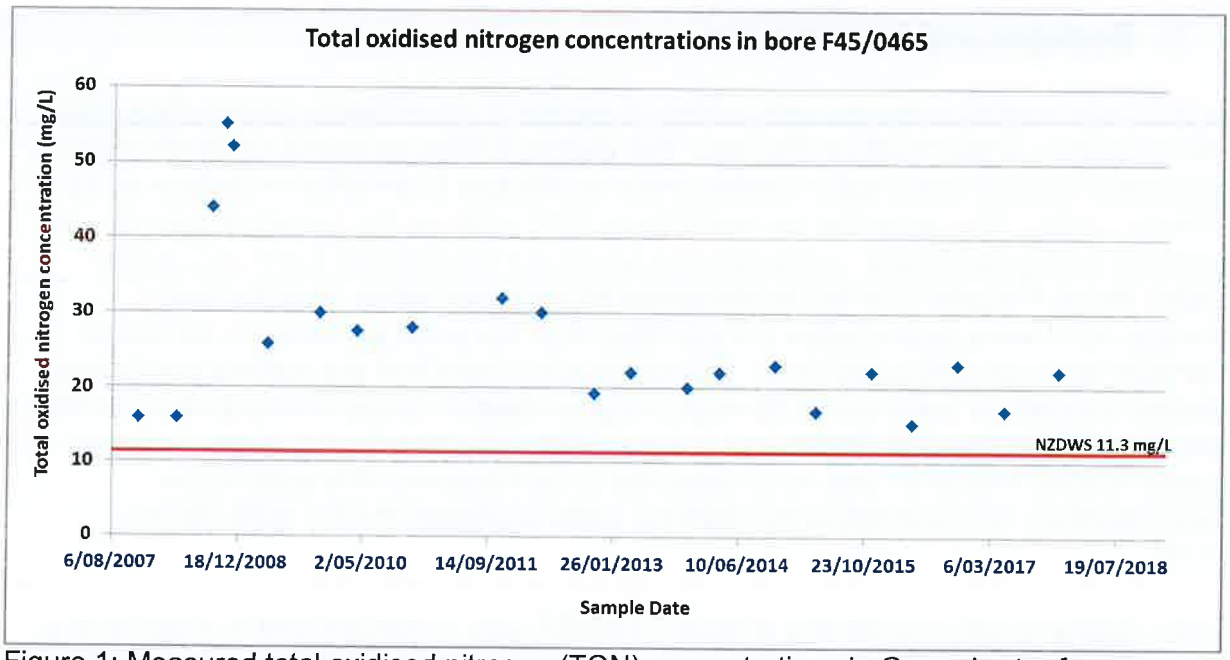


Figure 1: Measured total oxidised nitrogen (TON) concentrations in Groundwater from F45/465. This graph shows: initial nitrate nitrogen concentrations of approximately 16 mg/L; the peak in late 2008 up to 55 mg/L attributed to a leaking pond sump; and the slow decline since to the current state where concentrations range between approximately 15 and 23 mg/L.

Further data is presented below in Figure 2 from various bores on and around the property, including F45/0465. This does not include the data submitted on behalf of the applicant with the further information response. The locations of the bores in Figure 2 are shown in Figure 3.

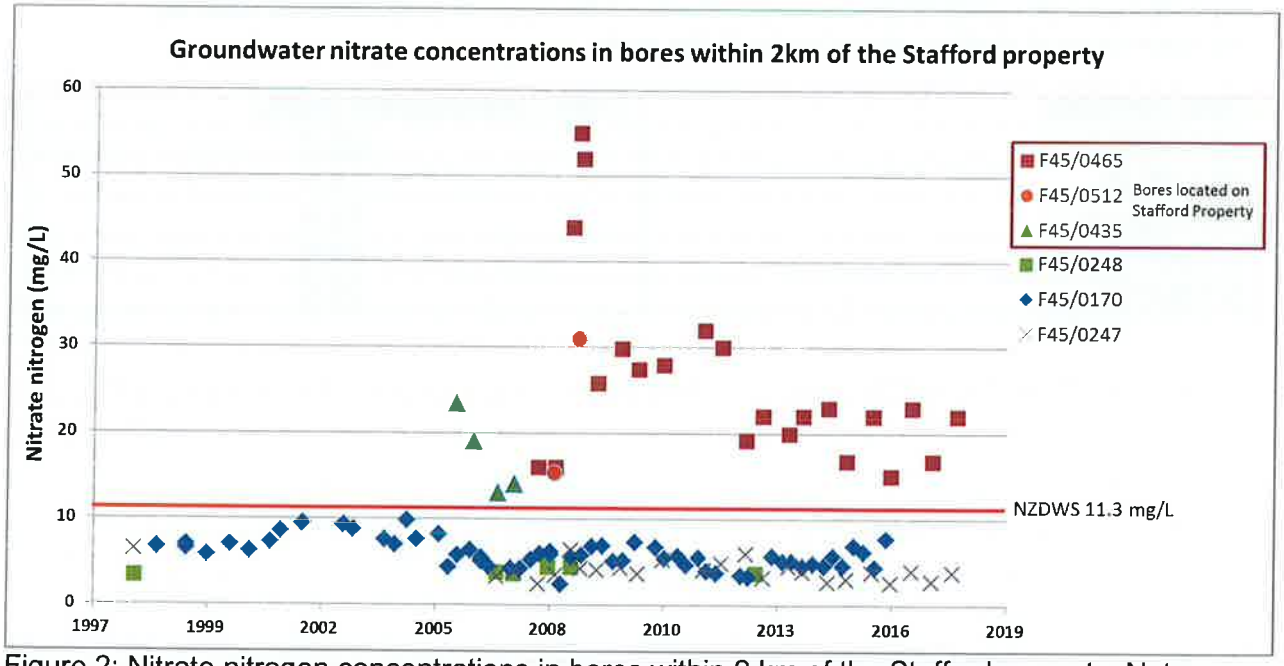


Figure 2: Nitrate nitrogen concentrations in bores within 2 km of the Stafford property. Note: Many results are total oxidised nitrogen and therefore include nitrite however are comparable as nitrite concentrations do not contribute significantly to the totals in these cases. Only bores with more than one measure are shown.

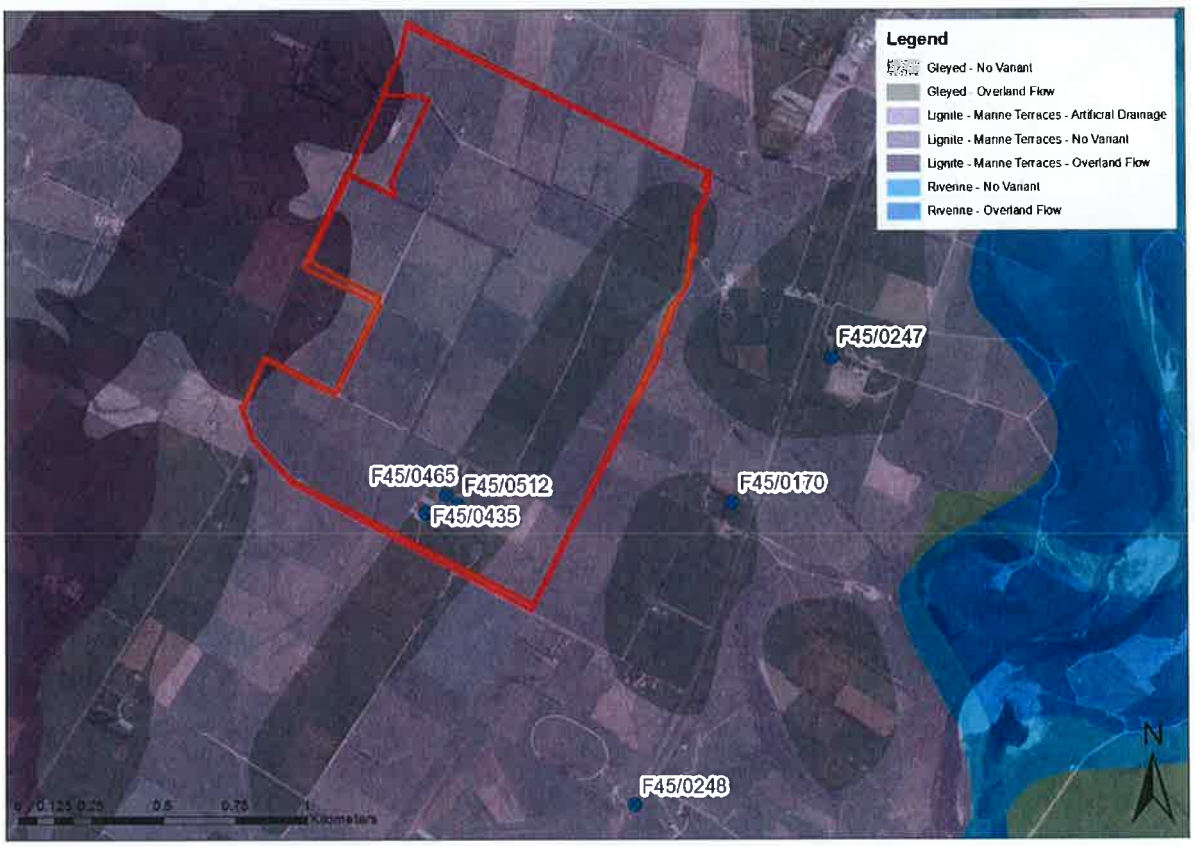


Figure 3: Map showing location of bores in relation to the Stafford property and physiographic zones.

