ravensdown

Farm Scenario Plan

Current and Proposed System Nutrient Budgets for Effluent consent

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60876935
WOLDWIDE FIVE LIMITED
C/- A & JJ DE WOLDE
104 SHAWS TREES ROAD; RD 3 WINTON 9783
22/02/2019
Reviewed by Andree Callaghan (CNMA)

60876935; WOLDWIDE FIVE LTD C/- A & JJ DE WOLDE Farm Scenario Plan, Plan 164(a1), Mark Crawford 22/07/2019

Executive Summary

Woldwide Five farm Ltd, have requested OVERSEER FM® Nutrient Budgets to reflect the current and proposed estimated nutrient losses from their consented 262.6 ha dairy farm as part of their resource consent application with an overall addition of land (73.0 ha) from a sheep farm (136.3 ha) purchased and split between Woldwide 4 (Report 163(a)) and Woldwide 5 dairy farms. An additional final proposal is provided for a wintering barn that is to be established later on. The farm is located at 800 Bayswater Road, Heddon Bush, 20 km west North West from Winton Township, 41 km nor-north west from Invercargill city and 34 km from the south west coast (Orepuki). The property is a dryland dairy farm, milking approximately 680 cows (consented numbers 800; modelled at 680 from current 540 average with the additional cows modelled allowed for the 44.3 ha of consented land yet converted).

Current (combined) Farm System

Average Nitrogen lost from the root zone, calculated from the combined current farm systems modelled, using OVERSEER FM® Nutrient Budgets (OVERSEER FM 6.3.1/2.6.2.0) was **15,978 kg N/year** or **48 kg N/ha/year.**

Average Phosphorus lost from the combined current farm systems modelled using OVERSEER FM® Nutrient Budgets (OVERSEER FM 6.3.1/2.6.2.0) was **239 kg P /year** or **0.7 kg P/ha/year.**

Proposed Transitional (interim) phase Farm System

Average Nitrogen lost from the root zone, calculated from the proposed farm system modelled, using OVERSEER FM® Nutrient Budgets (OVERSEER FM 6.3.1/2.6.2.0) was **16,029 kg N/year** or **48 kg N/ha/year.**

Average Phosphorus lost from the proposed farm system modelled using OVERSEER FM® Nutrient Budgets (OVERSEER FM 6.3.1/2.6.2.0) was **232 kg P /year** or **0.7 kg P/ha/year.**

Final Winter Barn Proposal

Average Nitrogen lost from the root zone, calculated from the proposed farm system modelled, using OVERSEER FM® Nutrient Budgets (OVERSEER FM 6.3.1/2.6.2.0) was **14,378 kg N/year** or **43 kg N/ha/year.**

Average Phosphorus lost from the proposed farm system modelled using OVERSEER FM® Nutrient Budgets (OVERSEER FM 6.3.1/2.6.2.0) was **244 kg P /year** or **0.7 kg P/ha/year.** Further mitigated losses from other sources can account for a further reduction **of 11 kg P/year** leading to a P loss risk for the farm system now **being 233 kg P/year or 0.7 kg P/ha/year or a 2.5 % reduction** from the combined result.

The productivity and urine patch deposition on gley plus recent soils with a high and low buffering capacity to leaching (high and low PAW and deep to shallow topsoil's) from increased stock intensity, artificial drainage and crops are key risk reducing and increasing factors respectively.

In the proposed interim(transitional) farm scenario, the additional land with the increased number (to consented) of dairy cows, but with the use of the wintering pads; altered tonnage of supplements imported into the farm system and with the cropping able to be carried out on the more versatile soils, has the effect of reducing the overall risk of P losses, but N losses are similar but slightly higher.

The wintering barn final proposal negates the effect of cropping losses and increased stock numbers, but this is less evident on the more vulnerable soils to N leaching (Upukeroroa), and so mitigating this by lowered calving and peak cow numbers (by 70) plus grazing times on these soils, plus use of the winter barn enables the farm to reduce the impacts of N loss to well below the current combined losses calculated.

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. Both the proposed farm system and winter barn example, as modelled by OVERSEER FM®, includes strategies to reduce these risks of Nitrogen loss to water. These strategies are summarised in the report, with no cropping (or cropping on less vulnerable soils) and reduced stocking in autumn and spring by use of winter barns or feed pads key mitigations. Riparian strip planting, allowing the capture of sediment from crops and laneways through adequate buffer zones, as well as having soil test phosphate levels within the agronomic optimal range, are all practices which will reduce the risk of P losses. Ensuring the lowest volume applications and depths are applied to the tiled soils, with none applied at the highest risk times plus cropping on the more versatile soils are further mitigations that will be used.

Overseer Nutrient Budget Version 6.3.1/2.6.2.0 have been used to create the nutrient budgets presented in this report.

Contents

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Mark Crawford

Farm Environmental Consultant

Dated 22nd July 2019

General

Aim and Purpose of Farm Scenario Plan

Woldwide Five Ltd, has requested current and proposed OVERSEER FM® Nutrient Budgets to reflect the current and proposed estimated nutrient losses from their consented 262.6 ha dairy farm as part of their resource consent application, with the addition of 73.0 ha of a 136.3 ha neighbouring sheep farm (the remaining area is included in Woldwide 4). The farm is located at 800 Bayswater Road, Heddon Bush, 20 km west North West from Winton Township, 41 km nor-north west from Invercargill city and 34 km from the south west coast (Orepuki). The property is a dryland farm, currently milking approximately 560 cows (consented numbers 800; note with additional consented area yet to be converted (44.3 ha) included in actual dairy farm of 218.3 ha, it is now modelled 680 cows calving).

The total titled area of the property is 246.6 ha, and the GIS map with paddock areas calculates to 262.6 ha which is modelled. In this figure there is 12.9 ha of riparian edges and river margin (modelled as a "Riparian" block in Overseer). The effective area is calculated at 241.2 ha, close to the owner stated 240 ha of paddocks. In addition, there is an estimated 8.5 ha of non-effective area, comprising of sheds, lanes, feed pads and yards. The property is of flat to gently rolling topography (modelled flat).

Soil types on the farm are (with the addition of the consented 44.3 ha land) mostly Tuatepere_6b.2, Silt Loam, (Orthic Melanic soil, Well drained, PAW (plant available water) to 60 cm of 81.2 mm), 135.5 ha; Braxton_4a.1, Silt Loam over clay, (Orthic Gley soil, Poorly drained, PAW (plant available water) to 60 cm of 147.6 mm), 75.4 ha; plus an area of Upukerora_8a.1 Sandy Loam, (Recent soil, Well drained, PAW (plant available water) to 60 cm of 37.6 mm), 51.7 ha. The Braxton and Tuatapere soils are both deep to moderately deep soils and the Braxton being a heavier silty loam texture meaning a lower risk of nitrogen leaching.

Overseer modelling of the system has been undertaken in accordance with the Overseer 6.3.1/2.6.2.0 "best practice data input standards" (BPDIS) and has been reviewed by a certified nutrient management advisor.
The following report summarises the respective Overseer 6.3.1/2.6.2.0 nutrient budgets and key assumptions made.

Property Details

Location/address	800 Bayswater Road, Heddon Bush 9783 RD 3, Winton
Legal Description	Lot 1 Deposited Plan 344176, Lot 2 Deposited Plan 344176, Lot 1 Deposited Plan 310140, Part Lot 12 Deposited Plan 238 and Lot 2-3 Deposited Plan 478843, Lot 1 Deposited Plan 12253 plus Lot 1 Deposited Plan 478843 (additional 44.3 ha)
Total area (ha)	246.57 ha titled total farmed land calculated at 262.6 ha including roadside and river margins. Effective area estimated at 241.2 ha, This will increase to 335.6 ha total and 311.3 ha effective with sheep farm added
Owners	A & JJ DE WOLDE
Contact details	
Phone	(03) 2258344 mobile (027) 2272537
Email	abe@woldwide.nz
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 –978 mm/year, PET – 719 mm/year and average temperature – 9.8 ^{o}C, based on location close to latitude/longitude - 46.09075; 168.08465 (transect 9 co-ordinates). Climate data has been modelled as per Overseer BPDIS.

Description of Current Farm System

The 262.6 ha property is operated as a seasonal dryland dairy farm including a consented block of 44.3 ha not yet converted but included in the current assessment of environmental effects given it has been consented. Given this, the numbers subsequently used were adjusted using averages from the current farm system of 218.3 ha and 540 cows calved. The current adjusted property is calving 680 cows (800 consented) and peak milking 665 (540 kg LW) Friesian cows. Adjusted milk production averaged over the last two years is 314,081 kg MS/year (465 kg MS/cow). Cow numbers are shown in the table below (page 10). All cows are wintered on-farm for June and July on the developing block crops plus the first calving heifers (170 and at 500 kg LW), which come back from grazing off in May, with all cows brought back to the dairy platform in mobs over the month of August. An additional number of grazers are currently wintered given the additional crop area currently cultivated during the conversion stage and have been included. Mean calving date is the 20th August for the main herd, with the first calvers a week earlier on the 12th of August

The dry-off date is the 1st of June and the 25th of May for the cows and first calving heifers respectively. All replacements (170) are grazed off-the platform from weaning until they return as in calf rising two year old (R2) heifers in May. Cows are milked once a day or 16 hourly occasionally over autumn drying off (modelled never) and all calves are fed colostrum and waste milk.

Friesian Bulls (20) at 700 kg LW are run with the herd over December and January.

The 28.1 ha of developing Upukerora crop block has been used to winter the 540 dairy cows, as well as the 170 in calf heifer replacements, plus additional dairy cows and in calf replacement heifer grazers. With the increase in milking cow numbers for the consented area added in, the number of grazers wintered was reduced to allow for the wintering of these extra cows. It now winters all dairy cows and replacement heifers plus an additional 200 in calf dairy heifer replacements wintered from mid-May till the 25th August.

Supplements

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

- 254 T DM Barley grain and 254 T DM distilled Brewers grain imported and used over the season through the milking shed (averaged amount of 508 T DM grain split in half between grain types).
- 61 T DM of Molasses imported and fed through the shed.
- 203 T DM of Palm Kernel Expeller (PKE); fed through dairy shed.
- 300 T DM of silage purchased on average and fed to dairy cows on blocks.
- 80 T DM of silage purchased and fed to dry stock on pastoral blocks, however, some of this will also be fed on crop, but not modelled as such given the difficulty in reconciling this with the crop blocks and crop yields in the model.

Supplementary feed made and fed during the season is assumed to be minor, and is cut and fed in the same season, thus no areas were modelled as being cut and/or baled for silage/baleage. Given the net importing of silage onto the platform, this would be a reasonable expectation.

Farm System - Dairy			
Herd Type/Breed	Friesian	**Total Milk Solids (kg/year)**	314,081
Seasonal Supply	Seasonal	**Winter milk**	No
Number of cows	680 (665 peak)	**Milk Solids (kg/cow)**	465
Stocking rate (cows/ha)	2.8 (3.3/ha grazed)*	**Milk Solids (kg/ha)**	1302/ha effective (1513/ ha grazed)*
Other Information			
Winter off milking platform		Yes, all cows and in calf heifers on crop blocks and additional replacement heifer grazers	
Stock grazed off (%)		Nil, cows and first calvers, who return in May, in June and July and August	
Young stock reared off milking platform		Yes from weaning until before winter, wintered on crop areas	
Imported Feeds	508 T DM Grain (50 % each Barley and distilled brewers grain), fed through shed to milking cows, 61 T DM of Molasses to dairy cows through shed; 203 T DM of PKE fed through milking shed; 380 T DM silage purchased, 300 T DM fed on pastoral blocks to dairy cows and 80 T DM silage fed on pastoral to dry stock over winter. Total 1152 T DM		

		Current				
Cows	Av weight kg LW	540 kg LW main herd; 500 kg LW for first calving heifers				
	Median calving Date	20th August for main Herd, 12th August for Heifers				
	Dry-Off date	1st June for main herd and 25th May for Heifers				
	Peak Milk (1 Dec)	665 cows				
	Cow Numbers		**No cows Dairy Herd & first calvers**	**In calf Heifers**	**Dry cows & Bulls & repl. grazers**	**In shed feeding (Y/N)**
		Jul	0 & 20	150	510&0&165	N
		Aug	201 & 162	8	309	Y
		Sept	470 & 170		40	Y
		Oct	505 & 168		0	Y
		Nov	505 & 165		0	Y
		Dec	500 & 165		0 & 20	Y
		Jan	500 & 165		0 & 20	Y
		Feb	490 & 160		0	Y
		Mar	470 & 160		0	Y
		Apr	470 & 155		0	Y
		May	460 & 120	170	35 &0&100	Y
		Jun	0	170	510&0&200	N
	Production kg/MS	314,081				
	Lactation length	287 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 & distillers grain and Molasses	254 & 254 & 61	Fed to dairy milking cows through shed			
	Silage/Baleage	380	Purchased and fed to dairy cows on pastoral blocks (300) & Dry cattle (80)			
	Other PKE	203	Fed to dairy cows on pastoral blocks			
Supplements Made		**Amount (T/DM)**	**Ha**	**Fed or stored?**		
	Fodder beet	25	28.1	Fed to replacements and dry cows in May, June July and August		
Effluent	Type/system	Holding Pond system after stone trap and applied via K Line pods.				
	Application Depth mm	Application depth at < 10 mm per application (modelled < 12 mm) from August to May (spray irregularly as not modelling June or July to receive effluent). Due to travelling irrigator used, sludge applied in months Nov to February to mimic stir and spray operation, whilst K line used of rest of season.				
Replacements	On/off farm when & what age	Off farm from weaning, back to support block as in calf heifers in May				

* Calculated on milking platform area only excluding the crop area and non-effective area.

Fertiliser

Fertiliser applications have been modelled from Ravensdown past sale records, farmer information and are based on average monthly rates. Practices are similar to Woldwide 4, Ammo 36 is applied to the whole farm in August at rates of 120 kg/ha. Urea is then applied in October, November, and February behind the cows at rates of 50 to 60 kg/ha. There are liquid applications of Nitrogen in September and March at 100 L/ha at the equivalence of 18 Kg N/ha made with Express a gibberellic acid. The Effluent blocks receive less nitrogen with no urea applications in January. Maintenance applications of Potash Superphosphate and Flexi N are made in December at the same rate for both effluent and non-effluent.

There is also modelled effluent exported from Woldwide 3 farm and spread on the whole farm. It was modelled as an amount exported from an area on that farm, with that total amount then pro rata applied as organic fertiliser to equate to the total amount of nutrient which is 3660 kg N; 2562 kg P; 2196 kg K; 854 kg S; 5368 kg Ca; 2074 kg Mg and 366 kg Na. The total fertiliser nitrogen applied is 219 and 192 kg N/ha/year for the Non effluent and Effluent farm blocks and 172 kg N/ha across all blocks (whole property) on average, which includes the weighted average in NPKS of 14-10-8-3 from the dairy effluent imported.

