Dairy Green Ltd

Practical Engineering Solutions

Consents, Effluent, Stock water, Irrigation

Design through to Installation

Irrigation NZ Accredited Designer

Woldwide 1&2 dairy farm

WW2 Unit

Farm Environmental Management Plan – Appendix N

Version 1.3

1 June 2019 – 31 May 2020

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1 Property Details

Entity Name:	Woldwide Two Limited (WW2)
Physical Address	State Highway 99, Winton
Description of landholding ownership	Woldwide Two Limited owns the land at the WTL dairy platform. It is owned by Woldwide Trust (98%), (1%) A de Wolde, (1%) JJ e Wolde; Woldwide Farming Limited owns the Horner Block;
Landholding owner's details	A and JJ de Wolde 104 Shaws Trees Road, Heddon Bush, RD3 Winton, 9783
Contact Person:	Hamish (Dusty) Wright: 021-440006
Legal Description:	Lot 1 DP 14660, Lot 1 DP 9925, Lot 1 DP 10885, Pt Lots 1 and 2 DP 4092, Pt Lot 18 DP 942, Lots 1 and 3 DP 5610, Pt Section 417 Taringatura SD, Section 418 Taringatura SD, Section 419 Taringatura SD, Lot 1 DP 14661, Lot 1 DP 451158, Lot 1 DP 13077 Horner Block - Lot 4 DP399915
Land Area:	Milking platform – 240 hectares (effective) Horner block - 97 hectares – slurry discharge only
Resource Consents:	Existing discharge consent (20171278-01) Existing water permit (20171278-02) Existing land use consent for expanded dairy farming (20171278-03) All expire on 18/11/27 *Note: the consent holder in future consents will be "Woldwide One Limited and Woldwide Two Limited."*

This document is designed to be a living document.

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

2 Maps

2.1 Accompanying notes to maps

- The WW2 dairy platform lies north and south of Wrey's Bush Highway and is connected via an underpass.
- The Horner Block, which receives effluent from WW2, lies to the south west of Hundred Line Road East.
- Topography is flat and soils are well developed. There are minimal critical source areas at the property. One is indicated on figure 4a at the north of the dairy platform.
- Waterways are best described as surface drains, are fully fenced off and flow in a north to south/south east direction.
- All crossings are culverted; stock do not have access to surface waterways. Locations where lanes cross drains are managed as critical source areas to minimise runoff from tracks and lanes into surface waterways.
- The location, position and outfall of subsurface drainage is indicated on figure 4. The relative depth of subsurface drainage is drainage is c.800 mm.
- Infrastructure includes a dairy shed, wintering barn, effluent storage pond, silage pad and underpass.
- Culverts at WW2 are identified on aerial photos in the Appendix.

2.1 Boundaries

Figure 1a. Boundary of dairy platform at WW2

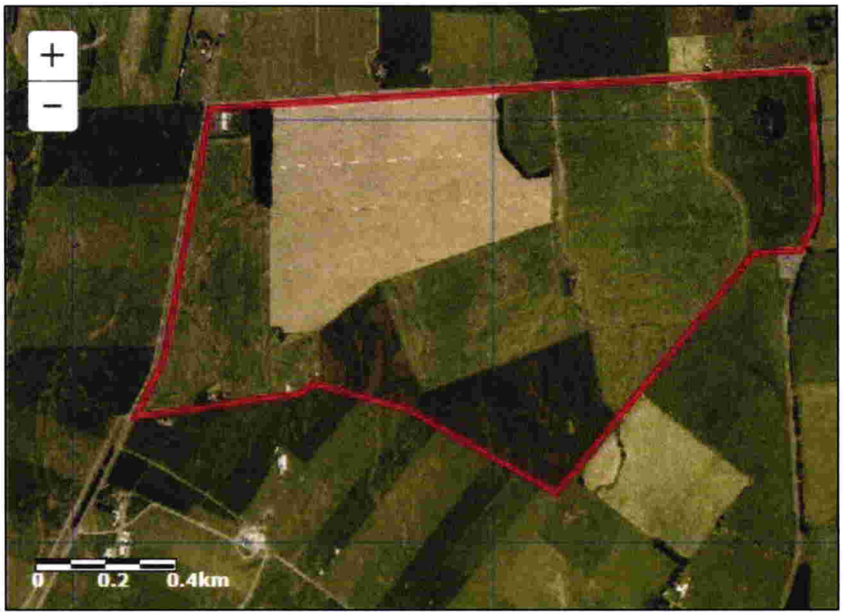


Figure 1b: Horner block property boundary (outlined in red)

