TIAKI

FARM SOURCE SUSTAINABLE DAIRYING

FARM ENVIRONMENT PLAN

FARM SOURCE

Fonterra

Dairy for life

ABOUT YOUR FARM ENVIRONMENT PLAN

This Farm Environment Plan document is the result of a tailored farm environment planning service provided to you through Tiaki Sustainable Dairying. It's part of the advantage you get through Farm Source as a member of the Fonterra Co-Operative. The purpose of this plan is to describe the environmental conditions present on your farm and the management of these conditions. From this, mitigations to potential impacts to water quality are documented and additional mitigations maybe planned, with sensible timeframes. Underpinning this plan, are the agreed national Good Farming Practices that are supported by the agricultural and horticultural sectors. Industry bodies along with Regional Councils and Central Government have developed the Good Farming Practice: Action Plan for Water Quality 2018 in a commitment to swimmable rivers and improving the ecological health of our waterways. The Dairy Industry Strategy (Dairy Tomorrow), as well as the Good Farming Practice: Action Plan for Water Quality 2018, both align with the goal for all dairy farms to have a Farm Environment Plan by 2025. Now that this plan has been created it's the plan owner's responsibility to ensure it is put into action and kept up to date as actions are completed or conditions on farm change. Tiaki Sustainable Dairying is here to help with that implementation and ongoing management through our team of Sustainable Dairying Advisors who can be contacted via the details below.

PHONE: 0800 65 65 68

EMAIL: sustainable.dairying@fonterra.com

CONTENTS:

FARM DETAILS

FARM NAME

Arlake Ltd

SUPPLIER NUMBER

31857

PLAN OWNER

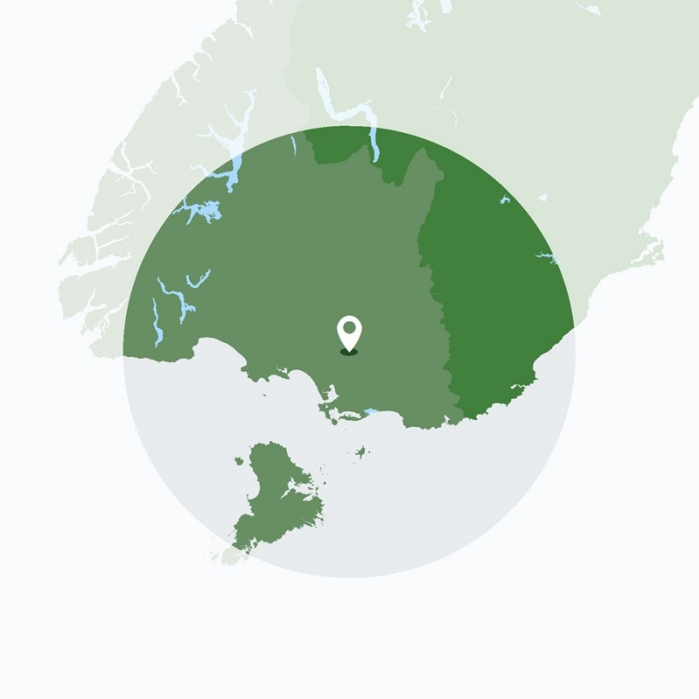
Nelson William Lindsay

+64 3 2366089
robyn@arlake.co.nz

FARM ADDRESS

135 CAPIL ROAD, GROVE BUSH, Invercargill

LOCATION



REGIONAL COUNCIL

Southland

PLAN LAST EDITED DATE

23 October 2019

POINTS OF NOTE

Gleyed - No Variant: 227.91 ha - 71.71 %. Lignite - Marine Terraces - Artificial Drainage: 1.10 ha - 0.35 %. Lignite - Marine Terraces - Artificial Drainage: 1.84 ha - 0.58 %. Lignite - Marine Terraces - Overland Flow: 0.01 ha - 0.00 %. Lignite - Marine Terraces - Overland Flow: 69.76 ha - 21.95 %. Oxidising - Overland Flow: 5.59 ha - 1.76 %. Oxidising - Overland Flow: 0.58 ha - 0.18 %. Oxidising - Overland Flow: 1.50 ha - 0.47 %. Peat Wetlands - No Variant: 9.53 ha - 3.00 %. Type:Dairy Consent,ID:AUTH-20168652-01,Expiry:2026-02-10: 0.01 ha - 0.00 %. Type:Water Permit,ID:AUTH-20168652-02,Expiry:2026-02-10: 0.01 ha - 0.00 %.

LAND PARCELS

Fee Simple, 1/1, Lot 1 Deposited Plan 12190, 439,760 m2, Fee Simple, 1/1, Section 64 Block V Mabel Hundred, 327 m2, Fee Simple, 1/1, Section 9 Block V Mabel Hundred, 289,350 m2, Fee Simple, 1/1, Section 51-52 Block V Mabel Hundred, 5,926 m2, Fee Simple, 1/1, Section 53 Block V Mabel Hundred, 5,564 m2, Fee Simple, 1/1, Part Section 14 Block V Mabel Hundred, 33,500 m2, Fee Simple, 1/1, Part Section 1 Block V Mabel Hundred, 248,705 m2, Fee Simple, 1/1, Part Section 14 Block V Mabel Hundred, 33,500 m2, Fee Simple, 1/1, Section 53 Block V Mabel Hundred, 5,564 m2, Fee Simple, 1/1, Section 17-18, Part Section 8 and Part Section 15-16 Block V Mabel Hundred, 1,392,169 m2, Fee Simple, 1/1, Part Section 1 Block V Mabel Hundred, 11,281 m2, Fee Simple,

FARM OVERVIEW MAP

The map below presents the land on which the farming operations covered in this document occur and identifies some key points of interest. More detailed maps looking at specific environmental management topics are contained throughout the document.

- Accord Defined Stock Excluded Waterway
- Accord Defined Stock Not Excluded Waterway
- Non-Accord Defined Stock Excluded Waterway
- Non-Accord Defined Stock Not Excluded Waterway
- Farm Boundary
- Compliant Crossing
- Non-Compliant Crossing
- Non-Compliant Non-Regular Crossing
- Dispensation Crossing
- Dairy Shed

SUMMARY OF OPEN ACTIONS

This table includes all open or ongoing actions that have been agreed as part of this Farm Environment Plan. They are organized by their target due date. Where an action has been identified as especially important an additional (Flag) icon may have been added.

CATEGORY	FEATURE TYPE & NAME	ACTION REQUIRED	TARGET DATE
F3	Infrastructure, storage, waste Overview	Relocate/Retire Offal Hole	**31 Oct 20**
L7	Race Maintenance & Management	Recamber Lanes Away From Waterways	**31 Oct 20**
W3	Crossing - Crossing	Repair Crossing (Paddock 40 & 41)	**31 Oct 20**
W6	Artificial or Tile Drainage	Map Tile Drains	**31 Oct 20**
N2	Nutrient Budget	Reduce Amount of K Fertilsier	**31 Oct 20**
N2	Nutrient Budget	Differentiate Fertiliser Applications	**31 Oct 20**
W2	Riparian Management Unit - Riparian Planting Zone	Riparian Planting	**31 Oct 21**
F1	Farm Overview	Ensure Accurate and Auditable Records are Kept	**Ongoing**
L2	Southland Physiographic Zone - Gleyed Physiographic Zone	Tile Drain Treatment	**Ongoing**
L2	Southland Physiographic Zone - Gleyed Physiographic Zone	Minimise Autumn Fertiliser Applications	**Ongoing**
L4	Southland Physiographic Zone - Oxidising (Overland Flow Variant)	Oxidising Zone - Minimise Grazing	**Ongoing**
L4	Southland Physiographic Zone - Oxidising (Overland Flow Variant)	Minimise Autumn Fertiliser Use	**Ongoing**
L8	Overland Flow Path - Critical Source Areas - Overland Flow	Extend Riparian Margins (CSA Overland Flow)	**Ongoing**
I1	Irrigation Overview	Update Farm Environment Plan	**Ongoing**
E4	Effluent Irrigation	Soil Moisture Monitoring	**Ongoing**
W4	Waterway Type - Wetland Area/Native Forest	Wetland Area Weed Control	**Ongoing**

W5	Riparian Management Unit - Forestry	Manage tree harvesting risks	**Ongoing**
W6	Artificial or Tile Drainage	Investigate Tile Drain Treatment Methods	**Ongoing**
N1	Nutrient Overview	Assess Pasture Requirements Before Applying N Fert	**Ongoing**

FARM MANAGEMENT

- F1 Farm Overview
- F2 Water Use Overview
- F3 Infrastructure, storage, waste Overview
- F4 Resource Consents
- F5 Key Feature - Bore
- F6 Key Feature - Bore
- F7 Key Feature - Fuel
- F8 Key Feature - Chemical Storage
- F9 Key Feature - Water Storage Tanks and Water Meter
- F10 Key Feature - Dairy Shed
- F11 Key Feature - Offal Pit
- F12 Key Feature - Disused Calving Shed
- F13 Key Feature - Hay Storage
- F14 Key Feature - Wintering Barn

F15 Key Feature - Silage Storage

F16 Key Feature - Irrigation Pond

FARM MANAGEMENT

F1 Farm Overview

DESCRIPTION:

Arlake Limited operate a 292 ha (285 ha effective) farming operation at Grove Bush. Approximately 850 cows (peak) are milked on the property through a 64 bale rotary dairy shed. The shed is equipped with an in shed feeding system, cup removers, Protrac and the ink up teat spray system.

Wintering is also done on farm in the 700 bale wintering barn where the cows are housed from April - October. Hours spent in the wintering barn vary over this period with the wintering barn being utilised during bad weather events

The farm is predominately located within the Hedgehope Stream catchment with a small area to the east located in the Gold Creek catchment and a small area to the south located in the Makarewa River catchment. The majority of the farm overlies the Gleyed Physiographic Zone with the remaining area located in the Oxidising & Lignite-Marine Terrace Physiographic Zones. The topography of the farm is generally flat with sections of hillcountry.

The farm the farm is currently owned by Capil Grove and leased back to Arlake Limited, Carl Lindsay is responsible for the day to day running of the farm.

Good Farming Practice:	Identify a farms environmental characteristics and plan for their management Practices: * The physical and biophysical characteristics of the farm system are identified, risk factors to water quality associated with the farm system have been assessed and are managed appropriately

IMAGES:

OPEN ACTIONS:

Ensure Accurate and Auditable Records are Kept

The maintenance of accurate and auditable records of farm inputs, outputs and management practices needs to occur. This is particularly important for supplementary feed, fertiliser use and location of spreading and stock numbers. Without this data an accurate picture of the farms environmental and economic performance cannot be obtained.

TARGET DATE: **Ongoing**

FARM MANAGEMENT

F2 Water Use Overview

IMPACT OF CONTAMINATION  +  LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

DESCRIPTION:

Dairy shed water is taken from bores E46/0673 and E46/0672, which are both located in the paddock to the right of the dairy shed. Up to 102 cubic metres of groundwater per day is able to be abstracted from these bores. Surface water is also abstracted from an un-named tributary of the Hedgehope Stream. This water is used to supplement water for the diary operation as well as for pasture irrigation. Up to 259.2 cubic meters surface water per day can be abstracted for use on the dairy farm or for pasture irrigation.

The bores used for dairy shed and stock water abstraction are not able to be accessed by stock, the top of the casings are above ground level and the outdoor bores are capped to prevent contamination. The surface water intake is also equipped with a fish screen.

A water meter is installed beside the water storage tanks (4 x 30,000L) and records all water abstracted from the two bores for the operation of the dairy shed and stock drinking water. The data recorded is sent to the Regional Council annually. An additional data logger is installed at the surface water intake which records all water abstracted and is sent directly to Regional Council. The meters were installed by Waterforce who will need to verify the accuracy of the water meters annually and complete the water measuring device verification.

Water use on the farm is generally efficient with yard hosing kept to a minimum. Water troughs are checked daily for leaks where stock are grazing.

The use of greenwash could be incorporated into the system to further improve water use efficiency.

Good Farming Practice:

Water use for the dairy shed and stock water is efficient

Practices:
* All water use on farm is measured (water meters)
* Water wastage is minimised from the dairy shed
* All leaks are fixed as soon as possible
* Water troughs are checked daily where animals are grazing

Evidence:
* Water meter and telemetry records

IMAGES:

OPEN ACTIONS:

NO ACTION REQUIRED

FARM MANAGEMENT

F3 Infrastructure, storage, waste Overview

IMPACT OF CONTAMINATION  +  LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

DESCRIPTION:

Household and farm rubbish is collected and removed off farm by Southern Skips. The households are active recyclers. Everything on farm that can be recycled is recycled. Dead stock are picked up by Wallace Group and all calves are picked by Slinkskins. There is an offal hole on farm that is only used for anything that cannot be picked up. Items which are able to be burned such as untreated wood and greenery are burnt on farm.

There are two permanent concrete silage storage pits. The stacks are covered and sealed to prevent rotting and water is diverted away from the storage facility. The pits are sealed and leachate contained and irrigated to land as a permitted activity under Rule 41 of the proposed Southland Water and Land Plan. One of the stacks was overfilled and a dirt bund was utilised to ensure that leachate was contained on the concrete pad.

There was one temporary silage storage pit located on the property. This was due to the farm being destocked due to M.Bovis. Subsequently there was surplus pasture and MPI made it into silage and stored it in a temporary silage stack.

Silage covers are re-used with the main cover being used as the side cover for the following year and then subsequently being recycled.

There is a covered single stall wintering barn with a concrete floor, feed lane and auto scrapers. The barn has 700 individual stalls but the wintering barn is able to house 850 cows during bad weather events by putting rubber mats in the holding yard.

Small amounts of fertiliser are stored on farm so that the tractor can spread fertiliser following the cows via a 3 point linkage spreader. All fertiliser is stored in a shed well away from surface water. The rest of the fertiliser is brought onto farm by Scullys as the spreading contractor when required.

Agrichemicals are stored securely in a Hazchem marked shed. The shed is kept locked and empty chemical containers are triple rinsed and stored for recycling.

Fuel tanks are located beside the old woolshed/implement shed and are elevated with no signs of significant leakage or spillage around them. There is a 1000 L petrol tank and a 3000 L diesel tank.

Significant infrastructure on the farm includes the dairy shed, calf shed, wintering barn, three houses, the effluent system and implement and storage sheds. The houses and the dairy shed all have old style septic tank systems.

Status:

Good Farming Practice:

Store, transport and distribute feed with minimal wastage, leachate and soil damage and leaching

Practices:
* Feed storage areas are located away from waterways
* Silage and other feeds are stored on hardsealed areas and leachate is collected
* Overland flow and rain water are diverted away from feed storage areas
* Silage is sufficiently wilted before being put into stack
* Silage remains sealed while stored to prevent rotting
* Permanent feed-out areas / facilities are sealed and effluent is collected

Good Farming Practice:

Farm waste is minimised and managed properly

Practices:
* Waste is recycled where possible
* Waste is contained and removed from farm where feasible
* Dead animals are sent off farm for processing or correctly disposed on-farm
* On-farm waste pits are small, away from waterways, and above the water table
* Pests are controlled

IMAGES:

OPEN ACTIONS:

Relocate/Retire Offal Hole
The offal hole is required to be located a minimum of 100 metres from the property boundary. Either relocate/retire the offal hole or apply for resource consent.
TARGET DATE: 31 Oct 2020

F4 Resource Consents

DESCRIPTION:

The dairy farm holds three current resource consents to discharge diary effluent to land, abstract ground water for the purpose of shed wash down and stock water and to abstract surface water for the purposes of dairy farm supply and pasture irrigation. A copy of the consents are attached in Appendix 1. All consents expire on 10 February 2026.

Surfacewater Permit Number:	AUTH-20181227
Groundwater Permit Number:	AUTH-20168652-02-V1
Maximum Effluent Application Depth Category A Land:	25 mm
Water abstraction rate:	3
Appendix Document:	Appendix 1
Maximum Effluent Application Depth Category C Land:	10 mm
Water abstraction rate groundwater permit:	102,000 Litres/Day
Max Nitrogen Loading Rate:	150 kg/N/ha/yr
Water abstraction rate surface water permit:	259,200 Litres/Daylitres
Max Cow numbers:	850
Discharge Permit Number:	AUTH-20168652-01

OPEN ACTIONS:

NO ACTION REQUIRED

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LAND MANAGEMENT

L1 Land & Soil Overview

DESCRIPTION:

The topography of the farm is a split between flat and hill country with some gullies that slope down to waterways on the property or follow the natural contours of the land.

The farm sits predominately within the Gleyed Physiographic Zone (No Variant) with a smaller area within the Oxidising & Lignite/Marine Terraces Physiographic Zones (Overland Flow Variant). There is also a small part of the farm located on the Peat Wetlands Physiographic Zone, this area is fenced off with stock excluded. The key risk to water quality on the farm is contaminant loss to surface water via artificial (tile) drains and overland flow.

Soils on the farm are predominately Braxton, Makarewa (poorly drained) and Pebbly Hills soils (well drained). A smaller part of the farm is made up of Ontanomomo soils (very poorly drained).

Pugging and soil compaction is minimised by utilising the wintering barn when conditions are wet. Supplements are also fed in the wintering barn. Wintering is undertaken in the barn where the cows are housed from April - October. Hours spent in the wintering barn vary over the shoulders of the season with the barn being utilised during bad weather events.

Waterways are permanently fenced with a riparian strip on each side. These strips are dominated by rank grass and act as filters for overland flow of surrounding paddocks. These areas could benefit from riparian planting in future.

Lanes are generally in good condition and are well maintained. There are a number of shelter belts that have been planted across the farm to protect stock from adverse weather conditions. These are well established and maintained. There is also a significant area of native bush located on farm.

Good Farming Practice:	Minimise losses of sediment and nutrient to water, and maintain soil structure Practices: * Pugging and compaction of soils is avoided * Supplement feed-out areas are located away from waterways * Riparian margins or buffer strips are left beside waterways and other areas where sediment and nutrients may flow such as gullies or swales.
Good Farming Practice:	Manage grazing to minimise nutrient loss from risk areas Practices: * If paddocks near waterways are used during wet periods, a buffer strip beside the waterway is fenced off * More feed is offered in cold conditions when demand is high and utilization low

OPEN ACTIONS:

NO ACTION REQUIRED

LAND MANAGEMENT

L2

Southland Physiographic Zone

Gleyed Physiographic Zone

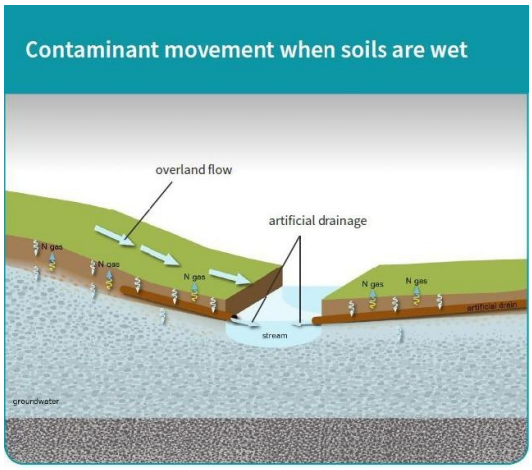
IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = HIGH RISK RATING

DESCRIPTION:

Soils may accumulate and store nitrogen during summer and early autumn when soil moisture levels are low. Accumulated nitrogen starts moving with water when soils become wet in late autumn and winter and may be lost via artificial drains or overland flow on sloping topography. Normally some nitrogen will be removed from the soil and aquifers via denitrification (lost as nitrogen gas), resulting in relatively low groundwater nitrate concentrations, however detailed studies for Waituna show soils on the farm only have a low to moderate ability to remove nitrogen with the underlying geology/aquifer having a low ability to remove nitrogen. On this basis both shallow groundwater and water transported via tile drains is likely to contain higher level of nitrogen. Recent science shows there is a low risk of sediment, phosphorus and microbial loss to water on the property.