Non Effluent block:

Month	Fertiliser	NPKS nutrient rating (kg/ha)
August	Ammo 36	43-0-0-12
September	Urea	18-0-0-0
October	Urea	28-0-0-0
November	Urea	23-0-0-0
December	Potash Superphosphate and FlexiN	21-55-30-66
December	Organic dairy effluent (solid)	18-12-10-4
January	Urea	28-0-0-0
February	Urea	23-0-0-0
March	Urea (liquid)	18-0-0-0
Total Nutrients		219-68-40-82*

Effluent block:

Month	Fertiliser	NPKS nutrient rating (kg/ha)
August	Ammo 36	43-0-0-12
September	Urea	18-0-0-0
October	Urea	28-0-0-0
November	Urea	23-0-0-0
December	Potash Superphosphate and FlexiN	21-55-30-66
December	Organic dairy effluent (solid)	18-12-10-4
February	Urea	23-0-0-0
March	Urea (liquid)	18-0-0-0
Total Nutrients		192-67-41-82*

* Please note that variance between actual fertiliser nutrients applied and total nutrients shown is the slurry effluent nutrients applied for the block

Soil Test Results

Taken from 2016/17 soil tests for the various areas in table below;

Soil tests	Olsen P	QTK	QT Ca	QT Mg	QT Na	Org S
Brax_4a.1 Non Effluent blocks	16	9	14	31	13	13
Brax_4a.1 Effluent blocks	21	9	14	31	13	13
Brax_4a.1 Effluent tile blocks	35	12	13	35	13	13
Tuap_6b.2 Effluent	32	11	18	43	15	12
Tuap_6b.2 Non effluent	25	14	16	38	14	10
Upukerora soils	27	23	13	43	14	8

Pasture Production

The predominant pasture species on the dairy farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity as 1 between dairy blocks on Brax_4a.1 and Tuap_6b2. Soil types, and 0.8 for the Upukerora grazing blocks on the stony river flats as they are drier:

Block	Relative productivity	T DM/ha/year
Dairy pastoral areas	1.0	15.3
Upuk_8a.1 Non Eff & Dev.	0.8	12.2

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 three wintering pads on the property, left by the previous owner and have not been currently used. They have a rotten rock base, with a knap rock layer on top and topped off with bark chips on top of this. It has the ability to stand off mobs of 100 to150 cows, with ad lib feeding of baleage in ring feeders. Effluent would be the solids from the bark which is scrapped after each season and spread by muck spreader.

Fodder Cropping

A fodder cropping cycle of Pasture to Fodder Beet (last two years in beet) before being re sown into pasture in October is practiced for approximately 25 to 30 ha or 10 % of the actual dairy block as a means of development. The area currently being cropped is the stonier land by the river, and so block history is entered as 5 years with crop to crop blocks having fallow as prior land use as they were cropped prior to conversion. Please note that the third crop block (Upuk_8a.1 FBt>YG) is effectively a pastoral block in its reporting year and not included in calculation for crop area Crops are modelled as crop blocks and information entered is;

- Fodder beet are sown in October after full cultivation, with dry cows and replacements grazed over May, June, July, and in August before calving.
- Sown with Cropmaster DAP, Ammonium sulphate, Potassium chloride plus boron and salt mix, NPKS rating (24-23-30-25) and a further application of Urea/potassium chloride made in February (NPKS rating 69-0-25-0).
- Yields are averaged at 25 T DM/ha and grazed in situ. Grazing durations (months grazed and % dairy/beef) were altered so to align animal metabolic intakes with crop yield and availability given the models inability to optimise feed demand and supply. All dry cattle are on crop over June, July and August, with some crop in May plus fodder supplement and pasture, whilst the dairy herd is allocated a small amount of crop in May and August in addition to pasture and supplement.

Effluent

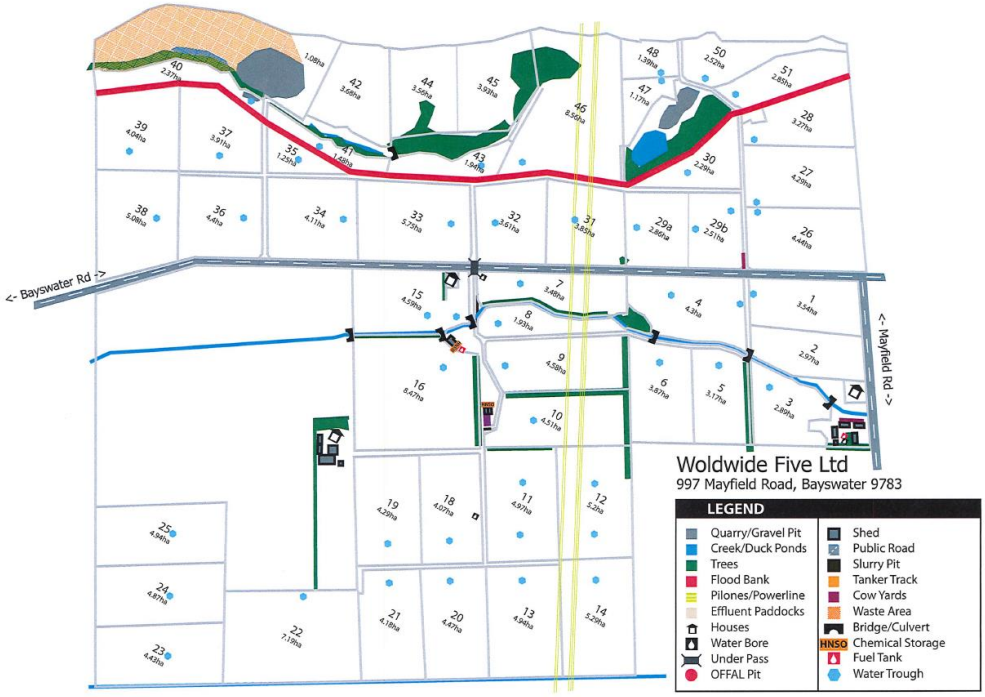
Effluent has been modelled as using Overseer default values, and calculated as applying 46 kg N/ha/year (liquid) plus 11 kg N/ha/year solids over the 112 ha, which is 86 % (adjusted to equal GIS area) of the modelled 130.1 ha (86.1 ha total area plus area consented of 44.3 ha less other area of 0.3 ha); plus 3 kg N/ha/year (solids) applied from pond sludge to the Non effluent areas. Currently, the effluent system has effluent gravity fed into a stone trap and sump then into holding tanks, from which the effluent is pumped through K Line pods applying liquids at depths of 10 mm per application or less by a pulsation system (modelled < 12 mm) or travelling irrigators. The current holding pond is estimated to hold 180 (6 tanks of 30,000 L) cubic metres of effluent (owner stated). Liquid effluent is sprayed during the months of August to May inclusive (modelled infrequently spray so as no effluent is modelled to be applied in June or July), with sludge applied in November to February to mimic the travelling irrigator applications. The rest of the sludge from the pond is modelled to be spread on the non-effluent areas in October every year by a slurry tanker (refer table below).

Management Unit details and Soil Information: Table 1

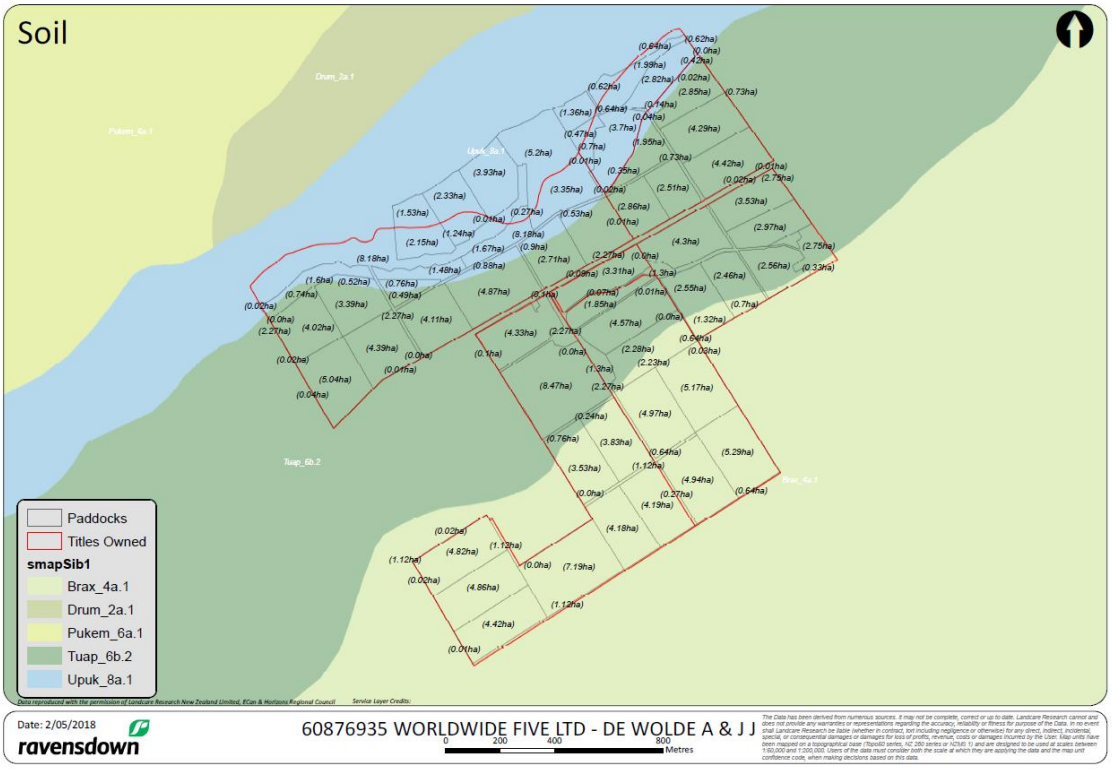
Block Name	Stock	Block Type	Soil Order	Drainage Class	Effluent	PAW (0-60cm)	Effective Area (ha)
Brax_4a.1 Effluent	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid & Sludge	148.7	18.4
Brax_4a.1 Eff Tile	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid & Sludge	148.7	52.5
Tuap_6b.2 Effluent	Dairy	Pastoral	Orthic Melanic	Well drained	Liquid & Sludge	81.2	59.2
Brax_4a.1 Non Eff	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge	148.7	2.4
Tuap_6b.2 Non Eff	Dairy	Pastoral	Orthic Melanic	Well drained	Pond Sludge	81.2	69.7
Upuk_8a.1 Non Eff	Dairy	Pastoral	Fluvial Recent	Well drained	Pond Sludge	37.6	4.3
Upuk_8a.1 Non Eff dev	Dry stock	Pastoral	Fluvial Recent	Well drained		37.6	1.1
Riparian 1	Riparian	Riparian	Various	Poorly drained	n/a	n/a	12.9
Upuk_8a.1 FBt>FBt	Dry stock	Crop	Fluvial Recent	Well drained		37.6	22.3
Upuk_8a.1 Past>FBt	Dry stock	Crop	Fluvial Recent	Well drained		37.6	5.8
Upuk_8a.1 FBt>YG	Dry stock	Crop	Fluvial Recent	Well drained		37.6	5.5
Non-Productive area							8.5
Total							**262.6**