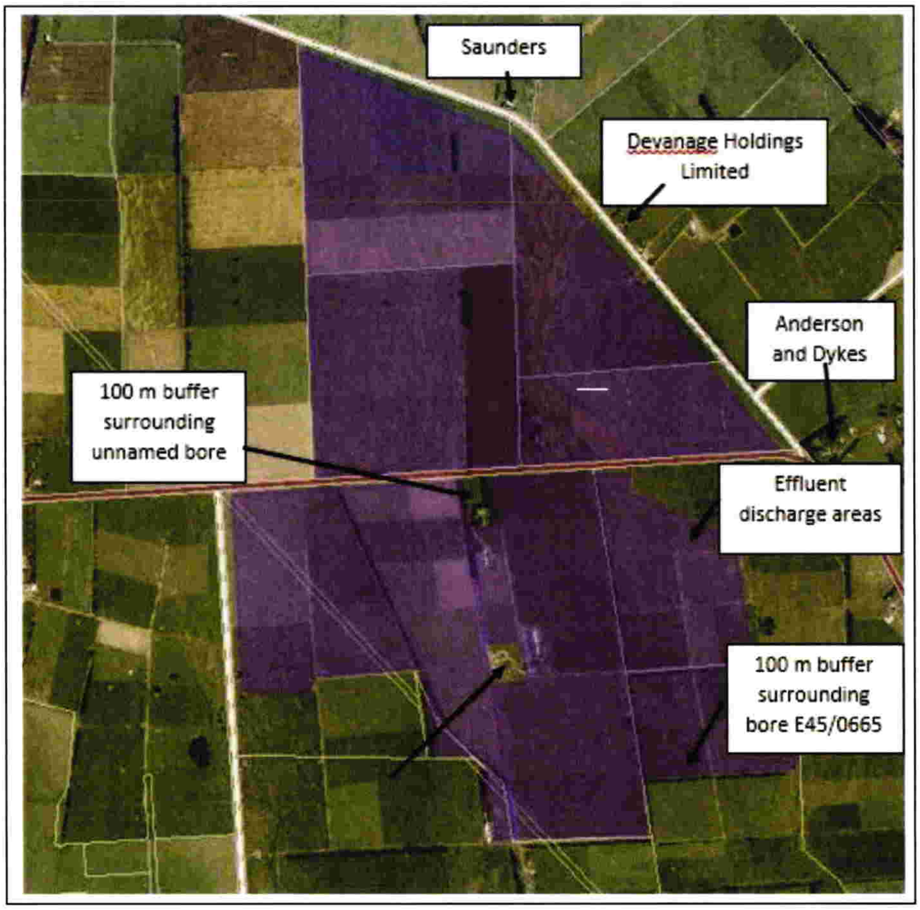


Figure 2a. Effluent discharge area at WW2 and neighbours.

Figure 2b. Effluent discharge area at Horner Block.

2.3 Infrastructure

Figure 3. Infrastructure at WW2.

2.4 Surface waterways, crossings and critical source areas

Figure 4a. Surfacewaterways, tiles and CSAs at WW2.

Figure 4b. Surfacewaterways, tiles and CSAs at the Horner Block.

Key	
Open Drain	
Tile Drain	
Critical Source Area	

2.5 Physiographic zones

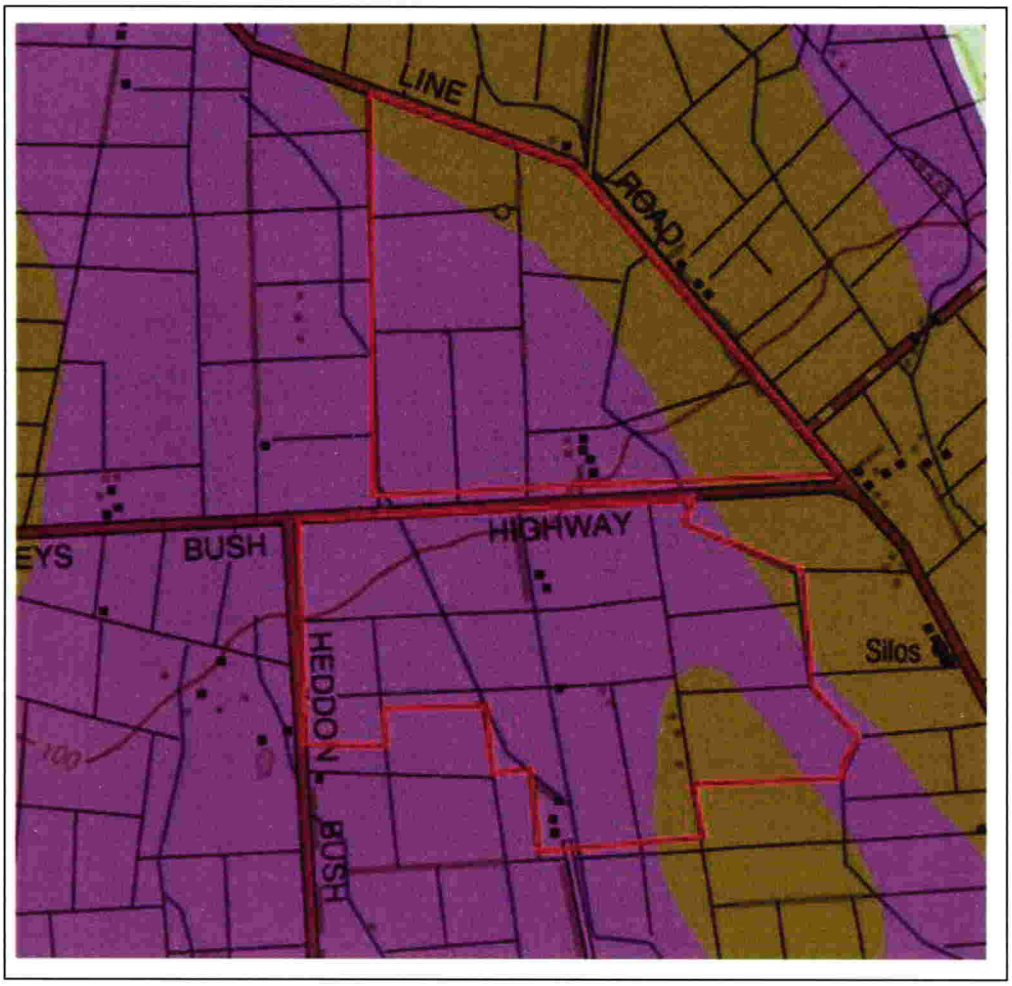
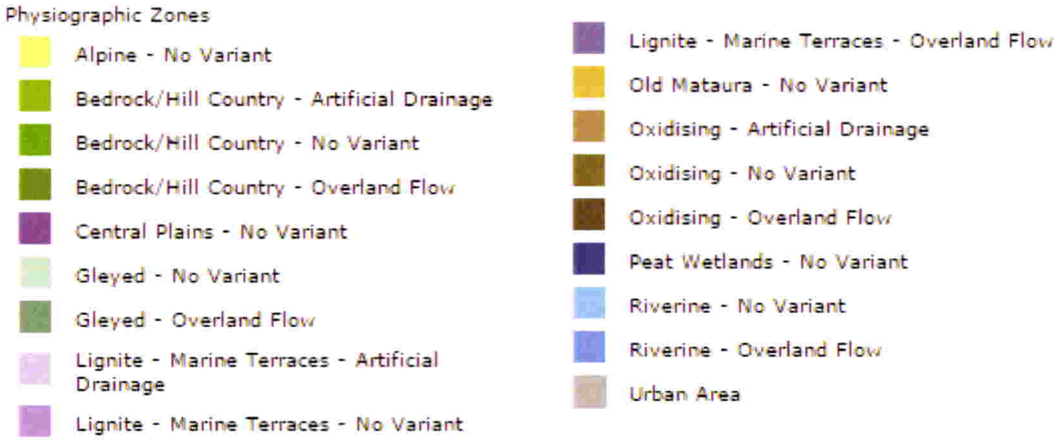


