ravensdown

Farm Scenario Plan

Current and Proposed System Nutrient Budgets for Effluent and Land Use Consent

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60856487
MIRAKA FARMS LTD
C/- P J DYKES & M F WITSEY
162 BOYLE ROAD; RD 3 WINTON 9783
10/07/18
Reviewed by Tim Lissaman (CNMA)

optimiser™
Environmental analysis and planning

Executive Summary

Miraka farms Ltd, have requested an OVERSEER® Nutrient Budgets to reflect the current and proposed estimated nutrient losses from their dairy farm as part of a renewal of their effluent discharge consent and an expansion of the cow herd. The farm is located at 162 Boyle Road, Heddon Bush, 14 km North West of Winton Township and 39 km west North West of Invercargill city and 43 km from the south west coast. The property is a dryland dairy farm, calving and peak milking 599 cows (consented number 599).

Average Nitrogen lost from the root zone, calculated from the current farm system modelled, using OVERSEER® Nutrient Budgets (OVERSEER) 6.3.0 was **8,891 kg N/year** or **34 kg N/ha/year.**

Average Phosphorus lost from the current farm system modelled using OVERSEER® Nutrient Budgets (OVERSEER) 6.3.0 was **182 kg P /year** or **0.7 kg P/ha/year.**

Average Nitrogen lost from the root zone, calculated from the proposed farm system modelled, using OVERSEER® Nutrient Budgets (OVERSEER) 6.3.0 was **8,577 kg N/year** or **32 kg N/ha/year.**

Average Phosphorus lost from the proposed farm system modelled using OVERSEER® Nutrient Budgets (OVERSEER) 6.3.0 was **189 kg P /year** or **0.7 kg P/ha/year.**

The productivity and urine patch deposition on gley soils with a high buffering capacity to leaching (high PAW and deep topsoil's) and crops are key risk reducing and increasing factors respectively.

The reduction of winter stocking, plus the associated increased effluent area enables the property to increase the cow herd, with a resulting slight reduction in the overall risk of N losses.

The farm is in a zone with a mostly moderate to high risk to nitrate levels and the physiographic zones point to high nitrates in ground water, nitrate accumulation and artificial drains as being risk factors. The proposed farm system, as modelled by OVERSEER®, has a number of strategies to reduce these risks of Nitrogen loss to water. These include an effluent system with its low application depths and greater storage to allow for deferred applications during periods of wet weather, a reduced winter stocking and continued use of crop to minimise soil damage over the spring period. Riparian strip planting, capture of sediment from crops and laneways through adequate buffer zones plus optimal phosphate levels are all practices which will reduce the risk of P losses. Future practices such as deferred grazing over autumn, plus ensuring the lowest volume applications and depths are applied to the well-drained and low PAW soils (Glenelg), with none applied at the highest risk times are further mitigations that may be used in the future.

The associated parameter reports are available in a separate document.

Overseer Nutrient Budget Version 6.3.0 have been used to create the nutrient budgets presented in this report.

Contents

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Mark Crawford

Farm Environmental Consultant

Dated 10th July 2018

General

Aim and Purpose of Farm Scenario Plan

Miraka Farms Ltd, has requested current and proposed OVERSEER® Nutrient Budgets to reflect the current and proposed estimated nutrient losses from their dairy farm as a part of a renewal of their effluent discharge consent and an expansion of the cow herd. The farm is at 162 Boyle Road, Heddon Bush, 14 km north west from Winton Township and 39 km west-north west from Invercargill city and 43 km from the south west coast (Te Wae Wae bay). The property is a dryland dairy farm, milking approximately 599 cows (consented numbers).

The property comprises of 6 titles; being Lot 3 DP168, Pt Lot 5 DP 168, Lot 1 DP 4967, Sec 234 Block XV Oreti Hundred and Lot 1 DP 471006, owned by the applicant and Lot 2 DP 471006 and Sec 144 Oreti Hundred owned by Alan Dykes. The land owned by the applicant totals 201.4139ha; whilst legal areas have been described here the total farmed area is 202.2ha. The land currently leased from Alan Dykes is a proportion of Lot 2 DP 471006 and Sec 144 Oreti Hundred totalling approximately 57.0ha. This leased area will increase under the proposed scenario to 62.3ha. There is 10.4 ha of non-productive area across the farm.

Soil types on the farm are mostly homogenous and include; mostly Braxton_4a.1, Silt Loam over clay, 246.0 ha (Orthic Gley soil, Poorly drained, PAW (plant available water) to 60 cm of 147.0 mm); and a Glenelg_4a.1 Silt Loam, 13.2 ha (Firm Brown, well drained, PAW of 78.0 mm). The Braxton soil is a deep to moderately deep soil and being a heavier silty loam texture means a lower risk of nitrogen leaching.

Overseer modelling of the system has been undertaken in accordance with the Overseer 6.3.0 “best practice data input standards” and has been reviewed by a certified nutrient management advisor.
The following report summarises the respective Overseer 6.3.0 nutrient budgets and key assumptions made.

Property Details

Location/address	162 Boyle Road, Heddon Bush 9783 RD 3, Winton
Legal Description	Lot 3 DP168, Pt Lot 5 DP 168, Lot 1 DP 4967, Sec 234 Block XV Oreti Hundred, Lot 1 DP 471006 and Lot 2 DP 471006 and Sec 144 Oreti Hundred
Total area (ha)	202.2 farmed (201.4139 ha titled) plus part area of 119.4291 land calculated at 57.0 ha for the current system, increasing to 62.3 ha for the proposed system. Current Total 259.2 ha. Proposed Total 264.5 ha
Owners	P J DYKES & M F WITSEY
Contact details	
Phone	(03) 2361121 mobile (027) 2224578
Email	mirakafarms@gmail.com
Farm Type	Seasonal supply Dairy farm

Current Farm System Analysis

Climate

Climate data for the property has been sourced from Overseer's Climate Station Tool data and has been entered as rainfall –984 mm/year, PET – 711 mm/year and average temperature – 9.9 ^{o}C, based on location close to latitude/longitude -46.073200, 168.17700 (Silo co-ordinates). Climate data has been modelled as per Overseer BPDIS.

Description of Current Farm System

The 259.2 ha property is operated as a dryland dairy farm, calving 599 cows and peak milking 599 (430 kg LW) smaller crossbred cows. Milk production aimed for is 260,000 kg MS/year (434 kg MS/cow). Cow numbers are shown in the table below. Most cows are wintered off-farm for June and July with a small number of lighter cows remaining (100) plus the first calving heifers, with all cows brought back in mobs over the month of August. Median calving date is the 24th August.

The dry-off date is the 31st of May for the cows and first calving heifers. All replacements (160) are grazed off-the platform until they return as in calf R2 heifers in August. Cows are never milked once a day over drying off (modelled never) and all calves are fed colostrum and waste milk.

A 97.1 ha support block is used to winter the 100 dairy cows, as well as graze the heifer replacements (160) and cuts silage to be used on the dairy platform. In addition it is used over the drying off period by the milking herd. The modelling is replacements (85% of grazing time) all year round; dry cattle (5%) over winter and milking cattle (10%) over drying off (April and May).

Supplements

Supplementary feed imported onto the property and to be fed during the season is as follows:

- 60 T DM Barley grain imported and used over the season through the milking shed.
- 55 T DM of Molasses imported and fed through the shed.
- 106 T DM of Palm Kernel Expeller (PKE); fed across pastoral areas for dairy cows (25 % over Sept/Oct and Jan/Feb)

Supplementary feed made and fed during the season is as follows;

- Approximately 290 T DM of grass baleage; made the support blocks and fed evenly across pastoral blocks to dairy cows.