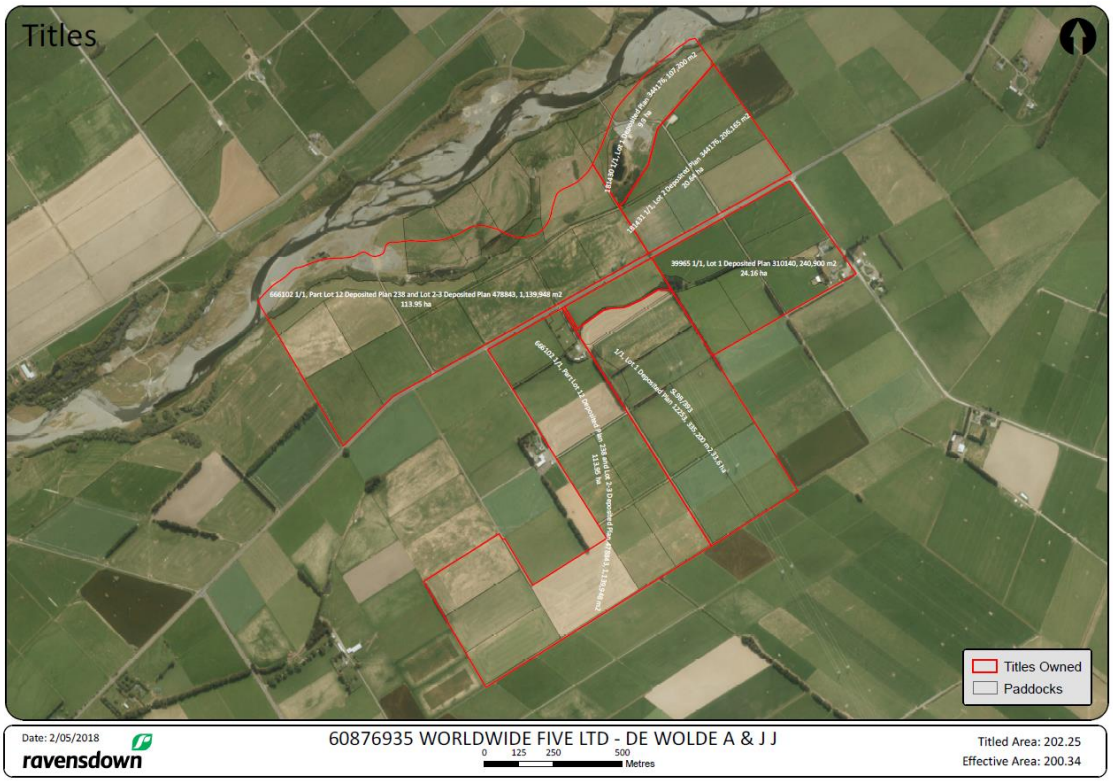
*PAW Landcare S maps calculated

Land Management Unit Map and Farm Map



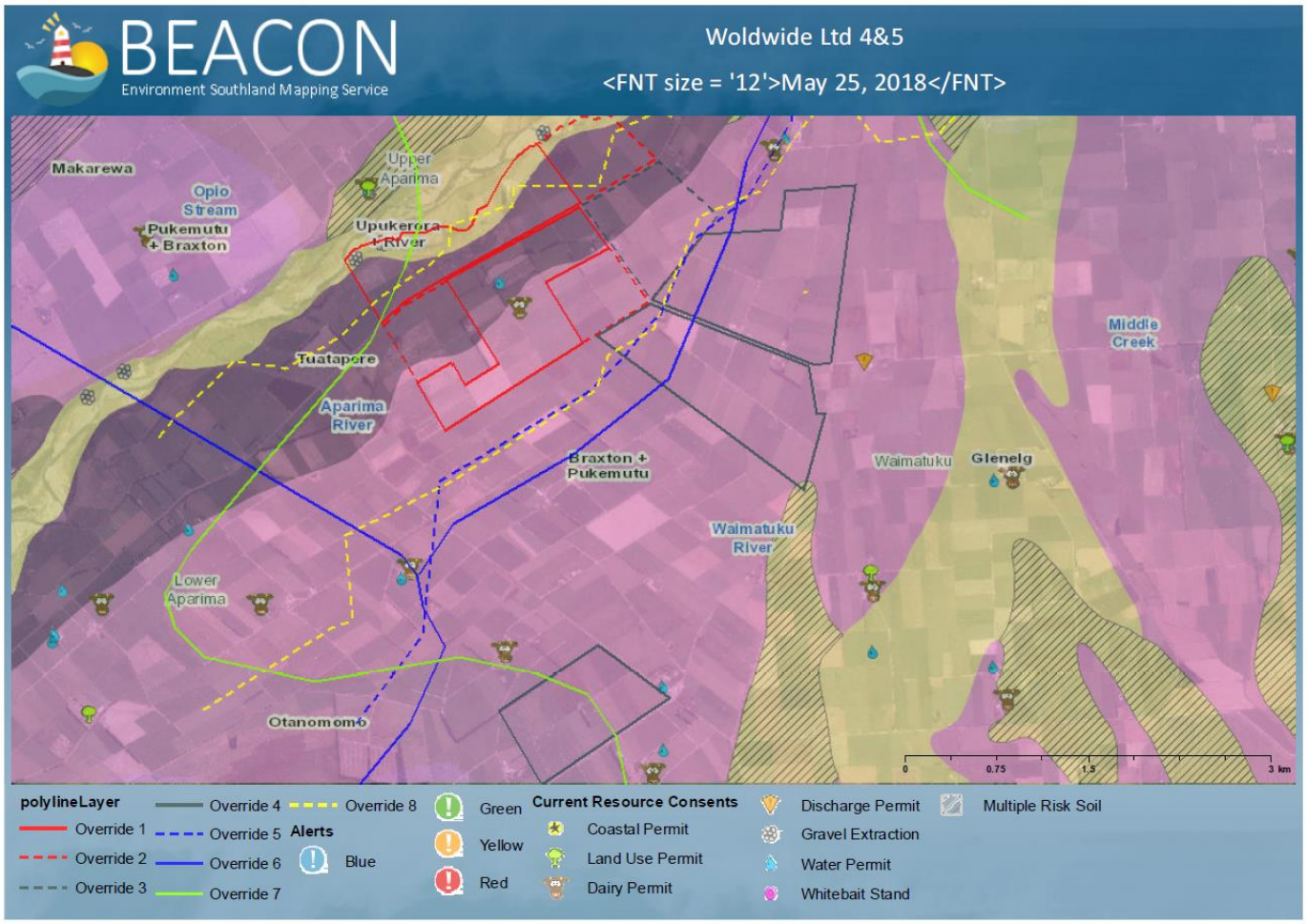
Farm map with area of 216.03 ha , discharge area has additional 44.3 ha included (excludes 30.54 ha title not drawn in top RHS) for current Effluent block indicated being paddocks 18 to 25 & 7 to 16, plus 44.3 ha, 130.1 ha in total less estimated setback areas based on 86 % equates to 111.9 ha. Total titled area is 246.57, GIS calculated area is 262.6 ha, estimated pastoral area of 241.2 ha.





Title area of 202.25 ha and soils, with additional 44.3 ha and soils from additional consented area plus river margin actual farm area included in paddocks calculated to be 262.6 ha GIS assessed.

Nitrate Levels and Physiographic Zonal Environment Southland Beacon Maps



Physiographic zones are Central plains (Braxton plus Pukemutu soils) brown oxidising (Tuatapere) and Riverine (Upukerora) soils (pink, dark and light yellow along river), with the blue dotted line denoting the two different sub catchments of Waimatuku river and the main Coastal catchment plus the Aparima river and the Aparima major catchment. The solid blue line denotes the three different ground water catchment zones, the lower Aparima and Upper Aparima with subsoils of quaternary gravel on top of tertiary sediment, plus the Waimatuku zone of alluvial gravel. The Green line separates minor to moderate (LHS) and moderate to high (RHS) nitrate levels with a hot spot situated nearby at drinking water threshold (not shown) nitrate levels.

The yellow dotted line is the division between the spring fed and lowland hard bed surface water zones.

The farm dairy effluent (FDE) risks are associated with the soil types, with the Braxton being a risk with artificial drainage and coarse soil structure, and the Tuatapere and Upukerora being well drained flat land and other well drained but very stony flat land.

The farms are Woldwide 4 is in dark green and the red line is the boundary for Woldwide 5. The dotted lines are the additions for the proposals.

Nutrient related resource Consents held by the Landowner

Resource Consent No.	Condition No.	Condition Text	Resource consent expiry date
AUTH-20157537-04	1.	This consent authorises the conversion of the subject land for use as a dairy farm as described in the application for resource consent dated 24 December 2015, further information dated 4 February 2015 and Conversion Environmental Plan dated 24 December 2014. The scope of the dairy farm activity to be established is described in the application and Conversion Environmental Plan as being; • The milking of up to 800 cows up to twice per day; • The construction and maintenance of: o A dairy milking shed • The discharge of dairy shed effluent to a discharge area of no more than 126 hectares; • The application to land of no more than 202 kilograms of nitrogen per hectare per year as a result of fertiliser application; • The establishment of environmental management practices as detailed in the Conversion Environmental Plan dated 24 December 2014.	Granted for an unlimited term
	2.	This consent shall be exercised in conjunction with Discharge Permit AUTH-20157537-01 and Water Permit AUTH-20157537-02, or any subsequent replacement permits.	
	20157537-01	The discharge to land of dairy shed effluent generated from milking of up to 800 cows up to twice per day. • The discharge of farm dairy effluent to land via a low rate pod system. • The discharge of dairy shed effluent to a discharge area of no more than 126 hectares as per the plan attached as Appendix 1. The discharge authorised by this consent shall not exceed the following rates at any time: (a) For the pod set irrigation system: A maximum depth of application of 1 millimetre for each individual application, at an instantaneous rate not exceeding 1 millimetre per hour; (b) a minimum return period of 28 days between applications; (c) a maximum combined depth of application of 25 mm per year to any land area; and (d) 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.	

Current Sheep Farm System Analysis

Description of Current Farm System

The farm dairy platform will be increased by 136.3 ha after including 63.26 ha of a purchased sheep block (Woldwide 4) and the additional 73.0 ha added to the Woldwide 5 platform. A conversation was had with the original owner, Mr Cochrane to confirm some figures used in a budget already completed for this property, with the resulting data used and modelled for this sheep farm.

The total titled area of the property is 136.3 ha. In this figure there is 4.2 ha of non-effective area (comprising of sheds, lanes, and yards) and river margin. The effective area is calculated at 132.1 ha. It is of flat to gently rolling topography (modelled flat).

Soil types on the farm are mostly Braxton_4a.1, Silt Loam over clay, (Orthic Gley soil, Poorly drained, PAW (plant available water) to 60 cm of 147.6 mm), 77.0 ha; Tuatepere_6b.2, Silt Loam, (Orthic Melanic soil, Well drained, PAW (plant available water) to 60 cm of 81.2 mm), 55.5 ha plus an area of Upukerora_8a.1 Sandy Loam, (Recent soil, Well drained, PAW (plant available water) to 60 cm of 37.6 mm), 3.8 ha.

The 136.3 ha property was operated as a dryland sheep farm, lambing 1550 mixed age (M.A.) ewes (Romney based) Data entered is as follows;

- Mean lambing date is the 28th August for the main mob, with weaning finished by the 28th of November. Lambing rate is 155 % STS (survival to sale), ewes mating weight is 65 kg LW, with weaning weights at 33 kg LW average.
- 390 ewe lambs kept as replacements (winter weight of 48 kg LW), not mated.
- 20 Romney breeding rams (110 kg LW) and 12,000 kg/year wool shorn and sold on average.
- All remaining lambs sold to works at 19 kg carcass; with 604 left by the end of February (30 %) and 15 % sold off mothers at weaning (301).

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	LW (kg)
M.A Ewes	1550	1550	1520	1510	1510	1510	1180	1550	1550	1550	1550	1550	65
Replacement Lambs	0	0	0	0	390	390	390	390	390	385	385	385	48
Ewe Hoggets	385	385	380	380	380	380	380						65
Rams	20	20	20	20	20	20	20	20	20	20	20	20	110
Works Lambs	0	0	0	0	2010	1709	1408	1006	604	303			19 c/c

Supplements

There is no Supplementary feed imported onto the property, however, 15 T DM baleage is used from storage and is as follows:

- 8 T DM Baleage stored and used over the following season on pastoral blocks to sheep.
- 7 T DM Baleage stored and used over the following season on winter fodder crop block

Supplementary feed made and stored during the season is as above and is as follows;

- 15 T DM of grass baleage; made on the Braxton and Tuatapere blocks and stored. None is made on the river flats

Fodder Cropping

There is 9 ha of fodder crop (swedes) cultivated and returned to pasture in the following spring (October). Detail is as follows;

- Sown in November, conventionally cultivated with 150 kg/ha of Cropzeal boron boost
- A further urea application of 100 kg/ha is made in January.
- Yield is 14 T DM/ha and it is fed from May to August by sheep, in situ.

Fertiliser

All pastoral blocks receive a dressing of 275 kg/ha of 15 % sulphur superphosphate in November with some areas receiving a urea application at varying rates in spring. This was deemed to be 60 kg/ha of Sustain N on average across all pastoral blocks, and modelled so.

Drainage

Only the heavier Braxton soils were drained by moles and tile drainage, and so it was deemed by the owner 90 % of these paddocks would be effective drained by tiles and moles.

Pasture Production

The predominant pasture species on the sheep farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity as 1 between heavier silt soils and 0.8 for the lighter river sandy loam blocks on the river flats:

Block	Relative productivity	T DM/ha/year
Tuap_6b.2 Sheep	1.0	15.6
Brax_4a.1 Sheep	1.0	15.6
Upuk_8a.1 Sheep block	0.8	12.5

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.

Management Unit details and Soil Information: Table 1b

Block Name	Stock	Block Type	Soil Order	Drainage Class	Fodder Crop rotates through	PAW (0-60cm)	Effective Area (ha)
Brax_4a.1 Sheep Block	Sheep	Pastoral	Orthic Gley	Poorly drained	Yes	148.7	72.8
Tuap_6b.2 Sheep Block	Sheep	Pastoral	Orthic Melanic	Well drained	Yes	81.2	55.5
Swedes	Sheep	Fodder Crop	Various	Various	(9 ha)	n/a	-
Upuk_8a.1 Sheep block	Sheep	Pastoral	Recent	Well drained	No	36.7	3.8
Non-Productive area							4.2
Total							**136.3**

*PAW Landcare S maps calculated

Proposed Transitional Farm System Analysis

Description of Proposed Transitional (interim) Farm System

The farm dairy platform will be increased by 73.0 ha after excluding 63.26 ha of the purchased sheep block (which is added to Woldwide 4), with the effluent area remaining the same, and an increase to consented cow numbers calved (800). A decision regarding if the cropping is to remain on the developing river flats block was made. With the need to renew the sheep pastures, the cropping area has shifted to the Braxton and Tuatapere soils, predominantly of the sheep blocks, with the area reduced as there is no longer a need to winter additional; replacement stock. There will be 26 ha of fodder beet grown in the proposed scenario.

The 335.6 ha property will be operated as a dryland dairy farm, calving 800 cows (795 modelled with deaths) and peak milking 785 (540 kg LW) Friesian cows. Milk production aimed for is increased to 360,000 kg MS/year (453 kg MS/cow). Cow numbers are shown in the table below. All cows are wintered on-farm for June and July on the crop

blocks plus the first calving heifers (190 and at 500 kg LW), which come back from grazing off in May. Mean calving date is the 20th August for the main herd, with the first calvers a week earlier on the 12th of August.

The dry-off dates are altered to reflect the increased calving numbers, with the dry-off date now being the 25th of May for the cows and first calving heifers. All replacements (190) are grazed off-the platform until they return as in calf R2 heifers in May. Cows are milked once a day or 16 hourly occasionally over autumn drying off (modelled never) and all calves are fed colostrum and waste milk. The other production factors remain the same as before

Friesian Bulls (20) at 700 kg LW are run with the herd over December and January.

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	LW (kg)
Dairy cows		244	565	605	600	600	590	590	570	565	443		540
First calving heifers	20	182	190	187	185	185	185	180	180	175	105		500
Dairy grazers (milking cows)	610	366	40								154	610	540
Dairy grazers (replacements)	0										190	190	480
Dairy grazers (replacements)	170	8											500
Bulls						20	20						700

Supplements

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

- 215 T DM Barley grain and 215 T DM distilled Brewers grain imported and used over the season through the milking shed (averaged amount of 430 T DM grain split in half between grain types).
- 61 T DM of Molasses imported and fed through the shed.
- 200 T DM of Palm Kernel Expeller (PKE); fed through the shed
- 85 T DM of baleage purchased, 20 T DM fed on crops and the rest on the wintering pads.
- 100 T DM of Cereal silage (lower Nitrogen feed) fed to dairy cows on pasture over spring (August September 25%) and autumn (March April 75%)

Because of the reduced stocking given the larger area, imported supplementary feed has reduced to the above amounts to reconcile the pastoral productivity between the two systems.

Supplementary feed made and fed during the season is the same as the original current scenario, with an assumption that any silage and baleage made is fed out in the same season, made from all the farm blocks.

Structures

The three wintering pads on the property, will now be used, as an environmental mitigation tool. They will stand off mobs of 100 cows each (modelled 25 % milking cows in April; 50 % in May; 50% in August and 25 % in September), modelled an uncovered wintering pad, with ad lib feeding of baleage in ring feeders and effluent which is scrapped after each season is spread by muck spreader in October to crop blocks and is not stored.

Fodder Cropping

The cropping management remains the same between the two systems modelled, however, the area is reduced by 4 ha as there are less cattle wintered and, and the area cropped is changed to the new additional areas of Tuatapere and Braxton soils (26 ha out of 117.3 ha (73.0 plus 44.3 ha) rotating). Please note that the third crop block is effectively a pastoral block in its reporting year and not included in calculation for crop area. Block history is still 5 years. The following detail was modelled;

- Fodder beet are sown in October after full cultivation, with dry cows and replacements grazed over May, June, July, and in August before calving.
- Sown with Cropmaster DAP, Ammonium sulphate, Potassium chloride plus boron and salt mix, NPKS rating (24-23-30-25) and a further application of Urea/potassium chloride made in February (NPKS rating 69-0-25-0).
- Yields are averaged at 25 T DM/ha and grazed in situ. Grazing durations (months grazed and % dairy/beef) were altered so to align animal metabolic intakes with crop yield and availability given the models inability to optimise feed demand and supply. The smaller blocks of Braxton crop is May to July grazing's, with May being 50/50 dairy/dry cattle, and June and July 100 % dry cattle. For the larger Tuatapere crop blocks, grazing is June to August, with the ratios being 100% dry cattle for June July and 20% dairy and 80 % dry cattle for 4 hours grazing in August. All dry cattle are on crop over June, July and August, with some crop in May plus fodder supplement and pasture, whilst the dairy herd is allocated a small amount of crop in May and August in addition to pasture and supplement.