Key contaminant pathway: Artificial Drainage

IMAGES:



OPEN ACTIONS:

Tile Drain Treatment

See Artificial Drainage Section under Waterways Management. Applies to Gleyed Zones where tile drains are installed.

TARGET DATE: Ongoing

Minimise Autumn Fertiliser Applications

To prevent the build-up of nitrogen in the soil during autumn, when it is more prone to be leached during winter drainage events, the application of autumn nitrogen fertiliser and effluent should be minimised.

TARGET DATE: Ongoing

LAND MANAGEMENT

L3

Southland Physiographic Zone

Lignite/Marine Terraces

IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = MEDIUM RISK RATING

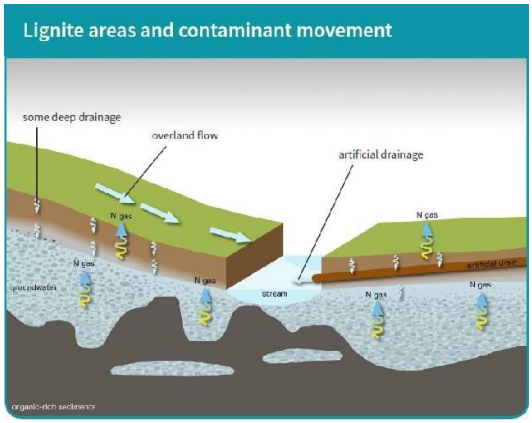
DESCRIPTION:

The Lignite Marine Terraces zone is dominated by areas where organic-rich sediment occurs at or near the land surface these sediment are largely comprises of lignite or coal in inland areas and marine sediments along the South Coast. Groundwater that is in close proximity to organic carbon sediments (i.e. coal) has a high ability to remove nitrate. Most contaminant loss occurs in this zone when soils are wet. Where land is sloping, water flows across the land via overland flow to nearby streams following heavy rainfall. In flatter areas streams receive contaminants from artificial drains. Generally nitrate leaching to groundwater is less of an issue for this zone due to the denitrification potential of the underlying aquifers. The aquifers in this zone generally have minimal connection to main river systems resulting in the slow movement of groundwater through the aquifer.

Physiographic Zone: Lignite-Marine Terraces

Key contaminant pathway: Overland Flow

IMAGES:



OPEN ACTIONS:

NO ACTION REQUIRED

L4

Southland Physiographic Zone

Oxidising (Overland Flow Variant)

DESCRIPTION:

The overland flow variant of this Physiographic Zone is predominately found on the property on the hill areas of the property.

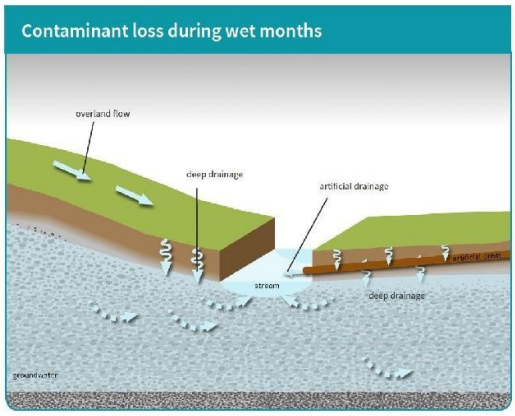
The Oxidising Zone is characterised by soil water and groundwater that contains high levels of oxygen, which allows nitrogen to accumulate.

Oxidised soils can be very good at absorbing and storing water and any nitrogen it contains. During drier months, nitrogen is able to accumulate in soil to high levels. During winter when soils are wet, any nitrogen not used by plants leaches down into the underlying aquifer or into nearby streams via overland flow.

Key contaminant pathway: Overland Flow

Physiographic Zone: Oxidising

IMAGES:



OPEN ACTIONS:

Oxidising Zone - Minimise Grazing

In order to prevent the build-up of nitrogen in the soil during late autumn and winter when it is more prone to being leached during winter drainage events, grazing of paddocks in the Oxidising Physiographic Zone should be minimised.

TARGET DATE: Ongoing

Minimise Autumn Fertiliser Use

To prevent the build-up of nitrogen in the soil during autumn when it is prone to be leached during winter drainage events the application of nitrogen fertiliser and effluent should be minimised where possible.

TARGET DATE: Ongoing

LAND MANAGEMENT

L5

Southland Physiographic Zone

Peat Wetlands Physiographic Zone

IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

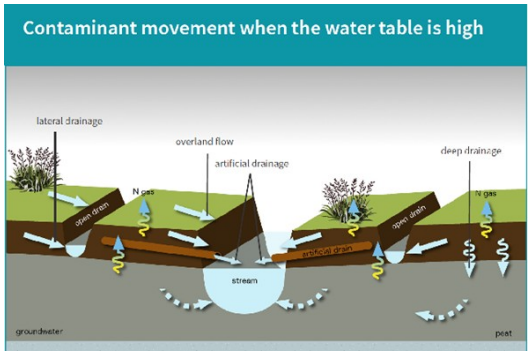
DESCRIPTION:

The Peat Wetlands Physiographic Zone makes up a small amount of the property and is completely fenced off with stock excluded. It is formed from rotted remains of wetland plants where there is a naturally high water table above a poorly permeable rock. Peat soils are extremely acidic and have high levels of organic matter. Drainage is required to lower the water table to support agriculture as a land use. Phosphorus loss is high as its poorly retained and leaches easily through the soils. Contaminant loss through artificial drainage occurs in high rainfall or when the water table is near the surface.

Physiographic Zone: Peat Wetlands

Key contaminant pathway: Artificial Drainage

IMAGES:



OPEN ACTIONS:

NO ACTION REQUIRED

L6 Soil

DESCRIPTION:

The farm is dominated by Makarewa, Braxton and Pebbly Hills Soils with a smaller section of Ontanomomo soils.

Makarewa soils are formed from fine alluvium from a range of sources and are moderately deep, poorly drained soils. These soils have silty clay textures and are typically stone free. Like Pukemutu and Braxton soils care needs to be taken to prevent waterlogging and compaction after prolonged wet periods. Makarewa soils are not prone to nutrient leaching but are extensively tile drained, which increases their vulnerability to contaminant loss to nearby waterways.

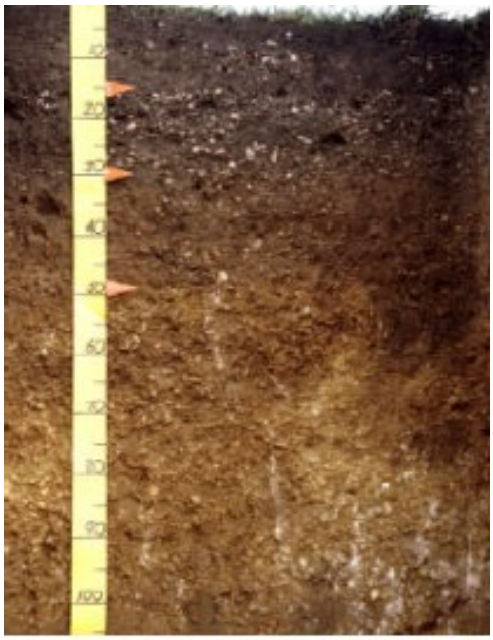
Braxton soils are moderately deep, poorly drained and have a silty clay to heavy silt loam texture. Due to the slow subsoil permeability and poor drainage these soils only have a slight vulnerability to nutrient leaching when they are well wetted, however they are often artificially drained and prone to cracking during dry conditions. This significantly increases their vulnerability to nutrient losses to nearby surface water and to underlying groundwater.

Pebbly Hills soils have a slightly deep rooting depth and moderate plant available water. Due to the well drained nature of the soils, there is a severe risk of nutrient leaching.

Ontanomomo soils are peat soils formed in weakly to moderate decomposed organic material. These soils have very poor drainage and are extremely acidic.

Appendix Document: Appendix 2 -Soil Map

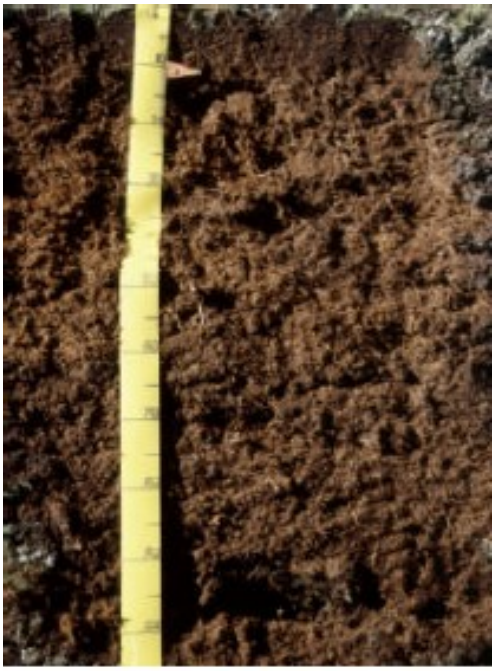
IMAGES:



Pebbly Hills profile

Braxton profile

Makarewa profile



Otanomomo profile

OPEN ACTIONS:

NO ACTION REQUIRED

L7 Race Maintenance & Management

IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

DESCRIPTION:

The dairy lanes over the farm are generally wide enough to facilitate good cow flow with a solid base and good surface incorporating an appropriate crown and camber. The lanes are regularly maintained and there were no significant issues noted with poor lane quality. Quality lanes allow for good stock flow, reducing lameness issues and the build-up of effluent on the lane surface and adjacent paddocks.

There are two sections of lane that run adjacent to waterways. These should be recambered to direct contaminants away from the waterway and a wide riparian buffer maintained.

General condition: Good

Maintenance: Regular

IMAGES:

OPEN ACTIONS:

Recamber Lanes Away From Waterways

Re camber the lanes so that effluent is directed away from the waterways. This can be done when maintenance is undertaken.

TARGET DATE: 31 Oct 2020

L8

Overland Flow Path

Critical Source Areas - Overland Flow

DESCRIPTION:

There are a number of small gullies and depressions on the farm that during heavy rain will result in a concentration of water and associated contaminants (sediment, phosphorus and bacteria) from surrounding paddocks being discharged into nearby surface waterways. The photos below show examples of such gullies/depressions (albeit they are difficult to see in the photos). Most of these gullies also have tile drains located under them and thus tile drain treatment options can also be investigated in these areas (where tile drains are significant). Where depressions flow through productive land the riparian margins can be extended where these gullies enter surface waterways, as per the diagram below. This will assist in filtering overland flow from surrounding paddocks.

IMAGES:

OPEN ACTIONS:

Extend Riparian Margins (CSA Overland Flow)

Extend the riparian margins where overland flow Critical Source Areas (CSAs) enter surface waterways. This creates a larger filtering area for run-off. Maintain these areas in rank grass or plant in grass species such as red tussock or carex secta.

TARGET DATE: Ongoing

IRRIGATION MANAGEMENT

I1 Irrigation Overview

I1 Irrigation Overview

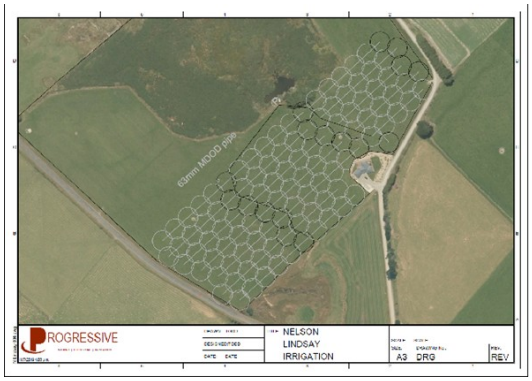
DESCRIPTION:

The property currently has resource consent for a small amount of pasture irrigation. There is currently no fresh water pasture irrigation undertaken on farm. There is currently a plan for the installation of an irrigation system located below the main farm house.

There is also an application in with Environment Southland to apply for another surface water take consent to irrigate sections of the farm. This section of the Farm Environment Plan will need to be updated once this consent has been granted and the installation of the irrigation system.

There is currently a 20 million litre irrigation pond being constructed on farm.

IMAGES:



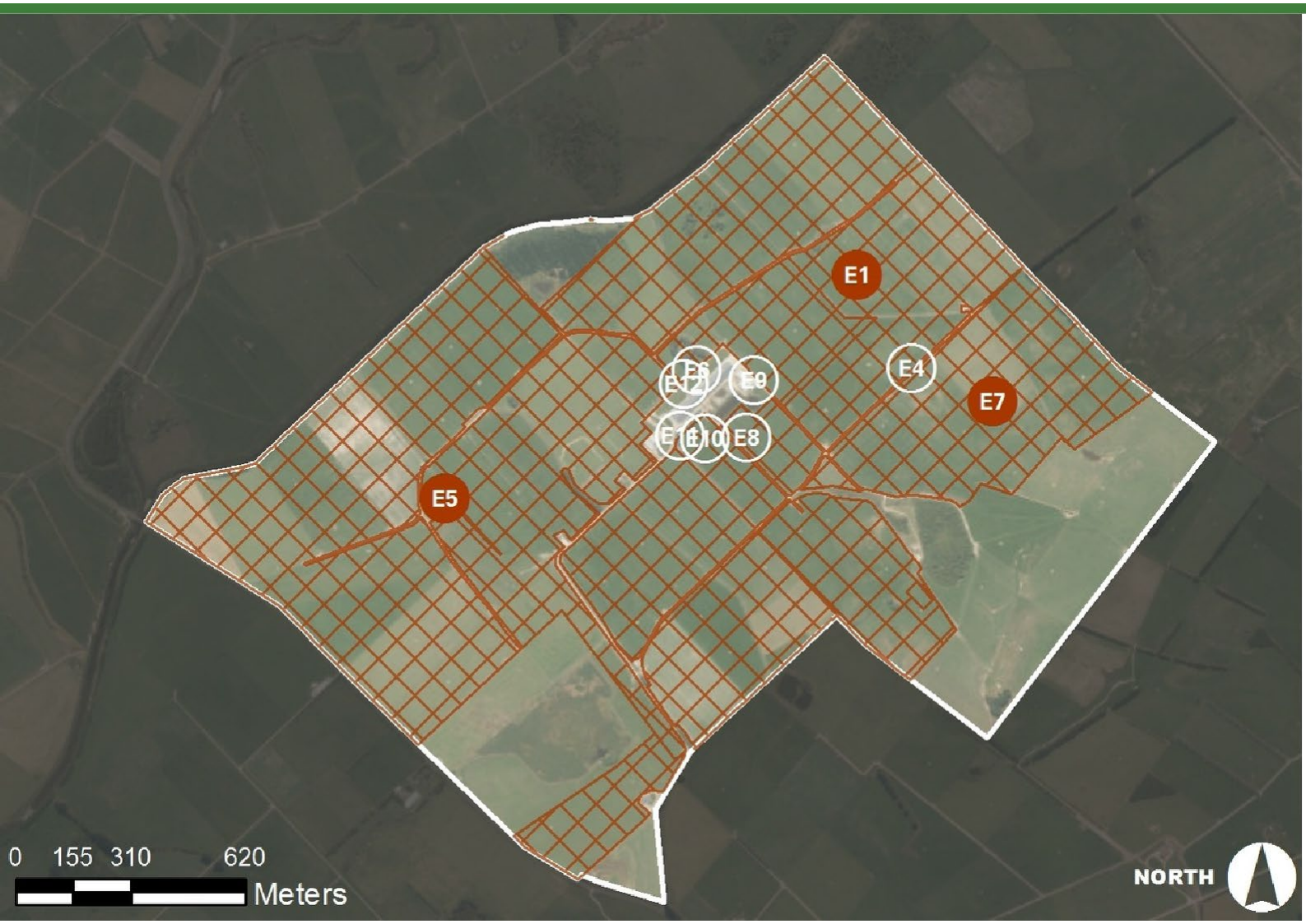
OPEN ACTIONS:

Update Farm Environment Plan

Please inform us when the consent application has been granted and the irrigation system installed so that the Farm Environment Plan can be updated.

TARGET DATE: Ongoing

EFFLUENT MANAGEMENT



- E1 Key Feature
- E2 Effluent Overview
- E3 Effluent Storage
- E4 Effluent Irrigation
- E5 Key Feature - Wintering Barn Effluent
- E6 Key Feature - Wintering Barn & Solid Scrapings Pond
- E7 Key Feature - Farm Dairy Effluent
- E8 Key Feature - Effluent Storage Pond 1
- E9 Key Feature - Effluent Storage Pond 2
- E10 Key Feature - Sandtrap
- E11 Key Feature - Solids Storage Bunker
- E12 Key Feature - Weeping wall

EFFLUENT MANAGEMENT

E2 Effluent Overview

IMPACT OF CONTAMINATION  +  LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

DESCRIPTION:

Effluent generated from the dairy shed and tanker pad/vat stand is washed down/scraped into the yard and shed sumps and subsequently into a larger transfer sump located at the southern entry of the wintering barn. Effluent from the transfer sump then flows through to the weeping wall to effluent pond 1 (3,982m3) which can either be pumped to the irrigator or directed to effluent pond 2 (3,982 m3). Effluent from effluent pond 2 is then gravity fed back to effluent pond 1 where it can be irrigated to pasture.

The wintering barn is automatically scraped to a strip drain that runs down the middle of the wintering barn which then flows into the wintering barn and solids scrapings pond (5,585m3). This is then emptied via slurry tanker which is located on farm.

The silage storage pits are underlain with drains throughout which drain to the main leachate sump located at the north eastern end of the wintering barn. Leachate is the spread to land under Rule 31 of the pSWLP as a permitted activity. There are also drains located on the walls of the silage pit that divert fresh water off the covers of the silage stack.

The farms effluent pond size has been assessed using dairy effluent storage calculator and is well in excess of the size required to avoid effluent having to be applied when conditions are unsuitable. The pond was constructed by an accredited effluent designer and is sealed with an HDPE liner. It is not equipped with a leak detection system.

Staff are trained on the use of the farms irrigation system and undertake regular maintenance. The application rate test has been carried out to ensure the irrigation system is operating correctly (appendix 4). An effluent management plan was also completed and has been supplied to council (appendix 5).

Effluent applications are only carried out when conditions are suitable although scheduling could be improved via on farm soil moisture monitoring and continuing to use data from Environment Southlands soil moisture site at Woodlands.

The effluent area is sufficiently sized to remove any risk of potassium overloading with potassium and phosphorus fertiliser applications adjusted to reflect the effluent irrigation area and the nutrient status of different paddocks. Nitrogen fertiliser is reduced on the effluent block to reflect the nitrogen supplied from dairy effluent.

The locations where effluent can be applied are shown on the farms resource consent and the map in this Farm Environment Plan. Staff are aware of the farms resource consent and the general conditions of that consent.

Good Farming Practice:	Spreading equipment is well maintained and calibrated Practices: * Effluent irrigator/spreading equipment is calibrated * Effluent equipment is inspected and maintained regularly * Effluent pumping equipment is routinely serviced Evidence: * Effluent calibration results - bucket test
Good Farming Practice:	Effluent system meets code of practice Practices: * Effluent is collected from all sources: dairy sheds, yards, feeds pads, underpasses * The system design is appropriate for the soil type, topography, and climate * New systems: accredited designer has been used

Good Farming Practice: Sufficient suitable storage available

Practices:
* Dairy Effluent Storage calculator has been used to work out storage needs
* New storage built, has been by an accredited effluent designer
* Effluent is applied whenever possible to keep storage low
* Storage facilities are sealed
* Effluent solids that accumulate are routinely removed
* Safety barriers, equipment and signage are in place

Good Farming Practice: All effluent systems

Practices:
* Effluent consent conditions and regional rules are understood and complied with
* An effluent management plan is in place
* All effluent applications are recorded
* Staff are trained on how to operate and maintain the effluent system

IMAGES:

OPEN ACTIONS:

NO ACTION REQUIRED

E3 Effluent Storage

IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

DESCRIPTION:

There are multiple effluent storage ponds located on the property. Effluent pond 1 (3,982m3) can either be pumped to the irrigator or directed to effluent pond 2 (3,982 m3). Effluent from effluent pond 2 is then gravity fed back to effluent pond 1 where it can be irrigated to pasture.