Farm System - Dairy			
Herd Type/Breed	Fr X J	**Total Milk Solids (kg/year)**	260,000
Seasonal Supply	Seasonal	**Winter milk**	No
Number of cows	599	**Milk Solids (kg/cow)**	433
Stocking rate (cows/ha)	3.7 (3.9/ha grazed)*	**Milk Solids (kg/ha)**	1604/ha (1713/ ha grazed)*

Other Information	
Winter off milking platform	Yes, 100 lighter cows and heifers on support block
Stock grazed off (%)	57 % (including first calvers) in June and July, returning August
Young stock reared off milking platform	Yes from weaning until before calving on support area
Imported Feeds	60 T DM Barley grain, fed through shed to milking cows, 55 T DM of Molasses to dairy cows through shed; 106 T DM of PKE fed evenly on pastoral areas to dairy cows. Total 221 T DM

		Proposed			
Cows	Av weight kg LW	430 kg LW			
	Median calving Date	24th August for Herd			
	Dry-Off date	31st May			
	Peak Milk (1 Dec)	599 cows			
	Cow Numbers		**No cows Dairy Herd**	**Dry cows & Heifers**	**In shed feeding (Y/N)**
		Jul	0	100 & 160 & 160	N
		Aug	395	50 & 160	Y
		Sept	599	160	Y
		Oct	599	160	Y
		Nov	599	160	Y
		Dec	599	160 & 160	Y
		Jan	599	160 & 160	Y
		Feb	599	160 & 160	Y
		Mar	580	160 & 160	Y
		Apr	550	160 & 160	Y
		May	500	160 & 160	Y
		Jun	0	100 & 160 & 160	N
	Production kg/MS	260,000			
	Lactation length	280 days used			
	Once a day Milking (e.g half season, dry off, never)	Never			
	Calves fed milk powder (Y/N)	No			
Supplements Imported		**Amount(T/DM)**	**Fed (e.g. paddock, shed, trough, crop)**		
	Barley grain and Molasses	60 & 55	Fed to dairy milking cows through shed		
	Other PKE	106	Fed to dairy cows on pastoral blocks		
Supplements Made		**Amount (T/DM)**	**Ha**	**Fed or stored?**	
	Baleage	290	@ 3.6 & 3.8 T DM/ha	Made and fed out evenly across dairy milking cow pastoral blocks	
	Swedes	12	20	Fed to replacements and dry cows in June July and milking cows over August	
Effluent	Type/system	Holding Pond system after weeping walls and applied via K Line pods			
	Application Depth mm	Application depth at < 10 mm per application (modelled < 12 mm) from August to May (stir and spray regularly			
Replacements	On/off farm when & what age	On support block from weaning, back as First calvers in August			

* Calculated on milking platform area only excluding the support area.

Fertiliser

Fertiliser applications have been modelled from Ravensdown sales records and farmer information, and are based on average monthly rates. Ammo 31 is applied to the whole farm in August at rates of 100 kg/ha. Urea is then applied in October, December, February and March behind the cows at rates of 45 kg/ha. Records point to 4 applications of Nitrogen over the season. Both effluent and non-effluent blocks receive the same nitrogen and also the same maintenance application of 100 kg/ha of Cropmaster DAP and 30kg/ha Sulphur 90 in November as well as 100 kg/ha of Cropmaster 13 in February plus potassium chloride in December at 80 kg/ha in December. In April Urea is applied in liquid form with Express a gibberellic acid The total fertiliser nitrogen applied is 161 kg N/ha/year for farm blocks and 149 kg N/ha across all blocks (whole property) on average.

Non Effluent and Effluent blocks:

Month	Fertiliser	NPKS nutrient rating (kg/ha)
August	Ammo 31	31-0-0-14
October	Urea	21-0-0-0
November	Crop DAP & Sulphur 90	18-20-0-28
December	Urea	21-0-0-0
February	Urea	21-0-0-0
February	Crop 13	12-14-15-1
March	Urea	21-0-0-0
April	Urea	18-0-0-0
December	Potassium Chloride	0-0-40-0

Soil Test Results

Taken from 2015 and 2016 soil tests for the various areas in table below;

Soil tests	Olsen P	QTK	QT Ca	QT Mg	QT Na	Org S
Non Effluent blocks	30	10	13	33	11	16
Effluent blocks	36	10	13	33	11	16
Support Block	20	10	13	31	11	16

Pasture Production

The predominant pasture species on the dairy farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity as no differences between blocks:

Block	Relative productivity	T DM/ha/year
Dairy pastoral areas	No differences	14.8 to 16.5

It should be noted that this estimated pasture production is based on default South Island pasture ME values and may be different to actual ME values and utilisation values on this farm which in turn would influence estimated pasture production.

Structures

There are no structures on the property, with swedes used as the stand-off paddock over the August period.

Fodder Cropping

A fodder cropping cycle of Pasture to Swedes before being re sown into pasture in October is practiced for approximately 20 ha or 20 % of the support platform. Crops are modelled as Fodder crops and information entered is;

- Swedes are sown in December via direct drilling, 20 ha in total, with dry cows and replacements grazed over June and July, however in August it is grazed by dairy cows before calving as well.
- Sown with Cropmaster DAP plus boron at 250 kg/ha, NPKS rating (41-47-0-2) and one further application of Urea made at 100 kg/ha in February.
- Yields are averaged at 12 T DM/ha.

Effluent

Effluent has been modelled as using Overseer default values, and calculated as applying 34 kg N/ha/year (liquid) over the 112 ha (120 ha total area less riparian and non-effective areas calculated to 112 ha) effluent area, plus 10 kg N/ha/year (solids) applied as well from pond sludge and weeping wall pond solids. The non-effluent blocks that receive pond sludge and solids only have the 10 kg N/ha/year applied. Currently, the effluent system has effluent gravity fed into a stone trap and sump then into a weeping wall followed by a holding pond, from which the effluent is pumped through K Line pods applying liquids at depths of 10 mm per application or less (modelled < 12 mm). The current holding pond is estimated to hold 27 days of effluent storage (WSP Opus Memo dated 13/06/18). Liquid effluent is sprayed during the months of August to May inclusive (modelled stir and spray). Sludge from the pond is modelled to be spread on all areas in January every 5 years by a muck spreader, given there has been little need to de sludge the pond; with all solids (separated solids from weeping wall pond) has been modelled to be spread over effluent and non-effluent blocks in December.