Nitrate levels in bores on the Stafford property have typically been an order of magnitude higher than other bores in the area (albeit these also show moderate to high land use impacts with regard to nitrate. This gives an indication that the activities occurring on the Stafford property have resulted in contamination to a significantly greater degree than what is observed in adjacent areas with similar physiographic settings. While nitrate contamination of groundwater in the Lignite/Marine Physiographic Zone is less common on a regional scale (Hughes et al., 2016 and Rissmann et al., 2016), contamination on a local scale can be significant as observed in this case. This may occur specifically where water in the shallow alluvium is not chemically influenced by the underlying lignite or marine terrace units.

Further background information on water quality can be taken from the 2009 technical comment by Dianne Elliotte (Elliotte, 2009). Included with her comment is a map showing results of groundwater and surface water analyses, an excerpt of which is shown in Figure 4. Nitrate concentrations in the spring fed creek increase as it crossed the property to levels at which disturbance of the ecology (growth effects on aquatic species) would be expected (MFE, 2017). The position of the creek suggests this is not likely to have resulted from the faulty sump contamination issue occurring at that time broadly down gradient from the creek. These increases are more likely due to diffuse losses of nitrogen from the farm dairy effluent (FDE) application and dairy farming activities.

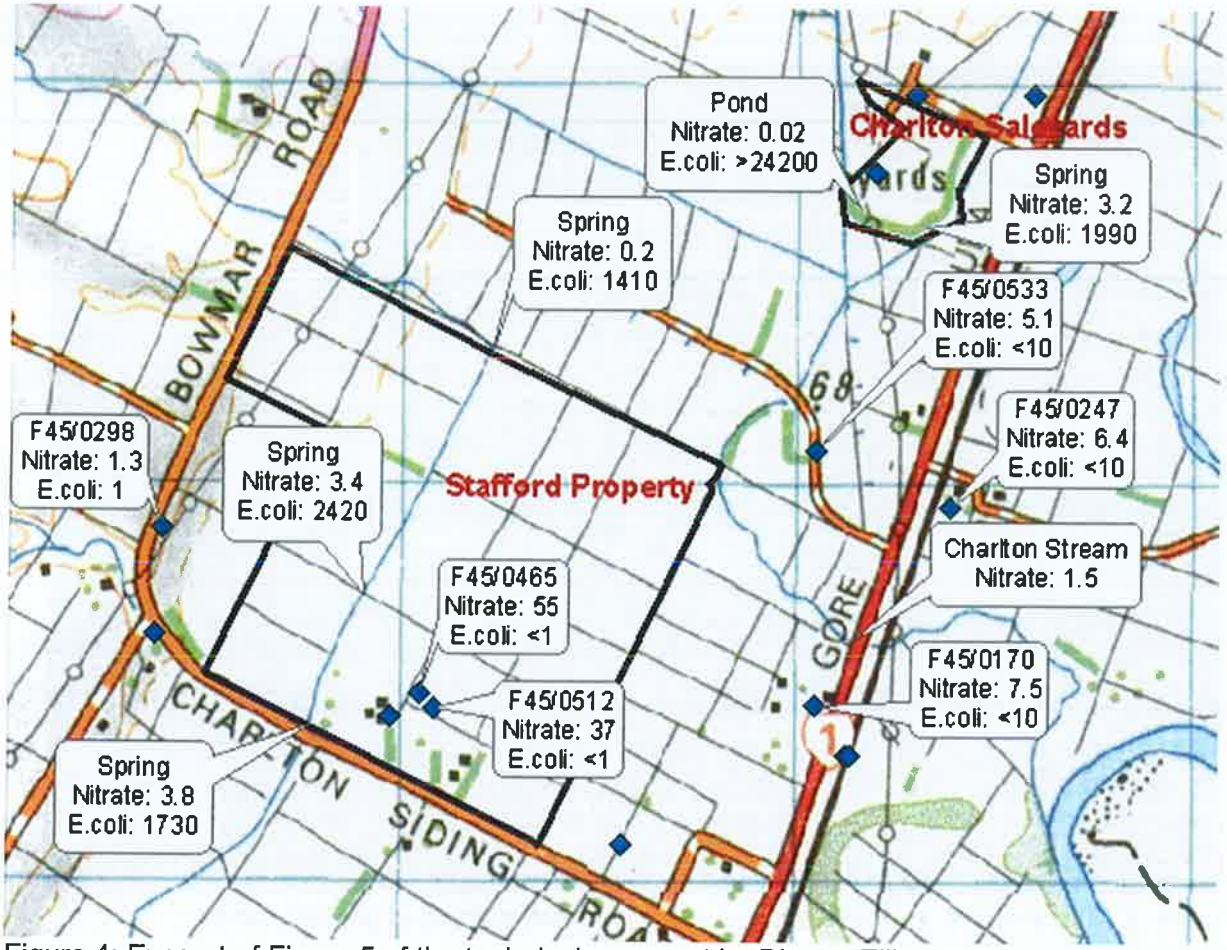


Figure 4: Excerpt of Figure 5 of the technical comment by Dianne Elliotte, 2009. Note, "nitrate" refers to nitrate-nitrogen and in some cases was measured as TON.

Given: A) the historic application of effluent in an environmentally degrading manner (there being no ability to defer irrigation prior to 2009); B) FDE applied to an area of soils with very high nitrogen loss risk (Topoclimate South, 2001); and C) elevated nitrate concentrations (16 mg/L) prior to the impact of the pond sump leak; it can be concluded that background nitrate levels on the farm in locations impacted by the FDE discharge area are likely to be high due to diffuse pollution from application of FDE combined with N losses from the urine and dung of dairy cows. Therefore, it is expected that nitrate values are likely stay above the drinking water standard of 11.3 mg/L in the short to medium term, at least while FDE is still being applied to the area of high risk Gore soils on the property in conjunction with the dairy farming activity. The groundwater beneath the property and immediately downstream of the FDE irrigation area can be classed as being highly degraded, as well as highly sensitive to further degradation due to its obvious susceptibility to nitrogen contamination. More work could be completed to delineate the boundaries of the zone affected, including groundwater sampling and perhaps an electromagnetic induction survey. The propriety of these investigations would require further investigation.

2. Suitability of Groundwater Quality Monitoring

Groundwater monitoring has been conducted on a six monthly basis for the past nine years with some additional samples taken in 2007 and 2008 relating to the sump failure incident. This monitoring of groundwater quality in F45/0465 has been effective in detecting and tracking nitrate contamination as described above. Analysis for Escherichia coli (*E. coli*) is useful, in addition to assessing microbial risks, to infer whether direct bore contamination has occurred (results indicate in this instance it has not) and electrical conductivity gives further useful context to the nitrate measurement. The bore is largely down gradient from the activity and sourced in shallow alluvium where the risk and effects of contamination are present.

The vadose zone travel time and the shallow saturated aquifer mixing time have been estimated and can be combined to give a total time lag at the Stafford property of 3-5 years (Wilson et al., 2014). This would indicate that groundwater monitoring occurring on the property over the last 4 years is representative of the effect of the current practice on groundwater nitrate-N concentrations.

It is recommended that groundwater quality monitoring should continue in bore F45/0465 on six monthly basis. The parameters tested for should include TON, *E.coli* and electrical conductivity.

3. The merits and/or implications of restricting effluent discharge during winter months, or when soils are below a certain temperature and the practicality of mitigation measures proposed by the applicant.

The application and FEMP are rather vague as to if and when deferred irrigation would be used, or what exceptional circumstances might lead to a higher rate of application. For example in section D.5 of the FEMP, 'Good management practices', the following is advocated: 'Care in irrigation of FDE, especially when the ground is near or at field capacity.' In fact, application of FDE should cease when soil is at or near field capacity. There did not appear to be any clear indication that FDE application would be restricted or cease under any specific conditions.

Application of FDE should be limited to periods when grass is actively growing and therefore FDE application should not be permitted when soils are below general thresholds for pasture growth (7°C in autumn and 5°C in spring). FDE should only be applied when there is no forecast of imminent rainfall, and when there is sufficient soil moisture deficit to absorb the FDE allowing for some margin of error. The closest Environment Southland monitoring site to the property is 'Mataura' on the ES Beacon display online. However, because the Tuturau soil at the Mataura site has high moisture holding capacity in addition to being well drained, it may overestimate the capacity of soils on the applicant's property which are inclined to be waterlogged in the case of the Jacobstown soil or excessively drained with lower moisture holding capacity in the case of the Gore soil. A more appropriate site to consult for soil moisture information, despite being further away, would be 'Edendale'. This would require cessation of FDE irrigation for up to a three month block in winter. FDE

management at the property to date appears to have been manifestly inadequate to prevent groundwater and probably surface water contamination. This may have been in part due to a misunderstanding of the soil properties, overestimation of the capacity of the Lignite/Marine physiographic unit to reduce nitrate in shallow alluvium where local inputs are high, and overestimation of the capacity of the soil to absorb FDE based on the behaviour of the Mataura monitoring site.