The wintering barn is automatically scraped to a strip drain that runs down the middle of the wintering barn which then flows into the wintering barn and solids scrapings pond (5,585m3). This is then emptied via slurry tanker which is located on farm.

The farms effluent pond size has been assessed using dairy effluent storage calculator and is well in excess of the size required to avoid effluent having to be applied when conditions are unsuitable. The pond was constructed by an accredited effluent designer and is sealed with an HDPE liner. It is not equipped with a leak detection system.

The pond is fenced to prevent unauthorised access and the pump pontoon can be used to get out of the pond in the event of an accidental fall.

Dairy effluent storage calculator:	Yes
Solids management:	Spread immediately
Pond lining:	lined
Stormwater diversion:	Yes

IMAGES:

OPEN ACTIONS:

NO ACTION REQUIRED

EFFLUENT MANAGEMENT

E4 Effluent Irrigation

IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

DESCRIPTION:

Effluent can be applied over a consented area of 253 ha, which is shown on the Effluent Management Map at the beginning of this section. The effluent irrigation area is split into FDE risk profiles into category A & C land categories. Effluent irrigation methods reflect the different soil risks with the slurry tanker being utilised on the category A land and low rate irrigation utilised on the category C land.

Effluent is spread to category C land via a set of 5 K-line-Max70 pods. The pods are fitted with an electronic failsafe to automatically shut down the pump if there is a sudden pressure drop or increase. The application rate of these pods were tested and are applying at an average rate of 4.8 mm per hour putting out 19.44 m3 of effluent per hour in total over the 5 pods.(appendix 3)

Effluent is also spread to category A land via a slurry tanker where it is spread at a low depth and is actively monitored by the tractor operator.

The soil moisture data is used from the nearby Woodlands soil moisture site to assist with irrigation scheduling.

Irrigation Method:	Low Rate Pods
Irrigation method:	Slurry wagon
Application Depth (Category A):	25 mm depth, 10 mm rate
Application depth testing:	Yes annually
Application Depth (Category C):	10 mm depth, 10 mm rate

IMAGES:

OPEN ACTIONS:

Soil Moisture Monitoring

On farm soil moisture monitoring (i.e. Regen) is the best way to ensure soil moisture conditions are suitable for applying effluent and provide valuable data on available irrigation days to assist with future consent applications and irrigation best practice. In the absence of on farm data the nearest Environment Southland Soil moisture site can be used as a guide (Woodlands).

TARGET DATE: Ongoing

WATERWAYS & BIODIVERSITY MANAGEMENT

- W1 Waterways & Biodiversity Overview
- W2 Riparian Management Unit - Riparian Planting Zone
- W3 Crossing - Crossing
- W4 Waterway Type - Wetland Area/Native Forest
- W5 Riparian Management Unit - Forestry
- W6 Artificial or Tile Drainage

- Accord Defined Stock Excluded Waterway
- Accord Defined Stock Not Excluded Waterway
- Non-Accord Defined Stock Excluded Waterway
- Non-Accord Defined Stock Not Excluded Waterway
- Compliant Crossing
- Non-Compliant Crossing
- Non-Compliant Non-Regular Crossing

Dispensation Crossing

W1 Waterways & Biodiversity Overview

DESCRIPTION:

There are three main waterways on the property as well as a number of smaller streams and drains. These are all tributaries of the Hedgehope Stream. All the waterways are permanently fenced to exclude stock. Riparian margins vary between 1-5 metres with the average margins of approximately 3m. There are also three duck ponds located on the property, all of these areas have undergone some native planting but could benefit from more to improve native habitat and biodiversity.

The riparian margins across the dairy farm are maintained in a mix of rank grass and native and exotic vegetation. There are numerous areas across the farm where additional riparian planting could be carried out or wetland areas enhanced. A riparian management plan can be produced to assist in developing a more tailored planting plan for these areas.

All stock crossings over waterways on the farm are culverted and in good condition (except one area that needs attention). Lanes have not generally been established alongside waterways reducing the risk of run-off flowing into waterways. Generally, water is directed off lanes into paddocks at regular intervals and the lanes are in good condition (See Land Management Section).

There are a number of significant areas of biodiversity on the farm including the wetland areas, duck ponds, planted riparian margins, native forest area to as well as a block of pine tree.

Good Farming Practice:	Stock are excluded from waterways Practices: * All permanently flowing waterways (including wetlands) are fenced * All regular stock crossings are bridged or culverted * Drains are well managed
Good Farming Practice:	Tracks, feed areas, gateways and troughs are located away from waterways Practices: * Tracks are located away from waterways where practical * Supplement is fed out away from waterways * Water troughs are located away from waterways in a dry area of paddocks * Gateways are in a dry point and are wide enough for good cow flow to reduce pugging
Good Farming Practice:	Areas of native plants or significant biodiversity are protected Practices: * Areas are identified on the farm map * Stock are fenced out of the area * Weeds are controlled within the area * Animal pests are trapped or poisoned
Good Farming Practice:	Identify areas where runoff may occur and manage to avoid runoff entering waterways Practices: * Risk areas where surface runoff may enter waterways are identified * A grass buffer strip or riparian plantings have been left between waterways and fences

IMAGES:

OPEN ACTIONS:

NO ACTION REQUIRED

W2

Riparian Management Unit

Riparian Planting Zone

DESCRIPTION:

South east of the dairy shed is a tributary of the Hedgehope Stream which starts at the base of the block of native forest located on the property. This waterway is roughly 0.5 m wide and has rank grass and red tussocks planted with an array of other native plant species.

The margins could be planted in a range of lower bank plants such as Toetoe, Carex Secta and Red Tussock (1m spacing's) to complement the existing Toetoes that are already established in places.

This would provide shading of the waterway, reducing weed growth and also provide habitat for fish and other native invertebrates. An additional row of upper bank plants could be planted at 2m spacing's if space was available.

Riparian Management Plan:	Yes
Vegetation status:	Rank Grass
Waterway type:	Stream/Creek
Fencing status:	Permanently Fenced

IMAGES:

OPEN ACTIONS:

Riparian Planting

This area has been identified as a possible riparian planting area due to the existing native vegetation in places and the good riparian margins. Planting one row of lower bank plants such as carex secta, red tussock or toetoe (1m intervals) would create fish habitat and stream shading to reduce weed growth.

TARGET DATE: **31 Oct 2021**

W3

Crossing

Crossing

DESCRIPTION:

The culvert that crosses the creek between paddocks 40 and 41 has signs of erosion. This should be repaired to prevent damage to lane and the loss of sediment and nutrient off the lane into the water way below. The lane is also tapered so that all water would be directed into the creek.

Type:	Culvert
Condition:	Average
Fish Passage (Culvert):	Yes

IMAGES:

OPEN ACTIONS:

Repair Crossing (Paddock 40 & 41)

Rebuild and fill the edge of the culvert to prevent further erosion, and relocate the fence on the edge of the culvert to ensure stock access cannot further erode this edge. Build up the edge of the culvert to direct sediment run-off to riparian edge, not allowing directly flow into the waterway.

TARGET DATE: **31 Oct 2020**

W4

Waterway Type

Wetland Area/Native Forest

DESCRIPTION:

There is one section of highly modified wetland on the property that is dominated by gorse with spanish heath in the central wet area. This site was drained in the past when the property was run as a sheep farm. The drainage has now mostly dried out the peat which has allowed the gorse to dominate. Weed control and additional planting would be beneficial in this area.

There is also a very nice section of podocarp hardwood forest remnant dominated by matai and kahikatea with some rimu and areas of regenerating hardwood forest. This is a substantial area of native and exotic trees which will provide significant bird and animal habitat.

All these areas are fenced and excluded from stock

Fencing status:	Permanently Fenced
Waterway type:	Wetland,River
Flood risk:	Low
Waterway Type:	Wetland

IMAGES:

OPEN ACTIONS:

Wetland Area Weed Control
Undertake weed and pest control around wetland areas to allow native vegetation and species to re-establish. Consider infill planting some of these areas to enhance the biodiversity values and prevent weeds re-establishing.
TARGET DATE: Ongoing

W5

Riparian Management Unit

Forestry

DESCRIPTION:

There is a large block of mature pine trees which was purchase recently. This area will be harvested in the next 10 year with the aim of incorporating this land into the dairy platform.

Vegetation status: Exotic

IMAGES:

OPEN ACTIONS:

Manage tree harvesting risks

When the trees are felled. ensure the forestry contractors have a comprehensive plan for managing risks of soil loss and other impacts on waterways.

TARGET DATE: Ongoing

W6 Artificial or Tile Drainage

IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = HIGH RISK RATING

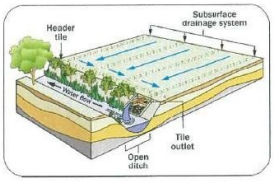
DESCRIPTION:

The farm is drained by a network of subsurface drains that allow water to be quickly transported from the land surface and subsoil to waterways on the farm. This prevents soil damage, protects pasture and allows the land to be used for intensive farming. The downside is subsurface drainage provides a rapid transport mechanism for contaminants such as sediment, E.coli and nutrients to also be transported from the land and subsoil to waterways on the farm.

Where possible, tile drains should be directed into sediment traps (ponds) prior to discharging into waterways to allow sediment and associated nutrients (phosphate) to be filtered. In addition to this, major tile drains may be able to be treated with bio-filtration in the future, whereby water passes through a carbon rich medium (such as woodchips) that houses bacteria that convert nitrate into nitrogen gas. Research on the practical implementation of these tools is currently being carried out by Dairy NZ and can be a focus for future iterations of this Farm Environment Plan.

Tile Drain Outlets Marked: No

IMAGES:



OPEN ACTIONS:

Map Tile Drains

Map all tile drians on the property. When completed please send tile drain map in to be updated.

TARGET DATE: 31 Oct 2020

Investigate Tile Drain Treatment Methods

Tile drains are a pathway for the transportation of contaminants such as sediment and nutrients to surface waterways. Where practical, consider creating sediment ponds prior to major tile drains discharging into surface water bodies or diverting tile outlets into existing ponds.

TARGET DATE: Ongoing

NUTRIENT MANAGEMENT

N1 Nutrient Overview

IMPACT OF CONTAMINATION  +  LIKELIHOOD OF CONTAMINATION = MEDIUM RISK RATING

DESCRIPTION:

The appropriate use of nutrients on the farm is determined by regular soil testing and advice from the farms fertiliser representative (Fert Wholesale Direct Ltd, Shane Harold). Random paddock testing is carried out yearly to assess Olsen P and other nutrient levels over time. Olsen P levels for all but one of the paddocks tested are within the optimum range.

Fertiliser is applied by Scullys transport who are spreadmark accredited and use proof of placement. Fertiliser applications are also made via a 3 point linkage spreader, this system is used to follow the cows. This is calibrated regularly through the use of tubs. All fertiliser is applied taking into account soil and weather conditions.

Good Farming Practice: General nutrient management

Practices:
* A nutrient budget is used to help fertiliser decision making
* Supply farm nutrient information to your milk company at the end of each season

Good Farming Practice: Fertiliser spreading equipment is well maintained and calibrated

Practices:
* Farm spreading equipment is calibrated regularly -- spreading width and volume checked
* Spreaders cleaned and greased routinely
* Paddocks are checked for paddock stripes after spreading
* Contractors are Spreadmark accredited

Good Farming Practice: Monitor and maintain P levels at the economic optimum

Practices:
* Olsen P trends continue to be monitored over successive years
* Olsen P is maintained in the optimum range
* Fertiliser applications are tailored for different management blocks

Good Farming Practice: Fertiliser application matches plant requirements and minimises losses

Practices:
* All fertiliser applications are recorded -- product, rate, date, location (If a contractor is used the information is gathered from them)
* Soil temperature and moisture levels are assessed before applying fertiliser (i.e. avoid winter months)
* Fertiliser applications are avoided: --When heavy rainfall is forecast and runoff is likely --Close to waterways
* N is applied little and often and when pasture is actively growing

OPEN ACTIONS:

Assess Pasture Requirements Before Applying N Fert
Assess pasture requirements before applying nitrogen fertiliser.
TARGET DATE: Ongoing

N2 Nutrient Budget

DESCRIPTION:

Predictive whole farm and block nutrient budgets have been prepared using Overseer FM Version 6.3.2. These are attached to this Farm Environment Plan in Appendix 5.

The nutrient budget is based on peak milking 850 cows (current), which produce 327735 kg/ms/yr. All cows are wintered on the dairy platform utilising a wintering barn.

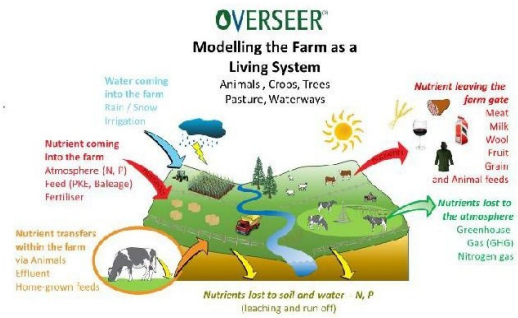
Supplements used are comprised of Palm Kernal (446T), Barley Grain (316T), Molasses (117T), Silage (1109T), Hay (25 Bales) and Barley Straw (82T). All silage is made on farm.

Maintenance fertiliser is currently being applied at rates that are in line with what is required to maintain Olsen P levels at 30 (optimum economic fertility). Generally Olsen P levels are within the optimum range (25-30).

The property averages 211 units of nitrogen per hectare per year, which is high for the modelled pasture production on farm. Fertiliser applications should be differentiate per block to reflect the nutrient value of the effluent being applied to certain blocks. No potassium fertiliser should be applied to the effluent blocks as they are currently increasing by 4 units per year. If this were to continue there is potential for animal health issues infuture.

Nitrogen Leaching: 50kg/N/ha/yr

IMAGES:



OPEN ACTIONS:

Differentiate Fertiliser Applications

The current level of nitrogen fertiliser being applied is high compared to modelled pasture production.,. Differentiate fertiliser applications between effluent and non-effluent blocks so that the nutrient value of the effluent is accounted for. Reduce nitrogen fertiliser use to better account for pasture requirements.

TARGET DATE: 31 Oct 2020

Reduce Amount of K Fertilsier

No potassium fertiliser should be applied to the effluent blocks as they are currently increasing by 4 units per year. If this were to continue there is the potential for animal health issues in future.

TARGET DATE: 31 Oct 2020

N3 Fertiliser applications

IMPACT OF CONTAMINATION + LIKELIHOOD OF CONTAMINATION = LOW RISK RATING

DESCRIPTION:

Fertiliser is spread by Scullys Transport. Who are a Spreadmark accredited company. Scullys Transport also use Tracmap which is GPS technology to spread fertiliser and have regular maintenance carried out on all spreading equipment.

A three point linkage spreader is used for maintenance fertiliser and to follow the cows. This system is regularly calibrated via performing an application rate test using tubs.

Consider utilising newer forms of spreading technology such as Fine Particle Application, these give a more accurate and uniform application of fertiliser with associated pasture growth benefits (See Appendix 5).

Exclusion Zones defined for spreading: Yes

Proof of placement/Fertliser application records: Yes

Spreadmark certified/spreader calibrated: Yes

Fertiliser Programme Planned: Yes

IMAGES:

OPEN ACTIONS:

NO ACTION REQUIRED

N4 Plantain

DESCRIPTION:

The use of an environmental plantain (i.e. Ecotain) at a 20% pasture mix can result in a large reduction in N leaching from a cow urine patch - up to 89% depending on sward blend. This provides an environmentally friendly forage solution to mitigate N leaching and also increases feed quality and/or supply during summer and autumn. Currently Plantain is being used across the farm at up to 10% of the pasture mix. This is being used purely for environmental reasons.

IMAGES:

OPEN ACTIONS:

NO ACTION REQUIRED

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THANK YOU

DISCLAIMER:

*Provision of advice in relation to effluent storage, effluent irrigation systems and the management of other environmental risk areas on farm.

The advice that Fonterra Co-operative Group Ltd (Fonterra, we, us) provides to farmers in relation to effluent storage capacity and other environmental compliance practices, including mitigation actions described in Farm Environment Plans, is based on the information and assumptions that farmers and their agents have provided to us and on our knowledge and understanding of current best practice in the industry. Fonterra does not purport to replace sound engineering or other professional advice and as such we strongly encourage farmers to seek independent expert advice before any construction, upgrades, or other change to your on farm practices. Farmers are ultimately responsible for the environmental compliance of their farm and on farm practices. Fonterra gives no warranties (express or implied) and, to the maximum extent permissible by law, excludes all liability in contract or tort (including, without limitation, liability for negligence) or otherwise in relation to the advice provided.

APPENDIX 1

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Cnr North Road and Price Street
(Private Bag 90116
DX YX20175)
Invercargill

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

Discharge Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council to **Arlake Limited, C/- Nelson Lindsay, 27 Capil Road, RD2 Invercargill 9870** from 10 February 2016.

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

Details of Permit

Purpose for which permit is granted:		To discharge dairy shed effluent, wintering barn and calving pad effluent to land for the purpose of disposing of agricultural effluent
Location	- site locality	27 Capil Road, Grove Bush
	- map reference	NZTM2000 1251058E 4866486N
	- groundwater zone	Makarewa
	- catchment	Hedgehope Stream, Makarewa River and Gold Creek
Legal description of land at the site:		Lot 1 DP 4404, Lot 1 DP 12190, Pt Section 1 Blk V Mabel HUN, Pt Section 7A Blk V Mabel HUN, Pt Section 8 Blk V Mabel HUN, Pt Section 15 Blk V Mabel HUN, Pt Section 16 Blk V Mabel HUN, Section 17 Blk V Mabel HUN, Section 9 Blk V Mabel HUN, Section 18 Blk V Mabel HUN and road reserve.
Expiry date:		**10 February 2026**

History of Changes and Transfers

- Transferred from Kapuka Farm Ltd to Arlake Ltd on 1 December 2017.
- Consent conditions varied 26 April 2018.

Conditions

1. This consent shall not be exercised until Discharge Permit 204140 is surrendered or has expired.

2.
   (a) This consent authorises the discharge of dairy shed effluent and wintering barn effluent onto land, via a land disposal system, as described in the application for resource consent dated 21 January 2016, amendment to the application dated 1 February 2016 and the application for consent variation dated 9 April 2018. The scope of the activity is described in the application,

the amendment to the application and the application for consent variation as being, amongst other things:

- the discharge to land of dairy shed effluent generated from milking of up to 850 cows up to twice per day between 1 September – 30 April;
- the discharge to land of dairy shed effluent generated from milking of up to 700 cows up to twice per day in May and August;
- the discharge to land of dairy shed effluent generated from milking of up to 500 cows twice per day between 1 June – 31 July;
- the discharge of farm dairy effluent to land via a low rate pod system, low rate travelling irrigator, slurry tanker and umbilical system to a discharge area of no more than 253 hectares as per the plan attached as Appendix 1;
- the discharge of dairy shed effluent and calving pad effluent to land; and
- the discharge to land of wintering barn effluent generated from the use of the barn.

3. The discharge authorised by this consent shall not exceed the following rates at any time:
   <u>Area A (Category A Land)</u>
   (a) For the low rate pod system and low rate travelling system, a maximum depth of application of 25 millimetres for each individual application, at an instantaneous rate not exceeding 10 millimetres per hour; and
   (b) For the umbilical system and slurry tanker A maximum depth of application of 10 millimetres for each individual application; and

   <u>Area B (Category C Land)</u>
   (c) For the low rate pod system and low rate travelling system a maximum depth of application of 10 millimetres for each individual application, at an instantaneous rate not exceeding 10 millimetres per hour; and
   (d) For the umbilical system and slurry tanker a maximum depth of application of 5 millimetres for each individual application; and
   (e) The maximum loading rate of nitrogen onto any land area as a result of the exercise of this consent shall not exceed 150 kilograms of nitrogen per hectare per year.