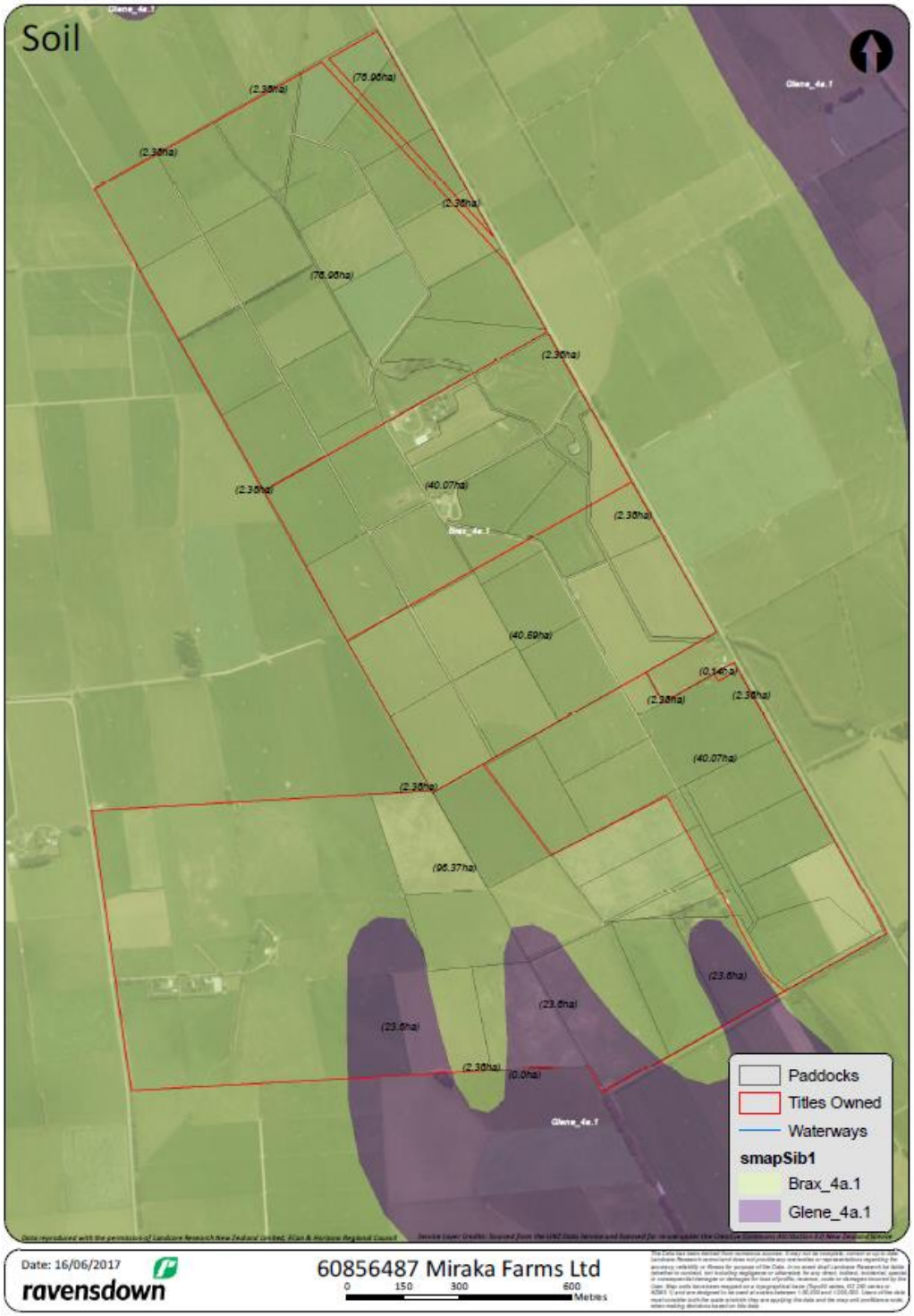
Management Unit details and Soil Information: Table 1

Block Name	Stock	Block Type	Soil Order	Drainage Class	Effluent	PAW (0-60cm)	Effective Area (ha)
Brax_4a.1 Non Eff	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge and solid	147	39.7
Brax_4a.1 Effluent	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid and pond sludge and solid	147	112.0
Brax_4a.1 Support*	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge and solid	147	83.9
Glene_4a.1 Support*	Dairy	Pastoral	Firm Brown	Well drained	Pond Sludge and solid	78	13.2
Riparian	Dairy	Pastoral	Orthic Gley	Poorly drained			2.4
Trees and Scrub	Dairy	Crop	Orthic Gley	Poorly drained			1.0
Swedes	Dairy	Fodder Crop	Various	Various			(20)
Non-Productive area							7.0
Total							**259.2**

* Fodder crop rotates through these blocks; PAW Overseer calculated

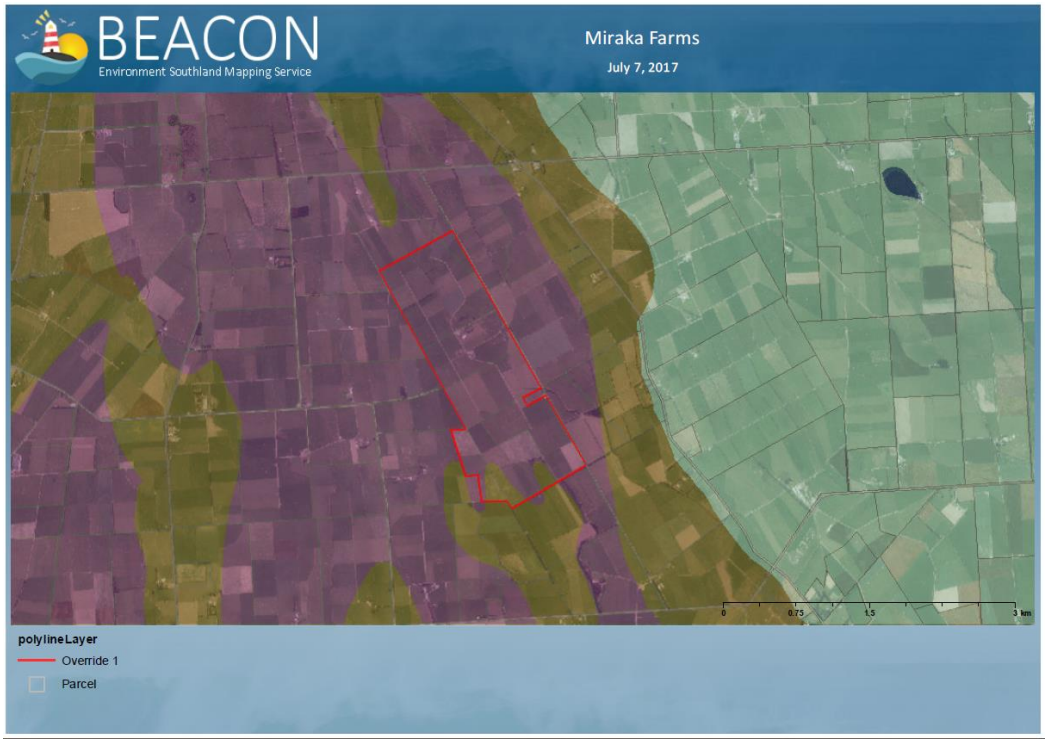
Land Management Unit Map and Farm Map

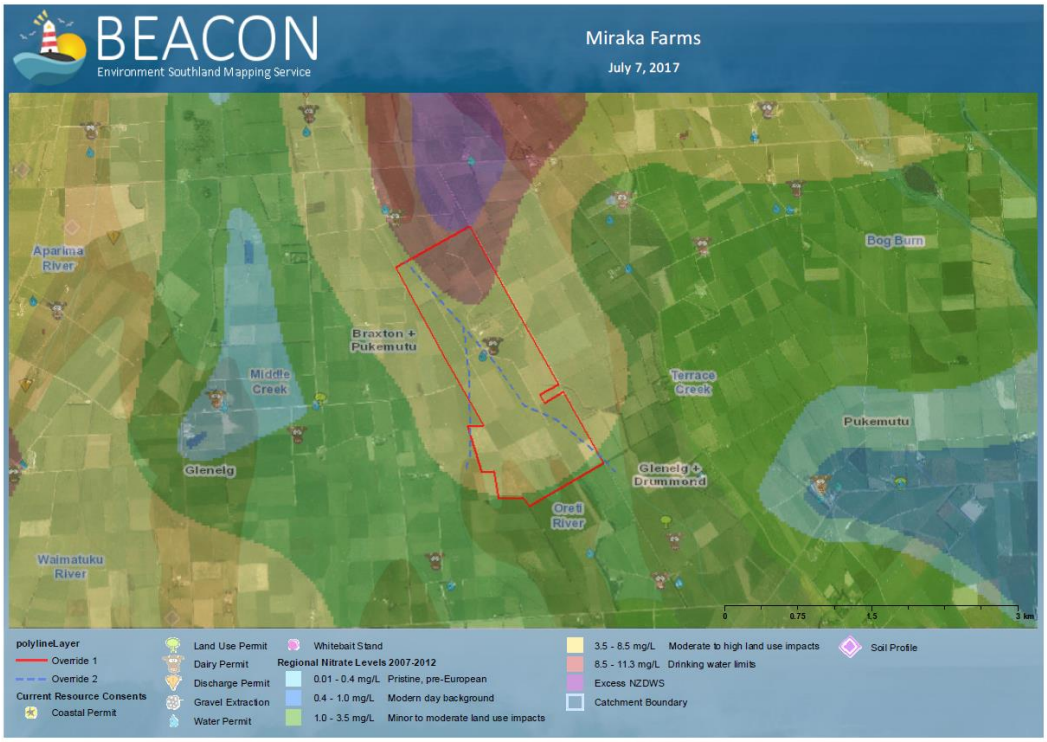
Farm map with Effluent block outlined, 123.6 ha in total less riparian areas and non-productive areas.