Section C.5 of the FEMP states: 'the farm consists of the Jacobstown and Gore types, although the distinction between the two is somewhat blurred in the field with profiles appearing very similar'. While they may grade into one another in the field, these are very different soil types – Gore soil is stony and free draining while Jacobstown is stoneless and poorly drained. It is, however, entirely possible that the exact spatial distributions of these soils are not accurately mapped in the Topoclimate survey. Management of FDE application to minimise risks should include an understanding of the actual distribution of soil types on the property as they will exhibit different capacities to absorb FDE at different times. Stoniness within a couple of spade depths of the surface would indicate the Gore soil. The subsoil is very stony.

The Lignite-Marine Terraces – Artificial Drainage physiographic unit, incorporating the Jacobstown soils on the property, presents risks of contaminant flow (phosphorus, pathogens and nitrogen) to surface waters on the property via tile drains, while there is localised risk of nitrate contamination of groundwater in the Lignite-Marine Terraces – No Variant physiographic unit which incorporates Gore soils on the property, despite the broader capacity of this physiographic unit to reduce nitrate.

Concerning the merits and disadvantages of restricting effluent discharge during winter months, or when soils are below a certain temperature, these measures have potential to limit losses of nutrients and pathogens by overland flow or by rapid drainage to tile drains or shallow groundwater – the 'direct losses' described by Houlbrooke (2009). However, as stated by Houlbrooke (2009):

> "Indirect losses of nutrients associated with land application of FDE are the result of nutrient enrichment of the soil during the summer-autumn period followed by leaching during the subsequent winter-spring drainage period. Indirect drainage losses therefore reflect a soil's fertility level and cannot be managed using effluent application best management practices. Effluent best management practices have been developed to specifically address the risk of direct drainage losses of effluent contaminants on soils..."

The 'best management practices' referred to above by Houlbrooke (2009) include deferred and low rate irrigation which are largely ineffective to prevent seasonal leaching of accumulated nitrogen.

The application misrepresents the effectiveness of low rate and deferred irrigation to limit 'direct losses' as the capacity to prevent nutrient losses from FDE altogether, e.g.

'With the discharge to land only occurring when there is a sufficient soil moisture deficit there will be no effect as the nutrient applied will be held in the pasture root zone.' (C. 22)

and:

'The 2009 Houlbrooke and Monaghan report provides context and background to the principle that low depth effluent application should not cause adverse effects on water quality.' (C. 23)

Rather, Houlbrooke (2009) identifies that nitrogen from FDE contributes a smaller part of 'indirect losses' of nitrogen than is sourced from other farm activities and processes such as urine deposition and fertiliser, albeit 'indirect losses' overall are the by far the greater part of nitrogen losses. These 'indirect losses' are the 'system losses' of the 'N Loss' diagram on p.14 of the application, taken from Houlbrooke (2009), and include seasonal leaching of nitrogen sourced from FDE along with other contributors to nitrogen enrichment of soil (urine patches, fertiliser etc.).

Houlbrooke (2009) therefore recommends that mitigation of 'indirect' or 'system losses' should focus on the larger contributors to these (urine patches, fertiliser etc.). However, that paper does not consider the situation where groundwater already exceeds the drinking water standard for nitrate (MOH, 2008), small further contributions of nitrate will worsen that effect, and all avenues to lessen nitrogen leaching by any amount from any source, including from FDE, should be pursued.

A critical factor in limiting seasonal leaching of accumulated nitrogen from FDE is management of the overall nutrient budget as promoted in the Farm Environment Management Plan included in the application e.g. a 'Fertiliser management plan prepared for each soil type with guidance from Overseer output reports' (FEMP C. 6. II), and 'Prepare, implement and monitor a Nutrient Management Budget to maximise the returns and minimise losses from the resource particularly N, P & K' (FEMP D. 1. b.). No quantitative nutrient budget, describing all inputs and losses has been included in the application or FEMP.

Without a nutrient budget it is difficult to assess the ability of pasture to take up nitrogen from FDE, given that other nitrogen inputs are unknown. Nitrogen from FDE may be part of, or in excess of, the amount able to be utilized by pasture. The potential for nutrient accumulation and subsequent, seasonal leaching is, however, demonstrated by the high nitrate level in groundwater at the property which is considered to originate from these processes.

Condition 8c of the current discharge consent does help to limit nitrogen accumulation in soil by capping combined nitrogen inputs from FDE and fertiliser at 150 kg/ha/year. The nutrient budget, when prepared, and documentation of fertiliser and FDE applications should demonstrate compliance with this condition.

4. Comments on the applicants assessment of risk to groundwater

Section 92(1) of the further information response states: 'The continued use of land for dairy farming and the discharge of agricultural effluent on the property is unlikely to give rise to further adverse effects, or contribute negatively to existing cumulative effects on water quality... The risk of N loss is well managed on the farm'. The further information request also states "With no substantive change in the dairy operation in terms of stocking rates, effluent system, land area etc., it is reasonable to conclude that there will be little to no change in risk to groundwater". In fact it is evident from groundwater monitoring and limited surface water analyses that whatever management practices have been in effect on the farm, significant nitrogen loss has occurred and has contributed negatively to existing water quality issues, to date sustaining toxic levels of nitrate in groundwater. It is also evident that FDE discharge has contributed to this contamination.

Condition 8(a) of the previous discharge permit, 204546 reads as follows:

> *8.(a) There shall be no surface run-off/overland flow, ponding or contamination of water resulting from the application of the dairy shed effluent to pasture.*

Analysis of surface water and groundwater on the property and in the vicinity of the property indicates that contamination of water with nitrate has occurred as a result of activities on the farm including the application of FDE. Condition 8(a) therefore has not been satisfied and is unlikely to be satisfied should the activity and mitigation measures continue unchanged.

5. Summary and Conclusions

1. Groundwater in the area of the Stafford property is highly degraded with regards to nitrate contamination based on observations in wells F45/0465, F45/0512 and F45/0435.
2. It would appear that, while there have been historical contamination issues on this property, the current land activities including the FDE discharge are resulting in continued groundwater nitrate contamination in excess of the national drinking water standards of 11.3 mg/L. It is then logical to assume that continuation of these activities will not result in anything other than the same outcome.
3. Should consent for the FDE discharge be granted, the existing groundwater monitoring regime (including the bore, analytes and frequency) is effective and should be continued.
4. Should consent for the FDE discharge be granted, FDE application should not be permitted when soils are below general thresholds for pasture growth (7°C in autumn and 5°C in spring) or when soils are at or wetter than field capacity. The ES monitoring site 'Edendale' should be consulted and FDE applied only when 'Low rate' or 'Safe to irrigate' conditions are indicated, not 'Pulse irrigation' or 'No irrigation'. This does not replace but complements the requirement to assess soil conditions directly. To satisfy the above conditions, it should be considered that FDE application may not be permitted, depending on soil conditions, for up to three months over the winter period.
5. Condition 8c of the current discharge consent does help to limit nitrogen accumulation in soil by capping combined nitrogen inputs from FDE and fertiliser at 150 kg/ha/year. The nutrient budget and documentation of fertiliser and FDE applications should demonstrate compliance with this condition.

Kind regards

Ewen Rodway (Environmental Scientist)

And

Michael Killick (Technical Specialist)

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Technical Comment – Sump Discussion

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Technical Comment

From: Dianne Elliotte
Groundwater Technician

Date: Tuesday 16th March 2009

File Reference: C107-001, S217-001

Subject: ***Charlton saleyard settling pond, Stafford property - Charlton Siding road***