   The application of effluent to land shall not occur when the moisture content of the soils is at or above field capacity.

4. Prior to the exercise of this consent, the consent holder shall measure the application rate of the low rate travelling irrigator as installed to demonstrate compliance with condition 3(a) and 3(c) of this consent. The consent holder shall provide the results of the measurement to the Consent Authority within 10 working days of the measurement being completed.

5. Effluent shall not be discharged within:
   (a) 20 metres of any surface watercourse;
   (b) 100 metres of any water abstraction point;
   (c) 200 metres of any residential dwelling other than residential dwellings on the subject property; and
   (d) 20 metres from any property boundaries.

   Where there is inconsistency between the plan attached as Appendix 1 and the conditions of this consent, the conditions of this consent shall prevail.

6. The consent holder shall have and maintain between 16,089 cubic metres and 18,597 cubic metres of effluent storage capacity for the purpose of avoiding irrigation of effluent when soils are at or above field capacity.

7. Within six months of the first exercise of this consent, the consent holder shall demonstrate whether or not the effluent storage ponds are leaking by:
   (a) obtaining written confirmation regarding the ongoing performance of the ponds from a suitably qualified engineer; and/or
   (b) engaging a suitably qualified engineer to undertake the necessary testing to demonstrate the ongoing performance of the ponds; and
   (c) providing the confirmation or a report(s) of the test results to the Consent Authority.

8. No effluent shall be discharged to any surface watercourse directly or by overland flow, runoff, or via a pipe, nor shall there be any surface runoff/overland flow, ponding or contamination of water resulting from the exercise of this consent.

9. There shall be no odour or spray drift beyond the boundary of the site as a result of the exercise of this consent that is offensive or objectionable to the extent that it causes an adverse effect in the opinion of an authorised officer of the Consent Authority.

10.
    (a) Prior to the first exercise of this consent, the consent holder shall install and maintain an alarm and automatic switch-off system as a contingency measure in the event of an effluent system failure, such as a sudden pressure drop, irrigator stoppage or breakdown.
    (b) Where the effluent reticulation system is installed in such a way that effluent can be siphoned when pumping ceases, the consent holder shall install and maintain an antisiphon device in the effluent pipeline.

11.
    (a) Prior to the first exercise of this consent, the consent holder shall prepare, and submit to the Consent Authority, an Effluent Management Plan. The purpose of the plan is to provide direction to the consent holder's staff about the operation of the effluent system, including identification of environmental risks, to ensure compliance with the conditions of this consent. The plan shall be a concise document that is easy to use by all farm staff and shall include:
        - a plan of how effluent will be managed when soils are at or above field capacity and/or during adverse weather conditions;
        - a maintenance schedule for effluent disposal infrastructure (maintenance of irrigators, checking anti-siphon/switch-off systems, desludging the pond etc);
        - identification of drains, surface waterways, sub-surface drainage and critical source areas in the effluent disposal area so that the risk of effluent entering water can be avoided; and
        - a plan of how effluent application rates will be monitored to ensure the consent requirements are being met.
    (b) The Effluent Management Plan shall be reviewed at least on an annual basis to check that it still accurately reflects on-site activities and whether any improvements to management procedures need to be made. The results of the review shall be reported to the Consent Authority within one month of the review being undertaken.
    (c) If/when the plan is amended, a copy of the amended version, (or amended sections) shall be sent to the Consent Authority as soon as practicable following amendment.
    (d) This permit shall be exercised in accordance with the Effluent Management Plan at all times. Where there is inconsistency between the Effluent Management Plan and the conditions of this consent, the conditions of this consent shall prevail.

12. Prior to the first exercise of this consent, the consent holder shall notify the Consent Authority of the identity of the person in charge of the effluent disposal system. If a new operator is appointed, the consent holder shall notify the Consent Authority within five working days.

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

14. In the event of the failure or mismanagement of the effluent disposal system, or any other event that may result in a discharge of effluent that may have significant adverse effect on water quality, particularly in the region of the abstraction point of a registered drinkingwater supply, the consent holder shall notify, as soon as reasonably practicable, the following:
    - the Consent Authority (ph 03 211 5115 or 03 211 5225 after hours)
    - the Southland District Council (ph 0800 732 732)

15. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent during the period 1 February to 30 September each year, or within two months of any enforcement action being taken by the Consent Authority in relation to the exercise of this consent, or on receiving monitoring results, for the purposes of:
    (a) determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cumulative effects, which may arise from the exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit;
    (b) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement;
    (c) amending the monitoring programme to be undertaken;
    (d) adding or adjusting compliance limits; or
    (e) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this permit.

Reissued 26 April 2018 after amendments to condition 2.
for the **Southland Regional Council**

Joanna Gilroy
Team Leader Consents

Notes:

1. ***In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.***

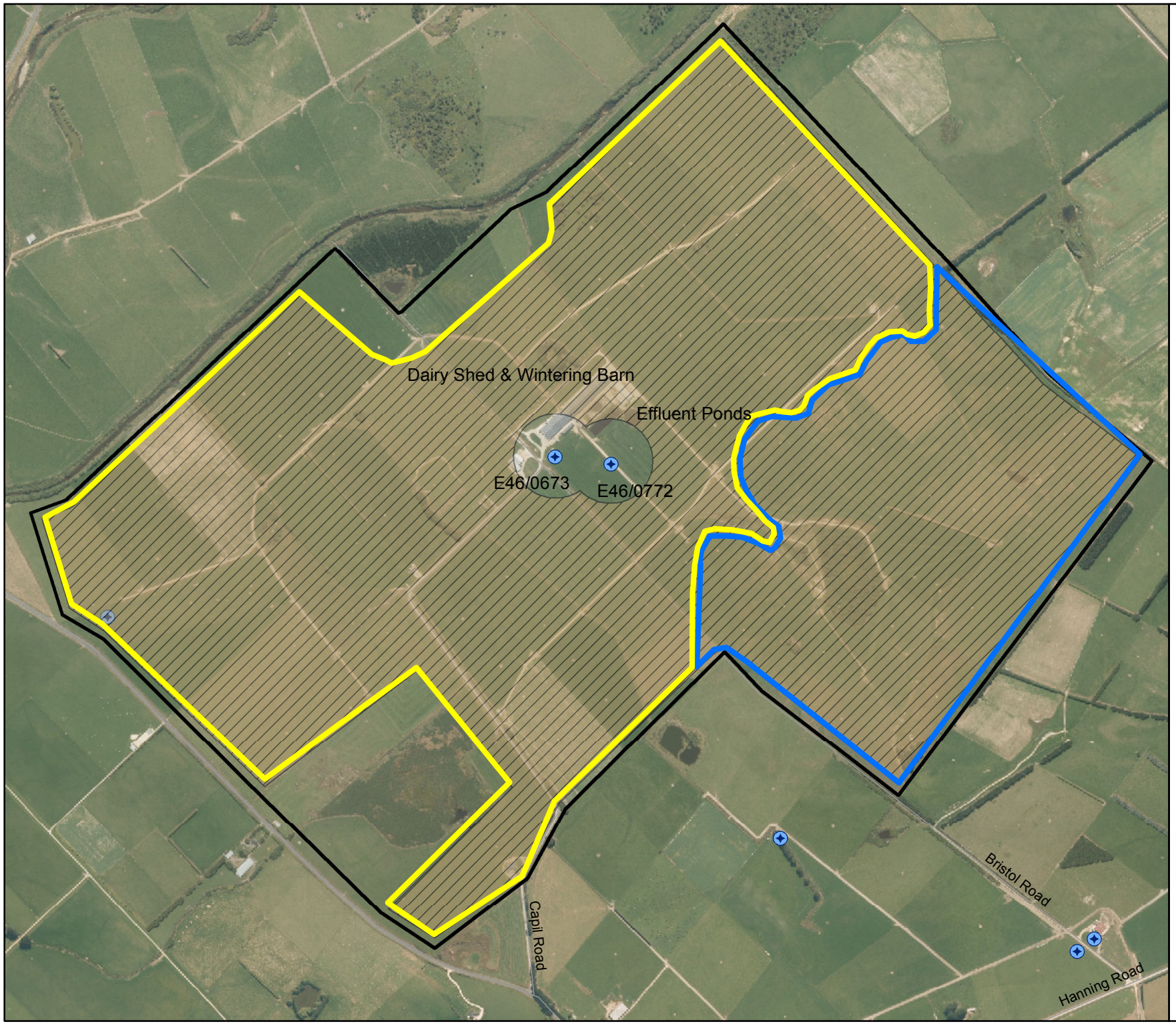
2. ***If you require a replacement permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.***

3. ***Dairy shed effluent should not be discharged onto any land area that has been grazed within the previous 5-10 days. Where there has been significant damage to soil during grazing, it is recommended that effluent not be applied until that damage has been repaired.***

4. ***Measuring the moisture content of the soil to determine when the soils are at or above field capacity is to be done by either actual monitoring on site or by reference to the appropriate Council monitoring site. The Council's soil moisture monitoring sites can be viewed at http://www.es.govt.nz and following the "Farming", "Dairy Advisor" and "Soil Moisture Map" links.***

5. ***Ponding is the accumulation of effluent on the soil surface resulting from the application of effluent to saturated soils, or the application of effluent inducing saturated soil conditions. It does not refer to the temporary accumulation of effluent on the soil surface resulting from the application of effluent at a rate that exceeds the soil infiltration rate. 6. Extreme caution should be taken when applying nitrogen fertiliser to the effluent disposal area. It is recommended that a nutrient budget is used to check that nitrogen and potassium application rates to the effluent disposal area are not excessive. 7. The consent holder should display, in a prominent place in the dairy shed, a copy of the resource consent and relevant limits about the operation of the effluent disposal system that must be complied with.***

8. ***Storage ponds should be operated at low levels when conditions for effluent disposal are suitable in order to maintain storage for wet weather periods. In particular, storage ponds should be emptied in late summer/early autumn to ensure sufficient storage capacity for the following late winter/early spring period.***



Appendix 1

Date: 10/02/2016

Wells

Dairyshed Effluent

Farm Boundaries

Area A (category A Land)

Area B (category C land)

N

1:12,000

environment SOUTHLAND

AUTH-20168652-02-V1

environment SOUTHLAND
Te Taiao Tonga

Cnr North Road and Price Street
(Private Bag 90116
DX YX20175)
Invercargill

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

Water Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council to **Arlake Limited, C/- Nelson Lindsay, 27 Capil Road, R D 2, Invercargill 9870** from **10 February 2016**

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

Details of Permit

Purpose for which permit is granted:		To take and use groundwater for the purpose of shed washdown and stock water for a dairy operation.
Location	- site locality	27 Capil Road, Grove Bush
	- map reference	NZTM2000 1251078E 4866421N
	- groundwater zone	Makarewa
	- catchment	Hedgehope Stream, Makarewa River and Gold Creek
	- well number	E46/0673
Legal description of land at the site:		Pt Section 16 Blk V Mabel HUN
Expiry date:		**10 February 2026**

History of Changes and Transfers

- Transferred from **Kapuka Farm Ltd to Arlake Ltd** on 1 December 2017.
- Conditions varied on 8 June 2018

Schedule of Conditions

1. This consent shall not be exercised at the same time as abstraction under Water Permit AUTH-20181227.

2. The permit authorises the taking of groundwater at the location specified above. The rate of abstraction shall not exceed:

(a) 1.9 litres per second;
(b) 102 cubic metres per day; and
(c) 37,230 cubic metres per year.

3. Prior to the first exercise of this consent, the consent holder shall install a backflow prevention device or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.

4.

(a) Prior to the first exercise of this consent, the consent holder shall install a water meter to record the water take, within an error accuracy range of +/-5% over the meter's nominal flow range. The consent holder shall forward a copy of the installation certificate to the Consent Authority within one month of installing the water meter.

(b) The water meter shall be installed in a straight length of pipe, before any diversion of water occurs. The straight length of pipe shall be part of the pump outlet plumbing, easily accessible, have no fittings and obstructions in it. There shall be a straight length of pipe on either side of the water meter, on the upstream side there shall be a distance that is 10 times the diameter of the pipe and on the downstream side there shall be a distance of 5 times the diameter of the pipe.

(c) The consent holder shall ensure the full operation of the water meter at all times during the exercise of this consent. All malfunctions of the water meter during the exercise of this consent shall be reported to the Consent Authority within five working days of observation and appropriate repairs shall be performed within five working days. Once the malfunction has been remedied, a Water Measuring Device Verification Form completed with photographic evidence must be submitted to the Consent Authority within five working days of the completion of repairs.

(d) (i) If a mechanical insert water meter is installed it shall be verified for accuracy each and every year from the first exercise of this consent.
(ii) Any electromagnetic or ultrasonic flow meter shall be verified for accuracy every five years from the first exercise of this consent.
(iii) Each verification shall be undertaken by a Consent Authority approved operator and a Water Measuring Device Verification Form shall be completed and supplied to the Consent Authority with receipts of service. These shall be supplied within five working days of the verification, and at any time upon request.

(e) The consent holder shall provide maintain a record of the total volume of water abstracted each week. The consent holder shall provide this record to the Consent Authority by 31 May each year and at any other time on request.

5. Prior to the exercise of this consent, the consent holder shall notify the Consent Authority of the person who is in charge of the operation this consent. If the person in charge changes during the term of this consent, the consent holder shall notify the

Consent Authority of the new operator no later than five working days after that person takes responsibility.

6. The consent holder shall pay an administration and monitoring charge to the Consent Authority collected in accordance with Section 36 of the Resource Management Act, payable in advance on 1 July each year.

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

   (a) adjusting the consented rate or volume of water under Condition 2, should monitoring under Condition 4 or future changes in water use indicate that the consented rate or volume is not able to be fully utilised;
   (b) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage;
   (c) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement; or
   (d) adjusting or altering the method of water take data recording and transmission.

Reissued 8 June 2018 following variation to Condition 1.

for the **Southland Regional Council**

Joanna Gilroy
Team Leader Consents

Notes:

1. *In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.*
2. *Section 126 of the Resource Management Act provides for this resource consent to be cancelled if the consent has been exercised in the past but has not been exercised during the preceding five years.*
3. *If you require a replacement permit upon the expiry date of this permit, any new application should be lodged at least six months prior to the expiry date of this permit. Applying at least six months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*

AUTH-20181227

environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

Cnr North Road and Price Street
(Private Bag 90116
DX YX20175)
Invercargill

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

Water Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council to **Arlake Limited, C/-N W Lindsay, 27 Capil Road, RD 2, Grove Bush, Invercargill 9872** from **8 June 2018**

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

Details of Permit

Purpose for which permit is granted:		To take and use surface water for the purpose of dairy farm supply and for pasture irrigation
Location	- site locality	27 Capil Road, Grove Bush
	- map reference	NZTM2000 1,250,830E 4,865,531N
	- groundwater zone	Makarewa
	- catchment	Makarewa
	- physiographic zone	Gleyed
	- FMU	Oreti
Legal description of land at the site:		Part Sections 1, 7A, 8, 15 and 16 Block V Mabel HUN, and Sections 9, 17 and 18 Block V Mabel HUN, and Lot 1 DP 4404, and Lot 1 DP 12190
Expiry date:		**10 February 2026**

Schedule of Conditions

1. The rate of abstraction as primary allocation shall not exceed:
   (i) 3 litres per second;
   (ii) 259.2 cubic metres per day; and
   (iii) 49,358 cubic metres per year.

2. Prior to the first exercise of this consent, the consent holder shall install a backflow prevention device or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.

3. No abstraction shall occur when flow in the Makarewa River, as measured at Environment Southland's Counsell Road flow monitoring site, is at or below 1.821 cubic metres per second.

4. (a) Prior to the first exercise of this consent, the consent holder shall install a water meter to record the water take, within an error accuracy range of +/-5% over the meter's nominal flow range, and datalogger with at least 24 months data storage capacity to record the rate and volume of take, and the date and time this water was taken.
   (i) The consent holder shall forward a copy of the installation certificate to the Consent Authority within one month of installing the water meter and datalogger.

   (b) The water meter shall be installed in a straight length of pipe, before any diversion of water occurs.
   (i) The straight length of pipe shall be part of the pump outlet plumbing, easily accessible, have no fittings and obstructions in it.
   (ii) There shall be a straight length of pipe on either side of the water meter, on the upstream side there shall be a distance that is 10 times the diameter of the pipe and on the downstream side there shall be a distance of 5 times the diameter of the pipe.

   (c) The consent holder shall ensure the full operation of the water meter and datalogger at all times during the exercise of this consent.
   (i) All malfunctions of the water meter and/or datalogger during the exercise of this consent shall be reported to the Consent Authority within five working days of observation and appropriate repairs shall be performed within five working days. Once the malfunction has been remedied, a Water Measuring Device Verification Form completed with photographic evidence must be submitted to the Consent Authority within five working days of the completion of repairs.

   (d) (i) If a mechanical insert water meter is installed it shall be verified for accuracy each and every year from the first exercise of this consent.
   (ii) Any electromagnetic or ultrasonic flow meter shall be verified for accuracy every five years from the first exercise of this consent.
   (iii) Each verification shall be undertaken by a Consent Authority approved operator and a Water Measuring Device Verification Form shall be completed and supplied to the Consent Authority with receipts of service. These shall be supplied within five working days of the verification, and at any time upon request.

   (e) The consent holder shall monitor and record the volume of water taken each day.

   (f) The consent holder shall provide records from the datalogger to the Consent Authority via a system that can send the data into the Consent Authority's computer database in CSV format, Hilltop or Tideda format, or XML formatted as required by Hilltop software.
   (i) The consent holder shall provide records from the datalogger to the Consent Authority by 31 May each year and at any other time on request.

5. Prior to the exercise of this consent, the consent holder shall notify the Consent Authority of the person who is in charge of the operation this consent. If the person in charge changes during the term of this consent, the consent holder shall notify the Consent Authority of the new operator no later than five working days after that person takes responsibility.

6. Prior to exercising the consent, the consent holder shall install, operate and effectively maintain a fish screen across the instream take. The fish screen shall comply with the following:

   (a) approach water velocity shall not exceed 0.12 metres per second;
   (b) sweeping velocity shall be equal or greater than approach velocity;
   (c) maximum screening material opening size shall not exceed 3 millimetres for woven mesh screens, 2 millimetres for profile bar screens and 3.2 millimetres for perforated plate screens; and
   (d) the fish screen shall be repaired or replaced immediately if damaged, or alternatively the intake shall be shut down if damage cannot immediately be repaired.

7. (a) Irrigation to land shall not occur when the moisture content of the soils is at or above field capacity, nor shall irrigation increase soil moisture above field capacity.

   (b) The consent holder shall take all practicable steps to ensure that:
      (i) there is no leakage from pipes and structures;
      (ii) there is no run-off of irrigation water in irrigated areas either on-site or off-site.

8. The consent holder shall pay administration, consent monitoring and research & monitoring charges to the Consent Authority collected in accordance with Section 36 of the Resource Management Act, payable in advance on 1 July each year.