Fertiliser

This has changed between the two systems modelled. The total fertiliser nitrogen applied is now, due to area changes and less urea applied with the greater effluent being spread, 206 and 174 kg N/ha/year for the Non effluent and Effluent farm blocks and 164 kg N/ha across all blocks (whole property) on average which includes the weighted average in NPKS of 11-8-7-3 from the same amount of dairy effluent imported across *a greater area* (207.7 ha pastoral blocks in current scenario to 268.4 ha of Tuatapere and Braxton pastoral blocks plus crop blocks). The Upukeroroa blocks due to their productivity and risk of N loss, have reduced fertiliser amounts by stopping the January application and no imported dairy effluent, as mitigation steps.

Non Effluent block:

Month	Fertiliser	NPKS nutrient rating (kg/ha)
August	Ammo 36	43-0-0-12
September	Urea	18-0-0-0
October	Urea	23-0-0-0
November	Urea	23-0-0-0
December	Potash Superphosphate and FlexiN	21-55-30-66
December (not applied to Upukeroroa)	Organic dairy effluent (solid)	14-10-8-3
January (not applied to Upukeroroa)	Urea	23-0-0-0
February	Urea	23-0-0-0
March	Urea (liquid)	18-0-0-0
		206-65-38-81

Effluent block:

Month	Fertiliser	NPKS nutrient rating (kg/ha)
August	Ammo 36	43-0-0-12
September	Urea	18-0-0-0
October	Urea	23-0-0-0
November	Urea	18-0-0-0
December	Potash Superphosphate and FlexiN	21-55-30-66
December	Organic dairy effluent (solid)	14-10-8-3
February	Urea	18-0-0-0
March	Urea (liquid)	18-0-0-0
Total		174-65-38-81

Effluent

Effluent has been modelled as using Overseer default values, and calculated as applying 55 kg N/ha/year (liquid) over the 107 ha (130.1 ha total area less 14 % areas not receiving effluent; calculated to 112 ha less crop area) effluent area, plus 12 kg N/ha/year (solids) applied from pond sludge, as well as 3 kg N/ha/year from pond sludge to the Non effluent areas, except the Upukeroroa blocks, again as a mitigating step, given their vulnerability to N loss. The effluent system remains the same.

Pasture Production

The predominant pasture species on the dairy farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity as 1 between dairy blocks, and 0.8 for the stonier Upukerora grazing blocks on the river flats:

Block	Relative productivity	T DM/ha/year
Dairy pastoral areas	1.0	15.3
Upuk_8a.1 Non Eff &dev	0.8	12.2

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.

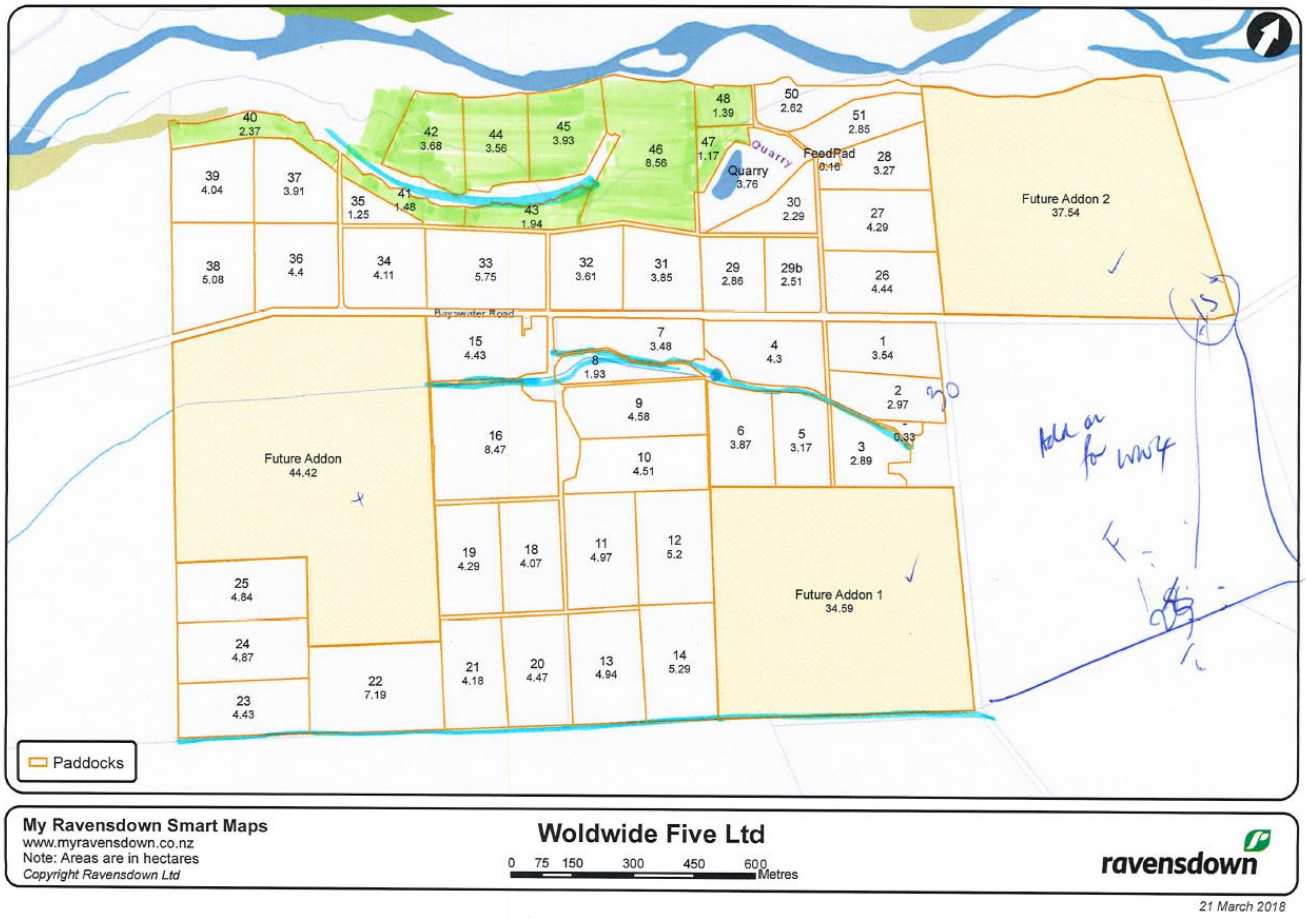
All other factors have remained the same.

Management Unit details and Soil Information: Table 1b

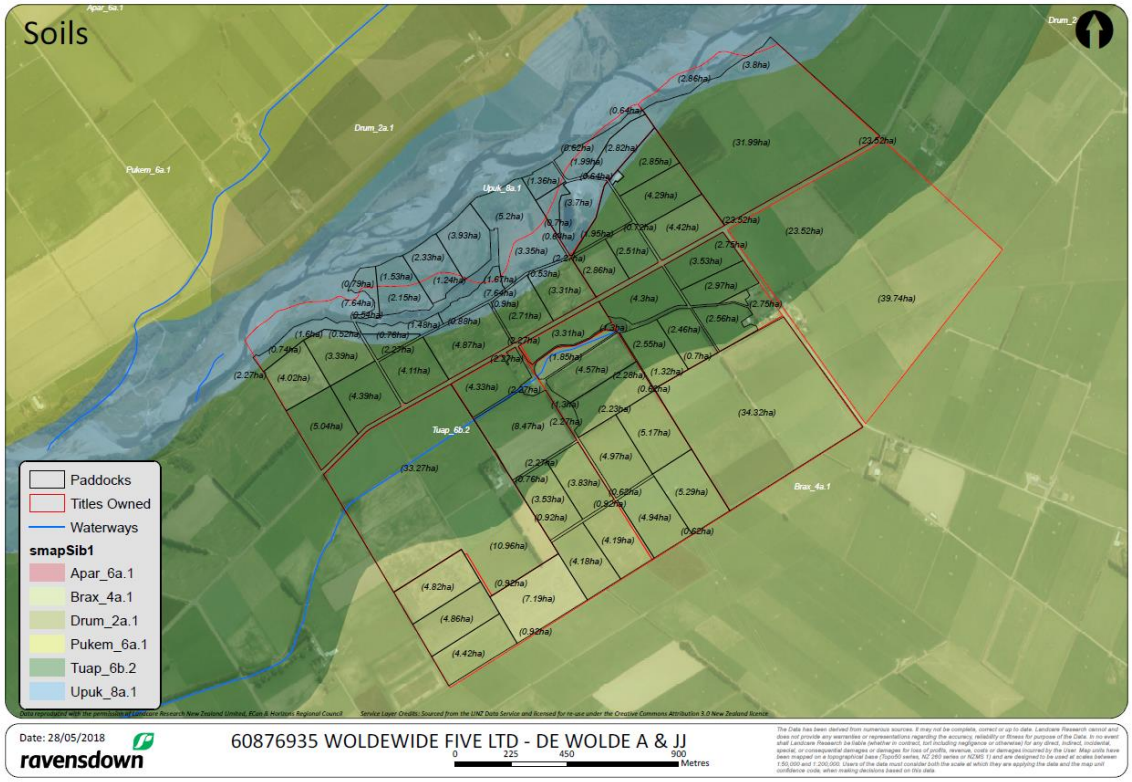
Block Name	Stock	Block Type	Soil Order	Drainage Class	Effluent	PAW (0-60cm)	Effective Area (ha)	Increased or Reduced Area Sheep
Brax_4a.1 Effluent	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid & Sludge	148.7	18.4	
Brax_4a.1 Eff Tile	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid & Sludge	148.7	47.2	
Tuap_6b.2 Effluent	Dairy	Pastoral	Orthic Melanic	Well drained	Liquid & Sludge	81.2	59.2	
Brax_4a.1 Non Eff	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge	148.7	33.0	+ 30.6 ha (sheep)
Tuap_6b.2 Non Eff	Dairy	Pastoral	Orthic Melanic	Well drained	Pond Sludge	81.2	71.7	+ 2.0 ha (sheep)
Upuk_8a.1 Non Eff	Dairy	Pastoral	Fluvial Recent	Well drained		37.6	13.6	+ 3.6 ha (sheep)
Upuk_8a.1 Non Eff dev	Dairy	Pastoral	Fluvial Recent	Well drained		37.6	29.2	
Riparian 1	n/a	Riparian			n/a	148.7	12.9	
Tuap_6b.2 FBt>FBt	Diary & Dry stock	Crop	Orthic Melanic	Well drained	Winter pad solids	81.2	10	+ 10.0 ha (sheep)
Tuap_6b.2 Past>FBt	Diary & Dry stock	Crop	Orthic Melanic	Well drained	Winter pad solids	81.2	10	+ 10.0 ha (sheep)
Tuap_6b.2 FBt>YG	Diary & Dry stock	Crop	Orthic Melanic	Well drained		81.2	10	+ 10.0 ha (sheep)
Brax_4a.1 Past>FBt	Diary & Dry stock	Crop	Orthic Gley	Poorly drained	Winter pad solids	148.7	3	+ 1.23 ha (sheep)
Brax_4a.1 FBt>FBt	Diary & Dry stock	Crop	Orthic Gley	Poorly drained	Winter pad solids	148.7	3	+ 1.23 ha (sheep)
Brax_4a.1 FBt>YG	Diary & Dry stock	Crop	Orthic Gley	Poorly drained		148.7	3	+ 1.23 ha (sheep)
Non-Productive area							11.4	+ 2.9 ha (sheep)
Total							**335.6 (262.6+73.0)**	**+73.0 (sheep)**

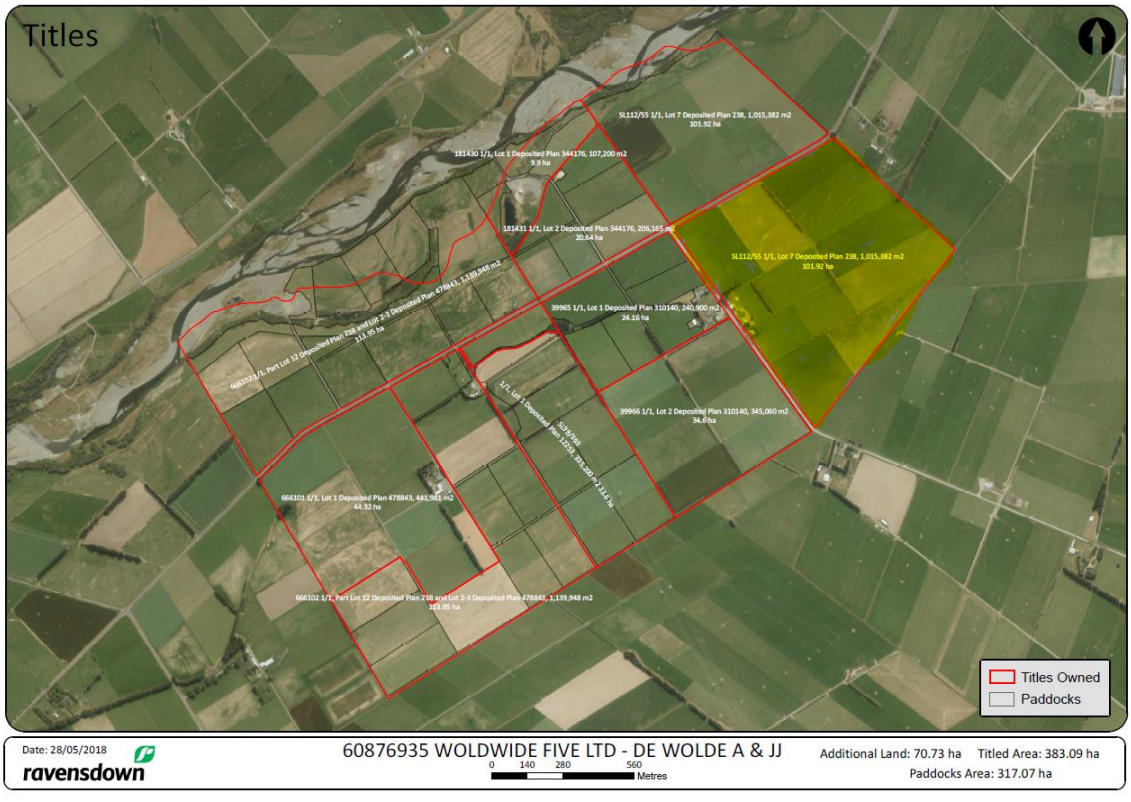
*PAW Landcare S maps calculated

Land Management Unit Map and Farm Map



Farm map with additional blocks outlined, 117.6 ha in total according to title (117.3 plus 63.3 ha added in Woldwide 4 less consented 44.3 ha equals 136.3 ha sheep unit), and added to 218.3 ha assessed by GIS. Total area now 335.5 ha, 12.9 ha of riparian and river margin and 11.4 ha of non-productive, estimated pastoral area of 311.2 ha.