2008 Sampling Results

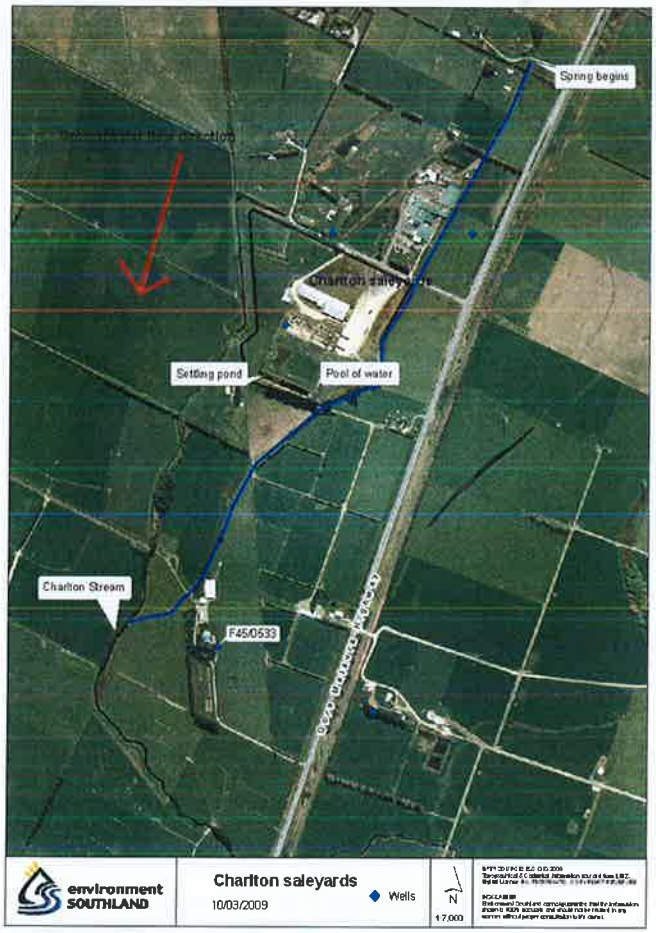
1 Charlton saleyard settling pond

1.1 Background

The Charlton Saleyard has a resource consent (number 98172) for the discharge of wash water to land via a settling pond as shown in Figure 1 at Saleyard road, Charlton. This resource consent, which expires in May 2009, requires an inspection of the settling pond every three years in order to ensure the settling pond is not overflowing and correct effluent disposal practices are being carried out. In 2002 and 2005 the compliance inspections resulted in no obvious problems, however following an inspection on the 8th of July 2008, concerns were raised by the Compliance Officer over the construction of the settling pond. In particular there was an apparent lack of compaction or liners in the settling pond which could result in contaminants being leached out. The construction was considered to be inconsistent with the existing regulations on the maximum permeability for effluent ponds. In addition, it was observed storage within the settling pond was at a high level and there was an absence of mitigation measures to ensure any overspill did not result in runoff to the nearest surface water way (located approximately 100 metres away). The Compliance Officer discussed his concerns with Environment Southland's Groundwater Scientist who was aware groundwater in the area had elevated nitrate levels. As a result, an investigation was carried out in order to determine whether the pond had been leaking and what environmental effects may have occurred as a result of the leaching. The purpose of this technical comment is to report on the results of that investigation.

- **Figure 1: Photograph of the Charlton saleyard settling pond and surrounding topography (2nd September 2008)**

- **Figure 2 (right): Map showing the Charlton saleyard area in relation to the spring and the regional groundwater flow direction – local variability.**



1.2 Environmental Setting

Soil mapping from Topoclimate South (1998) shows the predominant soil type in the area around the Charlton saleyard is Gore, which typically comprises of alluvial gravels with schist and greywacke stones underlying a silt loam topsoil. Gore soils are well drained and as a result have limited water-holding capacity. These characteristics make these soils vulnerable to leaching which is reflected in this area being assessed as having a very severe nitrate leaching risk. (Crops for Southland, 2002)

The hydrogeology of the Lower Mataura groundwater zone consists of a series of thin (< 15 metres) alluvial terraces that overly the thick mudstone and lignite sediments of the Eastern Southland Group. Groundwater discharge is typically via small springs and through flow into other lower lying aquifers, ultimately discharging into the Mataura river. The relatively high clay content in the alluvial gravels means aquifer transmissivity is relatively low which means the aquifer has a poor dilution capacity. This is reflected in the Farm Dairy Effluent Risk Assessment (Environment Southland and SKM, 2007) where the area is classified as having a moderate to very high risk to nutrient leaching.

A small spring shown in Figure 2, runs parallel to the property which originates 600 metres upstream of the settling pond and drains into the Charlton Stream near the Mataura – Gore Highway. The spring is a likely result of the water table intersecting the surface which shows

groundwater levels are high and vulnerable to contamination. The proximity of the spring to the settling pond means surface water is susceptible to the Saleyard wash water leaching through the walls and subsurface of the settling pond into the spring. There is possible evidence of this occurring in Figure 3. There is also a risk of contaminating the spring, if the settling pond breaches the banks and water flows directly into the spring.

- **Figure 2: Photograph of the spring parallel to the Charlton saleyard property, 100 metres from the settling pond (30th October 2008)**

- **Figure 3: Photograph of the pool of water east of the Charlton saleyard settling pond (30th October 2008)**

There is no available information on the settling pond construction or maintenance. It is assumed that the settling pond was constructed with little in the way of compaction or liners (e.g. clay) as this was the standard practice at least 10 years ago which we know is the minimum time for the settling pond to have existed based on the consent duration. This assumption is supported by photographs of the upper portion of the settling pond which shows very little clay and a high proportion of gravel along the pond's walls as shown in Figure 4.

Figure 4: Photograph of the construction of the Charlton saleyard settling pond walls (2nd September 2008)

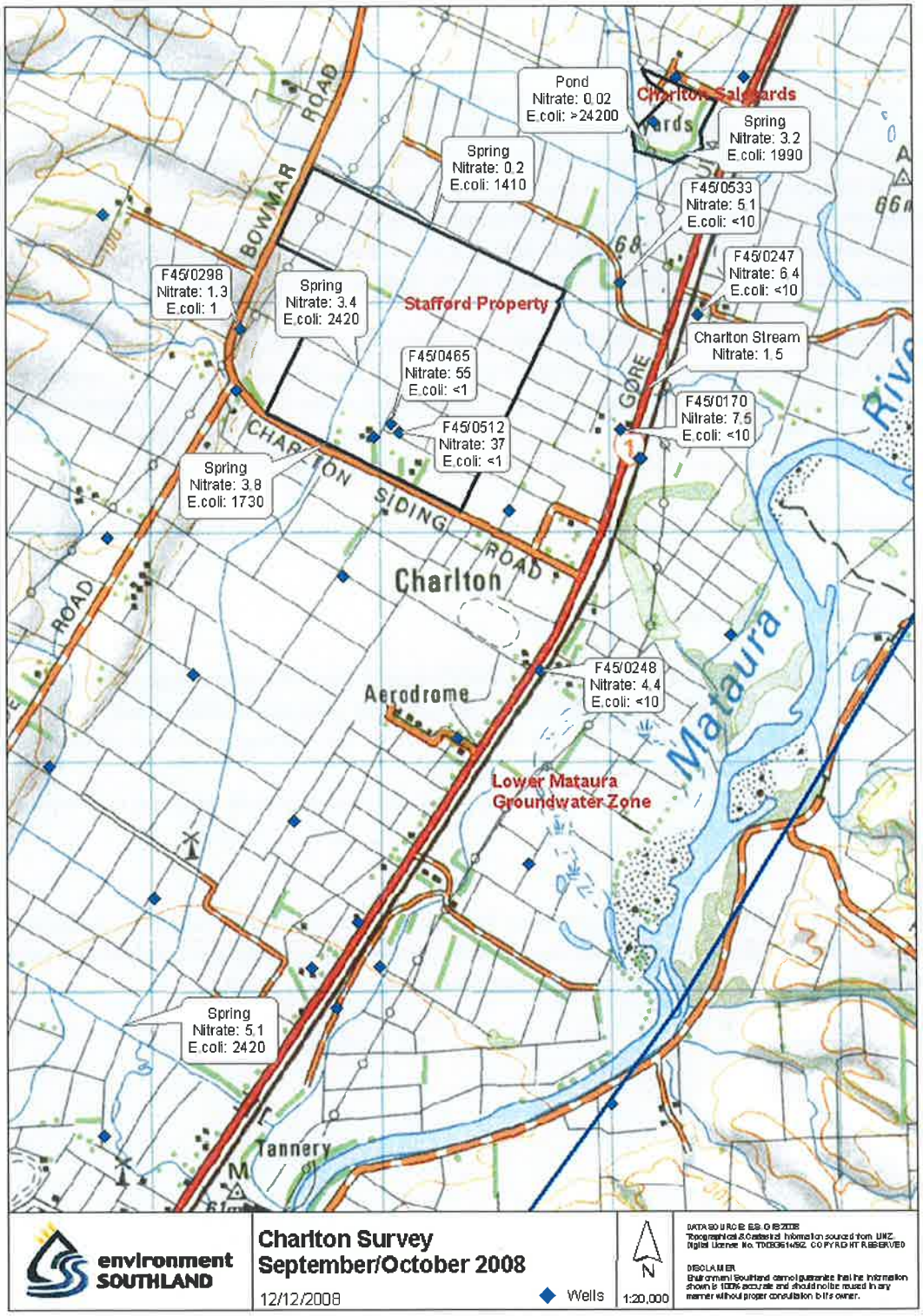
1.3 Results

A groundwater quality survey was carried out on the 2nd of September 2008 which included sampling of the Saleyard pond, surrounding bores and streams. Figure 5 shows the locations and results of the water quality samples taken. A second survey was completed on the 30th of October after high nitrate values were measured at bore F45/0465 on Charlton Siding Road which is discussed further in section two.