Title area and soils.

Nitrate Levels and Physiographic Zonal Environment Southland Beacon Maps





Physiographic zones are oxidising and central plains, with the blue line denotes the three different stream catchments of Terrace, Middle and Oreti River, all which contribute to the Oreti catchment. Green, Yellow and Red shades depict minor to moderate (green) and moderate to high (orange) and at drinking water threshold (red) nitrate levels.

Proposed Farm System Analysis

Description of Proposed (Consent) Farm System *with changes*

The farm dairy platform will be increased to the entire property including the increased leased area, given a total farmed area of 264.50 ha. The effluent area will also be extended to 220.4ha. This area includes crop blocks which are rotated throughout the effluent area, not necessarily receiving effluent whilst in crop. There will no longer be a support block, with most cows wintered off the platform, except the 100 lighter cows, as well as the dairy heifers as in calf heifers (170), giving a combined wintered cow number of 270. There will now be 15 ha of crop grown, but in a two year crop rotation, modelled through the Braxton soils only of property as they are the main soil type (95%). To enable this an additional 5.3 ha of leased land of Braxton soils is included, (see Proposed Farm Map)

The 264.50 ha property will be operated as a dryland dairy farm, calving 750 cows and peak milking 740 (430 kg LW) smaller crossbred cows. Milk production aimed for is 316,500 kg MS/year (428 kg MS/cow), a reduction in 5,500 kg MS/year to reflect the lowered autumn numbers. Cow numbers are shown in the table below. Most cows are wintered off-farm for June and July with a small number of lighter cows remaining (100) plus the first calving heifers, with all cows brought back in mobs over the month of August. Mean calving date is still the 24th August.

Mob name	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Dairy cows		465	750	750	740	740	740	725	700	650	430	
Dairy grazers (milking cows)	100	50									25	100
Dairy grazers (replacements)	170											170

The dry-off date is now the 25th of May for the cows and first calving heifers, thus reflecting a lower averaged figure for May. All replacements (170) are grazed off-the platform until they return as in calf R2 heifers in June to be wintered. Cows are never milked once a day over drying off (modelled never) and all calves are fed colostrum and waste milk. Stock numbers were also reduced in autumn by 35 and 65 cows in April; and May respectively, reflecting more on the approximate number of cows to be wintered for that season for these months from mid-April on, as well as drying off a week earlier and getting cows off. In addition, the owner is recently introduced 16 hourly milking in the last month of lactation and once a day for the last week, leading to the modelling of once a day milking during drying off.

Supplements

Supplementary feed imported onto the property and to be fed during the season is as follows:

- 103 T DM Barley grain imported and used over the season through the milking shed.
- 40 T DM of Molasses imported and fed through the shed.
- 93 T DM of Palm Kernel Expeller (PKE); fed across pastoral areas for dairy cows (a reduction of 20 T DM)
- 106 T DM of silage is imported and fed out to dairy cows on blocks mostly good quality silage (74 T DM) with 32 T DM to crops. The 74 T DM is fed in the August September (30 %) and mainly March April May (70 %) periods and has been reduced by 30 T DM, reflecting the reduced requirement with altered cow numbers in autumn.

Supplementary feed made and fed during the season on farm is still not included (modelled) to reconcile the pastoral productivity. There is still, however, a reduced opportunity to make supplementary feed on farm on average, in comparison to the current system.

Fodder Cropping

A fodder cropping cycle of Pasture to Kale to Swedes before being re sown into pasture in October is now practiced for approximately 15 ha or 6 % of the dairy farm. In addition, there is a 5 ha summer forage crop (modelled here as summer turnips) sown in October and re sown into Pasture in March April after being grazed in February March. Crops are modelled as crop blocks for the two year cycle crops and a fodder crop for the late summer forage crop. Information entered is now as follows;

Swedes

- Still sown in December but by conventional cultivation, 7.5 ha, with dry cattle and replacements being grazed in late July (100 %), August (50 %) and later calving milking cows in August (50 %) and September (100 %).
- Sown with Cropmaster DAP plus boron at 200 kg/ha, NPKS rating (33-37-0-2) and one further application of urea at 100 kg/ha in January.
- Yields are 13 T DM/ha, reflecting a better yield after conventional cultivation. A catch crop is also modelled as being broadcast in late August/September prior to cultivation to try and capture any available nutrient and provide cover until this second year crop is sown in December.
- Normal fertiliser on re sown pasture is resumed in November after October sowing.

Kale

- Sown November/December (modelled December) by direct drilling, 7.5 ha, with dry cows and replacements grazing it over June and July (100%).
- Sown with 250 kg/ha of Cropmaster boron plus (NPKS rating of 41-47-0-2) plus one further application of urea at 100 kg/ha in February.
- Yields are averaged at 14 T DM/ha

Summer forage crop (Turnips)

- A leafy turnip crop is sown in October by direct drilling, 5 ha, with milking cows grazing it 4 hourly per day over February March, with it being re sown into permanent pasture in late March April.
- Sown with 200 kg/ha of Cropmaster boron plus (NPKS rating of 33-37-0-2) plus one further application of urea at 100 kg/ha in December.
- Yields averaged at 8 T DM/ha

Effluent

Effluent has been modelled as using Overseer default values, and calculated as applying 15 kg N/ha/year (liquid) on average over the proposed 220.4 ha effluent area, plus 16 kg N/ha/year (solids) applied as well from pond sludge and weeping wall pond solids. The non-effluent blocks that receive pond sludge and solids only have the 16 kg N/ha/year applied. The effluent system is largely the same, however the proposed holding pond is estimated to hold 150 days of effluent. Liquid effluent is sprayed during the months of August to April inclusive (modelled spray infrequently). Sludge from the pond is now modelled to be spread on all areas in January every year by a muck spreader, even though there has been little need to de sludge the pond; as little and often will reduce losses here; with all solids (separated solids from weeping wall pond) has been modelled to be spread over effluent and non-effluent blocks in December. Nil solids are applied to young grass paddocks.

Pasture Production

The predominant pasture species on the dairy farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity as no differences between blocks:

Block	Relative productivity	T DM/ha/year
Dairy pastoral areas	No differences	16.1

It should be noted that this estimated pasture production is based on default South Island pasture ME values and may be different to actual ME values and utilisation values on this farm which in turn would influence estimated pasture production.

All other factors have remained the same.

Proposed Farm System Information

Farm System - Dairy			
Herd Type/Breed	Fr X J	**Total Milk Solids (kg/year)**	316,500
Seasonal Supply	Seasonal	**Winter milk**	No
Number of cows	750	**Milk Solids (kg/cow)**	428
Stocking rate (cows/ha grazed)	3.0 (2.8/ha total)	**Milk Solids (kg/ha grazed)**	1,324 (1197/ha total)
Other Information			
Winter off milking platform		Yes, 100 lighter cows and replacement in calf heifers wintered on	
Stock grazed off (%)		All bar 100 as above are off over June and July, with in calf R 2 Heifers coming back in first week of May, to be wintered	
Young stock reared off milking platform		Yes from weaning	
Imported Feeds		103 T DM Barley grain, fed through shed to milking cows, 40 T DM of Molasses to dairy cows through shed; 93 T DM of PKE fed through shed, with 90 T DM cereal silage fed on pastoral areas to dairy cows, plus 16 T DM baleage fed on crops Total 342 T DM	