Title area of 319.83 ha and soils above excludes highlighted area which is part of Woldwide 4, actual farm area included in paddocks calculated to be 335.5 ha

Proposed (Final) Farm System Analysis: Winter Barn Example

Description of Proposed Winter barn Farm System

To provide an example of what the effects of a wintering barn would look like, it is easier to use the existing Woldwide 5 platform as the basis for the dairy platform example, with the dairy cows no longer wintered on this block, nor do the additional 200 cows in the current scenario (see pages 8 & 9 for full explanation). The effluent area will remain the same. With wintering all mixed age cows inside in the barn, there will no longer be any of fodder beet grown (33.6 ha for current scenario or 39 ha for original proposal), but to pay for the barn, additional cows are milked with a longer lactation given they can keep milking cows indoors towards the end of the season.

The 335.6 ha property will be operated as a dryland dairy farm, calving 960 cows and peak milking 930 (540 & 500 kg LW) Friesian cows. Milk production aimed for is at 535,000 kg MS/year (575 kg MS/cow peak). Cow numbers are shown in the table below. All mixed age cows are wintered in the barn, with in calf first calving heifers also wintered in barn, coming back from grazing off in mid May. Mean calving date is still the 20th August for the main herd, with the first calvers a week earlier on the 12th of August.

The dry-off date is now the 15th of June and the 31st of May for the cows and first calving heifers. All replacements (248) are grazed off-the platform until they return as in calf R2 heifers in mid May as mentioned. Cows are never milked once a day over autumn drying off (modelled never) and all calves are fed colostrum and waste milk.

Friesian Bulls (20) at 700 kg LW are run with the herd over December and January.

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	LW (kg)
Dairy cows		265	715	705	695	695	675	665	655	645	600	260	540
First calving heifers	30	220	247	240	235	235	235	225	225	225	195		500
Dairy grazers (milking cows)	715	450									0	455	540
Dairy grazers (Repl. In calf hfrs)	218	27									122* (248)	248	480 & 500
Bulls						20	20						700

* Overseer FM shows 248, however would have calculated the weighted average from 15th May, and so have also shown 122 as a weighted average

Supplements

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

- 350 T DM Barley grain and 250 T DM distilled Brewers grain imported and used over the season through the milking shed. A further 35 T DM is fed to milking cows in the wintering barn
- 99 T DM of Molasses imported and fed through the shed.
- 500 T DM of Palm Kernel Expeller (PKE); 350 T DM fed through the shed, with the remainder (150 T DM) fed on pastoral blocks. A further 40 T DM is fed to milking cows in the wintering barn
- Approximately 700 T DM of grass silage; made from the support block and fed ***evenly across pastoral blocks*** to dairy cows.
- 410 T DM of silage made on the support block and fed to ***dry cattle*** in the wintering barn
- 140 T DM silage made on the support block and fed to the ***milking cows*** in the wintering barn
- 105 T DM silage made from the support block and fed to the ***replacement in calf heifers*** in the wintering barn

Because of the increased stocking and longer lactation, imported supplementary feed has increased to the above amounts to mostly reconcile the pastoral productivity between the two systems. However, additional fertiliser and barn slurry is also been used to reconcile the increased pastoral productivity also. In addition, it is noted the two barn examples for both Woldwide 4 & 5 are also similar in pasture productivity.

Supplementary feed made and fed during the season remains as before and is less likely given the increased stocking rates over the milking season will mean all pasture is more likely utilised by milking animals within the platform.

Fodder Cropping

This is now no longer required compared to the other two systems modelled. The losses are likely lower on blocks which in the past wintered the mixed age cows on crop. Pasture renewal is now by grass to grass renewal.

Fertiliser

This changes again between the two systems modelled. This is given the increased need given the higher pastoral productivity (an increase of 0.38 T DM/ha over the current system), however more nitrogen is supplied by effluent and barn slurry, so the additional fertiliser nitrogen required equates to roughly a ***decrease*** for the effluent blocks and ***a nil to small increase*** for the non-effluent blocks, with in effect ***a small increase in fertiliser N***. There is a 39 kg of N/ha decrease for effluent blocks (but a 41 kg N/ha increase for the tiled effluent areas receiving no barn slurry; Brax_4a.1 effluent tiled) and a differing amount for the non-effluent blocks (1 kg N/ha decrease to 10 kg N/ha increase), depending on how much barn slurry and effluent from Woldwide 3 is applied. The total fertiliser nitrogen applied is now 202 and 190 for the non-effluent blocks(169 for the Upukeroroa block) plus 201 and 121 kg N/ha/year for the Effluent farm blocks depending on which receives barn slurry, with 219 kg

N/ha across all blocks (whole property) on average, which includes the weighted average in NPKS of 58-19-71-8 from the same amount of dairy effluent imported from Woldwide 3 and barn slurry across a greater area (207.7 ha pastoral blocks in current scenario to 231.8 ha of Tuatapere and Braxton pastoral blocks). See fertiliser reconciliation summary page 39.

Note also maintenance fertiliser was also adjusted to account for the Phosphate in the barn slurry

Non Effluent block:

Month	Fertiliser	NPKS nutrient rating (kg/ha)**	NPKS nutrient rating (kg/ha)*
August	Ammo 36	43-0-0-12	43-0-0-12
September	Urea	35-0-0-0	23-0-0-0
October	Urea	30-0-0-0	23-0-0-0
November	Organic dairy barn slurry	61-12-67-6 or 49-12-67-6	23-0-0-0 (Urea)
December	Potash Superphosphate and FlexiN or Organic Dairy Barn Slurry	24-6-33-3 or 43-16-33-15	25-18-50-28 (soluble fert)
January	Organic effluent pad solids WW3	32-13-19-17^	
February	Urea	23-0-0-0	
March	Urea	23-0-0-0	23-0-0-0
April	Urea (liquid)	18-0-0-0	9-0-0-0
Totals		275-28-100-33 or 277-32-119-38	169-18-50-40

* Upukeroroa blocks ** Tuatapere and Braxton Non effluent blocks ^Tuatapere Non effluent only

Effluent block and Effluent Tile:

Month	Fertiliser	NPKS nutrient rating (kg/ha)
August	Ammo 36	43-0-0-12
September	Urea	23-0-0-0 Eff Tile 35-0-0-0
October	Urea	23-0-0-0 Eff Tile 35-0-0-0
November	Urea	49-12-67-6 Eff Tile 35-0-0-0
December	Potassic Superphosphate and FlexiN	24-6-33-3 Eff Tile 23-12-0-14
December	Organic effluent pad solids WW3	18-12-11-4
March	Urea	23-0-0-0
April	Urea (liquid)	9-0-0-0
Total		212-31-111-25**219-24-11-30#

**Note effluent blocks receive variable dairy shed effluent amounts now, with Effluent Tile# shown second

Effluent

Effluent has been modelled as using Overseer default values, and calculated as applying 54 to 77 kg N/ha/year (amounts differ depending upon soil type and tiled areas) (liquid) over the 112.0 ha, (130.1 ha total area less 14 % areas not receiving effluent; calculated to 112 ha, increased area due to no cropping) effluent area, plus 3 to 5 kg N/ha/year (solids) applied from pond sludge. The effluent system essentially remains the same as what was detailed in the “current” farm system analysis. Wintering barn effluent is as detailed in the consent for Woldwide 1&2 and is a slurry which is exported and re imported as a dairy organic fertiliser. Solids applied to the Non effluent areas equates to 17 kg N/ha/year

Farm dairy feeding structure: Wintering Barn.

There is one housing barn on farm that has been modelled as two structures so as to contain the milking herd (winter barn plus grazing) and dry cows (winter pad only) at the times specified in table below. In addition, due to a modelling error, the dry cows are required to be grazing a pastoral block for the model to run, however in reality these animals will be all in the barn. To work around this, 99 % of the dry cattle are in the barn in August, with the Braxton and Tuatapere effluent and non-effluent blocks grazing these dry cattle for only 1% of the time in August.

The nutrient concentration of wintering barn effluent is higher than dairy shed effluent due to lack of dilution and the housing of cows in the barns for up 24 hours per day.

The nutrient content of pond effluent (slurry) was tested as part of a 2011 AgResearch study "Characterising dairy manures and slurries – Case study 15." The nutrient content of slurry at the applicant's pond was measured at: 3,200 g/m^3 N; 800 g/m^3 P; 4,400 g/m^3 K; 400 g/m^3 S
Applying 15.2 m^3/hectare applies slurry effluent at a depth of 1.5 mm. Discharging slurry effluent at 15.2 m^3/hectare applies:
49 kg of N; 12 kg of P; 69 kg of K; and 6 kg of S.

Table: Winter barn management:

Pad type	Covered animal shelter
Bunker lining material	No lining material
Bunker cleaning method	Scraped
Concrete feeding apron	Scraped
Solids separated	No
Solids storage	N/A
Time in storage	N/A
Liquid effluent	All exported as a slurry, as effluent composition different to dairy shed effluent
Solids management	Re imported as slurry, spread on all blocks bar the tiled effluent and Upukeroroa blocks. The Non effluent blocks receive a full application and effluent blocks half an application of barn slurry.
Months applied	November and December for non-effluent blocks
Separated solids from pond and housing barn on pasture N application rate, Kg N/ha/year	variable for effluent blocks and for non-effluent blocks (see fertiliser summary page 39)

Table: Feeding management in winter barn:

Herd		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Milking herd	% of cows				50	100	100	100	100				
	Hours/ day grazing				10	10	0	0	10				
Dry cows	% of cows						100	100	99				
	Hours/ day grazing						0	0	0				
Repl. In calf Heifers	% of cows					99	100	100	100				
	Hours/ day grazing					0	0	0	0				

Pasture Production

The predominant pasture species on the dairy farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity as 1 between dairy blocks, and 0.8 and 0.5 for the rougher grazing blocks on the platform and support block respectively:

Block	Relative productivity	T DM/ha/year
Dairy pastoral areas	1.0	15.7
Upukeroroa river soils	0.8	12.5

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.

All other factors have remained the same.

Management Unit details and Soil Information: Table 1b

Block Name	Stock	Block Type	Soil Order	Drainage Class	Effluent	PAW (0-60cm)	Effective Area (ha)	Increased or Reduced Area Sheep
Brax_4a.1 Effluent	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid & Sludge & Barn slurry *0.5	148.7	18.4	
Brax_4a.1 Eff Tile	Dairy	Pastoral	Orthic Gley	Poorly drained	Liquid & Sludge	148.7	52.5	
Tuap_6b.2 Effluent	Dairy	Pastoral	Orthic Melanic	Well drained	Liquid & Sludge & Barn slurry *0.5	81.2	59.2	
Brax_4a.1 Non Eff	Dairy	Pastoral	Orthic Gley	Poorly drained	Pond Sludge & Barn slurry * 1.0	148.7	36.7	+ 34.3 ha (sheep)
Tuap_6b.2 Non Eff	Dairy	Pastoral	Orthic Melanic	Well drained	Pond Sludge & Barn slurry * 1.0	81.2	101.7	+32.0 ha (sheep)
Upuk_8a.1 Non Eff	Dairy	Pastoral	Fluvial Recent	Well drained		37.6	13.6	+ 3.6 ha (sheep)
Upuk_8a.1 Non Eff dev	Dairy	Pastoral	Fluvial Recent	Well drained		37.6	29.2	
Riparian 1	n/a	Riparian			n/a	148.7	12.9	
Non-Productive area							11.4	+ 2.9 ha (sheep)
Total							**335.6 (262.6+73.0)**	**+73.0 (sheep)**

*PAW Landcare S maps calculated

Summary of Current and Proposed Farm System Scenario: Table 2

	Current scenario	Current Sheep Farm	Interim scenario	Winter Barn Proposal
System Type	Seasonal dairy supply block	Sheep breeding and finishing	Seasonal dairy supply block	Seasonal dairy supply
Total Area (ha)	262.6	136.3 (only 73.0 ha transferred to WW5)	335.6	335.6
Effluent area (ha)	112 ha (86 % of 130.1) receiving liquids & sludge from dairy shed plus 76.4 ha non-effluent having pond sludge from the holding pond applied	n/a	107 ha (86 % of 130.1 less crop) receiving liquids & sludge from dairy shed plus 147.4 ha non-effluent having pond sludge from the holding pond applied	112 ha (86 % of 130.1) receiving liquids & sludge from dairy shed plus 138.4 ha non-effluent having pond sludge from the holding pond applied. All wintering barn effluent re imported as fertiliser and applied to non-tiled effluent and non-effluent areas
Stocking rate (s.u/ha)	7,683 s.u* or 31.9 s.u/ha effective or 2.8 cows/ha platform (3.3 cows/ha grazed)	2,642 s.u* or 19.4 s.u/ha effective or 20.0/ha grazed	8,589 s.u* or 27.6 s.u/ha effective or 2.6 cows/ha platform (2.9 cows/ha grazed)	11,485 s.u* or 36.9 s.u/ha effective or 3.1 cows/ha platform (34.2 s.u/ha total or 2.9 cows/ha total)
N use (kg N/ha/year)	172 across the whole farm (158 fertiliser)	30 across the whole farm	164 across the whole farm (153 fertiliser)	194 across the whole farm
Production (kg MS/ha grazed)	1,302/ha effective platform (1,513/ha total grazed)	1,117 kg LW sold/ha grazed	1,157/ha effective platform (1,323/ha total grazed)	1,719/ha effective platform (1,594/ha total farm)
Supplements Imported (kg DM/ha/year)	1,152 T DM in total or 4,776 per effective platform.	n/a	876 T DM in total or 2,815 per effective platform.	2,629 T DM in total or 8,445 per effective platform.
Wintering system	On farm on crop plus in calf heifers wintered on plus additional 200 in calf dairy replacements	On farm on crop and pasture	On farm on crop plus in calf heifers wintered on with no additional in calf heifers	In wintering barn on platform plus in calf heifers wintered off
Pasture production(kg DM/ha/year) - Platform Pastures - Upukerora paddocks	 15,299** 12,299	 15,614 12,491	 15,256** 12,205	 15,685** 12,548