The groundwater quality results from the September 2008 samples showed no signs of Escherichia coli (c.coli) present in the bores that were sampled indicating adequate well head protection. The surface water samples showed that there was very little difference in e.coli concentrations from the headwaters of the spring to 2.3 kilometres downstream at Charlton Creek at the Mataura-Gore highway bridge and that the concentrations were relatively high.

During the October survey a small pond that had been observed over the eastern wall of the settling pond in September was monitored, which is shown in Figure 3. It is not certain if this small pool is formed from the Charlton saleyard settling pond or originates from other sources but water quality results showed that in comparison with the settling pond, the small pool of water had relatively high electrical conductivity. E.coli results were higher in the pool of water and even higher again in the spring showing these water bodies are receiving contaminants.

Figure 5: Map of nitrate-nitrate (mg/l-N) and e.coli (MPN/100ml) results from the September and October 2008 water quality surveys (the most recent values have been used in sites monitored twice)



1.4 Summary and Recommendations

The results from the water quality investigation around the Charlton saleyard are inconclusive. There was no evidence of bacterial contamination of surfacewater and groundwater near the settling pond, however this could be due to the travel time it takes for the water to reach the bores and streams resulting in e.coli die off.

The area has elevated nitrate concentrations in the groundwater and surfacewater, however monitoring data was unable to conclusively link this to the Charlton Saleyard settling pond. There was evidence that at least the upper portion of the settling pond is likely to be highly leaky due to the lack of impermeable material in the construction of the walls, which means there is a risk the settling pond could be contaminating surrounding water bodies. The elevated nutrient results in water quality in the area therefore likely reflect a combination of sources including land use practices and the intensification of farming on the surrounding free draining soils.

The discharge permit for the Charlton saleyard settling pond is due to expire on the 21st of May 2009. If the consent were to be renewed, I recommend that the settling pond construction be improved to existing standards recognising that although there is no clear link between the settling pond and the water quality issues in the area, the potential exists for contamination to occur by overland flow to the nearby spring and through leaching into the aquifer

To monitor effects the settling pond may have on surrounding water bodies it is recommended that:

- Three e.coli samples are collected:

    1. Where the spring intersects with Saleyard Road to measure the concentration in the spring water upstream of the Charlton saleyard settling pond.
    2. Approximately 30 metres downstream of the settling pond to evaluate any affects the settling pond has on the spring.
    3. The Charlton saleyard settling pond water to compare with the two samples taken in the spring.

If the discharge permit is not renewed then immediate steps should be taken to ensure appropriate ES staff consult with the Central Saleyard board representative to discuss methods of removing the wash water and decommissioning the settling pond.

2 Charlton Siding Road

2.1 Background

The Stafford farm is located adjacent to Charlton Siding Road and is 150 hectares. It has a resource consent (number 204546) for the discharge of farm dairy effluent from 500 cows and is inspected annually for compliance monitoring purposes. The farm dairy effluent storage sump is north of the dairy shed and has to increase the holding capacity from 2,750 litres to 70,000 litres of storage by August 2008 in order to enable deferred irrigation as per consent conditions.

Compliance groundwater monitoring on the property has been carried out twice yearly at bore F45/0435 until May 2007 when it was sealed. A new bore, F45/0465 was drilled for dairy and stock supply and replaces F45/0435 as the monitoring bore.

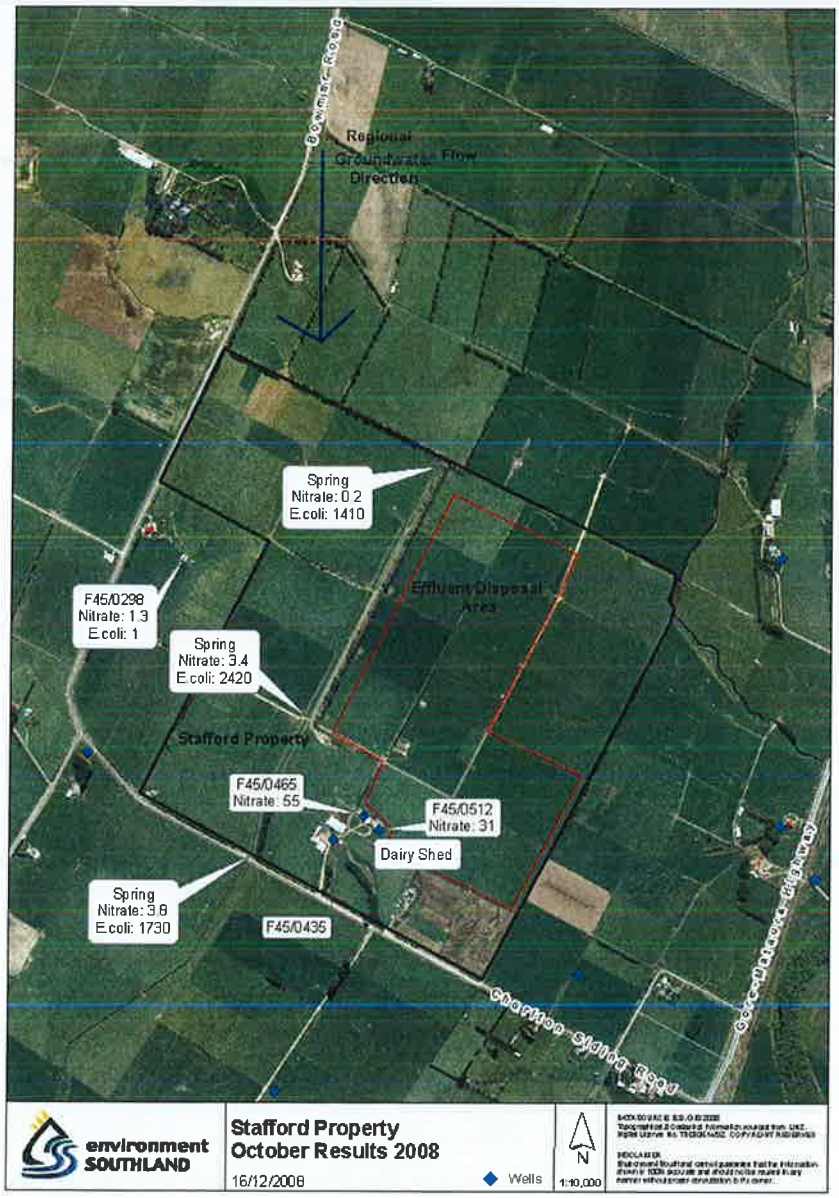
Results from the September 2008 survey, which found nitrate levels were 4 times the New Zealand Drinking Water Standard (Ministry of Health, 2005) in bore F45/0465. As a result, a more extensive survey was carried out on the 30th of October.

2.2 Environmental Setting

Topoclimate South (1998) soil mapping show that the soil type underlying the Stafford farm is mostly Gore with some Jacobstown. Gore soils typically consist of alluvial gravel overlain by a silt loam topsoil and are very free draining with limited water holding capacity, while Jacobstown soils generally consist of fine alluvium that is silty and stone free and are poorly drained soils. A large portion of the effluent disposal area is underlain by the free draining Gore soils. Due to the soil characteristics, this area has been assessed as having a very severe nitrate leaching risk (Crops for Southland, 2002). Some water logging is known to occur over Jacobstown soils, however in most cases, this no longer occurs due to the installation of mole and tile drains.

There is a small spring that originates 700 metres upstream of the Stafford farm near the base of the terrace on Bowmar Road. This spring runs north to south through the property and is approximately 80 metres east of the effluent disposal area shown in Figure 6. The spring discharges into Boundary Creek, a tributary of the Mataura River 2.8 kilometres downstream of Charlton Siding Road.

Figure 6: Results from the Charlton Siding Road area



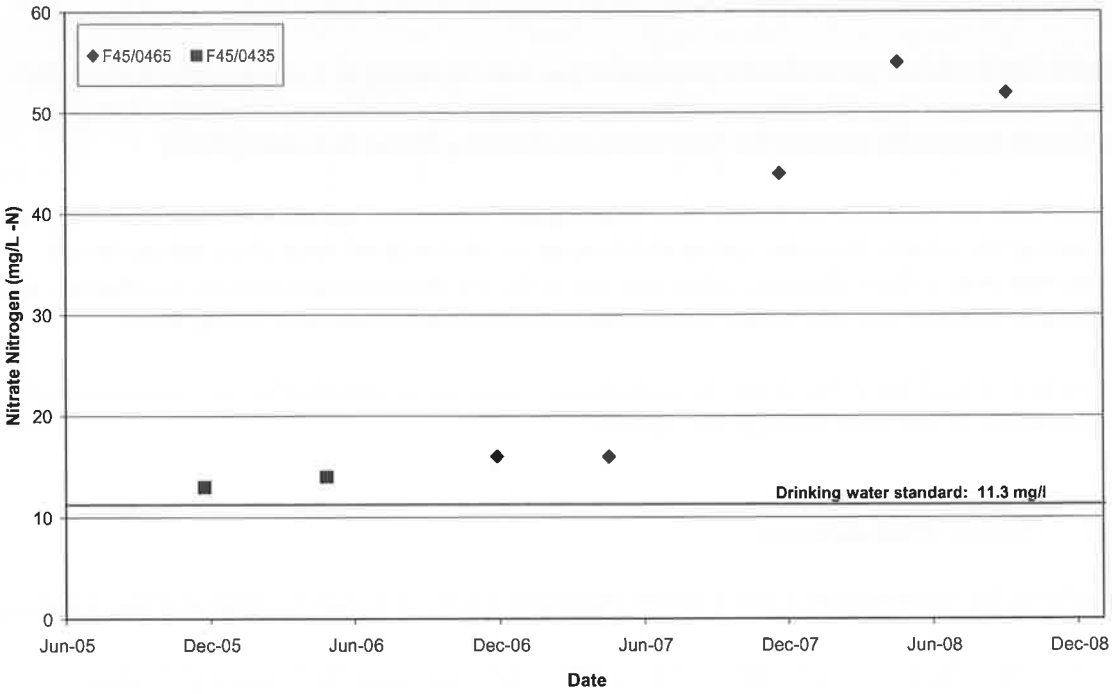
2.3 Results

Compliance monitoring results illustrated in Figure 6 from F45/0435 and F45/0465 show nitrate levels in April this year were high but not to the extent of the levels measured in October. Results for chloride, sodium and electrical conductivity were all elevated compared to surrounding bores tested suggesting there is a localised source of contamination.