Figure 5a. Physiographic zones at WW2.

Figure 5b. Physiographic zones at Horner Block.



2.6 Riparian Vegetation and Fencing

Waterways flow in a north to south/south east direction. All streams and drains are fenced off to ensure cows cannot enter the waterways. Riparian buffer are wide and have good grass cover.

2.7 Heritage

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

2.8 Significant Indigenous Biodiversity

There are no known or recorded sites of significant indigenous biodiversity on the property.

2.9 Soils

The soil types and areas shown on Topoclimate appear to be incorrect, John Scandrett (Scandrett Rural Limited) carried out a field investigation and has mapped the soil boundaries as shown in figures 6a and 6b. Note that the map used in figure 6 was the farm map at the time that soil investigation was carried out by Mr. Scandrett. The soils for the Horner block have been obtained from the Topoclimate layer in Environment Southland's Beacon mapping service.

As is shown in figure 7, the Horner block is overlying by Braxton soils, with intergrades of Pukemutu soils in places; Drummond soils with intergrades of Glenelg soils in places, and Waiau soils with intergrades of Tuatapere soils in places.

Figure 6a. Soils at WW2 (south of Wrey's Bush Highway)

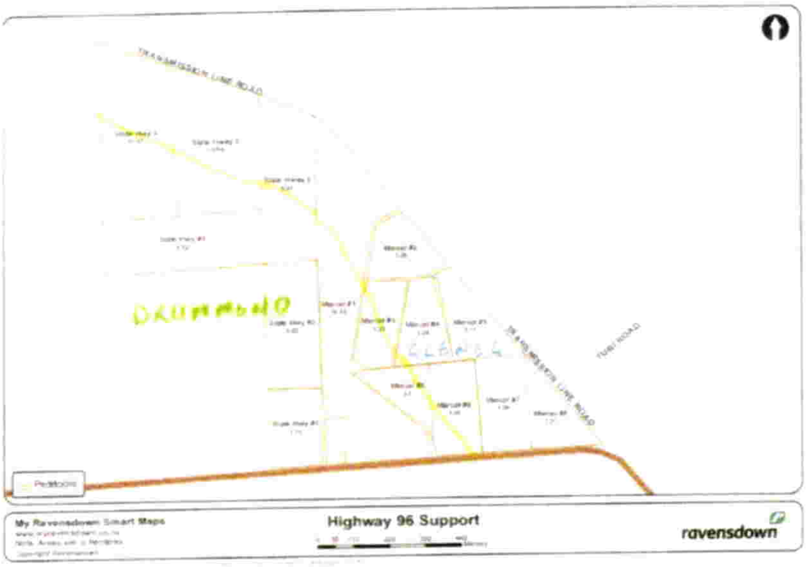


Figure 6b. Soils at WW2 (north of Wrey's Bush Highway)

Figure 6c. Soils at Horner Block.

The vulnerability of the soils on the property are shown in Table 1.

Table 1: Vulnerability of soils at the WW2 and Horner block.

Soil type	Compaction	Nutrient Leaching	Erodibility	Organic Matter Loss	Waterlogging
Braxton	Moderate	Slight	Slight	Slight	Severe
Drummond	Minimal	Moderate	Minimal	Slight	Slight
Glenelg	Slight	Very severe	Minimal	Moderate	Nil
Waiau	Moderate	Very severe	Slight	Moderate	Nil

3 Nutrient Management

3.1 Soils and Properties

Profiles of dominant soils are shown in figures 6, 7 and 8. The dominant soil types are Braxton (found in a small area at the south west of WW2 and at the east of Horner Block), Drummond types (mid to east at WW2 and mid-west the Horner Block) and Glenelg soils at the north east WW2. Drummond soils may have intergrades to Glenelg soils in places.

Drummond Soils

Drummond soils have deep potential rooting depth, with no major rooting restriction. The soils are well drained, have good aeration, and high plant available water. Textures are generally silty clay to heavy silt loam, with topsoil clay content of 35– 40%. The moderately deep phase will have gravels below 45cm depth, resulting in less rooting depth and available water.

Topsoil organic matter levels are 8–11%; P-retention values 40–70%; pH values usually above 5.7 in all horizons; cation exchange values and base saturation medium to high. Natural levels of phosphorus, potassium and magnesium are moderate, with responses to P and K occurring in intensive farming operations. Micro nutrient levels are generally adequate.

Drummond profile

Figure 6. Drummond soil profile.