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

   (a) adjusting the consented rate or volume of water under Condition 1, should monitoring under Condition 4 or future changes in water use indicate that the consented rate or volume is not able to be fully utilised;
   (b) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage;
   (c) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement; or
   (d) adjusting or altering the method of water take data recording and transmission.

for the **Southland Regional Council**

Joanna Gilroy
Team Leader Consents

Notes:

1. *In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.*
2. *Section 126 of the Resource Management Act provides for this resource consent to be cancelled if the consent has been exercised in the past but has not been exercised during the preceding five years.*
3. *If you require a replacement permit upon the expiry date of this permit, any new application should be lodged at least six months prior to the expiry date of this permit. Applying at least six months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*
4. *The first trigger flow specified in Condition 3(b)(i) is the Q95 flow of 1,821 plus the cumulative surface water allocation from the Makarewa catchment. The second trigger flow specified in Condition 3(b)(ii) is the Q95 flow plus half the cumulative surface water allocation from the catchment.*
5. *Cubic metres per second are a unit of measurement called "cumecs" on the Consent Authority's website: http://envdata.es.govt.nz/index.aspx*

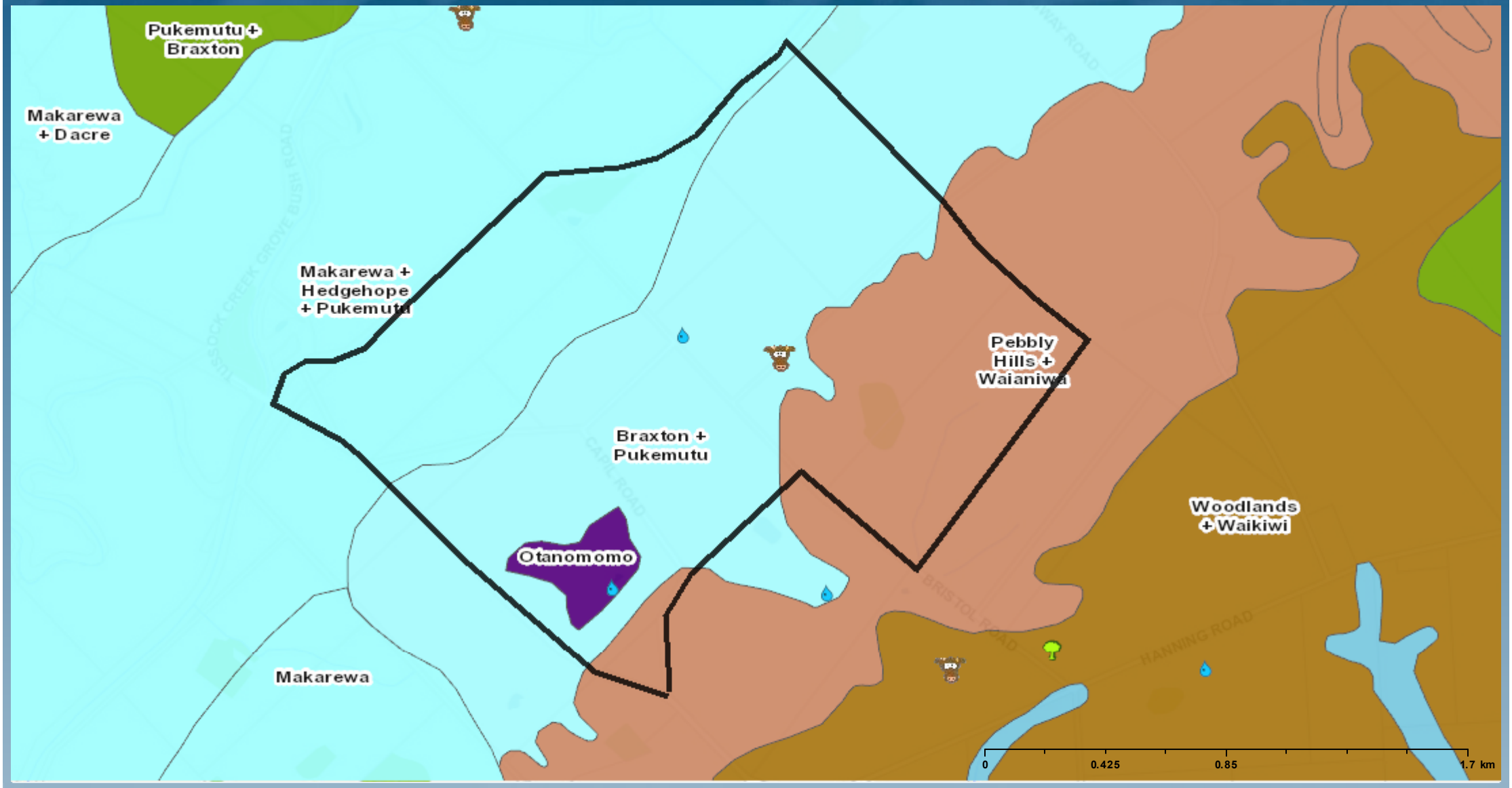
APPENDIX 2

BEACON

Environment Southland Mapping Service

Soil Map

October 9, 2019



polylineLayer

Override 1

Alerts

Blue

Green

Yellow

Red

Current Resource Consents

Coastal Permit

Land Use Permit

Dairy Permit

Discharge Permit

Gravel Extraction

Water Permit

Whitebait Stand

Soil Profile

Soil name: Braxton

Overview

Braxton soils occupy about 19,300 ha on intermediate terraces adjacent to the Aparima River and Waiau Valley. They are formed in a mixture of fine alluvium and loess that is derived from tuffaceous greywacke and volcanic rocks of the Takitimu Mountains. These soils are deep to moderately deep, poorly drained, and have silty clay to heavy silt loam textures. They are used for sheep, deer and dairy production with some cropping. Climate is cool temperate with regular summer rain.

Braxton profile

Physical properties

Braxton soils have a deep rooting depth and high available soil water, although the rooting depth may be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability. Mottles occur in all horizons – another indication of poor drainage. Texture varies between heavy silt loam and silty clay in the subsoil, and silt loam topsoil clay content is 22–30%. The soils are typically stone-free, although the moderately deep phase will have gravel between 45 and 90cm depth.

Fertility properties

Topsoil organic matter levels range from7 to 10%; P-retentions 30–60%, with moderate pH values (5.5–6.2) that change little down the profile. Cation exchange values are moderate and base saturation values high. Available magnesium and potassium are low. Reserve phosphorus values are low. Micro-nutrient levels are generally adequate, although boron responses in brassicas and molybdenum responses in legumes are likely.

Associated and similar soils

Some soils that commonly occur in association with Braxton soils are:

- Glenelg: well drained, shallow stony soil
- Pukemutu: poorly drained soil due to water perching on subsoil fragipan
- Drummond: Well drained, moderately deep to deep soil

Some soils that have similar properties to Braxton soils are:

- Sobig: occur on high terraces; moderately deep to deep soils that are poorly drained due to water perching on clay-bound gravel
- Glenure: occur on terraces and downlands in northern Southland; consistently have silty textures
- Dipton: occur on intermediate terraces, shallow soils that are poorly drained due to water perching on clay bound gravel
- Makarewa: occur on floodplains

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the poor drainage.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the poor drainage, high water-holding capacity and slow subsoil permeability.
Topsoil erodibility by water	slight	Due to the moderate clay content, the topsoil erodibility of these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	slight	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties, and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	severe	These soils have a severe vulnerability to waterlogging during wet periods. This rating reflects the poor drainage and slow subsoil permeability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

BxU1 (Braxton undulating deep)
BxU2 (Braxton undulating moderately deep)
BxR1 (Braxton rolling deep)

Versatility evaluation for soil BxU1, BxU2, BxR1		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rainfall.
Arable	Limited	Inadequate aeration during wet periods; risk of short-term water logging after heavy rainfall.
Intensive pasture	Moderate	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rainfall.
Forestry	Limited	Inadequate aeration during wet periods; vulnerability to sustained waterlogging.

Management practices that may improve soil versatility

- Careful management after heavy rainfall and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and vehicular traffic should be minimised during these periods.
- Installation and maintenance of subsurface mole and tile drains will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct moisture condition and depth can be of benefit.

Soil name: Makarewa

Overview

Makarewa soils occupy about 38,500 ha on the flood plains of rivers and streams across the Southland region. They are formed in fine alluvium from mixed sources that commonly has some influences of tuffaceous greywacke and basic rocks in western Southland. These soils are deep to moderately deep, poorly drained, and have silty clay textures. They are used for intensive pastoral farming with sheep, dairy and deer, with some cropping. Climate is cool temperate with regular rain and soils rarely dry out.

Makarewa profile

Physical properties

Makarewa soils have a deep rooting depth and moderately high available soil water, although the rooting depth may be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability. Texture is variable, with layered texture profiles common, but there is always at least one horizon with silty clay texture and topsoil clay content is 30-60%. The soils are typically stone free, although the moderately deep phase will have gravel between 45 and 90cm depth.

Fertility properties

Topsoil organic matter levels range from 6 to 10%; P-retention values 30-50% and pH values moderate. Cation exchange and base saturation levels are moderate to high throughout the profile, resulting in high availability of cations present. Potassium levels are very low. Reserve phosphorus levels are also bw and there are moderate levels of sulphate sulphur in the subsoil. Micro-nutrient levels are generally adequate.

Associated and similar soils

Some soils that commonly occur in association with Makarewa soils are:

- Dacre: poorly drained soil on flodplains of streams and minor drainage channels.
- Hedgehope: moderately well to imperfectly drained soils formed on levees
- Jacobstown: similar profile, but has silty textures
- Lumsden: shallow, poorly drained soil with silty textures
- Pukemutu: poorly drained due to water perching on a fragipan.

Some soils that have similar properties to Makarewa soils are:

- Braxton: occurs on terraces; textures vary from silt loam to silty clay
- McLeish: shallow, poorly drained soil with clayey textures
- Caroline: has a cemented ironpan in the subsoil
- Titipua: has over-thickened slightly peaty topsoils

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the poor drainage.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the poor drainage, high water holding capacity and slow subsoil permeability .
Topsoil erodibility by water	minimal	Due to the moderate to high clay content, the topsoil erodibility of these soils is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	slight	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties, and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	severe	These soils havea severe vulnerability to waterlogging during wet periods. This rating reflects the poor drainage and slow subsoil permeability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

MkU1 (Makarewa undulating deep)
MkU2 (Makarewa undulating moderately deep)
MkU1vr Makarewa undulating deep recent variant)

Versatility evaluation for soil MkU1, MkU2, MkU1vr		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Arable	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Intensive pasture	Moderate	Inadequate aeration during wet periods; vulnerability of topsoil to structural degradation by cultivation and compaction.
Forestry	Limited	Inadequate aeration during wet periods; potential flood risk.

Management practices that may improve soil versatility

- Careful management after heavy rain and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and heavy vehicular traffic use should be minimal during these periods.
- Installation and maintenance of subsurface mole and tile drains will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct depth and moisture condition can be of benefit.

Soil name: Otanomomo

Overview

Otanomomo soils occupy about 14,300 ha scattered throughout the lowlands of Southland. They are peat soils formed in weakly to moderately decomposed organic material. Otanomomo soils typically occur as raised bogs (up to 6m deep) overlaying fine alluvium and gravel, and the peat bogs vary in size from a few metres across to hundreds of hectares. The soils have very poor drainage and are extremely acid, which severely restricts the growth of most crops. Many peat swamps have only been developed around the edges, with areas of deeper peat partially or not developed, and are now used for casual pastoral grazing or are included in the conservation estate. Climate varies according to location.

Otanomomo profile

Physical properties

Otanomomo soils in the natural state have shallow rooting depth that is limited by the very poor aeration and extremely acid subsoils. Soils that have been developed will have deeper rooting depth, depending on the degree to which the aeration and acidity have been improved. Otanomomo soils have moderately high plant available water and very low bulk densities. The texture is dominated by organic material, and the texture of the mineral fraction varies with a clay content of 30-50%. Stones and gravel are absent except in moderately deep soil where they occur below 45cm.

Fertility properties

Organic matter levels are greater then 30%, and most typically 50-90%; P-retention values and pH values are very low (<4.9). Cation exchange is very high, reflecting the organic matter content, but the base saturation is low. Available cations vary, with low values in many locations. Reserves of phosphorus and sulphur are also very low as are micro-nutrient levels.

Associated and similar soils

Some soils that commonly occur in association with Otanomomo soils are:

- Te Anau: well drained, shallow moraine soils that, together with Monowai soils, are associated with Otanomomo soils in the Te Anau Basin.
- Pukemutu: poorly drained soils with a fragipan formed in deep loess on the Southland Plain
- Tisbury: poorly drained soil formed in deep loess on the Southland Plain
- Mokotua: imperfectly drained soil formed in deep loess on the Southland Plain.
- Tiwai and Kapuka: shallow to moderately deep podzolised soils forming on marine terraces in the lower Southland Plain.

Some soils that have similar properties to Otanomomo soils are:

- Andrews: very similar weakly decomposed peat; formed from plant materials that have a minor moss component
- Invercargill: commonly occur as basin peats, and the organic material is strongly decomposed
- Colac: moderately decomposed basin peat formed on marine terraces adjacent to Colac Bay
- Titipua: has a peaty topsoil, but the organic content is between 18-30%, and is not high enough to meet the requirements of Organic soils.

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	minimal	These soils have a minimal vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the very high organic matter levels.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the very poor drainage and water holding capacity.
Topsoil erodibility by water	minimal	Due to the high organic matter content, the topsoil erodibility of these soils is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	minimal	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties, and highly dependent on management practices (e.g., crop residue management and cultivation practices). Soils that have been drained will initially have a very severe vulnerability.
Waterlogging	severe	These soils have a severe vulnerability to waterlogging during wet periods. This rating reflects the very poor drainage.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

OnU1 (Otanomomo undulating deep)
OnU2 (Otanomomo undulating moderately deep)
OnU1vm (Otanomomo undulating deep mineral subsoil variant)

Versatility evaluation for soil OnU1, OnU2, OnU1vm		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Restricted rooting depth; vulnerability to sustained waterlogging
Arable	Unsuitable	Restricted rooting depth; vulnerability to sustained waterlogging
Intensive pasture	Unsuitable	Restricted rooting depth; vulnerability to sustained waterlogging
Forestry	Unsuitable	Restricted rooting depth; vulnerability to sustained waterlogging

Management practices that may improve soil versatility

- Installation and maintenance of drainage ditches
- Liming to raise the soil pH

Soil name: Pebbly Hills

Overview

Pebbly Hills soils occupy about 1800 ha on rolling downs in the Pebbly Hills district. They are formed into quartz gravel deposits overlayen by a thin layer of loess. Soils are shallow and well drained, with a slightly deep rooting depth and moderate water-holding capacity. Present use is pastoral grazing with sheep and some deer and beef cattle. They have a cool temperate climate with regular rainfall.

Pebbly Hills profile

Physical properties

Pebbly Hills soils have a slightly deep rooting depth and moderate plant available water, and are limited by the subsoil gravel. The soils are well drained, with good aeration in upper horizons that decreases with depth, and the subsoil is slowly permeable. Textures are silt loams, grading to sandy loams in the gravelly horizons. Topsoil clay content is about 20–30%, and slightly to moderately gravelly. Subsoils are typically very to extremely gravelly.

Fertility properties

Topsoil organic matter levels are about 13%; P-retention <30% in the topsoil, and 50–90% in the subsoil; and pH moderate (low–mid 5s). Cation exchange values are moderate and base saturation high. Available calcium, magnesium and potassium levels are moderate and soil reserve phosphorus levels low. Micronutrient levels are generally adequate.

Associated and similar soils

Some soils that commonly occur in association with Pebbly Hills soils are:

- Woodlands: formed in deep loess, with gravel at greater than 45cm depth, and imperfect drainage.
- Pukemutu: formed in deep loess, with gravel at greater than 90cm depth, and poorly drained due to fragipan
- Waikiwi: formed in deep loess, with gravel at greater than 45cm depth, and well drained.

Some soils that have similar properties to Pebbly Hills soils are:

- Oteramika: occurs across the Southland plain. Typically formed into a matrix of mixed quartz and highly weathered greywacke and schist gravel; moderately well to imperfectly drained
- Benio: occurs in northern Southland. Typically formed into a matrix of mixed quartz and highly weathered greywacke and schist gravel.
- Wairaki: occurs on high terraces and fans from the Takitimu Mountains. Formed in tuffaceous greywacke alluvium.

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the good drainage, offset by the low–moderate clay and P-retention.
Nutrient leaching	severe	These soils have a severe vulnerability to leaching to groundwater. This rating reflects the good drainage and moderate water-holding capacity.
Topsoil erodibility by water	slight	Due to the high organic matter content, topsoil erodibility in these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	moderate	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage. The hilly phase will have nil vulnerability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

PbH3 (Pebbly Hills hilly shallow)

Versatility evaluation for soil PbH3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Hilly slope
Arable	Unsuitable	Hilly slope
Intensive pasture	Limited	Hilly slope
Forestry	Limited	Restricted rooting depth

PbU3 (Pebbly Hills undulating shallow)

Versatility evaluation for soil PbU3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Intensive pasture	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

PbR3 (Pebbly Hills rolling shallow)

Versatility evaluation for soil PbR3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

Management practices that may improve soil versatility

- Management of nutrient applications so as to minimise leaching losses
- Organic matter levels should be carefully maintained and enhanced

APPENDIX 3

Fonterra Co-operative Group Limited
120A Leet Street, Invercargill, 9810, New Zealand
t 0800 65 65 68, m +64 27 703 1743
www.fonterra.com

1 March 2019

Carl Lindsay
27 Capil Road,
RD2
Invercargill, 9872

Dear Carl,

Effluent Irrigation System Testing – DSN: 31857

Thank you for the opportunity to visit your farm and analyse the performance of your effluent irrigation system. The information provided below provides important details on your system and will help you manage the application of effluent, to maximise pasture growth and comply with the conditions of your resource consent.

On the 28th February 2019 testing was carried out on a line of one set of 5- k-line-max^{70} pods approximately 468 m south east of the pump shed. The pods were fitted with 10mm nozzles and the effluent was pumped to the pods via a 75mm mainline before dropping to a 63mm line at the pods. Wind conditions were moderate and had an impact on the spreading uniformity

Trays were laid out in an L-shape from the last pod at 1.5m intervals, across the full length of the wetted area and testing was carried out in accordance with the Dairy NZ procedures contained in "A staff guide to operating your effluent irrigation system – Low Rate System". An inline flow meter (Seametrics WMP 104 electromatic flow meter) and pressure gauge were fitted on the main line at the hydrant.

The following results were obtained:

- Operating Pressure (at the hydrant 150 m from pods) = **70PSI**
- System Run Time = **1 hr**
- Flow-rate = **5.8 L/sec**
- Effluent Volume = **21 m^3/hr**
- Average Application Rate = **9.6mm/hr** *(Discharge Permit limit = 10mm/hr)*
- Maximum Application Rate (Line 2 Tray 3) = **22.8 mm/hr**
- Minimum Application Rate (Line 1 Tray 8) = **3 mm/hr**

Distribution across Trays (mm/hr)

Line 1

Tray 1	Tray 2	Tray 3	Tray 4	Tray 5	Tray 6	Tray 7	Tray 8				
5.4	5.6	5.4	5.6	7.9	14.6	16	3				

Line 2

Tray 1	Tray 2	Tray 3	Tray 4								
6	11.8	22.8	11.29								

To ensure you are gaining the maximum benefit from your farm dairy effluent the depth application of effluent applied should be matched to the soil moisture deficit of the soil it is being applied to. For example, a 10mm soil deficit should be present before running the pod system for 1 hour. The application depth can be decreased by reducing the time the pod system operates for.

Issues and Recommendations

- Low pressure at irrigator

  This impacts on irrigator uniformity and effluent spread diameter. Poor pressure will lead to higher application rates and poor effluent distribution over a paddock. Your pod system should be able to achieve an application rate of <5mm/hr, which will allow you to operate the system when low soil moisture deficits exists. The pipe network leading to the pods appears to be suitable specified (75mm mainline and 63mm drag hose) however your pump doesn't appear to have been matched to your irrigation system and therefore isn't producing enough pressure at the pods for the system to operate as per the manufactures specifications. Your pod system needs approximately 40 PSI at the first pod to operate correctly. I would recommend contacting a reputable pumping contractor to undertake a head loss calculation and specify an appropriate pump for your system. I would recommend removing the 5th pod in the interim to increase pressure.

Please do not hesitate in contacting me if you wish to discuss the attached results in more detail or would like more information on maximising the benefits of your farm dairy effluent.