		Proposed			
Cows	Av weight kg LW	430 kg LW			
	Median calving Date	24th August for Herd			
	Dry-Off date	25st May			
	Peak Milk (1 Dec)	740 cows			
	Cow Numbers		No cows Dairy Herd	Dry cows & Heifers	In shed feeding (Y/N)
		Jul	0	100 & 170	N
		Aug	465	50 & 0	Y
		Sept	750		Y
		Oct	750		Y
		Nov	740		Y
		Dec	740		Y
		Jan	740		Y
		Feb	725		Y
		Mar	700		Y
		Apr	650		Y
		May	430	25	Y
		Jun	0	100 & 170	N
	Production kg/MS	316,500			
	Lactation length	*276 days used*			
	Once a day Milking (e.g half season, dry off, never)	*During drying off*			
	Calves fed milk powder (Y/N)	No			
Supplements Imported		Amount(T/DM)	Fed (e.g. paddock, shed, trough, crop)		
	Barley grain and Molasses	103 & 40	Fed to dairy milking cows through shed		
	Other PKE	93	Fed to dairy cows through shed		
	Cereal silage/Baleage	74&32	Fed to dairy cows on pastoral blocks in Aug Sept and March April May, with 32 T DM baleage to crop blocks		
Supplements Made		Amount (T/DM)	Ha	Fed or stored?	
	Kale	14	7.5	Fed to replacements and dry cows in June July (100)	
	Swedes	13	7.5	Fed to replacements and dry cows in July 100% August 50 % to calving milking cows August 50 % and September 100 %	
	Summer Forage (leafy turnip)	8	5	Fed to milking cows 4 hours per day over February to March	
Effluent	Type/system	Holding Pond system after weeping walls and applied via K Line pods			
	Application Depth mm	Application depth at < 10 mm per application (modelled < 12 mm) from August to May (stir and spray regularly			
Replacements	On/off farm when & what age	Off from weaning, back as First calvers in June to winter			

Proposed Land Management Unit Maps

Title area and soils, of which 62.5 ha is leased. This includes an additional 5.3 ha was added (paddock 58) which to new proposed budget

Proposed Land Management Unit details and Soil Information: Table 1(a)

Block Name	Stock	Block Type	Soil Order	Drainage Class	Effluent	PAW (0-60cm)	Effective Area (ha)
Brax_4a.1 Non Eff*	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge and solid	147	10.1
Brax_4a.1 Effluent*	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid and pond sludge and solid	147	127.3
Brax_4a.1Non Eff Support*	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge and solid	147	15.0
Glene_4a.1 Non Eff Support	Dairy	Pastoral	Firm Brown	Well drained	Pond Sludge and solid	78	3.7
Brax_4a.1 Eff Support*	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid and pond sludge and solid	147	61.1
Glene_4a.1 Eff Support	Dairy	Pastoral	Firm Brown	Well drained	Liquid and pond sludge and solid	78	9.5
Brax_4a.1Non Eff Support Extra*	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge and solid	147	4.9
Riparian	Dairy	Pastoral	Orthic Gley	Poorly drained			2.4
Trees and Scrub	Dairy	Crop	Orthic Gley	Poorly drained			1.0
Past>Kale	Dairy	Crop	Orthic Gley	Poorly drained			7.5
Kale>Swedes	Dairy	Crop	Orthic Gley	Poorly drained			7.5
Swedes>Past	Dairy	Crop	Orthic Gley	Poorly drained	Liquid and pond sludge only		7.5
Summer Forage (Turnip)	Dairy	Fodder Crop	Various	Various			(5)
Non-Productive area							7.0
Total							**264.5**

* Areas fodder crop rotates through.

Summary of Current and Proposed Farm System Scenario: Table 2

	Current scenario	Proposed scenario with adjustments
System Type	Seasonal dairy supply and support block	Seasonal dairy supply
Total Area (ha)	259.2	264.5
Effluent area (ha)	112 ha receiving liquids from dairy shed with this area plus 39.7 ha non effluent and 97.1 ha support block having pond sludge from the holding pond and weeping wall solids applied as well.	220.4 ha in total with 201 ha receiving liquids and pond sludge plus weeping wall solids each year less crop areas, with the remaining non effluent areas receiving sludge and solids, solids applied yearly
Stocking rate (s.u/ha)	6,265 s.u* or 25.2 s.u/ha effective or 3.9 cows/ha platform (2.3 cows/ha total)	6,620 s.u or 26.1 s.u/ha effective or 3.0 cows/ha platform (2.8 cows/ha total)
N use (kg N/ha/year)	149 across the whole farm	133 across the whole farm
Production (kg MS/ha grazed)	1714/ha effective platform (1045/ha total grazed)	1245/ha effective platform (1,196/ha total or 1366/ha grazed))
Supplements Imported (kg DM/ha/year)	221 T DM in total or 1456 effective platform. Note also 290 T DM baleage is made on support blocks and fed out on dairy pastoral blocks and 10 ha of swedes is fed over June and July with dry cows and heifers and dairy cows graze crop in August.	342 T DM in total or 1346 effective platform.
Wintering system	Off farm mostly, with 100 dairy cows and R1 & 2 heifers wintered on support block	Off farm mainly, with 100 dairy cows plus replacements wintered on.
Pasture production(kg DM/ha/year) - Platform Pastures - Support paddocks	 16,498** 14,780	 16,101**

*As calculated by OVERSEER and including and dry cows**As calculated by OVERSEER with standard default and ME values likely to be lower than Southland values.

Summary of Current Whole Farm Nutrient Loss Indicators: Table 3

	Current scenario	Proposed scenario
Nitrogen leaching loss to water (Total kg N) Dairy platform* Support block	8,891 4,360 4,531	8,577
Nitrogen leaching loss to water (kg N/ha) Dairy platform Support block	34 27 47	32
Phosphorus runoff to water (Total kg P) Dairy platform Support block	182 152 30	189
Phosphorus runoff to water (kg P/ha) Dairy platform Support block	0.7 0.9 0.3	0.7

* Losses split pro rata with riparian, trees and other losses

Discussion on Whole Farm Nutrient Loss Indicators

From the information provided by Miraka Farms, farm records, and the assumptions listed above, the N loss from the root zone and P loss to second order streams for the farm system is outlined below.

Current Farm System

- The N loss from the root zone from the farm system modelled was calculated using OVERSEER® (v6.3.0) to be **34 kg N/ha/year or 8,891 kg N/year.**
- The P loss risk from the farm system modelled was calculated using OVERSEER® (v6.3.0) to be **0.7 kg P/ha/year or 182 kg P/year.**

Proposed Farm System with adjustments

- The N loss from the root zone from the farm system modelled was calculated using OVERSEER® (v6.3.0) to be **32 kg N/ha/year or 8,577 kg N/year.**
- The P loss risk from the farm system modelled was calculated using OVERSEER® (v6.3.0) to be **0.7 kg P/ha/year or 189 kg P/year.**

The overall N loss for the mitigated proposed farm operation is now 32 kg N/ha/year or 8,577 kg N total, as seen in the above Table 3 page 22. The overall N loss for this scenario is now 2 kg N/ha/year less or a difference of 314 kg N/year from the current farm system modelled at a 34 kg N/ha/year Nitrogen loss, with a total yearly losses of 8,891 kg/year.

Issues have arisen with this consent application and the supporting budgets in the confidence in the results given a perceived increase in intensity from the current to proposed system, when peak cow numbers are used as the metric. To clarify the reasons for why the resulting increase in cow number does not reflect on higher losses, and why the adjusted budget shows a further decline, one needs to note the following;

- The amount of urinary N deposited is **highest in the current system**, due to its higher pastoral intensity on the designated milking platform, with the support block having a similar intensity but greater area of cropping, leading to the higher Nitrogen losses with this block. In addition the support block had a large amount of urinary N in April May, this was queried by Council but reflects the stocking of this block before winter with cows that are dried off or in the process of being dried off, as well as reflecting the need to graze this before destocking for the winter. This is opposite to the dairy platform which has cover left to carry forward for calving.