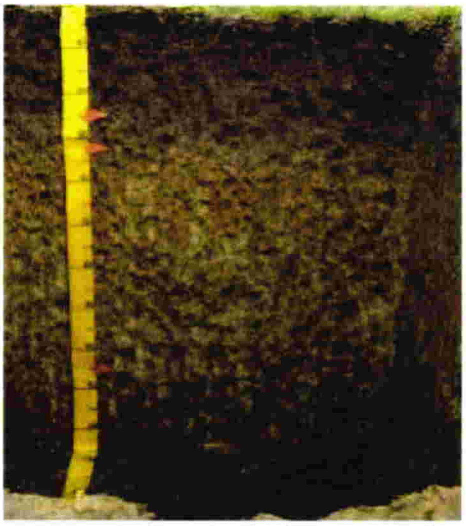
Braxton Soils

Braxton soils have a deep rooting depth and high available soil water, although the rooting depth may be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability.

Mottles occur in all horizons – another indication of poor drainage. Texture varies between heavy silt loam and silty clay in the subsoil, and silt loam topsoil clay content is 22–30%. The soils are typically stone-free, although the moderately deep phase will have gravel between 45 and 90cm depth.

Topsoil organic matter levels range from 7 to 10%; P-retentions 30–60%, with moderate pH values (5.5–6.2) that change little down the profile. Cation exchange values are moderate and base saturation values high. Available magnesium and potassium are low. Reserve phosphorus values are low. Micro-nutrient levels are generally adequate, although boron responses in brassicas and molybdenum responses in legumes are likely.

Braxton soils have swell/crack properties. They can become waterlogged in wet conditions so tend to have subsurface drainage installed. They can crack during dry summer conditions. Deep cracks can provide a pathway for contaminants to reach groundwater via bypass drainage to the underlying aquifer.



Braxton profile

Figure 7. Braxton soil profile.

Glenelg Soils

Rooting depth in Glenelg soils is restricted to varying degrees, depending on the gravel content and depth to the cemented pan in the subsoil. Plant available water varies from moderate to low depending on the quantity of gravel present. Textures are loamy silts and silt loams grading to sandy loams and sand. Topsoil clay content is 15–25%. Gravel occurs throughout the profile, with gravel content often above 70% in the subsoil.

Topsoil organic matter levels are 10–16%; P-retention values 50–75% and pH values moderate. Cation exchange vales are high in the topsoil but decrease down the profile with base saturation values low. Available calcium, magnesium and potassium are low, as is reserve phosphorus and sulphur. Micro-nutrient levels are generally adequate.

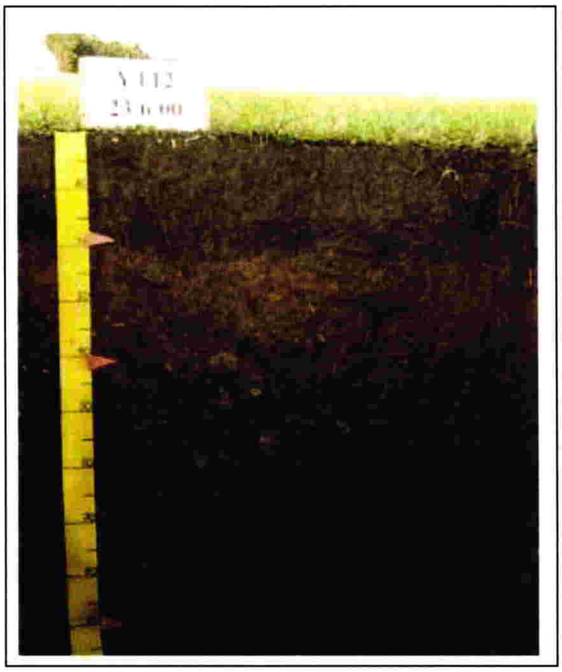


Figure 8. Glenelg soil profile.

Waiau Soils

Waiau soils have a moderate to slightly deep rooting depth, depending on the gravelness of the subsoil. Plant available water will vary from moderate to low depending on the amount of gravel present. The soils are well drained (sometimes excessively) and aerated. Textures are usually silt loams to sandy loams in the topsoil, grading to sand in deeper horizons, with topsoil clay content of 20–28%. Topsoils often are slightly too moderately gravelly, and moderately to extremely gravelly below.

Topsoil organic matter content is 8–13%, P-retention 40–70% and pH moderate (high 5s). Cation exchange levels are moderate, but low in the subsoil, with base saturation levels similar. Reserve calcium levels are high, magnesium levels moderate and potassium levels low. Soil reserve phosphate and sulphur levels are low. Micronutrient levels are generally adequate.

Figure 9. Waiau soil profile.

Plant Available Water (PAW)

The PAW in the top 30 cm of the soil profile values for the soils at the property have been obtained from the Landcare SMap database and are provided in Table 2.

Table 2: PAW values

Soil Type	PAW_{30}
Braxton	92 mm
Drummond	146 mm
Glenelg	53 mm
Waiau	50 mm

3.2 Environmental Management Actions Recommended

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

i. Soil and herbage testing to monitor soil chemistry and inform on decisions regarding fertiliser and lime application to maintain optimum soil fertility levels. Testing should initially be annually until an understanding and trends have been established. See Appendix for latest soil mapping based on soil tests;

ii. Fertiliser and lime management plan prepared annually with guidance from Overseer output reports. See Appendix for the latest Agronomy Plan;

iii. Exclude stock from streams;

iv. Monitor soils for the formation of cracks, particularly deep cracks that can form in Braxton soil types in dry summer conditions. If and where deep cracks form avoid grazing stock and discharging effluent to the area until cracks disappear;

v. Tracks and lanes sited away from streams where possible. Lanes constructed to divert run off away from potential waterway ingress. Water tables will be designed to shed water to pasture for riparian treatment where practical;

vi. Effluent concentration measured and effluent application depth managed for optimum use of nutrients;

vii. Stock will be managed in a placid manner to reduce the collection of effluent at the dairy shed; and

viii. Winter cows off paddocks.