Surface water quality monitoring of the spring on the Stafford Farm was also carried out during the October survey. The results showed that nitrate levels in the spring increased rapidly with nitrate concentrations increasing from 0.2 mg/L at the northern boundary to 3.4 mg/L 700 metres downstream. At least one tile drain was noticed flowing into the spring from the right bank during the survey (opposite bank of the effluent disposal area).

Bacterial concentrations were also high in the spring with the highest e.coli value of 2420 MPN/100ml being measured at the middle sample point down stream of the effluent disposal area. The localised spike in nitrate and e.coli levels in the surfacewater and groundwater indicate there is an issue with the effluent storage sump and the disposal area.

Figure 7: Graph of nitrate concentrations in F45/0435 and F45/0465



2.4 Compliance inspections

Since 2004 the Stafford farm has been regularly inspected and overall no major issues have been identified. In February 2008, some issues regarding the management of the effluent disposal system were raised and the consent holder was reminded about the requirement to install larger effluent storage capacity by August 2008.

Following the October 2008 water quality survey, a compliance officer inspected the property on the 10th of December 2008 to follow up on any outstanding matters from the past inspection. A major problem was identified with the effluent storage sump which was considered to be potentially leaking effluent into the soil and groundwater. The compliance officer requested urgent remedial action.

2.5 Summary

The results from the October 2008 water quality investigation at the Stafford farm showed that the groundwater and surfacewater were being affected by the leak in the effluent storage sump. The recent increasing trend in nitrate and electrical conductivity levels indicate this leak may have occurred late in 2007. With effluent leaking into the soil and groundwater from the faulty effluent storage sump, you would expect high levels of e.coli measured in bores F45/0465 and F45/0512. The absence of e.coli measured in the Stafford farm bores is possibly due to the movement of the groundwater and the time it takes to get from the sump to the bores.

Significant levels of groundwater contamination was occurring as a result of the leak in the effluent storage sump resulting in nitrate concentration levels of up to five times above the maximum acceptable level in the New Zealand Drinking Water Standard (2005).

As the soils on the farm are mostly free draining and effluent is spread onto the land daily, it is not surprising the results from the spring monitoring on the Stafford farm show nitrate levels increasing over a short distance. This was also reflected downstream near the confluence with Boundary Creek where the nitrate levels nearly doubled from Charlton Siding Road.

There is potential for down gradient groundwater users to be affected by the contaminated groundwater as it moves through the aquifer.

2.6 Recommendations

Given the contamination has a clearly identified source, I would recommend the following:

- The effluent storage sump needs to be repaired immediately to prevent further contamination of the groundwater.
- Monthly groundwater quality monitoring in bore F45/0465 until nitrate concentrations are within the New Zealand Drinking Water Standards.
- Some monitoring of potentially affected groundwater users down gradient of Charlton Siding Road should also be undertaken to ensure users are not being affected by the contaminated groundwater.

2.7 References

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Crops for Southland, 2002. Soil Information sheets. Prepared for Environment Southland.

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Appendix 1: Sampling Results from the 2nd of September and the 30th of October 2008

Site	Location	Conductivity (µs/cm)	Chloride (mg/L)	Nitrate (mg/L)	Ecoli (MPN/ 100ml)
2nd of September 2008 sampling					
Spring	Mataura Gore Highway	180	21	1.4	320
Saleyard Settling Pond	Saleyard Road, Charlton	677*	35	0.14	240000
Pool of water	Saleyard Road, Charlton	415*			
Charlton Stream	Mataura Gore Highway	223*	24	1.5	320
F45/0247	607 Mataura Gore Highway	249	30	6.4	<10
F45/0170	Mataura Gore Highway	245	25	7.5	<10
F45/0533	Mataura Gore Highway		27	5.1	<10
F45/0248	Mataura Gore Highway	225	30	4.4	<10
F45/0465	Charlton Siding Road	816*	95	44.4	<10
Spring	Bowmar Road	204*	23	0.9	41
Spring	Charlton Siding Road	284*	31	5.3	110
30th of October 2008 sampling					
Saleyard Settling Pond	Saleyard Road, Charlton	1110		0.017	>24200
Pool of water	Saleyard Road, Charlton	430			1550
Spring (Charlton Tributary)	Saleyard Road, Charlton	227		3.2	1990
F45/0298	Paterson, Bowmar Road	174*	20	1.3	1
F45/0465	Charlton Siding Road	815		55	<1
F45/0512		619		31	<1
Spring (top site)		218		0.2	1410
Spring (bottom site)		266		3.4	2420
Spring	Charlton Siding Road Bridge	268		3.8	1730
Spring	Above Boundary Creek confluence	270*		5.1	2420
25th of November 2008 - compliance sampling					
F45/0465	Charlton Siding Road	766		52	<1

* Field measurement only

Supplementary Policy Assessment

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

Regional Policy Statement 1997 (RPS)

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

Ngai Tahu

Objective 1.1	*To protect wahi tapu from the adverse effects of resource use activities*
Objective 1.2	*To recognise the importance of wahi tapu, wahi toaka, mahika kai and the customary use of water to Kai Tahu.*
Objective 1.4	*To have particular regard to the concept of kaitiakitanga in relation to managing the use, development and protection of natural and physical resources.*
Objective 4.5	*To recognise the relationship of Maori with the water.*
Policy 1.2	*Recognise "Te Whakatau Kaupapa o Murihiku" as a Kai Tahu resource management reference planning document for the Region.*

Tangata whenua have a significant relationship with all waters of Southland. Te Tangi a Tauira, and the views of Te Runanga o Ngai Tahu and Te Ao Marama Inc. (representatives of the four rūnanga) have been taken into account in assessing the application. Te Ao Marama Inc. and Te Runanga o Ngai Tahu were both served copies of the application during the notification process of the application. Neither of these parties submitted on the application. Papatipu rūnanga have had the opportunity to effectively undertake their kaitiaki responsibilities in freshwater and land management. Te Whakatau Kaupapa o Murihiku has been superseded by Te Tangi a Tauira, which has been considered in Section 3.9 of this Report.

Water Quantity

Objective 4.1	*To sustain the quantity of the Region's water resources so as to –* *(a) meet the needs of a range of uses, including the reasonably foreseeable needs of future generations* *(b) safeguard the life-supporting capacity of water and related ecosystems*
Objective 4.2	*To manage the use and development of water and land resources so as, wherever practicable, to maintain and enhance flow regimes.*
Objective 4.4	*To achieve the efficient use of water extracted from water bodies.*

Policy 4.1	*Prepare regional plan(s) to clearly identify regimes for the management of water quantity.*
Policy 4.2	*Continue to recognise and provide for minor permanent and temporary takes and uses of water, as permitted activities where there are no adverse effects.*
Policy 4.3	*Manage abstraction of water and the transferability of permits on the basis of the effects of that abstraction, or transfer, taking into account the standards set for the water body and the use to which the water is to be put.*
Policy 4.4	*Encourage the conservation of water and its efficient allocation and use.*
Policy 4.5	*In preparing, implementing and administering Regional and District Plans and in considering resources consents, local authorities shall assess the effects of land use and development on the quantity and sustainability of water bodies and provide for any adverse effects to be avoided wherever practicable, or remedied or mitigated.*
Policy 4.7	*Adopt a precautionary approach in allocating ground water resources until there is a better knowledge and understanding of those resources.*

The groundwater abstraction and use is a medium scale activity, in an aquifer that is well within allocation limits and at a volume and rate that is reasonable for the intended use. The water abstraction is a permitted activity under the pSWLP. The application is consistent with the above policies.