Yours sincerely,

Kieran O'Connor

Sustainable Dairying Advisor - Fonterra Farm Source

APPENDIX 4

Arlake Limited

27 Capil Road, Grove Bush

January 2019

Discharge Consent Number: AUTH-20168652-01-V1

Fonterra Supply Number: 31857

Prepared by: Kieran O'Connor– Sustainable Dairy Advisor

Table of Contents

1. Introduction

This Farm Effluent Management Plan has been prepared for Arlake Limited & C/- Nelson Lindsay in order to ensure the effective management of farm dairy effluent on the property. It has been drafted to reflect current good management practices and sets out how the effluent system will be operated to achieve these. Farm dairy effluent is an important fertiliser resource, which if utilised correctly results in nutrients being returned to the soil and utilised by plants for pasture growth. This has significant environmental and economic benefits.

2. Location

The property is located at 27 Capil Road, Grove Bush and encompasses 300 ha of land within Southland.

3. General Farm Information

Up to 850 cows can be milked twice per day between 1 September – 30 April, 700 up to twice per day between in May and August and up to 500 cows twice per day between 1 June – 31 July through a 64 bale rotary shed. The effective area of the farm is 285 ha giving a maximum stocking rate of 2.98 cows/ha. The topography of the effluent irrigation area is flat with tile drains present in most paddocks. The effluent area is within the Gleyed, Lignite Marine Terraces (Overland flow variant) and Oxidising (Overland flow variant) physiographic zone and is located on the following soil types:

a) Braxton Soils

Braxton soils are formed from a mixture of fine alluvium and loess that is derived from tuffaceous greywacke and volcanic rocks of the Takitimu Mountains. These soils are moderately deep, poorly drained and have a silty clay to heavy silt loam texture.

Care needs to be taken to prevent waterlogging and compaction after heavy rain and prolonged wet periods. Intensive stocking, cultivation and heavy vehicular traffic use should be minimised during these periods. Due to the slow subsoil permeability and poor drainage these soils only have a slight vulnerability to nutrient leaching, however they are often artificially drained via tile and mole drains and prone to cracking in dry conditions; this increases their vulnerability to nutrient loss.

b) Makarewa Soils

Makarewa soils are formed from fine alluvium from a range of sources and are moderately deep, poorly drained soils. These soils have silty clay textures and are typically stone free.

Care needs to be taken prevent waterlogging and compaction after heavy rain and prolonged wet periods. Intensive stocking, cultivation and heavy vehicular traffic use should be minimised during these periods. Due to the very slow subsoil permeability and poor drainage these soils only have a slight vulnerability to nutrient leaching, however they are often artificially drained via tile and mole drains which increases their vulnerability to nutrient loss.

C) Pebbly Hills

Pebbly Hills soils have a slightly deep rooting depth and moderate plant available water, and are limited by subsoil gravel. The soils are well drained, with good aeration that decreases with depth and the subsoil is slowly permeable.

Care needs to be taken to prevent waterlogging during wet periods. These soils have a moderate vulnerability to structural degradation. Intensive stocking, cultivation and heavy vehicular traffic use should be minimised during these periods. These soils have a severe vulnerability to leaching to groundwater, this is due to the good drainage and moderate water-holding capacity.

Full details of the soils listed above can be found in Appendix 2. More detailed information on specific farm procedures and systems will be covered in Sections 4-12 below.

4. Effluent Management System

Effluent is viewed as an important resource at the property due to its ability to return key nutrients to the soil (Nitrogen, Phosphorus, Potassium, etc), thus allowing them to be utilised for plant growth. Generally New Zealand pastures are nitrogen (N) and phosphorus (P) limited, therefore effluent (source of N and P) can provide a cost effective mechanism for overcoming these deficiencies, achieving significantly better pasture growth, without (in many cases) the need for further fertiliser applications.

The current system configuration is as follows:

1. Effluent generated from the dairy shed and tanker pad/vat stand is washed down/scraped into the yard and shed sumps and subsequently into a larger transfer sump located at the southern entry of the wintering barn.
2. Effluent from the transfer sump then flows through to the weeping wall to effluent pond 1 (3,982m^3) which can either be pumped to the irrigator or directed to effluent pond 2 (3,982 m^3). Effluent from effluent pond 2 is then gravity fed back to effluent pond 1 where it can be irrigated to pasture.
3. The wintering barn is automatically scraped to a strip drain that runs down the middle of the wintering barn, which then flows into the wintering barn and solid scrapings pond (5,585m^3). This is then emptied via slurry tanker which is located on farm.

4. The silage storage pits are underlain with drains throughout which drain to the main leachate sump located at the north eastern end of the wintering barn. Leachate is the spread to land under Rule 31 of the pSWLP as a permitted activity. There are also drains located on the walls of the silage pit that divert fresh water off the covers of the silage stack.
5. Solid effluent from the sand traps and weeping wall is spread to land in accordance with Section 7 of this plan.
6. During suitable conditions effluent is irrigated from the effluent pond by one set of 5 K-line-Max^{70} pods. The pods are fitted with an electronic failsafe to automatically shut down the pump if there is a sudden pressure drop or increase.

7. The farm is also consented to use a slurry tanker/umbilical system to discharge effluent and this may be used on a periodic basis via the slurry tanker located on the property or umbilical system through employment of a contractor. **–HIGH RISK** (See Section 6).

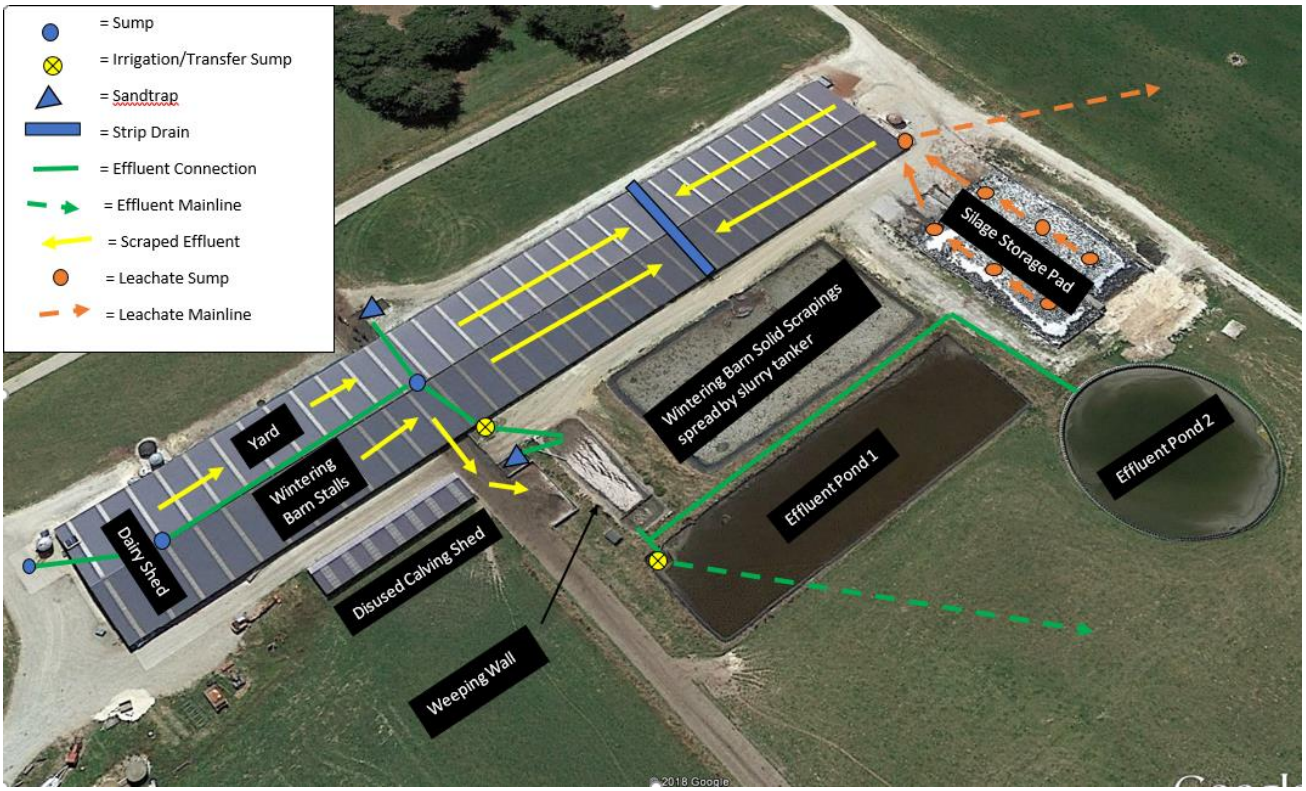


Figure 1 – Effluent System Overview

4.1 Effluent System Operation

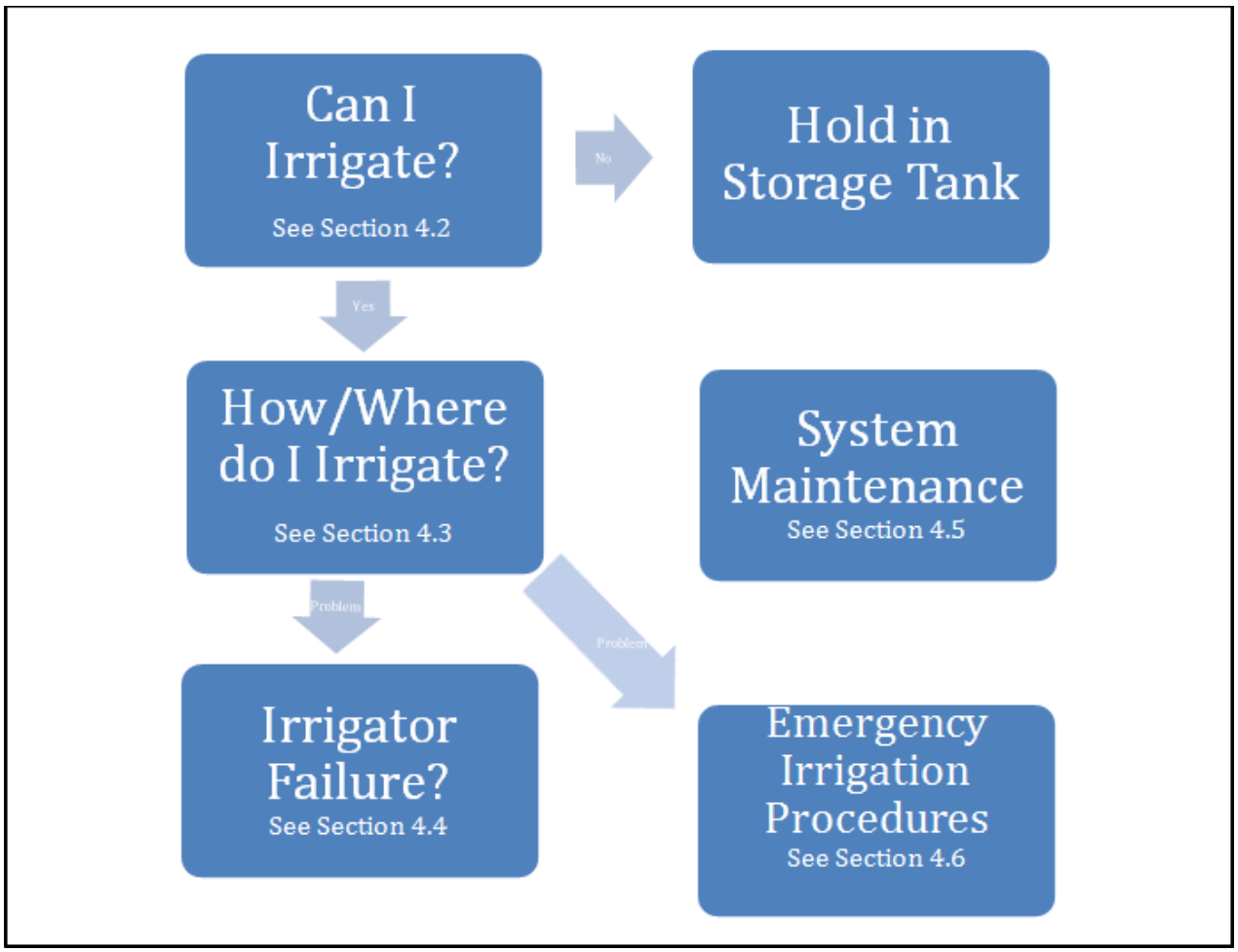


Figure 2 – Effluent System Operation Chart

4.2 Can I Irrigate?

1) Check the level of effluent in the effluent pond, is there a risk of it overflowing? Effluent must be discharged if this is the case by following the emergency procedures outlined in 4.6.
2) Check soil moisture levels and for significant soil cracking. A 2.5mm soil moisture deficit needs to exist before the pods can be operated for one hour. If effluent is to be applied for 2 hours without moving the pods a 5mm soil moisture deficit is required.
3) A guide to whether irrigation can be undertaken can be obtained from the closest Environment Southland soil moisture monitoring site (with a similar soil type) located at Tussock Creek. If this is not red then conditions may be suitable for irrigation. *Soil Moisture can be tested on farm using a soil moisture probe or alternatively refer to the Environment Southland Website www.es.govt.nz and click on Beacon/soil moisture.*
4) If soil moisture conditions are **unsuitable** or heavy rain is likely, effluent will be held in the effluent pond until conditions are suitable.
5) If soil moisture conditions are **suitable** effluent irrigation will occur in accordance with Section 4.3. Check wind conditions to ensure that effluent can be discharged without resulting in spray drift and odour beyond the boundary of the property.

4.3 How/Where Do I Irrigate?

1) Assuming weather and soil moisture conditions are suitable for irrigation the K-Line max ^{70} will be set up in a suitable paddock, observing 20m setbacks from waterways the property boundary and the consented discharge areas (Appendix 3). A visual inspection of the paddock will be made and this paddock shall only be used for effluent application if there are no visible danger signs. Such signs include: surface water, pugging, wheel ruts, stock grazing, soil cracking**,** etc. Select another paddock if any of these conditions exist. *Avoid irrigating over tile drains, soil cracks (dry conditions) and paddock low points, especially in wet weather (See Appendix 1 for map).*

2) The pods will be set up as outlined on pages 8-9 of this manual for detailed set up instructions refer to K-Line Max ^{70} system brochure.

3) Upon correct set-up of the pods check the failsafe is operational.

4) Start the irrigation system at the shed/pond hub and return to the paddock to check the irrigation system is operating correctly.

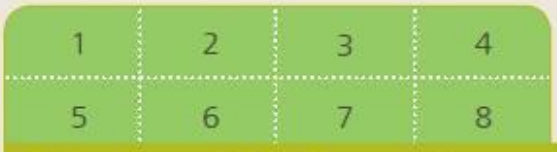
5) Record details of the effluent disposal duration and location and keep records for future reference (record these details on the form attached as Appendix 4 or in the Fonterra Dairy Diary).

Before irrigating

Moving standard pods: step by step

1. Soil

Check the soil moisture. Is it too wet to irrigate? Never use pods in the rain



2. Location suitable for conditions

Check irrigation record sheet, are pods are in the right location. Make sure pods not near waterways, tiles, gullies.

3. Pump - OFF

Turn off pump

4. Hydrant - OFF

Turn off or disconnect hydrant at paddock

5. Open Valves

Open all valves at end of each pod line, allow lines to empty before moving. Disconnect tow fittings (if attached) and take tow fitting to other end of pod line

6. Undo cam

Disconnect all cam locks connecting pod lines to feed line

7. Close valves

Close all end valves when empty

8. Cap

Close valve or put on cap on line at the drag end so dirt and stones do not enter pipes while towing

9. Vehicle direction

Face the tow vehicle the direction the line is to be towed.

10. Connect tow

Attach tow hook to tow vehicle

11. Drive smoothly

Drive smoothly to new location, use wide U shaped turns not V

12. Line up

Line up pod line with markers on the fence. If no markers avoid cross over spray approx. 25m

13. Tow hose

Once line is in place unhook and go to next line. Move all lines. Repeat until lines have been moved

14. Connect cam

Connect cam locks and move caps and towing systems to end of each line if at wrong end.

Before irrigating

15. Open valves

Open all valves that are connected to the feed line

16. End of line valves

Check all end of line valves and/or caps are closed before turning pump on

17. Turn on

Turn system on

18. Check valves

Check valves all shut again after system is on

19. Check pods

Check each pod is spraying properly. Spray should be fan shape not a solid jet. Look for blocked nozzles and leaks in the line. Have spare nozzles on hand and repair as required.

4.4 Irrigator Failure

1) The irrigation system is protected from continuing to irrigate in the event of a system failure by a failsafe system. The failsafe for the pods works on pressure with the pump automatically switching off in the event the system pressure goes outside a pre-set range.

2) The key errors to check if the system shuts off are:

- Pods Low Pressure
  - *Leak in pipe or camlock*
  - *Broken sprinkler head*
  - *Open ended line*
- Pods High Pressure
  - *Pipe blockage*
  - *Sprinkler blocked*

3) The pods can be restarted from the central hub by pressing the irrigate button. This should only be done after the source of the failure has been investigated and repaired. Any repairs that cannot be carried out on farm will be referred to a qualified service technician.

4.5 System Maintenance

1) Weekly Checks
   - *Clean out effluent sumps. Place solids on a sealed surface.*
   - *Check pump and float switches are clear and operational*
   - *Check pond level*
   - *Clean effluent line camlocks and check effluent lines have no cuts, splits or bulges*
   - *Check pipes running from the dairy shed to the sludge beds are not restricted.*
   - *Check pond odour levels are not excessive*

   Pods
   - *Check pod body has no cracks and the connections are secure*
   - *Check pod knocker arms are not broken*
   - *Clean effluent pipe connections and make sure they are not loose or leaking.*
   - *Check failsafe operation*

2) Monthly Checks
   - *Check the amount of solids accumulated in the sludge beds. Clean out one side if required by spreading directly to land (<10mm depth) when conditions are suitable (appropriate soil moisture deficit and soil temperature to facilitate plant growth).*
   - *Clean effluent pipe connections and make sure they are not lose or leaking.*
   - *Check all hydrants*

3) Annual Checks

- *Service the effluent irrigation pump – strip pump, oil and clean and check the pump seals/impeller*
- *Flush clean water through the delivery line to clean out pipes and irrigation lines.*
- *Check weeping wall slates and repair if required.*
- *De-sludge pond if required.*

Pods

- *Check pressure being achieved at the pods is at or above 36PSI.*
- *Measure the pod application rate and depth*

4) Any matters requiring follow up shall be followed up immediately or referred to the farm owner or qualified service technician.

4.6 Emergency Irrigation Procedures

1) In the event that irrigation needs to take place in unsuitable conditions (i.e. heavy rain, water logged soils) due to an immediate issue, such an emanate risk of a pond overflow or mechanical breakdown, the following measures will be undertaken prior to and after irrigating.
   - The farm owner shall be immediately notified
   - Environment Southland shall be contacted on 0800 76 88 45
   - A farm walk shall be conducted to determine the most suitable paddock for irrigation. This shall be a paddock with the least obvious signs of water logging (surface water ponding or wet areas), no tile drains, no waterways nearby and no recent grazing.
   - A written record must be maintained of the reasons for the use of the emergency irrigation procedure, what paddock irrigation occurred in and why this paddock was selected.
   - Irrigation should only occur for the length of time required to elevate the immediate issue that lead to the use of this procedure.