3.3 Fertiliser Application Best Management Practices

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

i. The spreaders used to apply fertiliser are 'Spread Mark' accredited and ideally have Tracmap or a similar recording system to show proof of placement;

ii. Buffer distances are maintained such that there is no direct contamination of waterways from the application of fertiliser;

iii. Best practice is to have a 20 m buffer between fertiliser placement and waterways;

iv. Fertiliser is not applied to saturated soils;

v. Nitrogen-containing fertilisers are only applied to actively growing pastures;

vi. Fertiliser is not applied when or where air drift can occur beyond the farm boundaries; and

vii. The need for large fertiliser dressings should be achieved through split dressings rather than a single application.

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

- Application must not occur within 30 m of a neighbouring residential unit without approval. Spray drift must also be minimised.
- There must be no direct discharge to water and no discharge when soil moisture exceeds field capacity. For permanently flowing waterbodies (including artificial drains), fertiliser in riparian plantings where stock is excluded can only be applied to establish the planting. If there is no riparian planting, a setback of 10 m is required.

3.4 Effluent Application Best Management Practices

To mitigate the potential effects of the discharge of effluent to land the following practices will be adopted as far as practical:

i. Test effluent nutrient concentrations and apply the depth that corresponds with the nutrient content of the effluent. This accounts for the higher strength nature of pond slurry compared to dairy shed effluent;

ii. The soil test values for the paddocks receiving effluent will be considered and the depth of application adjusted to suit;

iii. At all times the management of the effluent system will comply with the discharge consent conditions, including annual N loadings per hectare;

iv. Low depth application effluent irrigation systems and deferred storage are utilised. Very low depth application of pond slurry (1.7 mm per application) is achieved by applying slurry with the slurry tanker with the trailing shoe, at a rate of 17.2 m^3/hectare;

v. Do not apply effluent to areas prone to cracking in dry summer periods. Braxton soils, with swell crack characteristics, are found in a small area at the south western-most part of WW2 and at the Horner Block;

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

vii. 7 -10 days post grazing before effluent application;

viii. Application of sludge solids – less than 10 mm depth to suitable ground, with consideration of climate conditions; and

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

x. Do not use the slurry tanker when there is risk of soil compaction due to its weight; instead employ the service of an umbilical system contractor.

3.5 Potential Nutrient Loss Effects of Dairying

See the appended Overseer® summary report and related Overseer® input parameter report. The nutrient budget was prepared in Overseer® Version 6.3.1 by Mr. Cain Duncan, Certified Nutrient Advisor, in accordance with the latest version of the OVERSEER Best Practice Data Input Standards (March 2018).

A nutrient budget analysis report has been prepared by Mr. Duncan and is available for review. Please refer to the report for an analysis of nutrient losses, including inputs and outputs.

The nutrient budget has been prepared for a dairy farm including both the WW1 and WW2 dairy platforms and includes the wintering activity (i.e. 1,250 cows wintered in barns on site).

A summary of the nutrient loss from Overseer calculations is provided in Table 3.

Table 3: Nutrient loss summary for WW1&2 dairy platform.

Indices	WW1&2	Average NZ Dairy Farm
N/loss to water, kg N/ha/yr	40	24-42
N conversion efficiency, %	44 %	27-35

Indices	WW1&2	Average NZ Dairy Farm
P loss to water, kg/ha/yr	0.7	0.5-1.6

3.6 The Effect of Effluent Application

Effluent will be applied to the best suited soil types and topography based on time of the year, e.g. soil moisture conditions, climate conditions and pasture growth. The total effluent discharge area is up to approximately 240 hectares.

Account for the higher strength nature of slurry effluent when applying slurry. There are approximately 300 hectares available for effluent and slurry at WW2 and Horner Block.

4 Good Management Practices

4.1 Land

Key strategies to achieve this objective:

i. Fence off all waterways;

ii. Maintain riparian vegetation;

iii. Maintain good pasture coverage. Plant roots help to prevent soils from cracking during dry summer periods and help to avoid the formation of deep cracks;

iv. Soil test regularly and operate a fertiliser management plan;

v. Exclude stock from high risk critical collection source areas and swales when the soil is near or at field capacity;

vi. Ensure adequate buffer zones from waterways during tillage;

vii. Maintain sustainable stocking rate; and

viii. Stock management to avoid excessive pugging, e.g. winter cows in barn, stand cows off pastures during inclement weather, especially in the shoulders of the season.

4.2 Effluent and Nutrients

Key strategies to achieve this objective:

i. Prepare, implement and monitor a Nutrient Management Budget to maximise the returns and minimise losses from the resource particularly N, P and K;

ii. Controlled, judicious and justifiable use of fertiliser and other imported nutrients including nutrients in supplementary feed;

iii. Subject to soil moisture and weather conditions, irrigate effluent at every practical opportunity to keep the storage pond as empty as possible;

iv. Ensure that all appropriate staff are trained and competent in the effluent system operation, and are aware of the need to continuously monitor the effluent handling system and the farm's drainage networks and the potential for Braxton soil types to develop cracks;

v. Record each application of dairy effluent, including the location of the travelling irrigator and the depth applied;

vi. Record each application of slurry effluent, including paddock numbers and quantity applied. Apply a standard depth if possible;

vii. Ensure by regular and programmed checks that the supporting effluent infrastructure is in good condition, is inspected regularly and maintained under a preventative maintenance schedule;

viii. Ensure by regular inspection (that coincides with effluent application) that the farm's drains do not contain any obvious signs of dairy effluent contamination;

ix. Remain alert to new and emerging technologies that can be incorporated into the system to reduce risk, improve environmental and farm outcomes, whilst reducing input efforts and costs; and

x. Use monitoring bore data to inform on decisions regarding effluent and land management.

4.3 Physiographic Zones and Transport Pathways

The physiographic zones are shown on a map in Figure 5. These zones have the potential for N and P to leach to waterways and groundwater through artificial drainage, deep drainage and overland flow as shown in Table 4. Good Management Practices for these transport pathways are listed in section 4.6.