*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 average	Sheep Farm (136.3 ha)	Combined current (less 63.3 ha)	Interim scenario	Winter Barn Proposal
Nitrogen leaching loss to water (Total kg N)	14,590	2,509 (less 1,120)	15,978	16,029	14,378
Nitrogen leaching loss to water (kg N/ha)	56	18 (19)	48	48	43
Phosphorus runoff to water (Total kg P)	208	56 (less 25)	239	232	244
Phosphorus runoff to water (kg P/ha)	0.8	0.4 (0.4)	0.7	0.7	0.7

* Losses split apportionately with riparian, trees and other losses. Note Sheep Block apportioned in the following table:

Sheep Block (Brax_4a.1)	Pastoral	72.80	38.50	34.30
Sheep Block (Tuap_6b.2)	Pastoral	55.50	23.50	32.00
Sheep Block (Upuk_8a.1)	Pastoral	3.80		3.80
Swedes	Fodder Crop	-	***4.65***	***4.35***
Non prod		4.20	1.30	2.90
Totals		136.3	WW4 (63.3)	WW5 (73.0)

Discussion on Whole Farm Nutrient Loss Indicators

From the information provided by Woldwide Five, 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 scenario Farm System

- The N loss from the root zone from the farm system modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **56 kg N/ha/year or 14,590 kg N/year.**
- The P loss risk from the farm system modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **0.8 kg P/ha/year or 208 kg P/year.**

Combined Current Farm System

- The N loss from the root zone from the combined farm system (less the 63.3 ha included in Woldwide 4) modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **48 kg N/ha/year or 15,978 kg N/year.**
- The P loss risk from the farm system (less the 63.3 ha included in Woldwide 4) modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **0.7 kg P/ha/year or 239 kg P/year.**

Transitional (Interim) Farm System

- The N loss from the root zone from the farm system modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **48 kg N/ha/year or 16,029 kg N/year.**
- The P loss risk from the farm system modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **0.7 kg P/ha/year or 232 kg P/year.**

Proposed (final) Winter barn Farm System

- The N loss from the root zone from the farm system modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **43 kg N/ha/year or 14,378 kg N/year.**
- The P loss risk from the farm system modelled was calculated using OVERSEER® (v6.3.1/2.6.2.0) to be **0.7 kg P/ha/year or 244 kg P/year.** Further mitigated losses from other sources can account for a further reduction **of 11 kg P/year** leading to a P loss risk for the farm system now **being 233 kg P/year or 0.7 kg P/ha/year or a 2.5 % reduction** from the combined result

Key factors influencing Nutrient Loss include:

- Soil type and Profile Available Water (PAW) plus drainage.

  The soil type has a large impact on N leached. The soils on the property are mainly well drained silt loams, with poorly drained silt loams over clay and well drained stony sandy loams on the river flat. Plant Available Water (PAW) values range between (and would be considered) 'high' at 148.7 mm (0-60cm) to 'low' at 37.6 mm (0-60 cm). 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 and are less versatile (see N report in Appendix where the Tuatapere effluent block soil in the proposals loses 50 and 47 kg N/ha/year compared to the Braxton soils, losing 28 and 26 kg N/ha/year respectively on the Effluent pastoral blocks under the transitional and winter barn proposals respectively). The Upukerora soils lose between 84 to 90 and 81 kg N/ha/year, almost twice as much as the Tuatapere non-effluent soil (46 and 48 kg N/ha/year), with a PAW approximately twice (2.16) as much.

  The heavier soils are often tile drained (artificially drained, and are here) to remove water from the profile and enable higher productivity. The risk is that these drains also provide a conduit to nutrient flows and effluent discharges direct to water ways. Ensuring the nutrients are captured by plant growth and minimising effluent applications when soil PAW are near capacity will reduce this. This is evident with the tiled effluent area which has loses 2 kg N/ha/year higher than the non-tiled effluent block.

- Pastoral productivity

  The higher the pastoral productivity from dairy land and the associated higher stocking, the higher the risk of N losses on dairy farms, especially under the climatic, rainfall and evapotranspiration rates for Southland. The current system has a higher production per ha (1,513 kg MS/ha grazed) at a high stocking rate of 3.3 cows/ha platform grazed; (cf. to 2.73 cows/ha & 1056 kg MS/ha, NZ Southland Dairy statistics 2015-16) with a high amount (4,776 kg DM/ha) of supplement imported which supports the stocking and consequently the pasture production required at 15,299 kg DM/ha/year as seen in table 2, page 33. This leads to the high amount of urine deposition on pastures from the resulting cow intakes, resulting in increased risk from N leaching. The results point to a similar to slightly higher influence from urinary deposition in the proposals, with the amount of N loss attributed to urine decreasing as a percentage from 70 % to 69 % and increasing to 72 % for the transitional and barn proposals respectively, the rest

due to N losses from cropping and effluent applications (other sources) and direct (tiles).. It is noted the sheep unit is also at a similar pastoral productivity (15,614 kg DM/ha), and higher per ha productivity than district averages also. Losses here are at 33 % from urinary deposition given the lower risk from urine leaching with sheep.

- Cropping

  The crop blocks for the current system contribute 3,745 kg N/ha or 111 kg N/ha/year on average (26.0 % of total N losses and yet accounts for 12.8 % of the total land area). (Figures as in Block Nitrogen reports, pages 41, 44 & 46). It is the higher concentration of stock in a smaller area and thus the greater urine deposition which leads to this increased risk of losses. This is also exacerbated by these crops being grazed at a time when drainage events are most likely to occur, and that the crops are on the lightest soils of this farm. The losses are lower between the current and proposed transitional plus winter barn scenarios, with the proposed crop losses being 63 kg N/ha/year on average or 2453 kg N/year total (15.3 % of total losses and 11.6 % of area), due to the crop blocks now being on soils with lower risk of N losses from leaching. As well, it is the crop losses on the sheep block which on a proportionate basis contributes 33 % of total losses from 6.4 % of the total 73.0 ha which lifts the sheep losses to the overall N loss of 19 kg N/ha/year.

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 0.8 kg P/ha/year as seen in the Phosphate reports pages 41, 44 & 46, which are low to moderate risk in their impact. The P risk is mostly influenced by losses from other sources (123 kg or 59.4 % of total of 208 kg, refer Phosphorous block reports, pages 41,44 & 46) 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 have been or will be implemented on this farm. Olsen P levels are mostly within or below the optimum agronomic ranges, with the current fertiliser rates receiving above maintenance rates due to the recent conversion process. This will reduce in future, and has been in the final winter barn proposal. As well, the topography where the all of the fertiliser is applied is flat, which also helps to minimise P losses. Any new Effluent storage plus low volume applications will help to mitigate this risk and allow applications to be reduced on tiled soils at “at risk” times also. The proposed P losses are only 232 kg P/year, 7 kg P/year lower than the combined P losses and due mostly to the reduced losses on the cropping blocks, being mitigated by shifting to deeper less vulnerable soils, but with increased stocking the barn example increases these P losses to 244 kg P/year, a 5 kg P/year increase..

The current scenario is rated 13.9, the lower side of category 2 under the Soil versatility rating system (Landcare Research, 2002), as calculated in the table 4 below. The proposal reduces this score (13.4), as there is a greater percentage of less vulnerable soils (Braxton and Tuatapere). The farm already uses a number of effective Nitrogen

mitigation strategies to minimise losses for the proposal and allowing the proposal to crop less on these vulnerable soils culminating in the results above.

Soil Vulnerability Land Management Rating: Table 4

Soil Type (Proposed)	Soil Vulnerability	Vulnerability rating	% Farm	Rating score
Braxt_4a.1	Moderate	10	28.7 (33.6)	2.87 (3.36)
Tuap_6b.2	Moderate	10	51.6 (49.9)	5.16 (4.99)
Upuk_8a.1	Limited	30	19.7 (16.5)	5.91 (4.95)
Total			**100.0**	**13.94 (13.30)**

The property is situated in the Aparima River sub catchment, and the Aparima catchment of the proposed Environment Southland Regional Water and Land Plan. It is 29 % on a Central plain physiographic zone, with no variants, 50 % on the oxidising physiographic with no variants and 16.5 % on the riverine physiographic. (See map, page 17 and table above), meaning the farm must attach significance to these zones in its environmental management. The farm is within zones having influence in the high nitrate levels in ground water and is at risk from summer shrinking of soils and nitrogen losses from leaching. Water quality is characterised by lowland hard bed and spring fed, with quaternary gravel upon tertiary sediment in the Upper Aparima groundwater management zone. 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. An additional key risk factor for the Braxton soil is the losses of nitrogen through tiles which is the case here. No effluent applications to the highest risk soil during the highest risk periods would be helpful. This plus the use of the wintering pads at the riskier shoulder seasons and the reduction of wintering on the Upukerora would be mitigations to be used to reduce the risk of N loss over the autumn winter period. In addition, created Riparian strips and wetlands would be activities which would be required to mitigate any overland flows.

Summary of Mitigations re winter barn:

	Mitigations modelled:	Reason/Rationale:	Effect:
Winter Barn Farm System	1. Effluent mitigations (area maintained and targeted fertiliser applications)	Ensure effluent only applied to appropriate areas, with Nitrogen applications taking into account the additional effluent nutrients from barn slurry.	Effluent area maintained. Decrease Nitrogen applications to account for the application of the imported slurry to Non effluent areas (1.5 x apply) and effluent areas (1.5 x apply), not applying to Upukeroroa and tiled effluent areas. Adjust fertiliser applications to account for this and required pastoral productivity. Other blocks have additional fertiliser applied. Adjust effluent solids too
	2. Alter cropping regime with the Winter Barn	With the winter barn, no crop area is required.	No crop area over winter reduces Nitrogen losses in Upukeroroa blocks in current scenario from 4,550 to 3,481 kg N/ha, plus the risk of P losses is also reduced. Note the interim stage showed cropping on the Braxton would lower losses to 2,453 kg N/year, but these losses can be used to counter the increase in urine patch losses from pastures on the more vulnerable Upukeroroa soils
	3. Winter Barn	With the additional milking cows, the use of the barn over May and August gives the farm system an ability to reduce risk of pugging to pastures over spring and at autumn as required.	The risk of pugging reduces infiltration of soils and increases overland flow of nutrients. Also nutrients are held and spread onto soil by effluent applications when pastures more able to receive the nutrients and thus lowers risk of losses.
	4. Supplementary feed	Additional feed is able to be used for the extended lactation and for the wintering of cattle, with an ability to lower losses and ensure higher utilisation	Higher amounts of grain and PKE can mean one can reduce the pastoral productivity further, and so with a lower pastoral productivity and higher supplement use overall N losses will reduce. It was decided to use slightly more N fertiliser to equate pastoral productivity and the example still shows an equal amount of losses for the system when compared to the interim stage of more cows and added area.
	5. Mitigate stocking on more vulnerable Upukeroroa soils	Higher stocking on the dairy platform could lead to increased urine patch losses on the free draining river soils	Mitigate this by not grazing milking cows on these soils over autumn, and the lower productivity will mean reduced fertiliser applications on these soils. In addition the numbers wintered, calved and peak milked are lowered to account for this as well.

The sum effect from the wintering barn has been to lower the level of environmental losses from the increased farming system intensity (more cows and longer lactation with higher milk production) which is required to provide an added return on the additional capital invested. These effects are less able to be buffered by the freer draining and high vulnerability to leaching Upukeroroa soils, but more so by less vulnerable Braxton soils.

Fertiliser Reconciliation Summary:

				fert n	eff n	org n	total n	pasture
Current Scenario WW5	effIntadj	Area	N loss					
Brax_4a.1 Effluent	Pastoral	18.4	600	174	57	18	249	15299
Brax_4a.1 Eff Tile	Pastoral	52.5	1766	174	57	18	249	15299
Tuap_6b.2 Effluent	Pastoral	59.2	3458	174	57	18	249	15299
Brax_4a.1 Non Eff	Pastoral	2.4	73	202	3	18	223	15299
Tuap_6b.2 Non Eff	Pastoral	69.7	3897	202	3	18	223	15299
Upuk_8a.1 Non Eff	Pastoral	4.3	527	202	3	18	223	12491
Upuk_8a.1 Non Eff dev	Pastoral	1.1	135	202	0	18	220	12491
Riparian 1	Riparian	12.9	39					
Upuk_8a.1 FBt>FBt	Crop	22.3	2459					
Upuk_8a.1 Past>FBt	Crop	5.8	720					
Upuk_8a.1 FBt>YG	Crop	5.5	566					
Non prod		8.5	351					
Total		262.6	14590					
Sum total blocks		262.6	14591	158	14		172	

Winter Barn red P		fert n	eff n	org n	total n	pasture
Proposed	Area					
Brax_4a.1 Effluent	18.4	121	69	90	280	15685
Brax_4a.1 Eff Tile	52.5	201	54	18	273	15685
Tuap_6b.2 Effluent	59.2	121	77	91	289	15685
Brax_4a.1 Non Eff	36.7	202	17	73	292	15685
Tuap_6b.2 Non Eff	101.7	190	17	86	293	15685
Upuk_8a.1 Non Eff	13.6	169	0	0	169	12548
Upuk_8a.1 Non Eff dev	29.2	169	0	0	169	12548
Riparian 1	12.9					
Other sources	11.4					
Total	335.6					
Sum total blocks	335.6	161	58		219	

Proposed	Area	N loss					
Brax_4a.1 Effluent	18.4	523	160	68	14	242	15256
Brax_4a.1 Eff Tile	47.2	1402	160	68	14	242	15256
Tuap_6b.2 Effluent	59.2	2976	160	62	14	236	15256
Brax_4a.1 Non Eff	33	863	192	3	14	209	15256
Tuap_6b.2 Non Eff	71.7	3319	192	3	14	209	15256
Upuk_8a.1 Non Eff	13.6	1137	169	0	0	169	12205
Upuk_8a.1 Non Eff dev	29.2	2633	169	0	0	169	12205
Riparian 1	12.9	39					
Tuap_6b.2 FBt>FBt	10	838					
Tuap_6b.2 Past>FBt	10	720					
Tuap_6b.2 FBt>YG	10	512					
Brax_4a.1 Past>FBt	3	130					
Brax_4a.1 FBt>FBt	3	159					
Brax_4a.1 FBt>YG	3	94					
Other sources	11.4	684					
Total	335.6	16029					
Sum total blocks	335.6	16029					

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 v6.3.0 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

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	14,590	56
Phosphorus	208	0.8

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Fertiliser, lime and other	172	57	39	69	24	8	2
Irrigation	0	0	0	0	0	0	0
Supplements	111	18	49	12	13	8	6
Rain/clover fixation	44	0	2	4	2	5	23

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	56	0.8	20	93	102	4	15
As product	86	14	22	4	18	2	6
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	74	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	97	8	4	-14	1	0	0
Inorganic mineral	0	2	-12	0	-3	-4	-5
Inorganic soil pool	4	49	53	0	-79	19	13