Groundwater Quality

Objective 5.1	*To sustain the quality of the Region's water resources so as to:* *(a) meet the needs of a range of uses, including the reasonably foreseeable needs of future generations* *(b) safeguard the life-supporting capacity of water and related ecosystems.*
Objective 5.2	*To ensure that in the use and development of water and land resources, and the discharge of contaminants, water quality is maintained and wherever practicable enhanced.*
Policy 5.3	*Prepare Regional Plan(s) for the management of water quality considering both point and no-point course discharges.*
Policy 5.4	*Utilise land treatment of liquid wastes where this can be undertaken in a sustainable manner and without significant adverse environmental effects.*
Policy 5.5	*In preparing, implementing and administering Regional and District Plans and in considering resource consents, local authorities shall*

assess the effects of land use and development on ground water and surface water quality, including both point and non-point source discharges, and provide for any adverse effects to be avoided, remedied or mitigated.

The application is generally consistent with, but may be contrary to, Policy 5.4 depending on whether the high groundwater nitrate concentrations shown in groundwater monitoring is from the discharge activity or not. Provided the discharge activity is not adding to the high groundwater nitrate concentrations found underneath the property, the application will not be contrary to this policy.

Groundwater is being abstracted at a volume and rate which is reasonable for the use from an aquifer which is not facing allocation issues. Provided effluent is discharged to land in accordance with best practice, the life-supporting capacity of the groundwater resource is expected to be sustained.

Surface Water Quality

Objective 6.4	*To avoid wherever practicable, remedy or mitigate, the adverse effects of activities in, on, under, adjacent to, or over the beds of lakes, rivers and wetlands.*
Policy 6.11	*Manage the effects of activities that could adversely impact on the quality and quantity of water in rivers and lakes used for public and rural water supplied, and the structures used to draw such waters.*

Effluent will be discharged to flat land at a rate which matches the environmental risk to land. As the topography is flat, it is unexpected that effluent will contaminate surface water, reducing the quality of the resource. Provided the effluent is discharged in accordance with low rate best practise the application will be consistent with the above policy.

Soils

Objective 8.1	*Promote the sustainable management of all soils.*
Objective 8.4	*Avoid the contamination of soils.*
Policy 8.1	*Maintain and enhance Southland's soil resource by avoiding, remedying or mitigating the adverse effects of activities.*
Policy 8.5	*Promote land use practices which avoid the contamination of soils.*

Good management practices outlined in the Management Plan included in the application will help to ensure soil health is maintained, this includes a minimum return period of 28 days, the use of a low rate system, deferring effluent when soil moisture conditions are high and wintering most stock off of the farm. The application is consistent with the above objectives and policies.

3.6 Relevant provisions of the Proposed Southland Regional Policy Statement 2012 (Section 104(1)(b)(v))

Proposed Southland Regional Policy Statement 2012 (pRPS)

The following objectives and policies in the proposed Southland 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 [objective abbreviated].*
Objective TW.2	*All local authority resource management processes and decisions take into account iwi management plans.*
Policy TW.1	*Treaty of Waitangi / Te Tiriti o Waitangi [policy abbreviated]*
Policy TW.3	*Take iwi management plans into account within local authority resource management decision making processes.*

Tangata whenua have a significant relationship with all waters of Southland. Te Tangi a Tauira, and the views of Te Runanga o Ngai Tahu and Te Ao Marama Inc. (representatives of the four rūnanga) have been taken into account in assessing the application. Te Ao Marama Inc. and Te Runanga o Ngai Tahu were both served copies of the application during the notification process of the application. Neither of these parties submitted on the application. Papatipu rūnanga have had the opportunity to effectively undertake their kaitiaki responsibilities in freshwater and land management. Te Whakatau Kaupapa o Murihiku has been superseded by Te Tangi a Tauira, which has been considered in Section 3.9 of this Report.

Water Quality

Objective WQUAL.1	*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 water quality, or improve it, to ensure freshwater objectives are met.*

Policy WQAUL.2 — *In managing water quality, particular regard will be had to the following contaminants:*
(a) nitrogen;
(b) phosphorus;
(c) sediment;
(d) microbiological contaminants.

Policy WQUAL.6 — *Recognise the social, economic and cultural benefits that may be derived from the use, development or protection of water resources.*

Policy WQUAL.7 — *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.8 — *Avoid the direct discharge of sewage, wastewater, industrial and trade waste and agricultural effluent to water unless these discharges have undergone treatment.*

Policy WQUAL.9 — *Where practicable, manage the siting and operation of activities that result in point source discharges of contaminants to land to ensure that adverse effects on groundwater, surface water and coastal water quality are avoided, remedied or mitigated.*

The application is consistent with the above policies. Effluent will be discharged to land at a low rate and high depth and standard buffers form waterways, point of water abstraction, farm boundaries and dwellings or places of assembly will apply. Freshwater management objectives as directed by the National Policy Statement for Freshwater Management 2014 have not been completed yet and at present, no catchment nutrient loading limits or limits for specific water bodies have been set by Council.

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 Statement 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:*
(a) is efficient;
(b) ... [not applicable]

Policy WQUAN.2	*Avoid over-allocation of surface and groundwater... [policy abbreviated].*
Policy WQUAN.3	*Recognise the finite nature of water resources and catchments and identify management regimes in accordance with the National Policy Statement for Freshwater 2014 [policy abbreviated].*
Policy WQUAN.6	*(a) Ensure that any water taken from surface water or groundwater is used efficiently;* *(b)...*
Policy WQUAN.7	*Recognise the social, economic and cultural benefits that may be derived from the use, development or protection of water resources.*

The groundwater abstraction use is required for this operation and is for a medium scale activity, in an aquifer that is well within allocation limits and at a rate that is reasonable for the intended use. Consent conditions will ensure the bore is metered and that the data is reported to Council. Therefore, the activity is consistent with the above objectives and policies.

3.7 Relevant provisions of national policy statements (Section 104(1)(b)(iii))

National Policy Statement for Freshwater Management (NPSFM) 2014

This NPSFM was superseded 7 September 2017 by a new version. The application was lodged prior to September, therefore the 2014 version has been used.

The NPSFM supports improved freshwater management in New Zealand. It does this by directing regional councils to establish objectives and set limits for fresh water in their regional plans.

The following objectives and policies in the National Policy Statement for Freshwater Management (NPSFM) 2014 are of particular relevance to this application:

Water Quality

Objective A1	*(a) To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water; and* *(b) the health of people and communities, in sustainably managing the use and development of land, and of discharges of contaminants.*
Objective A2	*The overall quality of fresh water within a region is maintained or improved while:* *(a) protecting the significant values of outstanding freshwater bodies;* *(b) protecting the significant values of wetlands; and*

(c) *improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated.*

Policy A2 — *Where freshwater management units do not meet the freshwater objectives made pursuant to Policy A1, every regional council is to specify targets and implement methods [policy abbreviated].*

Policy A3 — *By regional council:*

(a) *imposing conditions on discharge permits to ensure the limits and targets specified pursuant to Policy A1 and Policy A2 can be met; and*

(b) *where permissible, making rules requiring the adoption of the best practicable option to prevent or minimise any actual or likely adverse effect on the environment of any discharge of a contaminant into fresh water, or onto or into land in circumstances that may result in that contaminant entering fresh water.*

Policy A4 — *When considering any application for a discharge the consent authority must have regard to the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of fresh water including on any ecosystem associated with fresh water and on the health of people and communities as affected by their secondary contact with fresh water. the extent to which it is feasible and dependable that any more than minor adverse effect on fresh water, and on any ecosystem associated with fresh water, and the health of people and communities as affected by their secondary contact with fresh water resulting from the discharge would be avoided. This policy applies to the following discharges (including a diffuse discharge by any person or animal) a new discharge or a change or increase in any discharge. [policy summarised]*

The discharge element of the application is generally consistent with Objective A1. This is because the discharge is to land, the Applicant has adopted current practice for the effluent management system. Provided the discharge activity is not adding to the accumulation of high nitrates in groundwater, the application will be consistent with this policy.

Objective A2 seeks to ensure that overall water quality is maintained or improved. The application may be inconsistent with, or contrary to, Objective A2 as the actual effects of the discharge activity on the groundwater resource is unknown at this stage. The abstraction of water is consistent with this objective.

Policies A2, A3 and A4 require the Council to set objectives and limits to assist in the improvement of water quality in waterbodies. At present, no catchment nutrient loading limits or limits for specific water bodies have been set by Council.

The proposal is generally consistent with Policy A4, as when considering the application for the discharge the consent authority has had regard to the matters in this policy when making a decision on the application. At this stage I am unable to determine whether or not

the discharge activity will be consistent with, or contrary to, part 1 of Policy A4 as the actual effects of the discharge on groundwater is not well understood for this application. Provided the discharge activity does not cause ongoing adverse effects on the groundwater resource, and good management practise are followed, the discharge activity will be consistent with part 1 of Policy A4.