Table 4: Physiographic zones and transport pathways for WW2.

Physiographic Zone	Variant	Key Transport Pathway
Central Plains	N/A	Artificial drainage and deep drainage
Oxidising	N/A	Artificial drainage, deep drainage and overland flow

Note: Due to the flat topography at the property, overland flow is not deemed to be a particular risk for soils except close to waterways and at CSAs following periods of prolonged, heavy rain.

4.4 Review

General good management practices and those specific to the transport pathways to be implemented in the current year are contained in the tables in sections 4.5 and 4.6. These good management practices will be reviewed annually as part of the overall review of the Farm Environmental Management Plan.

4.5 General Good Management Practices

A policy of general good management practice has been implemented since 3 June 2016. Most of the practices are described in the table 5 below have been implemented since 3 June 2016.

However, some practices described in table 5 have not been fully implemented since 3 June 2016:

*Not all cows have been wintered off paddocks in barns since 3 June 2016;

*IWG on fodder crop has occurred since 3 June 2016;

*Young stock has been grazing on farm since 3 June 2016, including IWG over winter.

A policy of good practice will be undertaken on farm over the coming 12-month period (see table 5). All policies will be reviewed in June 2019.

Table 5. General good management practices (June 1 2018 – 31 May 2018).

Strategy Type	Summary of Management Practices
Capital	Fencing and enhancing riparian areas according to an agreed riparian enhancement plan where practical;
	Upgrading FDE handling equipment as new technology improves the utility and reduces risks of these systems.
	Upgrade/install culverts or bridges at stock crossings;
	Increase wintering barn facilities;
Operational	Utilising a nutrient management plan;

Strategy Type	Summary of Management Practices
	Soil testing is carried out each year; soil Olsen P levels are maintained at a biological optimum and no higher;
	Surface waterways are fully fenced and with good grass cover, fencing is maintained and stock are excluded from the riparian areas;
	Wide riparian buffers are maintained;
	All surface waterways are culverted;
	Sufficient land area is available for the dairy operation;
	*Young stock is grazed off farm from weaning;
	*Cows are wintered off paddocks in wintering barns;
	*No IWG of cows on fodder crops;
	Ongoing implementation of good soil management practices;
	Nutrients from wintering of cows are stored and returned to pastures at the dairy platform and the Horner block, where they are used to promote grass growth when plants are actively growing and taking up nutrients;
	Tracks and lanes are predominantly sited away from waterways;
	Use specialist machinery when harvesting grass at the Horner Block to avoid soil compaction;
	Lane runoff diverted to land with remedial work at lane/culvert/bridge crossings carried out as required;
	Good management practice of the silage pad and underpass is implemented;
	Restricted grazing of draining pastures in autumn/spring;
	Wintering barns are used as stand-off pads during inclement weather events;
	Care in irrigation of FDE, especially when the ground is near or at field capacity;
	A large land application area is available to ensure N & K returns are not excessive;
	Effluent volumes are minimized at source through efficient water use;
	Appropriate FDE storage volume to allow for deferred irrigation for effluent;
	All data and maps are kept up to date and all staff are trained and informed of any changes;
	Programmed maintenance is done in and around FDE, and piping infrastructure around the dairy shed, silage bunkers, cow yards etc.;

Strategy Type	Summary of Management Practices

4.6 Good management Practices for Key Transport Pathways (1 June 2019 – 31 May 2020)

WW2 and Horner Block are classed in the Oxidising and Central Plains physiographic zones.

Both physiographic types are susceptible to nitrate accumulation in soils and aquifers. Nitrates are transported to the underlying aquifer via deep drainage. Central Plain's type soils (Braxton) have particular risk of nitrate and contaminant (pathogen) loss to groundwater via cracks that can form in silty clay soils over extended dry summer periods. Subsequent heavy rainfall can transport nitrate or microbes down to the underlying aquifer. There is risk of contaminant loss (nutrients N and P, sediment and microbes) to surfacewaters via artificial drainage in Central Plain's type soils following heavy or prolonged rainfall.

Given the very flat topography and the tendency of soils to have good phosphorous retention, there is low risk of contaminant loss to surface waters via overland flow. CSAs close to waterways are managed appropriately. Any risk of contaminant loss to surface waters from tracks and lanes via overland flow is mitigated by good management of areas where tracks and lanes are close to surface waters.

Recommendations described on Good Practice Management factsheets issues by Environment are implemented where practical. These measures will be reviewed annually with the inclusion of new measures where appropriate.

Table 6. Good management practices for key contaminant transport pathways.

Mitigation	Good Management Practise	Key transport pathway
Avoid accumulation of surplus N in the soil, particularly during autumn and winter	Inputs of N, such as fertiliser or nitrogen contained in imported feed, to be maintained at a level to minimise leaching losses	Deep drainage of nitrogen Artificial subsurface drainage
	Control the duration of grazing of pasture (on-off grazing)	
	Winter all cows in wintering barn	
	Optimise timing and amounts of effluent application, accounting for the higher nutrient content of slurry compared to dairy shed effluent.	
	Wintering barn is also used to house cows during May, August and September as required, and as a stand-off pad during wet weather at other times	
	Cut and carry feed where practical	
	Time N application to meet pasture demand using split applications	