Sheep Farm

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	2,509	18
Phosphorus	56	0.4

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Fertiliser, lime and other	30	21	8	39	47	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	106	0	2	4	2	5	23

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	18	0.4	8	42	23	3	15
As product	21	2	1	3	4	0	1
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	47	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	49	10	0	-2	0	0	0
Inorganic mineral	0	2	-21	0	-2	-4	-4
Inorganic soil pool	8	8	33	0	26	7	12

Current Farm System Nutrient Loss Indicators

P report

Block P

Phosphorus summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)
BRAX_4A.1 EFF TILE	32	0.6
BRAX_4A.1 EFFLUENT	6	0.3
BRAX_4A.1 NON EFF	1	0.2
TUAP_6B.2 EFFLUENT	9	0.2
TUAP_6B.2 NON EFF	9	0.1
UPUK_8A.1 NON EFF	2	0.4
UPUK_8A.1 NON EFF DEV	0	0.4
UPUK_8A.1 FBT>FBT	17	0.8
UPUK_8A.1 FBT>YG	3	0.5
UPUK_8A.1 PAST>FBT	4	0.7

Sheep Farm

Phosphorus summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)
SHEEP BLOCK (BRAX_4A.1)	30	0.4
SHEEP BLOCK (TUAP_6B.2)	6	0.1
SHEEP BLOCK (UPUK_8A.1)	1	0.3
SWEDES	2	0.2

N report

Block N

Nitrogen summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)	N IN DRAINAGE (PPM)	N ADDED (KG/HA)	N SURPLUS (KG/HA)
BRAX_4A.1 EFF TILE	1766	34	10	248	251
BRAX_4A.1 EFFLUENT	600	33	10	248	251
BRAX_4A.1 NON EFF	73	31	10	222	222
TUAP_6B.2 EFFLUENT	3458	58	16	248	259
TUAP_6B.2 NON EFF	3897	56	16	222	234
UPUK_8A.1 NON EFF	527	123	30	222	301
UPUK_8A.1 NON EFF DEV	135	122	30	219	298
UPUK_8A.1 FBT>FBT	2459	110	25	93	113
UPUK_8A.1 FBT>YG	566	103	24	113	53
UPUK_8A.1 PAST>FBT	720	124	29	93	96

* Estimated N concentration in drainage water at the bottom of the root zone. Maximum recommeded 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.

Sheep Farm

Nitrogen summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)	N IN DRAINAGE (PPM)	N ADDED (KG/HA)	N SURPLUS (KG/HA)
SHEEP BLOCK (BRAX_4A.1)	669	10	3	28	120
SHEEP BLOCK (TUAP_6B.2)	761	15	4	28	118
SHEEP BLOCK (UPUK_8A.1)	143	38	9	28	115
SWEDES	891	99	24	71	59

Current System Pasture Production, Other Values and Effluent Report

Pasture/crops

	PASTURE/CROP	YIELD	GROWTH (KG DM/HA)	INTAKE (KG DM/HA)	REMOVED (KG DM/HA)	UTILISATION (%)	TOTAL RSU
BRAX_4A.1 EFF TILE	Ryegrass/white clover	-	15299	13004	0	85	23.49
BRAX_4A.1 EFFLUENT	Ryegrass/white clover	-	15299	13004	0	85	23.49
BRAX_4A.1 NON EFF	Ryegrass/white clover	-	15299	13004	0	85	23.49
TUAP_6B.2 EFFLUENT	Ryegrass/white clover	-	15299	13004	0	85	23.49
TUAP_6B.2 NON EFF	Ryegrass/white clover	-	15299	12660	0	83	22.87
UPUK_8A.1 NON EFF	Ryegrass/white clover	-	12239	8751	0	72	15.91
UPUK_8A.1 NON EFF DEV	Ryegrass/white clover	-	12239	8751	0	72	15.91
UPUK_8A.1 FBT>FBT	Fodder beets | Fodder beets |	50 T DM/Ha	0	0	0	0	0
UPUK_8A.1 FBT>YG	Fodder beets | Pasture |	25 T DM/Ha	12748	10836	0	85	19.51
UPUK_8A.1 PAST>FBT	Fodder beets |	25 T DM/Ha	609	506	0	83	0.93

Farm details

N: 14590 N/ha: 56 P: 208 P/ha: 0.8 GHG/ha: 14981 NCE: 26%

Total area	262.6 ha
Productive block area	241.20 ha
Nitrogen conversion efficiency (NCE)	26%
N Surplus	240 kg/ha
Region	Southland

GHG: Allocation to milk	0.82	Milk solids (kg/ha grazed)	1513
Total liveweight brought (kg/ha grazed)	3871	Milking herd size (peak cows/ha grazed)	3.3
Total liveweight reared (kg/ha grazed)	101	Beef / dairy grazing stock rate (RSU)	974
Total liveweight sold (kg/ha grazed)	3808	Dairy stock rate (RSU)	6709
Default calving date	06 August	Dairy replacements stock rate (RSU)	0
Milk production per cow (kg milk solids / cow)	465.3		

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
Brax_4a.1 Effluent	Pasture	18.4	600	33	251	6	0.3
Brax_4a.1 Eff Tile	Pasture	52.5	1766	34	251	32	0.6
Tuap_6b.2 Effluent	Pasture	59.2	3458	58	259	9	0.2
Brax_4a.1 Non Eff	Pasture	2.4	73	31	222	1	0.2
Tuap_6b.2 Non Eff	Pasture	69.7	3897	56	234	9	0.1
Upuk_8a.1 Non Eff	Pasture	4.3	527	123	301	2	0.4
Upuk_8a.1 Non Eff dev	Pasture	1.1	135	122	298	0	0.4
Upuk_8a.1 FBt>FBt	Crop	22.3	2459	110	113	17	0.8
Upuk_8a.1 Past>FBt	Crop	5.8	720	124	96	4	0.7
Upuk_8a.1 FBt>YG	Crop	5.5	566	103	53	3	0.5
Riparian 1	Riparian	12.9	39	3	0	1	0.1
Other sources	Other	-	351	-	-	124	-

Effluent report

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

CURRENT AREA RECEIVING LIQUID EFFLUENT	
Total area including crops	112 ha
Pastoral area receiving liquid	112 ha
% of farm pastoral area	54%
Average liquid effluent	53 kg N/ha/yr
Average fertiliser	174 kg N/ha/yr
Average other	11 kg N/ha/yr
AREA OF FARM TO APPLY ALL EFFLUENT TO ACHIEVE RATES OF	
150 kg N/ha/yr - Liquid	39 ha - based on the amount of effluent generated on the the farm and sprayed from sump.
150 kg N/ha/yr - Solid	11 ha
150 kg N/ha/yr - Total	50 ha
Maintenance K	7099 ha
100 kg K/ha/yr	75 ha
Maintenance K Warning	* Average K maintenance rates were less than 20 kg K/ha/yr - use with caution.
SOURCE OF N IN EFFLUENT BLOCK(S)	
Effluent from farm dairy	83%
Effluent from Feed pad	0%
Effluent from Standoff pad	0%
Effluent from Uncovered wintering pad/shelter	0%
Solids	17%
Exported	0%

The Sheep Farm

Pasture/crops

	PASTURE/CROP	YIELD	GROWTH (KG DM/HA)	INTAKE (KG DM/HA)	REMOVED (KG DM/HA)	UTILISATION (%)	TOTAL RSU
SHEEP BLOCK (BRAX_4A.1)	Ryegrass/white clover	-	15614	10848	117	70	19.48
SHEEP BLOCK (TUAP_6B.2)	Ryegrass/white clover	-	15614	10832	140	70	19.46
SHEEP BLOCK (UPUK_8A.1)	Ryegrass/white clover	-	12491	8744	0	70	15.69
SWEDES	Swedes | Pasture |	14 T DM/Ha	0	0	0	0	0

Farm details

N: 2509 N/ha: 18 P: 56 P/ha: 0.4 GHG/ha: 7095 NCE: 17%

Total area	136.3 ha
Productive block area	132.10 ha
Nitrogen conversion efficiency (NCE)	17%
N Surplus	113 kg/ha
Region	Southland

GHG: Allocation to wool - breeding mob	0.25	Total liveweight reared (kg/ha grazed)	424
GHG: Allocation to wool - trading mob	0.02	Total liveweight sold (kg/ha grazed)	1117
Total liveweight brought (kg/ha grazed)	831	Sheep stock rate (RSU)	2642

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
Sheep Block (Brax_4a.1)	Pasture	72.8	669	10	120	30	0.4
Sheep Block (Tuap_6b.2)	Pasture	55.5	761	15	118	6	0.1
Sheep Block (Upuk_8a.1)	Pasture	3.8	143	38	115	1	0.3
Swedes	Fodder crop	9	891	99	59	2	0.2
Other sources	Other	-	45	-	-	18	-

Current System Parameter Report

Available on request.

Proposed Transitional farm System Whole Farm Nutrient Budget

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	16,029	48
Phosphorus	232	0.7

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Fertiliser, lime and other	164	56	36	70	19	6	2
Irrigation	0	0	0	0	0	0	0
Supplements	64	11	28	8	7	5	3
Rain/clover fixation	62	0	2	4	2	5	23

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	48	0.7	24	90	95	4	16
As product	79	13	19	4	17	2	6
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	72	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	80	9	2	-14	0	0	0
Inorganic mineral	0	2	-18	0	-3	-4	-5
Inorganic soil pool	3	43	36	0	-82	15	11

Proposed Transitional Farm System Nutrient Loss Indicators

P report

Block P

Phosphorus summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)
BRAX_4A.1 EFF TILE	29	0.6
BRAX_4A.1 EFFLUENT	6	0.3
BRAX_4A.1 NON EFF	8	0.2
TUAP_6B.2 EFFLUENT	9	0.2
TUAP_6B.2 NON EFF	9	0.1
UPUK_8A.1 NON EFF	5	0.4
UPUK_8A.1 NON EFF DEV	12	0.4
BRAX_4A.1 FBT>FBT	2	0.8
BRAX_4A.1 FBT>YG	2	0.5
BRAX_4A.1 PAST>FBT	2	0.7
TUAP_6B.2 FBT>FBT	3	0.3
TUAP_6B.2 FBT>YG	2	0.2
TUAP_6B.2 PAST>FBT	3	0.3

N report

Block N

Nitrogen summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)	N IN DRAINAGE (PPM)	N ADDED (KG/HA)	N SURPLUS (KG/HA)
BRAX_4A.1 EFF TILE	1402	30	9	241	223
BRAX_4A.1 EFFLUENT	523	28	9	241	223
BRAX_4A.1 NON EFF	863	26	8	209	189
TUAP_6B.2 EFFLUENT	2976	50	14	236	226
TUAP_6B.2 NON EFF	3319	46	13	209	194
UPUK_8A.1 NON EFF	1137	84	20	169	176
UPUK_8A.1 NON EFF DEV	2633	90	22	169	185
BRAX_4A.1 FBT>FBT	159	53	14	118	114
BRAX_4A.1 FBT>YG	94	31	9	127	56
BRAX_4A.1 PAST>FBT	130	43	12	118	127
TUAP_6B.2 FBT>FBT	838	84	21	118	130
TUAP_6B.2 FBT>YG	512	51	13	127	56
TUAP_6B.2 PAST>FBT	720	72	18	118	142

* Estimated N concentration in drainage water at the bottom of the root zone. Maximum recommeded 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.

Proposed Transitional System Pasture Production, Other Values and Effluent Report

Pasture/crops

	PASTURE/CROP	YIELD	GROWTH (KG DM/HA)	INTAKE (KG DM/HA)	REMOVED (KG DM/HA)	UTILISATION (%)	TOTAL RSU
BRAX_4A.1 EFF TILE	Ryegrass/white clover	-	15256	12968	0	85	23.38
BRAX_4A.1 EFFLUENT	Ryegrass/white clover	-	15256	12968	0	85	23.38
BRAX_4A.1 NON EFF	Ryegrass/white clover	-	15256	12968	0	85	23.38
TUAP_6B.2 EFFLUENT	Ryegrass/white clover	-	15256	12968	0	85	23.38
TUAP_6B.2 NON EFF	Ryegrass/white clover	-	15256	12624	0	83	22.74
UPUK_8A.1 NON EFF	Ryegrass/white clover	-	12205	9459	0	77	17.04
UPUK_8A.1 NON EFF DEV	Ryegrass/white clover	-	12205	8726	0	72	15.81
BRAX_4A.1 FBT>FBT	Fodder beets | Fodder beets |	50 T DM/Ha	0	0	0	0	0
BRAX_4A.1 FBT>YG	Fodder beets | Pasture |	25 T DM/Ha	12179	10352	0	85	18.59
BRAX_4A.1 PAST>FBT	Fodder beets |	25 T DM/Ha	591	493	0	83	0.9
TUAP_6B.2 FBT>FBT	Fodder beets | Fodder beets |	50 T DM/Ha	0	0	0	0	0
TUAP_6B.2 FBT>YG	Fodder beets | Pasture |	25 T DM/Ha	12085	10272	0	85	18.46
TUAP_6B.2 PAST>FBT	Fodder beets |	25 T DM/Ha	591	493	0	83	0.9

Farm details

N: 16029 N/ha: 48 P: 232 P/ha: 0.7 GHG/ha: 13213 NCE: 27%

Total area	335.6 ha
Productive block area	311.30 ha
Nitrogen conversion efficiency (NCE)	27%
N Surplus	209 kg/ha
Region	Southland

GHG: Allocation to milk	0.82	Milk solids (kg/ha grazed)	1322
Total liveweight brought (kg/ha grazed)	3072	Milking herd size (peak cows/ha grazed)	2.9
Total liveweight reared (kg/ha grazed)	76	Beef / dairy grazing stock rate (RSU)	939
Total liveweight sold (kg/ha grazed)	3088	Dairy stock rate (RSU)	7649
Default calving date	06 August	Dairy replacements stock rate (RSU)	0
Milk production per cow (kg milk solids / cow)	452.8		

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
Brax_4a.1 Eff Tile	Pasture	47.2	1402	30	223	29	0.6
Brax_4a.1 Effluent	Pasture	18.4	523	28	223	6	0.3
Brax_4a.1 Non Eff	Pasture	33	863	26	189	8	0.2
Tuap_6b.2 Effluent	Pasture	59.2	2976	50	226	9	0.2
Tuap_6b.2 Non Eff	Pasture	71.7	3319	46	194	9	0.1
Upuk_8a.1 Non Eff	Pasture	13.6	1137	84	176	5	0.4
Upuk_8a.1 Non Eff dev	Pasture	29.2	2633	90	185	12	0.4
Brax_4a.1 FBt>FBt	Crop	3	159	53	114	2	0.8
Brax_4a.1 FBt>YG	Crop	3	94	31	56	2	0.5
Brax_4a.1 Past>FBt	Crop	3	130	43	127	2	0.7
Tuap_6b.2 FBt>FBt	Crop	10	838	84	130	3	0.3
Tuap_6b.2 FBt>YG	Crop	10	512	51	56	2	0.2
Tuap_6b.2 Past>FBt	Crop	10	720	72	142	3	0.3
Riparian 1	Riparian	12.9	39	3	0	1	0.1
Other sources	Other	-	684	-	-	139	-

Effluent report

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

CURRENT AREA RECEIVING LIQUID EFFLUENT	
Total area including crops	107 ha
Pastoral area receiving liquid	107 ha
% of farm pastoral area	39%
Average liquid effluent	61 kg N/ha/yr
Average fertiliser	160 kg N/ha/yr
Average other	12 kg N/ha/yr
AREA OF FARM TO APPLY ALL EFFLUENT TO ACHIEVE RATES OF	
150 kg N/ha/yr - Liquid	44 ha - based on the amount of effluent generated on the the farm and sprayed from sump.
150 kg N/ha/yr - Solid	14 ha
150 kg N/ha/yr - Total	58 ha
Maintenance K	363 ha
100 kg K/ha/yr	91 ha
SOURCE OF N IN EFFLUENT BLOCK(S)	
Effluent from farm dairy	82%
Effluent from Feed pad	0%
Effluent from Standoff pad	0%
Effluent from Uncovered wintering pad/shelter	0%
Solids	18%
Exported	0%

Proposed Transitional System Parameter Report

Available on request.