- The proposal also **does not** have the replacement heifers grazing all year round through to calving and it is this reduction in stock and the subsequent spreading of the dairy operation over the entire farm area, plus the above point which leads to the two operations to have similar Nitrogen losses.
- At the request of the Council, mitigated measures were modelled to further reduce Nitrogen, especially the autumn Nitrogen risk and the following measures were instigated after discussions with the farmer, with the most influential listed first and subsequent influence listed thereafter;
    - Cow numbers were reduced further in April and May by 35 and 65 as cull cows and dried off cows are removed immediately. As well peak cow numbers were at 740 allowing for losses which previously were not included. Resulting reductions in production and supplements were also made.
    - Drying off date was made a week earlier, to reduce the autumn N, so that on average the number of cow on the platform over May is reduced by 140.
    - Effluent sludge/solids modelled from the holding pond are spread annually (compared to every 4 to 5 years), showing that little and often is the best means for dealing with effluent applications.
    - A reduction of 21 kg N/ha/year in fertiliser on the effluent block was made in December to reflect a more equitable approach to Nitrogen amounts between the Non effluent and Effluent blocks is achieved (177 kg N/ha/year added N compared to 172 kg N/ha/year for the effluent block)
    - Effluent applications are started in August and stopped at the end of April
    - The winter cropping area has been reduced to 15 ha by double cropping and including a higher yielding first and second crop (Kale at 14 T DM/ha and swedes at 13 T DM/ha) and differentiating times grazed between the two crops. In addition a catch crop is modelled (Italian ryegrass) and suggested that this be investigated by the owner as to what crop type and system is best
    - A summer forage crop is modelled, making the cropping area the same, but 5 ha is now designated to graze milking cows on and reduce pastoral N in autumn onto this crop, which can be followed once finished in early autumn with pastoral species which can catch a greater percentage of autumn N. This is in effect an autumn standoff area.
    - An additional paddock of Braxton soils 5.3 ha was added in, but having very little effect. Additional Glenelg soils could well have the opposite effect due to their leaching vulnerability.

The N loss for the adjusted proposal ranges from 2 to 3 kg N/ha/year for the Trees and Riparian areas to 71 kg N/ha/year for the Swede fodder crop block grazed over winter; with dairy pastures ranging between 29 and 69 kg N/ha/year. (Block Nitrogen reports, pages 29 & 32).

The key factors determining these losses and the difference between the two systems modelled (current and adjusted proposal) are:

- Winter crop blocks (and crop type) have one of the highest losses per ha; ranging from 28 to 71 kg N/ha/year in the proposed sceanrio. The current crop blocks contribute a total of 1,266 kg Nitrogen/year or 14.3 % of total losses of 8,891 yet only occupying 7.7 % of the land area. In the adjusted proposal these figures are reduced to 1,117 (including summer forage crop) kg N/year total, 13.0 % of the total losses and 10.4 % of the total area. This reflects not only that it is the reduced winter grazing of cattle on pasture that has compensated for the increased N losses from more cows, thus maintaining the N losses on this property, but reduced winter crop area, catch crops and the introduction of Kale plus reduced autumn N from summer forage crops has reduced the loss of Nitrogen risk on this farm.
- The soil type has a large impact on N leached. The soils on the property are mainly poorly drained silt loams over clay. Plant Available Water (PAW) values would be considered 'moderate to high' ranging between 78 mm and 147 mm (0-60cm), with the main soil type being 147 mm. The Plant Available Water is described as "the amount of water potentially available to plant growth that can be stored in the soil to specific soil depths". It therefore makes sense that the soils with high PAW will have lower N leaching as there will be less drainage from these soils. Soils with lower PAW are less able to buffer against changes in nitrogen losses to the bottom of the root zone (from stocking rates, crop yields, irrigation volumes) as the soils have larger pores and are flushed frequently as compared to a poorer draining soil with a higher PAW (see N report in Appendix where the Glenelg soils lose 79 kg N/ha/year compared to the Braxton soils, losing 36 kg N/ha/year respectively on the Support pastoral blocks under the current system). A reduction in autumn winter intensity on the Support area is evident in that the support area loses less Nitrogen in the adjusted proposal than in the current system modelled (3,059 kg N/year compared to 3,259 kg N/year).
- Fertiliser and Effluent N applications, amounts and timings will impact upon N leached. Differential N applications by recognising the amount of readily available N in liquid effluent on average (15 kg N/ha/year), lead to a single reduction of fertiliser applied on the Effluent block in December (peak effluent applications). This and the stopping of liquid effluent applications at the end of April has led to the reduced amount of N in autumn and the reduced risk of autumn N being lost from the system.

The non-productive areas offset these N losses to an extent.

The other environmental risk indices are the current P losses to surface water at 0.7 kg P/ha/year as seen in the Phosphate reports pages 28 & 31, which are low risk in their impact. The P risk is mostly influenced by losses from other sources (98 kg or 53.8 % of total of 182 kg, refer Phosphorous block reports, pages 28&31) which is run off from tracks and yards into drains and ditches from the farm. Riparian strip planting and vegetation buffer zones for

crops and lane ways can reduce this and will need to be further implemented on this farm. Olsen P levels are within or below the optimum agronomic ranges, and the topography where the majority of the fertiliser is applied is flat, which also helps to minimise P losses. The new Effluent storage plus the low volume applications will help to mitigate this risk also. The proposed P losses are only 7 kg P/year higher and due entirely to the increase in other losses, mitigated by the above.

The current scenario is rated 10.0, the upper side of category 1 under the Soil versatility rating system (Landcare Research, 2002), as calculated in the table 4 below (page 26). The farm already uses a number of effective Nitrogen mitigation strategies to minimise losses for the proposal culminating in the results above. As modelled, the farm uses and/or has;

- All water ways are fenced and Riparian strips in place. A plan will further improve set back distances.
- The proposed effluent system is a holding pond, with adequate storage. The area is more than adequate when compared to effluent nutrients supplied, with 45 ha required for the standard effluent application of 150 kg/ha for this number of cows including solids, compared to the current 112 ha liquid plus sludge and pond solids and the rest of the farm area made available to spread pond sludge and solids (Effluent reports pages 30 & 33.).
- The farm proposes to winter most cows off farm and the replacements are grazed off farm, until coming home for their second winter. In comparing this to the current state, the winter stocking is reduced, with a slight increase in overall annual stocking rate, but a reduced milking cow stocking on the platform over the lactation. The farm uses a crop as a stand-off area when it is wet over late winter early spring. The soil type being Braxton is relatively forgiving to nutrient losses, and so this does help in minimising losses to a small area and the overall effect would be reduced treading and pugging damage. Further use of deferred grazing over the autumn period would help further in lowering N losses in time.

Soil Vulnerability Land Management Rating: Table 4

Soil Type/Farm blocks	Soil Vulnerability	Vulnerability rating	% Farm	Rating score
Braxt_4a.1	Moderate	10	94.9	9.49
Glene_4a.1	Moderate	10	5.1	0.51
Total			**100.0**	**10.0**

The property is situated in the Terrace and Middle creek and Oreti River sub catchments, and the Oreti catchment of the proposed Environment Southland Regional Water and Land Plan. It is 94.9 % on a gley soil central plains

physiographic zone, and 5.1 % on an brown soil oxidising physiographic zone, with no variants in overland flow (see map, page 14 and table above), meaning the farm must attach significance to both zones in its environmental management. The farm is within zones having influence in the high nitrate levels in ground water. Water quality is characterised by lowland hard bed, with either quaternary gravel or Waimatuku groundwater management zones, sub surfaces. Implications of this information are unknown at present but some catchment areas will be required to reduce their impacts. The zonal information would point to the presence of nitrate leaching; and nitrogen accumulation as key risk factors for the zone. With the key risk factors for the gley soils being overland flow and losses of nitrogen through tiles if any and not the case here, however this is being mitigated by the use of increased effluent storage and low volume applications, with a reduction in winter stocking. Reduced autumn stocking and autumn N by drying off and once a day milking are additional mitigations used, and the reduced winter cropping are, with an autumn summer forage crop have also reduced N losses. Further targeting of deferred grazing over at risk times would help further mitigate these risks. No effluent applications to the highest risk soil during the highest risk periods would be helpful. This and the created Riparian strips and wetlands would be the activities which would be required to mitigate any overland flows.