With regard to part 2 of Policy A4, the design, set up and management of the effluent system (by using low rate effluent discharge and having the ability to defer effluent application) seeks avoid contamination that will have an adverse effect on the life-supporting capacity of fresh water including on any ecosystem associated with fresh water and the health of people and communities as affected by their secondary contact (contact with limbs)with fresh water. Any more than minor adverse effects on fresh water and on the health of people and communities as affected by their secondary contact with fresh water should be avoided, as it is unlikely that discharge will contaminate surface water bodies where people come into secondary contact with water. This determination has been based on the soil characteristics, topography of the land, lack of artificial drainage in the discharge area and rate and depth of effluent discharge.

Water Quantity

Objective B1	*To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing the taking, using, damming, or diverting of fresh water.*
Objective B3	*To improve and maximise the efficient allocation and efficient use of water.*
Policy B4	*By every regional council identifying methods in regional plans to encourage the efficient use of water.*
Policy B5	*By every regional council ensuring that no decision will likely result in future over-allocation – including managing fresh water so that the aggregate of all amounts of fresh water in a freshwater management unit that are authorised to be taken, used, dammed or diverted does not over-allocate the water in the freshwater management unit.*
Policy B6	*By every regional council setting a defined timeframe and methods in regional plans by which over-allocation must be phased out, including by reviewing water permits and consents to help ensure the total amount of water allocated in the freshwater management unit is reduced to the level set to give effect to Policy B1.*
Policy B7	*When considering any application the consent authority must have regard to the extent to which the change would adversely affect safeguarding the life-supporting capacity of fresh water and of any associated ecosystem and the extent to which it is feasible and dependable that any adverse effect on the life-supporting capacity of fresh water and of any associated ecosystem resulting from the change would be avoided. This policy applies to any new activity*

and any change in the character, intensity or scale of any established activity –that involves any taking, using, damming or diverting of fresh water or draining of any wetland which is likely to result in any more than minor adverse change in the natural variability of flows or level of any fresh water, compared to that which immediately preceded the commencement of the new activity or the change in the established activity.

Policies B5 and B7 concern water quantity and seek to protect the life-supporting capacity of the fresh water resources. This application seeks to abstract groundwater and Objective B3 requires the efficient use of this fresh water resource. The proposed take is regarded as an efficient and reasonable use of water as it is consistent with Council's standard volume for dairy farms.

The application is consistent with Objective B1 and Policies B4 and B5. This is because the taking of the water will not result in the over allocation of the groundwater zone and will still enable the resource to be sustainably managed. As per the regional plans, water meter device(s) will be used to ensure the efficient use of water.

Integrated management

Objective C1 — *To improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment.*

Policy C1 — *By every regional council managing fresh water and land use and development in catchments in an integrated and sustainable way, so as to avoid, remedy or mitigate adverse effects, including cumulative effects.*

Policy C1 requires integrated management of freshwater and land use. The management practices described in the Management Plan supplied with the application, give effect to this policy. Further implementation of this policy is limited through the consent process.

Tāngata whenua roles and interests

Objective D1 — *To provide for the involvement of iwi and hapū, and to ensure that tāngata whenua values and interests are identified and reflected in the management of fresh water including associated ecosystems, and decision-making regarding freshwater planning, including on how all other objectives of this national policy statement are given effect to.*

Policy D1 — *Local authorities shall take reasonable steps to involve iwi and hapū in the management of fresh water and freshwater ecosystems in the region; work with iwi and hapū to identify tāngata whenua values and interests in fresh water and freshwater ecosystems in the region; and reflect tāngata whenua values and interests in the management of, and decision-making regarding, fresh water and freshwater ecosystems in the region.*

Comment
No parties were identified as affected by this application, however the application was publicly notified. No iwi representatives submitted on the application. The application is consistent with the above policies.

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

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

The edge of the discharge area is approximately 5 km upstream of a registered drinking-water supply that provides water to more than 501 people. The Gore District Council takes water from the Mataura River at Mataura for >501 people.

The discharge area is about 10.5 km upstream of a known unregistered water site. Dongwha Patinna Ltd takes water from the Mataura River at its plant near Mataura. The water is used for the factory and for drinking water.

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 contaminants at the drinking water abstraction point that would cause a breach of the standards.

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

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.

As the proposed take it less than 5 l/s then the regulations do not apply. However, metering will 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))

Te Tangi a Tauira

Te Tangi a Tauira is the Iwi Management Plan for Southland. The policies relevant to this application are:

Farm Effluent Management (Section 3.5.1)

Policy 2	*Ensure that Ngai Tahu ki Murihiku are provided with the opportunity to participate through pre hearing meetings or other*

	processes 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, in order to minimise adverse effects on the environment. This includes:* *(a) application rates that are specific to region and soil type;* *(b) use of low rate effluent irrigation technology;* *(c) use of appropriate irrigation technology to avoid irrigating over tile drains;* *(d) storing effluent when the soil is too wet or heavy to irrigate;* *(e) storing effluent when heavy pugging of stock ha occurred;* *(f) sealed storage ponds to avoid leaching of nutrients to groundwater;* *(g) avoiding ponding of effluent on paddocks;* *(h) monitoring of soils and groundwater;* *(i) developing contingency plans*
Policy 9	*Require that farm management plans include the location and extent of tile drains on the farm... [policy abbreviated].*
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	*Require the establishment of appropriate buffer zones between discharge activities and waterways. The size of buffer zones should reflect local geography [policy abbreviated].*
Policy 14	*Require the establishment of buffer zones of at least 100m between discharge activities and bores.*
Policy 15	*All spray drift, as a product of spray irrigation of effluent, must be managed and contained within the boundaries of the consent area.*
Policy 17	*Advocate for duration not exceeding 25 years for discharge of farm effluent to land consent applications, with opportunities for review within that time. The duration of consents must reflect potential risk to soil and water.*

The application is consistent with Policy 2. Te Tangi a Tauira, and the views of Te Rūnanga o Ngai Tahu and Te Ao Marama Inc. (representatives of the four rūnanga) have been taken into account in assessing the application. Te Ao Marama Inc. and Te Rūnanga o Ngai Tahu were both served copies of the application during the notification process of the application.

Neither of these parties submitted on the application. Papatipu rūnanga have had the opportunity to effectively undertake their kaitiaki responsibilities in freshwater and land management.

Good practice methods for the application of effluent have been proposed by the Applicant. These are consistent with Policy 8. The application has also based the proposed effluent application rate and depth on the soil types present on the property. Therefore, the application is consistent with Policies 4 and 7.

The Applicant states that ponding and surface run off of effluent and subsequent contamination of surface water bodies will be avoided through the use of a low rate system. The application also outlines that the closest Environment Southland Soil Moisture monitoring site will be used to inform the soil water deficit on farm, although the site has not been named. The Applicant will also use a high rate system and has not discussed if this method will also avoid ponding and run off. I consider that the application is largely consistent with Policy 11.

The application is consistent with Policy 14, as the Applicant is proposing to adhere to a buffer of 100 metres between any water abstraction point and the disposal area. It is also consistent with Policy 13 with buffers of 20 metres proposed between the disposal area and any waterways. The proposed buffer distances from property boundaries also align with the intent of Policy 15.

The farm map provided indicates the presence of tile drains and that there are no known tile drains within the discharge area.

Water Quality (Section 3.5.13)

Policy 4	*Avoid compromising water quality as a result of water abstraction.*
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 7	*When assessing the effects of an activity on water quality, where the water source is in a degraded state, the effects should be measured against the condition that the water should be, and not the existing condition of the water source.*

The groundwater abstraction and use is a medium scale activity, in an aquifer that is well within allocation limits and at a rate that is reasonable for the intended use. Therefore it is consistent with Policy 4.

The effluent will be discharged to land and the Applicant has outlined that the discharge to land rather than to water will minimise adverse effects on water quality.

I cannot determine if the application is contrary to Policy 6 as the actual effects of the discharge on groundwater are unknown at this stage. Groundwater quality monitoring suggests that the dairy operation is having adverse effects on groundwater quality due to

high nitrates, however it has not yet been determined if this effect is from the discharge of effluent to land.

Water Quantity - Abstractions (Section 3.5.14)

Policy 1	*Adopt the precautionary principle when making decisions on water abstraction resource consent applications, with respect to the nature and extent of knowledge and understanding of the resource.*
Policy 4	*In the Southland Plains region, the preference of Ngai Tahu ki Murihiku is for water takes from bores, as opposed to surface water abstractions.*
Policy 11	*Avoid excessive drawdown of aquifer levels as a result of groundwater abstractions, and to ensure that abstractions do not compromise the recovery of groundwater levels between irrigation seasons.*
Policy 16	*Encourage the installation of appropriate measuring devices on all existing and future water abstractions, to accurately measure, report, and monitor volumes of water being abstracted, and enable better management of water resources.*
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 volumes able to be abstracted from the bores on the basis of the observed seasonable recovery of groundwater levels.*
Policy 19	*Require that Ngai Tahu are provided with the opportunity to participate though pre hearing meetings or other processes in the development of appropriate consent condition including monitoring conditions to address our concerns.*

The application is consistent with the above provisions. This is because the proposed volume is in line with best practice volumes, the water take will be metered and the taking of the water should not result in the over allocation of the groundwater zone as the zone is not facing over allocation issues.