Mitigation	Good Management Practise	Key transport pathway
	Reduce inputs of N where possible through optimal fertilizer application on farm, use little and often approach	
	Only apply nitrogen fertiliser if soil temperature is above 6 ºC	
	Re-sow areas of bare or damaged soil as soon as possible	
Protect soil structure, particularly in swales and near stream areas.	Only re-sow 10 % of property at most each year	Artificial subsurface drainage Overland flow
	Cultivate before 1st March to avoid Autumn loss of nutrients	
	Fence off waterways. Stock will not graze riparian strips and riparian strips are sufficiently large and well vegetated;	
	Re-sow areas of bare or damaged soil as soon as possible	
	No IWG on fodder crop is carried out	
	Avoid heavy grazing on vulnerable or wet soils. Match stock management to land use capability, e.g. avoid grazing cows on more vulnerable soils, especially when wet. Wintering barn is used during wet periods to prevent pastures from pugging.	
Reduce phosphorus use or loss	Soil test whole farm every 4 years, reduce use of P fertiliser where Olsen P values are above agronomic optimum	Artificial subsurface drainage Overland flow
	Stand cows off pastures during wet periods to prevent pastures from pugging	
	Fertilise only when there is minimal risk of nutrient loss to water. Fertilise outside high risk months in autumn.	
	Manage CSAs close to surface drains appropriately.	
Avoid preferential flow of effluent through drains or soil cracks	Defer effluent application when soil moisture levels are high	Artificial subsurface drainage Deep drainage
	Observe buffer zones and placement guidelines e.g. do not over tile drains or over areas where cracks have formed in the soil during high risk periods.	
	At all times observe discharge consent conditions.	

Mitigation	Good Management Practise	Key transport pathway
	Apply slurry effluent at very low application depth (< 2.5 mm per application)	
	Apply dairy shed effluent at low application depth (at all times < 10 mm per application and less than 50% PAW)	
Manage CSAs; low areas overlying tiles close to outfalls at surface drains	Restrict grazing crops and pasture critical source areas when soils are near saturation	Overland flow
	Avoid working critical source areas and their margins	
	Leave grassed areas (or native vegetation) around critical source areas and margins	
	Plant riparian margins	
	Reduce runoff from tracks and races (using cut offs and shaping)	
Avoid loss of contaminants (nitrate and faecal microbes) to groundwater via cracks formed in summer dry periods in Braxton soil types.	Monitor paddocks for deep cracks in summer/autumn. If and where they form, avoid grazing the area and irrigating effluent to the area.	Deep drainage

4.7 Key mitigation measures associated with expansion

It is proposed to milk an additional 160 cows at WW1&2 in the 2019/20 season. Changes will be made to the farming system to offset a potential increase in nutrient losses and associated effects.

The nutrient budget analysis predicts an average annual N loss of 40 kg/hectare and an average annual P loss of 0.7 kg/hectare. Key drivers of controlling nutrient losses are regarded as key mitigation measures. These are as follows:

N loss – key changes/mitigations

i. Removal of summer and winter crop;
ii. Removal of cows & young stock wintered outside on crop (IWG);
iii. Expansion of size and use of wintering barn facilities;
iv. More efficient use of N fertiliser.

P loss – key mitigations

v. Decrease in winter crop area;
vi. Maintaining Olsen P at target level of 30;
vii. Expansion of size and use of wintering barn facilities.

Pending the granting of a consent for expansion of dairy farming, these key mitigation measures (i to vii inclusive) will be implemented in the 2019/2020 season. In the future any material change to the farming system will be modelling in Overseer prior to the changes being made, to ensure that the change(s) will not result in an increase in N or P loss.

5 Riparian Management

5.1 Streams, Creeks and Drains

i. All waterways are riparian fenced on both sides;

ii. Regular riparian fencing checks are to be completed and any damaged sections or breakages/breaches are to be repaired immediately;

iii. Calves or other stock that are found in the riparian areas are to be removed immediately;

iv. Check all crossings are contoured to channel run-off onto pasture;

v. Carry out weed control as required following best practice methods;

vi. Remove drain cleanings and spread over paddocks to utilize the nutrients and to prevent material returning to the water way; and

vii. Make sure fish have passage through all culverts and underneath bridges.

5.2 Weeds and Pests

Weeds (e.g. gorse, broom, blackberry, ragwort, thistles etc.) are controlled by manually removing them or by using sprays:

i. When sprays are used to control weeds, care is taken to ensure all sprays are certified to be aquatic safe and that appropriate staff training is given to ensure good health and safety practices are fully implemented;

ii. Spraying is best carried out when there is active growth (e.g. mid/late spring). The aim is to spray plants when they are small as less chemical is required;

6 Cultivation

6.1 Area of Cultivation

For winter 2019, no areas of cultivation into fodder crops (brassica or beet) have been sown and no cropping is anticipated in the future.

Note: The move to grass to grass re-grassing is dependent on the farming system changing; it is proposed that cow numbers are increased by 160 and cows wintered in the barn are increased by 225. If the farming system remains as per the 2017/2018 season, then there may be some fodder crops sown and IWG in the future although there will be no IWG in June/July 2019.

Re-grassing

An extensive re-grassing policy has been carried out, with most paddocks having been re-grassed at the time of writing. Approximately 5 - 10% of the farm's effective area will undergo cultivation into new grass each year. Where grass to grass re-grassing occurs, paddocks are sprayed off and direct drilled with grass seed or undergo full cultivation if necessary.

Forage brassica or beet crop – <u>not anticipated</u> in the future

- Paddocks are sprayed off in October/November;
- Paddocks are direct drilled or fully cultivated into fodder crop from mid-October to mid-November;
- Fodder crop is IWG in over winter by cows;
- Paddocks are subsequently re-grassed in October/November;

Surplus grass is harvested as baleage when possible. Grass harvested at the Horner Block is fed fresh to cows in the barns or is stored as silage at the silage pad or goes to other dairy farms. Specialist machinery is used to avoid the risk of soil compaction when harvesting grass if required.

Grass production, soil structure and fertility are the primary factors in paddock selection, with poorly performing pastures targeted for renewal. Soil moisture content is also a factor in the choice of paddock selection and timing of cultivation.