Please see information contained in the Appendices for detail relating to nutrient budgets, nitrogen block reports, phosphorus block reports and estimated pasture production for the current situation and scenario modelled.

OVERSEER v6.2.3 onwards has a new irrigation module to better reflect the management practices of irrigators. The Best Practice Data Input Standards give some guidance on what is now required. The model requires more information from users about their irrigation system and how water application decisions are made on farm. The extra data needed includes depth of water per application; return time and depending on how soil water is monitored what are the trigger points and targets (mm deficit). Ideally, this data needs to be actual long term average data as OVERSEER uses 30 year average climate data. Best estimates of these data will generally generate more drainage, and hence N loss to water, than has been the case with previous OVERSEER versions.

OVERSEER is a continually developing model with several aspects currently being investigated. In particular there are on-going issues in relation to the modelled nitrogen leaching from grazed crop blocks (and possibly forage blocks also) being less than expected. (Please see www.overseer.org.nz/OVERSEERModel/bugs.aspx for more detail).

When future versions of OVERSEER are stipulated for use associated with Regional Council rules both the current and the proposed farm systems will need to be re-modelled for consistency as the base N lost from the root zone may alter with updated OVERSEER versions.

Appendices

Current farm System Whole Farm Nutrient Budget

MIRAKA FARMS LTD - DYKES P J & WITSEY M — Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Current 2016_17 -FEPadj s blk- copy 3 (2016/17)

Farm Nutrient Budget - Whole farm

	N	P	K	S	Ca	Mg	Na
				(kg/ha/yr)			
Nutrients added							
Fertiliser, lime & other	149	34	49	38	0	0	1
Rain/clover N fixation	108	0	2	4	2	4	17
Irrigation	0	0	0	0	0	0	0
Supplements imported	16	3	14	3	2	2	1
Nutrients removed							
As products	76	13	17	5	19	2	5
Exported effluent	0	0	0	0	0	0	0
As supplements	0	0	0	0	0	0	0
To atmospheric	71	0	0	0	0	0	0
To water	34	0.7	18	58	73	3	12
Change in internal pools							
Plant material	-5	-1	-11	0	-1	-1	0
Organic pool	89	12	4	-18	1	0	0
Inorganic mineral	0	3	-16	0	-3	-4	-5
Inorganic soil pool	6	8	52	0	-85	6	7

Current Farm System Nutrient Loss Indicators

P report

Block P

MIRAKA FARMS LTD - DYKES P J & WITSEY M — Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Current 2016_17 -FEPadj s blk- copy 3 (2016/17)

Block Phosphorus

Block name	Total P lost (kg P/yr)	P lost (kg P/ha/yr)	P loss categories		
			Soil	Fertiliser	Effluent
Brax_4a.1 Non Eff	12	0.3	Low	Low	Low
Brax_4a.1 Effluent	40	0.4	Low	Low	Low
Brax_4a.1 Support ##	15	0.2	Low	Low	Low
Glene_4a.1 Support ##	1	0.1	Low	Low	n/a
Riparian 1	0	0.1	n/a	n/a	n/a
Trees and Scrub 1	0	0.1	n/a	n/a	n/a
Swedes	14	0.7	n/a	n/a	n/a
Other farm sources	98				
Whole farm	182	0.7			

Has a fodder crop rotating though, results for pastoral block component only

N report

Farm N

MIRAKA FARMS LTD - DYKES P J & WITSEY M

Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Current 2016_17 -FEPadj s blk- copy 3 (2016/17)

Farm Nitrogen

	Units	Benchmark farm	Current farm
Inputs (farm average)			
Clover N	kg N/ha/yr		106
Fertiliser N	kg N/ha/yr		149
Other N added	kg N/ha/yr		18
Indices			
Average N loss to water	kg N/ha/yr		34
includes N lost as effluent	kg N/ha/yr		0
N_2O emissions	kg N/ha/yr		23.7
For pastoral area of farm:			
Farm N surplus	kg N/ha/yr		196
N conversion efficiency	%		28

Block N

MIRAKA FARMS LTD - DYKES P J & WITSEY M

Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Current 2016_17 -FEPadj s blk- copy 3 (2016/17)

Block Nitrogen

Block name	Total N lost (kg N/yr)	N lost to water (kg N/ha/yr)	N in drainage * (ppm)	N surplus (kg N/ha/yr)	Added N ** (kg N/ha/yr)
Brax_4a.1 Non Eff	1010	25	7.8	185	171
Brax_4a.1 Effluent	3038	27	8.2	208	205
Brax_4a.1 Support ##	2431	36	11.1	169	171
Glene_4a.1 Support ##	834	79	**19.9**	190	171
Riparian 1	7	3	N/A		
Trees and Scrub 1	2	2	N/A		
Swedes	1266	63	**15.1**	53	87
Other farm sources	303				
Whole farm	8891	34			
Less N removed in wetlands	0				
Farm output	8891	34			

* Estimated N concentration in drainage water at the bottom of the root zone. Maximum recommended level for drinking water is 11.3 ppm (note that this is not an environmental water quality standard).

** Sum of fertiliser and external factory effluent inputs.

N/A: N in drainage not calculated for easy and steep pastoral blocks, or for tree and shrubs, riparian, wetland or house blocks.

Has a fodder crop rotating though, results for pastoral block component only

Current System Pasture Production, Other Values and Effluent Report

MIRAKA FARMS LTD - DYKES P J & WITSEY M

Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Current 2016_17 -FEPadj s blk- copy 3 (2016/17)

Block Pasture

Block name	On-farm fresh pasture intake (kg DM/ha/yr)	Estimated utilisation (%)	Supplements removed (kg DM/ha/yr)	Pasture growth (kg DM/ha/yr)
Brax_4a.1 Non Eff	14023	85	0	16498
Brax_4a.1 Effluent	14023	85	0	16498
Brax_4a.1 Support	8761	80	3784	14780
Glene_4a.1 Support	8883	80	3619	14772
Riparian 1	0	0	0	0
Trees and Scrub 1	0	0	0	0
Swedes	1477	76	0	1942

This report gives an estimated animal intake for each block based on animal production and supplements brought on to farm information supplied. Estimated annual pasture growth is shown for the animal utilisation value shown. Note: the model is not sensitive to changes in utilisation.

It is recommended that a consultant or software such as StockPol is used to estimate farm pasture production.

Client reference: 60856487

Farm name: Ovr-Miraka Consent Current 2016_17 -FEPadj s blk- copy 3 (2016/17)

Other values for farm - Ovr-Miraka Consent (

Milking herd size (peak cows/ha grazed)	2.4
Milk solids (kg/ha grazed)	1045
Milk production per cow (kg milk solids / cow)	434.1
Default calving data	06 August
Total liveweight brought (kg/ha grazed)	416
Total liveweight reared (kg/ha grazed)	170
Total liveweight sold (kg/ha grazed)	724
No fertiliser costs entered	
GHG: Allocation to milk	0.84
Dairy stock rate (RSU)	5319
Dairy replacements stock rate (RSU)	852
Beef / dairy grazing stock rate (RSU)	94
Sows per ha	NaN

MIRAKA FARMS LTD - DYKES P J & WITSEY M

Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Current 2016_17 -FEPadj s blk- copy 3 (2016/17)

Effluent Report

	Units	Current farm
Current effluent area		
Area of effluent blocks	ha	112
% of pastoral farm area	%	49
Area of farm to apply effluent to achieve rates of:		
150 kg N/ha/yr	ha	40
Maintenance K	ha	237
100 kg K/ha/yr	ha	65
Source of N applied to effluent blocks		
Average of N applied to effluent blocks	kg N/ha/yr	34
Effluent from farm dairy	%	75
Effluent from wintering pad	%	0
Effluent from feed pad	%	0
Average fertiliser N	kg N/ha/yr	161
Average other elements	kg N/ha/yr	10

Current System Parameter Report

Presented as a separate document.