5. Troubleshooting

5.1 Pods

Can I see a problem?		What should I do?
Not enough pressure Spray too thick and not throwing far enough Expected throw distances: • Small black pods – 12m • Small white and purple -14m • Big black pods -20m		STOP irrigating and tell your manager/ farm owner
Blockage in pod Effluent dribbling out of pod		STOP irrigating and tell your manager / farm owner. Clear blocked pod, and check solid separator for problems
Broken knocker arm/counter balance. Spray coming out as solid jet not fan shape		STOP irrigating and tell your manager / farm owner. Replace broken parts
Top broken Spray going in two directions, out nozzle and straight up		STOP irrigating and tell your manager / farm owner. Replace broken parts
Saddle leaking Spray will be leaking and puddling around pod		STOP irrigating and tell your manager / farm owner. Tighten, replace or repair

Top broken Spray going in two directions, out nozzle and straight up		STOP irrigating and tell your manager / farm owner. Replace broken parts
Saddle leaking Spray will be leaking and puddling around pod		STOP irrigating and tell your manager / farm owner. Tighten, replace or repair

5.2 In the Paddock

Can I see a problem?		*What should I do?*
Effluent running off in to waterways, streams or rivers		STOP irrigating and tell your manager/ farm owner. Move the irrigator away from waterways
A bad connection between hoses, foaming or puddling leaking from connection		STOP irrigating and reconnect. If parts need replacing tell your manager/ owner
A leak in the pipe - effluent is pooling in and around the pipe in the paddock		STOP irrigating and fix the leak temporarily if possible, tell your manager/owner

5.3 Ponding

Can I see a problem?		*What should I do?*
Small puddles or ponding after irrigation that don't disappear for a while		Tell your manager/ farm owner 
Large puddles, ponding or sludge remains for many hours and can be seen on pasture		STOP irrigating and tell your manager/ farm owner 

6. Slurry Tanker / Umbilical Application of Effluent

The Discharge Permit for Arlake Limited allows for applications of effluent via a slurry tanker and an umbilical system. This will occur directly from the effluent ponds and the wintering barn solid scrapings pond. The criteria in Section 4.2 will be used to determine if irrigation should occur along with Section 4.3 (1). Assuming conditions are suitable for irrigation, effluent will be sucked from the effluent storage ponds and wintering barn solids pond into the tanker or out to a tractor via a dedicated line and subsequently spread on suitable paddocks at a depth not exceeding 10 mm for Area A of the Appendix 1 Map (Appendix 3) and 5 mm for Area B of the Appendix 1 Map (Appendix 3). This is governed by the speed of the slurry tanker / tractor. The slurry tanker /umbilical system will only be operated by the farm owner, senior management or an experienced contractor. *The application of effluent using a slurry or umbilical system is high risk due to the very high application rates/intensity of these irrigators (150,000L/hr). This results in a high risk of overland flow or contamination of tile drains. These systems should only be used when soil moisture conditions are optimal.*

7. Solid Effluent Applications

Effluent solids from the scrapping out the sandtraps and weeping wall shall be discharged to land in accordance with Rule 38 of the Proposed Southland Water and Land Plan by observing the following application requirements:

a) Soil moisture levels need to be below field capacity;
b) Soil temperature must be above 5 degrees in winter/autumn and 7 degrees in spring;
c) No effluent is to be applied within 20m of the property boundary, a bore, or a waterway;
d) The average depth of application must be 10mm or less

A guide to the farms soil moisture and soil temperature can be obtained from the Environment Southland soil moisture site located at Tussock Creek (www.es.govt.nz).

8. Effluent System Upgrades/Repairs

The following table lists the current upgrades/repairs that are to be undertaken to the effluent irrigation system and future system analysis work planned.

Table 1: System Upgrade/Repairs Register

Area	Issue	Solution	Timeframe
Example: Travelling Irrigator	*Leaking flange seal causing a pressure drop in the system and slow moving irrigator.*	*Replace flange seal and correctly gear irrigator.*	*2 weeks*

9. Effluent System Training

The efficient operation of the effluent system, in accordance with the conditions of the farms Discharge Permit consent requires staff to be informed and aware of the Permit conditions and the steps required to be undertaken when operating the system.

Staff shall familiarise themselves with the details of this plan and the owner will be responsible for ensuring that staff are trained in the operation and maintenance of the effluent discharge system and any training of new employees. A guide to staff training requirements is detailed in Appendix 5 and shall be completed once training has been provided. Effluent training should be revisited or recapped at the beginning of each season to ensure all staff, new and existing are aware of consent requirements and responsibilities.

All staff dealing with the day to day operation of the effluent disposal system will be appropriately trained by senior management.

10. Farm Plan

The farm plan is located in Appendix 1. This map outlines the location of surface waterways and known tile drains. During wet or very dry conditions (soil cracking) effluent will not be applied in areas where significant cracks, tile drains, or swales (wet conditions only) are located to avoid any risk of surface water contamination. In normal conditions effluent can safely applied over tile drains and swales as effluent application depths are low enough to ensure effluent is retained in the plant root zone of the soil. Where the operator suspects there may be a risk of

effluent entering a tile drain a visual inspection will be made of the tile exit point and immediate action taken to block the tile if any effluent discharge is occurring. Environment Southland shall be notified of any such instances.

11. Effluent Application Rates

Every 24 months the application rate of the of the pods will be tested to ensure it complies with the application depth of 10 mm/hr. Any irrigator testing will be carried out by a suitably qualified person in accordance with Dairy NZ best practice specifications for measuring the application depths and rates for the various systems used on the property. Results of the irrigation tests will be retained and made available to Environment Southland on request.

12. Discharge Permit

The Discharge Permit for the farm is contained in Appendix 6. An application to renew this consent shall be lodged with Environment Southland 6 months prior to this date. The Discharge Permit authorises the discharge of effluent from 850 cows between 1 September – 30 April, 700 cows in May and August and 500 cows between 1 June – 31. The key conditions of the consent are as follows:

1. The discharge authorised by this consent shall not exceed the following rates at any time:

   Area A (Category A Land)

   a) For the low rate pod system and low rate travelling system, a maximum depth of application of 25 millimetres for each individual application, at an instantaneous rate not exceeding 10 millimetres per hour; and
   b) For the umbilical system and slurry tanker a maximum depth of application of 10 millimetres for each individual application; and

   Area B (Category C Land)

   c) For the low rate pod system and low rate travelling system a maximum depth of application of 10 millimetres for each individual application, at an instantaneous rate not exceeding 10 millimetres per hour; and
   d) For the umbilical system and slurry tanker a maximum depth of application of 5 millimetres for each individual application; and
   e) The maximum loading rate of nitrogen onto any land area as a result of the exercise of this consent shall not exceed 150 kilograms of nitrogen per hectare per year.

2. Effluent shall not be discharged within:
   a) 20 metres of any surface watercourse
   b) 100 metres of any potable water abstraction point
   c) 200 metres of any residential dwelling (other than a dwelling on the property)
   d) 20 metres of the property boundary
   e) Within the Peat Wetlands Physiographic Zone

13. Key Contacts

Environment Southland – 0800 76 88 45

Fonterra Sustainable Dairy Advisor – 0800 65 65 68

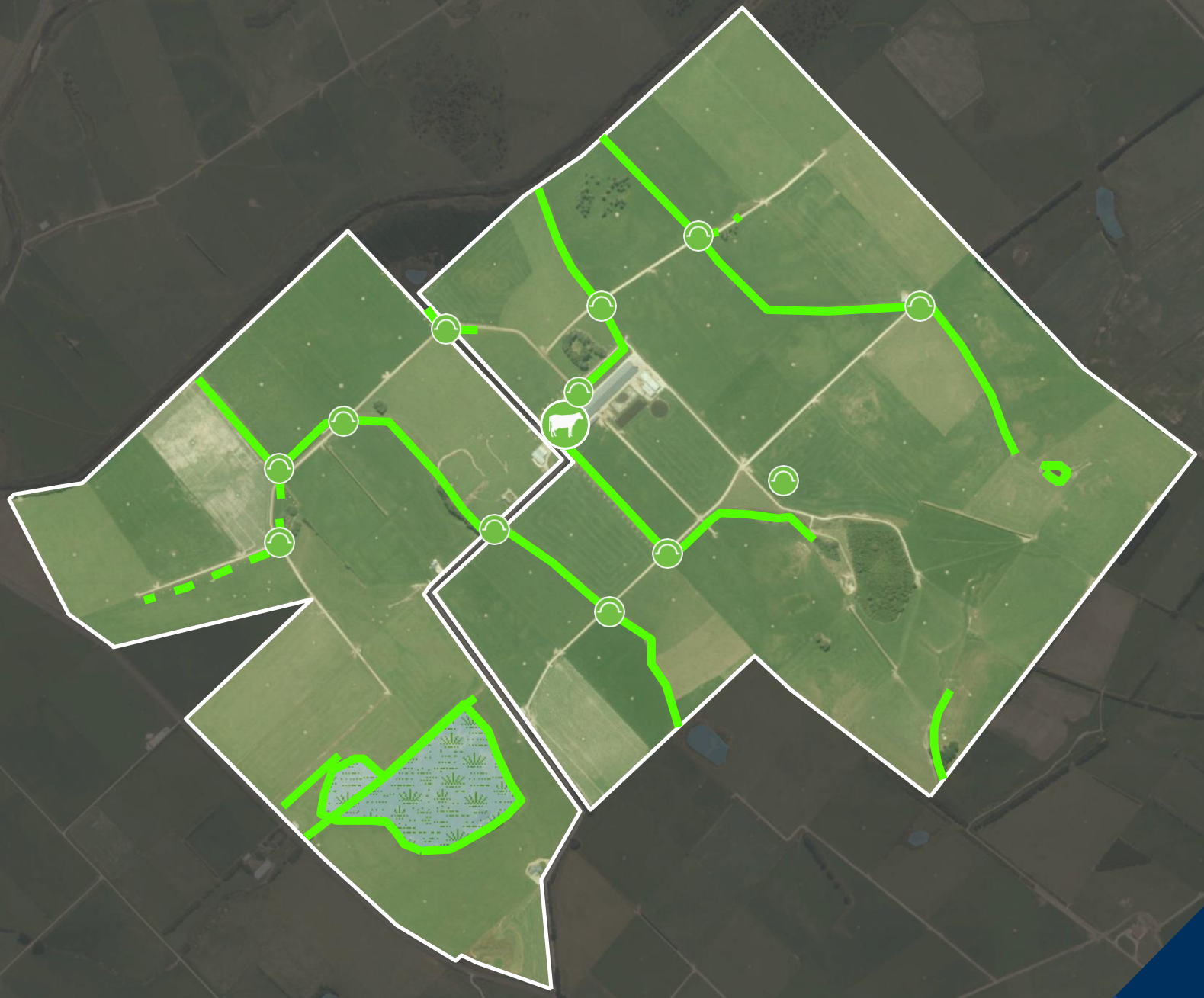
Appendix 1

Farm and Tile Drain Map

Fonterra

Dairy for life

Ward 24 Eastern Southland



ADWSE

NADWSE

Bridged/Culvert

Scale (In Metres)

130 65 0 130 260 390

SUPPLY

31857

Waterways Map

SCALE: 1:13416

GPS-it DATA MAPPING SOLUTIONS

Appendix 2
Soils Factsheet

Soil name: Braxton

Overview

Braxton soils occupy about 19,300 ha on intermediate terraces adjacent to the Aparima River and Waiau Valley. They are formed in a mixture of fine alluvium and loess that is derived from tuffaceous greywacke and volcanic rocks of the Takitimu Mountains. These soils are deep to moderately deep, poorly drained, and have silty clay to heavy silt loam text ures. They are used for sheep, deer and dairy production with some cropping. Climate is cool temperate with regular summer rain.

Braxton profile

Physical properties

Braxton soils have a deep rooting depth and high available soil water, although the rooting depth may be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability. Mottles occur in all horizons – another indication of poor drainage. Texture varies between heavy silt loam and silty clay in the subsoil, and silt loam topsoil clay content is 22–30%. The soils are typically stone-free, although the moderately deep phase will have gravel between 45 and 90cm depth.

Fertility properties

Topsoil organic matter levels range from7 to 10%; P-retentions 30–60%, with moderate pH values (5.5–6.2) that change little down the profile. Cation exchange values are moderate and base saturation values high. Available magnesium and potassium are low. Reserve phosphorus values are low. Micro-nutrient levels are generally adequate, although boron responses in brassicas and molybdenum responses in legumes are likely.

Associated and similar soils

Some soils that commonly occur in association with Braxton soils are:

- Glenelg: well drained, shallow stony soil
- Pukemutu: poorly drained soil due to water perching on subsoil fragipan
- Drummond: Well drained, moderately deep to deep soil

Some soils that have similar properties to Braxton soils are:

- Sobig: occur on high terraces; moderately deep to deep soils that are poorly drained due to water perching on clay-bound gravel
- Glenure: occur on terraces and downlands in northern Southland; consistently have silty textures
- Dipton: occur on intermediate terraces, shallow soils that are poorly drained due to water perching on clay bound gravel
- Makarewa: occur on floodplains

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the poor drainage.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the poor drainage, high water-holding capacity and slow subsoil permeability.
Topsoil erodibility by water	slight	Due to the moderate clay content, the topsoil erodibility of these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	slight	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties, and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	severe	These soils have a severe vulnerability to waterlogging during wet periods. This rating reflects the poor drainage and slow subsoil permeability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

BxU1 (Braxton undulating deep)
BxU2 (Braxton undulating moderately deep)
BxR1 (Braxton rolling deep)

Versatility evaluation for soil BxU1, BxU2, BxR1		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rainfall.
Arable	Limited	Inadequate aeration during wet periods; risk of short-term water logging after heavy rainfall.
Intensive pasture	Moderate	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rainfall.
Forestry	Limited	Inadequate aeration during wet periods; vulnerability to sustained waterlogging.

Management practices that may improve soil versatility

- Careful management after heavy rainfall and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and vehicular traffic should be minimised during these periods.
- Installation and maintenance of subsurface mole and tile drains will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct moisture condition and depth can be of benefit.

Soil name: Makarewa

Overview

Makarewa soils occupy about 38,500 ha on the flood plains of rivers and streams across the Southland region. They are formed in fine alluvium from mixed sources that commonly has some influences of tuffaceous greywacke and basic rocks in western Southland. These soils are deep to moderately deep, poorly drained, and have silty clay textures. They are used for intensive pastoral farming with sheep, dairy and deer, with some cropping. Climate is cool temperate with regular rain and soils rarely dry out.

Makarewa profile

Physical properties

Makarewa soils have a deep rooting depth and moderately high available soil water, although the rooting depth may be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability. Texture is variable, with layered texture profiles common, but there is always at least one horizon with silty clay texture and topsoil clay content is 30-60%. The soils are typically stone free, although the moderately deep phase will have gravel between 45 and 90cm depth.

Fertility properties

Topsoil organic matter levels range from 6 to 10%; P-retention values 30-50% and pH values moderate. Cation exchange and base saturation levels are moderate to high throughout the profile, resulting in high availability of cations present. Potassium levels are very low. Reserve phosphorus levels are also low and there are moderate levels of sulphate sulphur in the subsoil. Micro-nutrient levels are generally adequate.

Associated and similar soils

Some soils that commonly occur in association with Makarewa soils are:

- Dacre: poorly drained soil on flodplains of streams and minor drainage channels.
- Hedgehope: moderately well to imperfectly drained soils formed on levees
- Jacobstown: similar profile, but has silty textures
- Lumsden: shallow, poorly drained soil with silty textures
- Pukemutu: poorly drained due to water perching on a fragipan.

Some soils that have similar properties to Makarewa soils are:

- Braxton: occurs on terraces; textures vary from silt loam to silty clay
- McLeish: shallow, poorly drained soil with clayey textures
- Caroline: has a cemented ironpan in the subsoil
- Titipua: has over-thickened slightly peaty topsoils

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the poor drainage.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the poor drainage, high water holding capacity and slow subsoil permeability.
Topsoil erodibility by water	minimal	Due to the moderate to high clay content, the topsoil erodibility of these soils is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	slight	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties, and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	severe	These soils havea severe vulnerability to waterlogging during wet periods. This rating reflects the poor drainage and slow subsoil permeability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

MkU1 (Makarewa undulating deep)
MkU2 (Makarewa undulating moderately deep)
MkU1vr Makarewa undulating deep recent variant)

Versatility evaluation for soil MkU1, MkU2, MkU1vr		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Arable	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Intensive pasture	Moderate	Inadequate aeration during wet periods; vulnerability of topsoil to structural degradation by cultivation and compaction.
Forestry	Limited	Inadequate aeration during wet periods; potential flood risk.

Management practices that may improve soil versatility

- Careful management after heavy rain and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and heavy vehicular traffic use should be minimal during these periods.
- Installation and maintenance of subsurface mole and tile drains will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct depth and moisture condition can be of benefit.

Soil name: Pebbly Hills

Overview

Pebbly Hills soils occupy about 1800 ha on rolling downs in the Pebbly Hills district. They are formed into quartz gravel deposits overlayen by a thin layer of loess. Soils are shallow and well drained, with a slightly deep rooting depth and moderate water-holding capacity. Present use is pastoral grazing with sheep and some deer and beef cattle. They have a cool temperate climate with regular rainfall.

Pebbly Hills profile

Physical properties

Pebbly Hills soils have a slightly deep rooting depth and moderate plant available water, and are limited by the subsoil gravel. The soils are well drained, with good aeration in upper horizons that decreases with depth, and the subsoil is slowly permeable. Textures are silt loams, grading to sandy loams in the gravelly horizons. Topsoil clay content is about 20–30%, and slightly to moderately gravelly. Subsoils are typically very to extremely gravelly.

Fertility properties

Topsoil organic matter levels are about 13%; P-retention <30% in the topsoil, and 50–90% in the subsoil; and pH moderate (low–mid 5s). Cation exchange values are moderate and base saturation high. Available calcium, magnesium and potassium levels are moderate and soil reserve phosphorus levels low. Micronutrient levels are generally adequate.

Associated and similar soils

Some soils that commonly occur in association with Pebbly Hills soils are:

- Woodlands: formed in deep loess, with gravel at greater than 45cm depth, and imperfect drainage.
- Pukemutu: formed in deep loess, with gravel at greater than 90cm depth, and poorly drained due to fragipan
- Waikiwi: formed in deep loess, with gravel at greater than 45cm depth, and well drained.

Some soils that have similar properties to Pebbly Hills soils are:

- Oteramika: occurs across the Southland plain. Typically formed into a matrix of mixed quartz and highly weathered greywacke and schist gravel; moderately well to imperfectly drained
- Benio: occurs in northern Southland. Typically formed into a matrix of mixed quartz and highly weathered greywacke and schist gravel.
- Wairaki: occurs on high terraces and fans from the Takitimu Mountains. Formed in tuffaceous greywacke alluvium.