Proposed Final Winter Barn Whole Farm Nutrient Budget

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	14,378	43
Phosphorus	244	0.7

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Fertiliser, lime and other	219	26	81	30	16	6	1
Irrigation	0	0	0	0	0	0	0
Supplements	205	28	130	22	26	15	10
Rain/clover fixation	60	0	2	4	2	5	23

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	43	0.7	23	50	97	4	15
As product	129	22	30	8	31	3	9
Transfer	0	0	0	0	0	0	0
Effluent exported	99	12	87	8	19	7	5
To atmosphere	86	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	126	13	9	-10	2	1	1
Inorganic mineral	0	2	-10	0	-3	-4	-5
Inorganic soil pool	0	5	75	0	-103	17	9

Proposed Final Winter Barn Nutrient Loss Indicators

P report

Block P

Phosphorus summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)
BRAX_4A.1 EFF TILE	29	0.5
BRAX_4A.1 EFFLUENT	4	0.2
BRAX_4A.1 NON EFF	7	0.2
TUAP_6B.2 EFFLUENT	8	0.1
TUAP_6B.2 NON EFF	10	0.1
UPUK_8A.1 NON EFF	5	0.3
UPUK_8A.1 NON EFF DEV	10	0.3

N report

Block N

Nitrogen summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)	N IN DRAINAGE (PPM)	N ADDED (KG/HA)	N SURPLUS (KG/HA)
BRAX_4A.1 EFF TILE	1328	25	8	273	208
BRAX_4A.1 EFFLUENT	470	26	8	281	224
BRAX_4A.1 NON EFF	923	25	8	292	211
TUAP_6B.2 EFFLUENT	2800	47	13	289	237
TUAP_6B.2 NON EFF	4831	48	13	294	218
UPUK_8A.1 NON EFF	1103	81	20	169	207
UPUK_8A.1 NON EFF DEV	2368	81	20	169	207

* Estimated N concentration in drainage water at the bottom of the root zone. Maximum recommeded 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.

Proposed Final Winter Barn Pasture Production, Other Values and Effluent Report

Pasture/crops

	PASTURE/CROP	YIELD	GROWTH (KG DM/HA)	INTAKE (KG DM/HA)	REMOVED (KG DM/HA)	UTILISATION (%)	TOTAL RSU
BRAX_4A.1 EFF TILE	Ryegrass/white clover	-	15685	13332	0	85	24.09
BRAX_4A.1 EFFLUENT	Ryegrass/white clover	-	15685	13293	0	85	24.02
BRAX_4A.1 NON EFF	Ryegrass/white clover	-	15685	13293	0	85	24.02
TUAP_6B.2 EFFLUENT	Ryegrass/white clover	-	15685	13332	0	85	24.09
TUAP_6B.2 NON EFF	Ryegrass/white clover	-	15685	13293	0	85	24.02
UPUK_8A.1 NON EFF	Ryegrass/white clover	-	12548	10666	0	85	19.09
UPUK_8A.1 NON EFF DEV	Ryegrass/white clover	-	12548	10666	0	85	19.09

Farm details

N: 14378 N/ha: 43 P: 244 P/ha: 0.7 GHG/ha: 17860 NCE: 47%

Total area	335.6 ha
Productive block area	311.30 ha
Nitrogen conversion efficiency (NCE)	47%
N Surplus	255 kg/ha
Region	Southland

GHG: Allocation to milk	0.85	Milk solids (kg/ha grazed)	1719
Total liveweight brought (kg/ha grazed)	2320	Milking herd size (peak cows/ha grazed)	3.1
Total liveweight reared (kg/ha grazed)	67	Beef / dairy grazing stock rate (RSU)	650
Total liveweight sold (kg/ha grazed)	2406	Dairy stock rate (RSU)	10663
Default calving date	06 August	Dairy replacements stock rate (RSU)	172
Milk production per cow (kg milk solids / cow)	556.1		

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
Brax_4a.1 Eff Tile	Pasture	52.5	1328	25	208	29	0.5
Brax_4a.1 Effluent	Pasture	18.4	470	26	224	4	0.2
Brax_4a.1 Non Eff	Pasture	36.7	923	25	211	7	0.2
Tuap_6b.2 Effluent	Pasture	59.2	2800	47	237	8	0.1
Tuap_6b.2 Non Eff	Pasture	101.7	4831	48	218	10	0.1
Upuk_8a.1 Non Eff	Pasture	13.6	1103	81	207	5	0.3
Upuk_8a.1 Non Eff dev	Pasture	29.2	2368	81	207	10	0.3
Riparian 1	Riparian	12.9	39	3	0	1	0.1
Other sources	Other	-	516	-	-	170	-

Effluent report

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

CURRENT AREA RECEIVING LIQUID EFFLUENT	
Total area including crops	112 ha
Pastoral area receiving liquid	112 ha
% of farm pastoral area	36%
Average liquid effluent	78 kg N/ha/yr
Average fertiliser	153 kg N/ha/yr
Average other	0 kg N/ha/yr
AREA OF FARM TO APPLY ALL EFFLUENT TO ACHIEVE RATES OF	
150 kg N/ha/yr - Liquid	58 ha - based on the amount of effluent generated on the the farm and sprayed from sump.
150 kg N/ha/yr - Solid	16 ha
150 kg N/ha/yr - Total	74 ha
Maintenance K	1778 ha
100 kg K/ha/yr	119 ha
Maintenance K Warning	* Average K maintenance rates were less than 20 kg K/ha/yr - use with caution.
SOURCE OF N IN EFFLUENT BLOCK(S)	
Effluent from farm dairy	26%
Effluent from Feed pad	0%
Effluent from Standoff pad	0%
Effluent from Uncovered wintering pad/shelter	0%
Solids	5%
Exported	69%

Proposed Final Winter Barn Parameter Report

Available on request.

Stock Number Reconciliation:

WW5	Current scenario xtra eff	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
2015-17	Milking herd 1	0	201	470	505	505	500	500	490	470	470	460	0
	Milking herd 2	20	162	170	168	165	165	165	160	160	155	120	0
	Bulls 1	0	0	0	0	0	20	20	0	0	0	0	0
	Dairy grazing (milking cows) 1	510	309	40	0	0	0	0	0	0	0	35	510
	Dairy grazing (replacements) 1	0	0	0	0	0	0	0	0	0	0	170	170
	Dairy grazing (replacements) 2	150	8	0	0	0	0	0	0	0	0	0	0
	Dairy grazing (replacements) 3	0	0	0	0	0	0	0	0	0	0	100	200
	Dairy grazing (replacements) 4	165	0	0	0	0	0	0	0	0	0	0	0
	Totals	**845**	**680**	**680**	**673**	**670**	**685**	**685**	**650**	**630**	**625**	**885**	**880**

WW5	Proposed consnt xtra eff copy12	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
	Milking herd 1	0	244	565	605	600	600	590	590	570	565	443	0
	Milking herd 2	20	182	190	187	185	185	185	180	180	175	105	0
	Bulls 1	0	0	0	0	0	20	20	0	0	0	0	0
	Dairy grazing (milking cows) 1	610	366	40	0	0	0	0	0	0	0	154	610
	Dairy grazing (replacements) 1	0	0	0	0	0	0	0	0	0	0	190	190
	Dairy grazing (replacements) 2	170	8	0	0	0	0	0	0	0	0	0	0
	Totals	**800**	**800**	**795**	**792**	**785**	**805**	**795**	**770**	**750**	**740**	**892**	**800**

WW5	Barn Example copy 1-1	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
	Milking herd 1	0	265	715	705	695	695	675	665	655	645	600	260
	Milking herd 2	30	220	247	240	235	235	235	225	225	225	195	0
	Bulls 1	0	0	0	0	0	20	20	0	0	0	0	0
	Dairy grazing (milking cows) 1	715	450	0	0	0	0	0	0	0	0	0	455
	Dairy Repl (in calf heifers) total	**218**	**27**									**122**	**248**
	Totals	**745**	**935**	**962**	**945**	**930**	**950**	**930**	**890**	**880**	**870**	**795**	**715**
	Totals (incl R2 in calf Hfrs) total	**963**	**962**	**962**	**945**	**930**	**950**	**930**	**890**	**880**	**870**	**917**	**963**
	In Barns	963	962								435	918	963

Block Nitrogen Reconciliation:

											WW5 adj		Combined Situation				Proposed Situation					
Current Scenario WW5	**effIntadj**	Area	N loss	P loss	Sheep Block		Area	N loss	P loss	WW5 adj	N loss	P loss		**Area**	**N loss**	**P loss**	Proposed	Area	N loss	P loss	N loss dffce	P loss dffce
Brax_4a.1 Effluent	Pastoral	18.4	600	6	Sheep Block (Brax_4a.1)	Pastoral	72.8	669	30	34.3	315	14	**Brax_4a.1 Effluent**	**18.4**	**600**	**6**	Brax_4a.1 Effluent	18.4	523	6	77	0
Brax_4a.1 Eff Tile	Pastoral	52.5	1766	32	Sheep Block (Tuap_6b.2)	Pastoral	55.5	761	6	32	439	3	**Brax_4a.1 Eff Tile**	**52.5**	**1766**	**32**	Brax_4a.1 Eff Tile	47.2	1402	29	138	-1
Tuap_6b.2 Effluent	Pastoral	59.2	3458	9	Swedes	Fodder Cr	-	891	2		460	1	**Tuap_6b.2 Effluent**	**59.2**	**3458**	**9**	Tuap_6b.2 Effluent	59.2	2976	9	482	0
Brax_4a.1 Non Eff	Pastoral	2.4	73	1	Sheep Block Upuk_8a.1	Pastoral	3.8	143	1		143	1	**Brax_4a.1 Non Eff**	**36.7**	**650**	**16**	Brax_4a.1 Non Eff	33	863	8	-370	5
Tuap_6b.2 Non Eff	Pastoral	69.7	3897	9	Non prod		4.2	45	18	2.9	31	12	**Tuap_6b.2 Non Eff**	**101.7**	**4534**	**12**	Tuap_6b.2 Non Eff	71.7	3319	9	-855	-5
Upuk_8a.1 Non Eff	Pastoral	4.3	527	2	Total		136.3	2509	56	73	1388	31	**Upuk_8a.1 Non Eff**	**8.1**	**670**	**3**	Upuk_8a.1 Non Eff	13.6	1137	5	99	1
Upuk_8a.1 Non Eff dev	Pastoral	1.1	135	0									**Upuk_8a.1 Non Eff dev**	**1.1**	**135**	**0**	Upuk_8a.1 Non Eff dev	29.2	2633	12	681	9
Riparian 1	Riparian	12.9	39	1									**Riparian 1**	**12.9**	**39**	**1**	Riparian 1	12.9	39	1	0	0
Upuk_8a.1 FBt>FBt	Crop	22.3	2459	17									**Upuk_8a.1 FBt>FBt**	**22.3**	**2459**	**17**	Tuap_6b.2 FBt>FBt	10	838	3		
Upuk_8a.1 Past>FBt	Crop	5.8	720	4									**Upuk_8a.1 Past>FBt**	**5.8**	**720**	**4**	Tuap_6b.2 Past>FBt	10	720	3		
Upuk_8a.1 FBt>YG	Crop	5.5	566	3									**Upuk_8a.1 FBt>YG**	**5.5**	**566**	**3**	Tuap_6b.2 FBt>YG	10	512	2		
Non prod		8.5	351	123									**Non prod**	**11.4**	**382**	**135**	Brax_4a.1 Past>FBt	3	130	2		
Total		262.6	14590	208	Total		136.3	2509	56	73	1388	31	***incl crop portion***		**460**	**1**	Brax_4a.1 FBt>FBt	3	159	2		
Sum total blocks		262.6	14591	207	Sum total blocks		136.3	2509	57	73	1388	31	**Total**	**335.6**	**15978**	**239**	Brax_4a.1 FBt>YG	3	94	2		
													Sum total blocks	**335.6**	**15979**	**238**	Other sources	11.4	684	139	-302	-4
																	Total	335.6	16029	232	-51	7
																	Sum total blocks	335.6	16029	232	-50	6

Winter Barn April incl R2 Hfr					
Proposed	Area	N loss	P loss	N loss dffce	P loss dffce
Brax_4a.1 Effluent	18.4	470	4	130	2
Brax_4a.1 Eff Tile	52.5	1328	29	438	3
Tuap_6b.2 Effluent	59.2	2800	8	658	1
Brax_4a.1 Non Eff	36.7	923	7	-273	8.6
Tuap_6b.2 Non Eff	101.7	4831	10	-297	2.4
Upuk_8a.1 Non Eff	13.6	1103	5	133	1
Upuk_8a.1 Non Eff dev	29.2	2368	10	946	11
Riparian 1	12.9	39	1	0	0
Other sources	11.4	516	170	-134	-35
Total	335.6	14378	244	1600	-5
Sum total blocks	335.6	14378	244	1601	-6

NOTE: The green coloured Winter barn N & P blocks are lower than the combined current and sheep unit block totals. The orange coloured blocks are higher in total N & P loss. White cells are no change. There are rounding differences which mean the sum total of the blocks can differ from Overseer reported values. Commentary as to why these differences are lower are contained in the report. The overall difference between the sum totals as opposed to the total reported figures are at the bottom of the tables in green and orange above, the Nitrogen is showing an overall reduction by these amounts, whilst the Phosphorous is showing an overall increase by these amounts and are as reported and confirmed in the main body of the report