Proposed farm System Whole Farm Nutrient Budget

MIRAKA FARMS LTD - DYKES P J & WITSEY M — Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Proposed 2016_17 -autadjXcrp FEP
frmr copy 1 (2016/17)

Farm Nutrient Budget - Whole farm

	N	P	K	S	Ca	Mg	Na
				(kg/ha/yr)			
Nutrients added							
Fertiliser, lime & other	133	33	48	38	0	0	1
Rain/clover N fixation	117	0	2	4	2	4	17
Irrigation	0	0	0	0	0	0	0
Supplements imported	26	4	20	4	4	3	1
Nutrients removed							
As products	81	14	20	4	17	2	6
Exported effluent	0	0	0	0	0	0	0
As supplements	0	0	0	0	0	0	0
To atmospheric	77	0	0	0	0	0	0
To water	32	0.7	18	61	71	3	12
Change in internal pools							
Plant material	7	1	0	2	1	0	0
Organic pool	73	10	2	-21	0	0	0
Inorganic mineral	0	3	-13	0	-3	-4	-5
Inorganic soil pool	6	10	42	0	-81	6	6

Proposed Farm System Nutrient Loss Indicators

P report

Block P

MIRAKA FARMS LTD - DYKES P J & WITSEY M — Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Proposed 2016_17 -autadjXcrp FEP
frmr copy 1 (2016/17)

Block Phosphorus

Block name	Total P lost (kg P/yr)	P lost (kg P/ha/yr)	P loss categories		
			Soil	Fertiliser	Effluent
Brax_4a.1 Non Eff ##	3	0.3	Low	Low	Low
Brax_4a.1 Effluent ##	45	0.4	Low	Low	Low
Brax_4a.1 Non Eff S ##	3	0.2	Low	Low	Low
Glene_4a.1 Non Eff S	0	0.1	Low	Low	n/a
Riparian 1	0	0.1	n/a	n/a	n/a
Trees and Scrub 1	0	0.1	n/a	n/a	n/a
Brax_4a.1 Eff S ##	14	0.2	Low	Low	Low
Glene_4a.1 Eff S	1	0.1	Low	Low	n/a
Brax_4a.1 Non Eff S xtra ##	1	0.2	Low	Low	Low
Brax_4a.1 Past>Kale	5	0.7	n/a	n/a	n/a
Brax_4a.1 Kale>Sw	5	0.7	n/a	n/a	n/a
Summer forage	3	0.6	n/a	n/a	n/a
Brax_4a.1 Sw>past	3	0.4	n/a	n/a	n/a
Other farm sources	105				
Whole farm	189	0.7			

Has a fodder crop rotating though, results for pastoral block component only

N report

Farm N

MIRAKA FARMS LTD - DYKES P J & WITSEY M

Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Proposed 2016_17 -autadjXcrp FEP frmr copy 1 (2016/17)

Farm Nitrogen

	Units	Benchmark farm	Current farm
Inputs (farm average)			
Clover N	kg N/ha/yr		115
Fertiliser N	kg N/ha/yr		133
Other N added	kg N/ha/yr		28
Indices			
Average N loss to water	kg N/ha/yr		32
includes N lost as effluent	kg N/ha/yr		0
N_2O emissions	kg N/ha/yr		24.2
For pastoral area of farm:			
Farm N surplus	kg N/ha/yr		196
N conversion efficiency	%		29

Block N

MIRAKA FARMS LTD - DYKES P J & WITSEY M

Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Proposed 2016_17 -autadjXcrp FEP frmr copy 1 (2016/17)

Block Nitrogen

Block name	Total N lost (kg N/yr)	N lost to water (kg N/ha/yr)	N in drainage * (ppm)	N surplus (kg N/ha/yr)	Added N ** (kg N/ha/yr)
Brax_4a.1 Non Eff ##	284	29	8.8	186	177
Brax_4a.1 Effluent ##	3636	29	8.9	190	172
Brax_4a.1 Non Eff S ##	419	28	8.7	187	177
Glene_4a.1 Non Eff S	254	69	**17.2**	204	177
Riparian 1	7	3	N/A		
Trees and Scrub 1	2	2	N/A		
Brax_4a.1 Eff S ##	1728	29	8.8	190	172
Glene_4a.1 Eff S	658	69	**17.4**	207	172
Brax_4a.1 Non Eff S xtra ##	137	28	8.7	187	177
Brax_4a.1 Past>Kale	207	28	7.2	116	87
Brax_4a.1 Kale>Sw	531	71	**19.3**	27	79
Summer forage	108	22	5.2	77	79
Brax_4a.1 Sw>past	271	36	10.2	57	158
Other farm sources	336				
Whole farm	8577	32			
Less N removed in wetlands	0				
Farm output	8577	32			

* Estimated N concentration in drainage water at the bottom of the root zone. Maximum recommended level for drinking water is 11.3 ppm (note that this is not an environmental water quality standard).

** Sum of fertiliser and external factory effluent inputs.

N/A: N in drainage not calculated for easy and steep pastoral blocks, or for tree and shrubs, riparian, wetland or house blocks.

Has a fodder crop rotating though, results for pastoral block component only

Proposed System Pasture Production, Other Values and Effluent Report

MIRAKA FARMS LTD - DYKES P J & WITSEY M

Mark Crawford

Client reference: 60856487

Farm name: Ovr-Miraka Consent Proposed 2016_17 -autadjXcrp FEP frmr copy 1 (2016/17)

Block Pasture

Block name	On-farm fresh pasture intake (kg DM/ha/yr)	Estimated utilisation (%)	Supplements removed (kg DM/ha/yr)	Pasture growth (kg DM/ha/yr)
Brax_4a.1 Non Eff	13685	85	0	16101
Brax_4a.1 Effluent	13685	85	0	16101
Brax_4a.1 Non Eff S	13444	84	0	16101
Glene_4a.1 Non Eff S	13565	84	0	16101
Riparian 1	0	0	0	0
Trees and Scrub 1	0	0	0	0
Brax_4a.1 Eff S	13323	83	0	16101
Glene_4a.1 Eff S	13565	84	0	16101
Brax_4a.1 Non Eff S xtra	13444	84	0	16101
Brax_4a.1 Past>Kale	3076	85	0	3619
Brax_4a.1 Kale>Sw	0	0	0	0
Summer forage	1093	84	0	1302
Brax_4a.1 Sw>past	11772	85	0	13849

This report gives an estimated animal intake for each block based on animal production and supplements brought on to farm information supplied. Estimated annual pasture growth is shown for the animal utilisation value shown. Note: the model is not sensitive to changes in utilisation.

It is recommended that a consultant or software such as StockPol is used to estimate farm pasture production.

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Effluent Report

	Units	Current farm
Current effluent area		
Area of effluent blocks	ha	201
% of pastoral farm area	%	85
Area of farm to apply effluent to achieve rates of:		
150 kg N/ha/yr	ha	45
Maintenance K	ha	276
100 kg K/ha/yr	ha	75
Source of N applied to effluent blocks		
Average of N applied to effluent blocks	kg N/ha/yr	15
Effluent from farm dairy	%	69
Effluent from wintering pad	%	0
Effluent from feed pad	%	0
Average fertiliser N	kg N/ha/yr	141
Average other elements	kg N/ha/yr	16

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Other values for farm - Ovr-Miraka Consent F

Milking herd size (peak cows/ha grazed)	3.2
Milk solids (kg/ha grazed)	1366
Milk production per cow (kg milk solids / cow)	422.0
Default calving data	06 August
Total liveweight brought (kg/ha grazed)	1199
Total liveweight reared (kg/ha grazed)	57
Total liveweight sold (kg/ha grazed)	1239
No fertiliser costs entered	
GHG: Allocation to milk	0.90
Dairy stock rate (RSU)	6386
Dairy replacements stock rate (RSU)	0
Beef / dairy grazing stock rate (RSU)	234
Sows per ha	NaN

Proposed System Parameter Report

Presented as a separate document