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the good drainage, offset by the low–moderate clay and P-retention.
Nutrient leaching	severe	These soils have a severe vulnerability to leaching to groundwater. This rating reflects the good drainage and moderate water-holding capacity.
Topsoil erodibility by water	slight	Due to the high organic matter content, topsoil erodibility in these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	moderate	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage. The hilly phase will have nil vulnerability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

PbH3 (Pebbly Hills hilly shallow)

Versatility evaluation for soil PbH3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Hilly slope
Arable	Unsuitable	Hilly slope
Intensive pasture	Limited	Hilly slope
Forestry	Limited	Restricted rooting depth

PbU3 (Pebbly Hills undulating shallow)

Versatility evaluation for soil PbU3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Intensive pasture	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

PbR3 (Pebbly Hills rolling shallow)

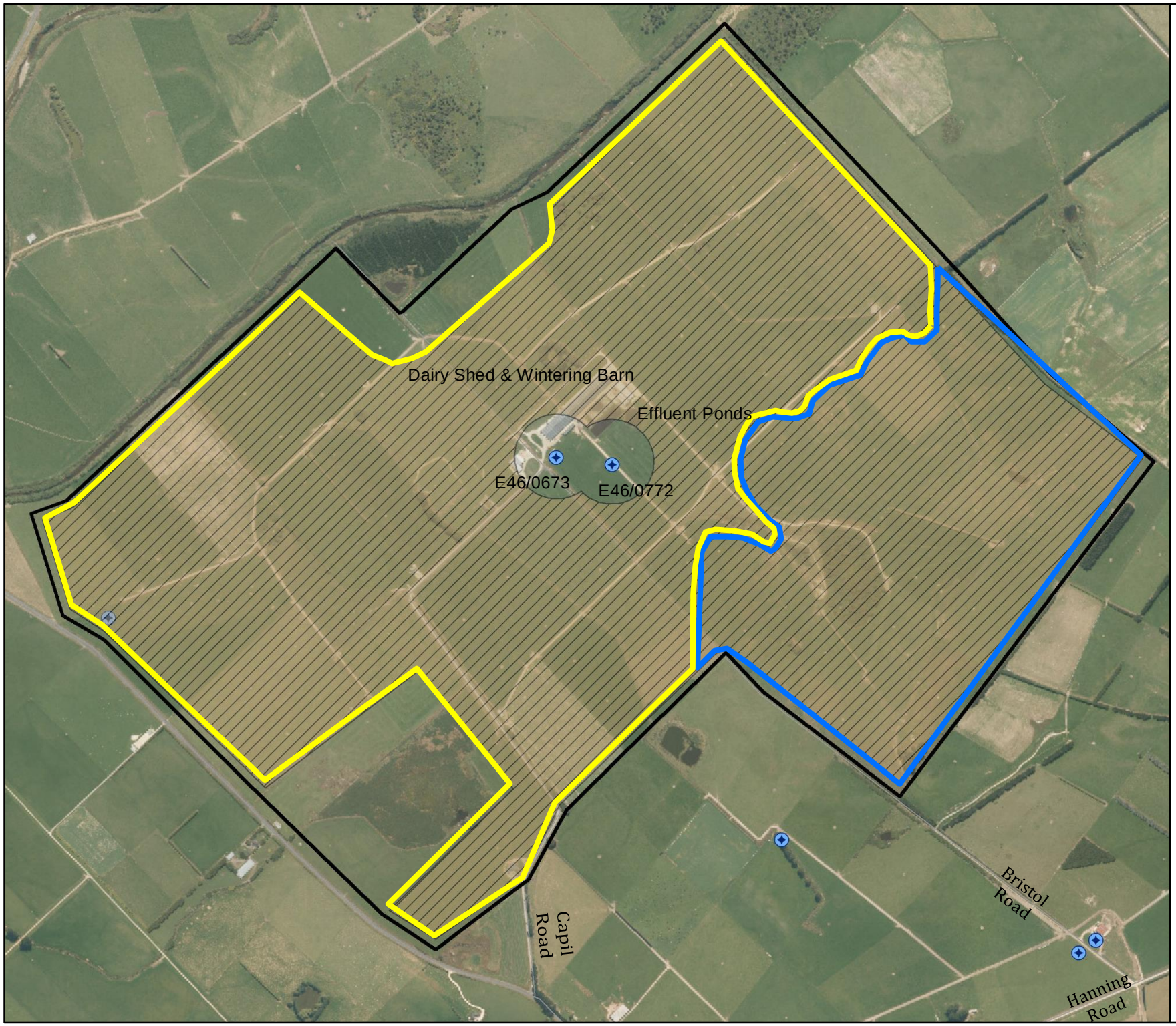
Versatility evaluation for soil PbR3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

Management practices that may improve soil versatility

- Management of nutrient applications so as to minimise leaching losses
- Organic matter levels should be carefully maintained and enhanced

Appendix 3

Consented Effluent Areas



Appendix 1

Date: 10/02/2016

% Wells

Dairyshed Effluent

Farm Boundaries

Area A (category A Land)

Area B (category C land)

1:12,000

environment SOUTHLAND

Appendix 4

Effluent Location Recording Sheet

Collected animal effluent management					
Effluent application diary				*Month*	
Date	*Paddock*	*Run number*	*Operating problems noted*	*Actions taken*	*Signature*
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
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31					

Appendix 5
Staff Training Checklist

Effluent Orientation and Training Record

Season___/___

Effluent Competencies	Employee name	Employee name	Employee name
General			
Understands the regional council rules and farm policies for effluent management			
Understands health and safety around the effluent system			
Understands record keeping for irrigator runs and maintenance			
At the Dairy			
Use of stormwater diversion system			
Good hosing practice and water management			
Animal handling to minimise effluent volume			
Cleaning the stone trap			
Sump, pump & pond monitoring and management (including float switches)			
In the Paddock			
When to irrigate: assessing soil and weather conditions			
Where to irrigate: runs, paddock rotations, high risk vs low risk soils etc (mark on farm map)			
Where not to irrigate: near waterways, drains, boundaries, slopes etc (mark on farm map)			
How the irrigator works, how to use it, set up, hose layout and performance checks			
Measuring the depth of effluent application			
Irrigator, pump maintenance/cleaning			
Greasing and general maintenance requirements (how and when)			
How to check and replace rubber nozzles and seals (same time as dairy rubber ware)			
Tyre pressure and condition			
Pipe-work, hose and hydrant condition			
Wire-rope, cam and ratchet condition			
Other			

Trainer signature			
Employee signature			
Date			

Date when staff become competent in each skill. If all training provided in one day, tick and date at the bottom.

Appendix 6

Discharge Permit

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Cnr North Road and Price Street
(Private Bag 90116
DX YX20175)
Invercargill

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

Discharge Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council to **Arlake Limited, C/- Nelson Lindsay, 27 Capil Road, RD2 Invercargill 9870** from 10 February 2016.

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

Details of Permit

Purpose for which permit is granted:		To discharge dairy shed effluent, wintering barn and calving pad effluent to land for the purpose of disposing of agricultural effluent
Location	- site locality	27 Capil Road, Grove Bush
	- map reference	NZTM2000 1251058E 4866486N
	- groundwater zone	Makarewa
	- catchment	Hedgehope Stream, Makarewa River and Gold Creek
Legal description of land at the site:		Lot 1 DP 4404, Lot 1 DP 12190, Pt Section 1 Blk V Mabel HUN, Pt Section 7A Blk V Mabel HUN, Pt Section 8 Blk V Mabel HUN, Pt Section 15 Blk V Mabel HUN, Pt Section 16 Blk V Mabel HUN, Section 17 Blk V Mabel HUN, Section 9 Blk V Mabel HUN, Section 18 Blk V Mabel HUN and road reserve.
Expiry date:		**10 February 2026**

History of Changes and Transfers

- Transferred from Kapuka Farm Ltd to Arlake Ltd on 1 December 2017.
- Consent conditions varied 26 April 2018.

Conditions

1. This consent shall not be exercised until Discharge Permit 204140 is surrendered or has expired.

2.
   (a) This consent authorises the discharge of dairy shed effluent and wintering barn effluent onto land, via a land disposal system, as described in the application for resource consent dated 21 January 2016, amendment to the application dated 1 February 2016 and the application for consent variation dated 9 April 2018. The scope of the activity is described in the application,

the amendment to the application and the application for consent variation as being, amongst other things:

- the discharge to land of dairy shed effluent generated from milking of up to 850 cows up to twice per day between 1 September – 30 April;
- the discharge to land of dairy shed effluent generated from milking of up to 700 cows up to twice per day in May and August;
- the discharge to land of dairy shed effluent generated from milking of up to 500 cows twice per day between 1 June – 31 July;
- the discharge of farm dairy effluent to land via a low rate pod system, low rate travelling irrigator, slurry tanker and umbilical system to a discharge area of no more than 253 hectares as per the plan attached as Appendix 1;
- the discharge of dairy shed effluent and calving pad effluent to land; and
- the discharge to land of wintering barn effluent generated from the use of the barn.

3. The discharge authorised by this consent shall not exceed the following rates at any time:

Area A (Category A Land)

(a) For the low rate pod system and low rate travelling system, a maximum depth of application of 25 millimetres for each individual application, at an instantaneous rate not exceeding 10 millimetres per hour; and

(b) For the umbilical system and slurry tanker A maximum depth of application of 10 millimetres for each individual application; and

Area B (Category C Land)

(c) For the low rate pod system and low rate travelling system a maximum depth of application of 10 millimetres for each individual application, at an instantaneous rate not exceeding 10 millimetres per hour; and

(d) For the umbilical system and slurry tanker a maximum depth of application of 5 millimetres for each individual application; and

(e) The maximum loading rate of nitrogen onto any land area as a result of the exercise of this consent shall not exceed 150 kilograms of nitrogen per hectare per year.

The application of effluent to land shall not occur when the moisture content of the soils is at or above field capacity.

4. Prior to the exercise of this consent, the consent holder shall measure the application rate of the low rate travelling irrigator as installed to demonstrate compliance with condition 3(a) and 3(c) of this consent. The consent holder shall provide the results of the measurement to the Consent Authority within 10 working days of the measurement being completed.

5. Effluent shall not be discharged within:

(a) 20 metres of any surface watercourse;

(b) 100 metres of any water abstraction point;

(c) 200 metres of any residential dwelling other than residential dwellings on the subject property; and

(d) 20 metres from any property boundaries.

Where there is inconsistency between the plan attached as Appendix 1 and the conditions of this consent, the conditions of this consent shall prevail.

6. The consent holder shall have and maintain between 16,089 cubic metres and 18,597 cubic metres of effluent storage capacity for the purpose of avoiding irrigation of effluent when soils are at or above field capacity.

7. Within six months of the first exercise of this consent, the consent holder shall demonstrate whether or not the effluent storage ponds are leaking by:

(a) obtaining written confirmation regarding the ongoing performance of the ponds from a suitably qualified engineer; and/or

(b) engaging a suitably qualified engineer to undertake the necessary testing to demonstrate the ongoing performance of the ponds; and

(c) providing the confirmation or a report(s) of the test results to the Consent Authority.

8. No effluent shall be discharged to any surface watercourse directly or by overland flow, runoff, or via a pipe, nor shall there be any surface runoff/overland flow, ponding or contamination of water resulting from the exercise of this consent.

9. There shall be no odour or spray drift beyond the boundary of the site as a result of the exercise of this consent that is offensive or objectionable to the extent that it causes an adverse effect in the opinion of an authorised officer of the Consent Authority.

10.
    (a) Prior to the first exercise of this consent, the consent holder shall install and maintain an alarm and automatic switch-off system as a contingency measure in the event of an effluent system failure, such as a sudden pressure drop, irrigator stoppage or breakdown.
    (b) Where the effluent reticulation system is installed in such a way that effluent can be siphoned when pumping ceases, the consent holder shall install and maintain an antisiphon device in the effluent pipeline.

11.
    (a) Prior to the first exercise of this consent, the consent holder shall prepare, and submit to the Consent Authority, an Effluent Management Plan. The purpose of the plan is to provide direction to the consent holder's staff about the operation of the effluent system, including identification of environmental risks, to ensure compliance with the conditions of this consent. The plan shall be a concise document that is easy to use by all farm staff and shall include:
        - a plan of how effluent will be managed when soils are at or above field capacity and/or during adverse weather conditions;
        - a maintenance schedule for effluent disposal infrastructure (maintenance of irrigators, checking anti-siphon/switch-off systems, desludging the pond etc);
        - identification of drains, surface waterways, sub-surface drainage and critical source areas in the effluent disposal area so that the risk of effluent entering water can be avoided; and
        - a plan of how effluent application rates will be monitored to ensure the consent requirements are being met.
    (b) The Effluent Management Plan shall be reviewed at least on an annual basis to check that it still accurately reflects on-site activities and whether any improvements to management procedures need to be made. The results of the review shall be reported to the Consent Authority within one month of the review being undertaken.
    (c) If/when the plan is amended, a copy of the amended version, (or amended sections) shall be sent to the Consent Authority as soon as practicable following amendment.
    (d) This permit shall be exercised in accordance with the Effluent Management Plan at all times. Where there is inconsistency between the Effluent Management Plan and the conditions of this consent, the conditions of this consent shall prevail.

12. Prior to the first exercise of this consent, the consent holder shall notify the Consent Authority of the identity of the person in charge of the effluent disposal system. If a new operator is appointed, the consent holder shall notify the Consent Authority within five working days.

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

14. In the event of the failure or mismanagement of the effluent disposal system, or any other event that may result in a discharge of effluent that may have significant adverse effect on water quality, particularly in the region of the abstraction point of a registered drinkingwater supply, the consent holder shall notify, as soon as reasonably practicable, the following:
    - the Consent Authority (ph 03 211 5115 or 03 211 5225 after hours)
    - the Southland District Council (ph 0800 732 732)

15. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent during the period 1 February to 30 September each year, or within two months of any enforcement action being taken by the Consent Authority in relation to the exercise of this consent, or on receiving monitoring results, for the purposes of:
    (a) determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cumulative effects, which may arise from the exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit;
    (b) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement;
    (c) amending the monitoring programme to be undertaken;
    (d) adding or adjusting compliance limits; or
    (e) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this permit.

Reissued 26 April 2018 after amendments to condition 2.
for the **Southland Regional Council**

Joanna Gilroy
Team Leader Consents

Notes:

1. ***In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.***

2. ***If you require a replacement permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.***

3. ***Dairy shed effluent should not be discharged onto any land area that has been grazed within the previous 5-10 days. Where there has been significant damage to soil during grazing, it is recommended that effluent not be applied until that damage has been repaired.***

4. ***Measuring the moisture content of the soil to determine when the soils are at or above field capacity is to be done by either actual monitoring on site or by reference to the appropriate Council monitoring site. The Council's soil moisture monitoring sites can be viewed at http://www.es.govt.nz and following the "Farming", "Dairy Advisor" and "Soil Moisture Map" links.***

5. ***Ponding is the accumulation of effluent on the soil surface resulting from the application of effluent to saturated soils, or the application of effluent inducing saturated soil conditions. It does not refer to the temporary accumulation of effluent on the soil surface resulting from the application of effluent at a rate that exceeds the soil infiltration rate. 6. Extreme caution should be taken when applying nitrogen fertiliser to the effluent disposal area. It is recommended that a nutrient budget is used to check that nitrogen and potassium application rates to the effluent disposal area are not excessive. 7. The consent holder should display, in a prominent place in the dairy shed, a copy of the resource consent and relevant limits about the operation of the effluent disposal system that must be complied with.***

8. ***Storage ponds should be operated at low levels when conditions for effluent disposal are suitable in order to maintain storage for wet weather periods. In particular, storage ponds should be emptied in late summer/early autumn to ensure sufficient storage capacity for the following late winter/early spring period.***

Appendix 7
Effluent System Photos

Picture 1: Wintering barn stalls and yard.

Picture 2: Yard.

Picture 3: Transfer sump located at the southern entry to the wintering barn.

Picture 4: Sand trap located at the southern entry and exit point to the wintering barn.

Picture 5: Solids bunker, and liquid effluent flow back into the transfer sump.

Picture 6: Weeping Wall, solids removed are spread to land as a permitted activity under Rule 38 of the pSWLP.

Picture 7: Wintering barn and solid scraping pond, with effluent pond 1 &2 in the background. Wintering Barn and solids scrapings pond is emptied via slurry tanker.

Picture 8: Dual silage pit with drains located throughout which flow to silage leachate sump located on the north eastern end of the shed. Silage leachate is discharge to land as a permitted activity under rule 41 of the pSWLP.

Picture 9: Feeding land and wintering barn stalls.

Picture 10: Slurry tanker used on farm.

APPENDIX 5

Arlake Limited

27 Capil Rd, Grove Bush 9872, New Zealand

OverseerFM

Year ending 2019

Analysis type	Year end
Is publication	No
Application version	2.8.3.1
Printed date	21 Oct, 2019, 2:49PM
Model version	6.3.2

Farm details

N: 14787 N/ha: 50 P: 281 P/ha: 1 GHG/ha: 14521 NCE: 35% v6.3.2

Total area	293 ha
Productive block area	288.70 ha
Nitrogen conversion efficiency (NCE)	35%
N Surplus	224 kg/ha
Region	Southland

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	14,787	50
Phosphorus	281	1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Fertiliser, lime and other	208	0	130	39	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	61	13	37	10	5	7	3
Rain/clover fixation	74	0	3	5	3	7	34

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	50	1	19	59	60	6	20
As product	84	14	20	4	18	2	6
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	114	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	116	13	7	-6	1	1	0
Inorganic mineral	0	3	-8	0	-2	-3	-4
Inorganic soil pool	0	-15	151	0	-62	11	17

Blocks

Farm Dairy Effluent

Pasture - 48.7ha

N loss: 3932 N loss/ha: 81.1 P loss: 32 P loss/ha: 0.7

BLOCK DETAILS

Area	48.7 ha
Distance from coast	25 km

SOILS

23%	BRAX_4A.1		77%	PEBB_1A.1	
11.2 ha	Gley		37.5 ha	Brown	

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	3,932	81.1
Phosphorus	32	0.7

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	65	1	100	4	1	1	2
Fertiliser, lime and other	211	0	132	39	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	1	0	3	0	1	0	0
Rain/clover fixation	104.64	0	3	5	3	7	34

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	81.13	0.66	18.69	51	84.81	6.54	22.62
As product	75	12	18	4	16	2	5
Transfer	59	2	60	0	12	1	1
Effluent exported	0	0	0	0	0	0	0
To atmosphere	65.61	0	0	0	0	0	0
As supplements and crop residues	42.23	4	33	3	7	2	1

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	59.44	10.23	0	-8	0	0	0
Inorganic mineral	0	3.77	-8	0	-2	-3	-4
Inorganic soil pool	0	-32.23	116.54	0	-113.58	0.46	10.38

Non-Effluent Block

Pasture - 45.5ha

N loss: 3358 N loss/ha: 74.3 P loss: 31 P loss/ha: 0.7

BLOCK DETAILS

Area	45.5 ha
Distance from coast	25 km

SOILS

25%	11.38 ha	BRAX_4A.1 Gley	75%	34.13 ha	PEBB_1A.1 Brown

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	3,358	74.3
Phosphorus	31	0.7

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	211	0	132	39	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	1	0	3	0	1	0	0
Rain/clover fixation	121.25	0	3	5	3	7	34

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	74.25	0.68	18.5	47	80	6.5	22.5
As product	77	13	19	4	16	2	5
Transfer	61	2	62	0	12	1	1
Effluent exported	0	0	0	0	0	0	0
To atmosphere	66.75	0	0	0	0	0	0
As supplements and crop residues	30	3	22	2	5	1	1

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	24.25	10.25	0	-8	0	0	0
Inorganic mineral	0	3.75	-13	0	-2	-3	-4
Inorganic soil pool	0	-32.25	29.75	0	-108	0.25	9.25

Wintering Barn Effluent

Pasture - 171.9ha

N loss: 6034 N loss/ha: 35 P loss: 92 P loss/ha: 0.5

BLOCK DETAILS

Area	171.9 ha
Distance from coast	25 km

SOILS

58%	BRAX_4A.1		42%	MAKAR_3B.1	
99.7 ha	Gley		72.2 ha	Gley	

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	6,034	35
Phosphorus	92	0.5

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	132	26	148	17	36	15	7
Fertiliser, lime and other	211	0	132	39	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	1	0	3	0	1	0	0
Rain/clover fixation	58.84	0	3	5	3	7	34

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	35	0.54	19	63	49	5	18.42
As product	75	12	18	4	16	2	5
Transfer	59	2	60	0	12	1	1
Effluent exported	0	0	0	0	0	0	0
To atmosphere	73.26	0	0	0	0	0	0
As supplements and crop residues	43	4	33	3	7	2	1

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	118.16	11	0	-7	0	0	0
Inorganic mineral	0	3	-8	0	-2	-3	-4
Inorganic soil pool	0	-7	164	0	-42	16	20

Wintering Barn/Farm Dairy Effluent

Pasture - 22.6ha

N loss: 953 N loss/ha: 42 P loss: 12 P loss/ha: 0.5

BLOCK DETAILS

Area	22.6 ha
Distance from coast	25 km

SOILS

100% BRAX_4A.1
22.6 ha Gley

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	953	42
Phosphorus	12	0.5

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	196	27	248	21	36	16	9
Fertiliser, lime and other	211	0	132	39	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	1	0	3	0	1	0	0
Rain/clover fixation	38	0	3	5	3	7	34

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	42	0.5	19	67	54	5	18
As product	75	12	18	4	16	2	5
Transfer	59	2	60	0	12	1	1
Effluent exported	0	0	0	0	0	0	0
To atmosphere	73	0	0	0	0	0	0
As supplements and crop residues	41	4	32	3	7	1	1

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	155	11	0	-7	0	0	0
Inorganic mineral	0	3	-7	0	-2	-3	-4
Inorganic soil pool	0	-6	263	0	-47	17	22