6.2 Cultivation Good Management Practices

If any fodder crop is sown in the future, good management practices will be followed:

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

ii. Direct drill paddocks where possible;

iii. Choose paddocks away from waterways to plant winter feed crops; and

iv. Plough lines will be kept 3 metres back from the top of drain banks. This ensures at least a 3 m buffer along waterways.

7 Intensive Winter Grazing

7.1 Stock Grazing Management

The Environment Southland Intensive Winter Grazing Rule covers the period from 1 May until 30 September. It is intended that all stock will be wintered off the milking platform (in wintering barns) during June and July, as well during May, August and September as required. No IWG of any fodder crop is WW2 is anticipated in the future, starting June 2019.

In the case of all grazing within the Environment Southland defined winter period, the following management will be employed. These procedures are also applicable to returning stock in early spring.

7.2 Pasture

Paddock selection

Judicious paddock selection based on the soil moisture content is a key tool. This is important not only to avoid overland flow, pugging etc. but to ensure that the pasture and soils are not damaged to any extent that would inhibit spring pasture growth. The range in soil types gives some flexibility of being able to move away from waterways to better draining soils during wet weather. The proposed stand-offs will reduce pugging damage through less time on pasture and more settled stock.

Back fencing

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

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

Water

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

Buffer zones

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

Wet weather

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

8 Collected Agricultural Effluent

8.1 Overview of the Proposed Effluent Collection, Storage and Irrigation System

Dairy Shed Effluent System

i. During adequate soil moisture conditions the effluent will be discharged from the dairy shed directly to the travelling irrigator;

ii. When soil moisture conditions do not allow for direct effluent discharge from the dairy shed, the effluent from the dairy shed is pumped to the storage pond adjacent to the wintering barn;

iii. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur;

iv. The effluent from the storage pond is discharged to land via slurry tanker; and

v. A rainwater diversion is used in the off season.

Wintering Barn Effluent System

i. The effluent flows by gravity or is scraped to a concrete collection channel, from where it is pumped to the storage pond;

ii. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur;

iii. The effluent is pumped from the pond to the slurry tanker with a trailing shoe, for discharge to the land; and

iv. A rainwater diversion is used in the off season.

8.2 Effluent System Volumes

Effluent Sources

i. Cowshed

ii. Rainwater captured on the yard area and milk vat stand area.

iii. The wintering barn will enable 625 cows to be wintered, with effluent collected in the effluent storage pond adjacent to the wintering barn.

iv. Silage pad – total area is 1,200 m^2. Leachate drains to the effluent storage pond. Rainwater is diverted to farm drainage.

v. Underpass – has its own effluent system.

Effluent Volume

The total average effluent generated <u>per day</u> at the dairy shed should be approximately 40 m^3.

The total volume of effluent generated by wintering cows in the barn over some of May, all of June and July, some of August and some of September is 3,048 m^3.

Leachate from the silage pad has been allowed for in the Massey DESC.

Effluent Storage Volume

The existing storage pond has a pumpable volume of approximately 3,751 m^3. The Massey Dairy Effluent Storage Calculator 90% storage probability volume for is 3,203 metres cubed, so the pond has sufficient storage for 800 cows plus wintering barn effluent and silage pad effluent.

8.3 Effluent Application Rate and Depth

The irrigator system's application rates, application depths and uniformities are to be checked annually in accordance with section 4: Land Application "A Farmer's Guide to Managing Farm Dairy Effluent – A Good Practice Guide for Land Application Systems" (2015).

Application Depth

Travelling irrigator:

The minimum application depth of the travelling irrigator is 8-9 mm per application, this is achieved when the travelling irrigator is set at the fastest speed. When soil conditions allow a higher application depth can be obtained by reducing the speed of the travelling irrigator. The specified pump will deliver 16 – 18 m^3 per hour. The travelling irrigator system has a safety system, which automatically switches the system off in the event of an effluent system failure, such as irrigator stoppage or breakdown.

Slurry tanker with a trailing shoe

The slurry tanker's application depth is set by tractor speed. It has an on-board GPS system, allowing the area and travel speed to be monitored. At a travel speed of 8-9 km/hour, the application depth is 2 mm. By speeding up the tractor speed, the application depth is lowered further. The maximum depth will not exceed 2.5 mm/application.

Umbilical system

The umbilical system may be used as a contingency irrigation method. The umbilical system will apply effluent at a maximum depth of application of 3 mm for each individual application. Its application depth can be lowered by speeding up travel speed.

Dairy shed effluent

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

1 mm of irrigated dairy shed effluent depth equals:

2.5 kg per hectare of N

3.0 kg per hectare of K

0.3 kg per hectare of P

So if 10 mm depth of effluent is irrigated over 1 ha, the nutrient application will be:

25.0 kg per hectare of N, 30.0 kg per hectare of K and 3.0 kg per hectare of P

Note: Due potential to animal health issues, it is advised that not more than half the annual potassium requirement be applied per application of effluent i.e. the annual requirement of potassium (is 60 - 80 kg per hectare per annum).

Wintering barn effluent

The nutrient concentration of wintering barn effluent is much higher due to lack of dilution. The slurry effluent in the ponds is predominantly composed of wintering barn effluent, with minor dilution from rain falling on the pond and dairy shed effluent, which is diverted to the ponds when ground conditions are unsuitable for irrigation.

The nutrient content of pond effluent (slurry) has been 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:

N	3,200 g/m^3
P	800 g/m^3
K	4,400 g/m^3
S	400 g/m^3

Applying 17.2 m^3/hectare applies slurry effluent at a depth of 1.7 mm. Discharging slurry effluent at 17.2 m^3/hectare applies:

N	49 kg
P	12 kg
K	67 kg
S	6 kg

8.4 Effluent Irrigation Records

As each paddock is irrigated the daily pumping time will be recorded. This will also provide an annual record of the total depth of effluent applied.

Application Log book

As each paddock is irrigated the irrigator placement location and date is recorded in a farm diary and on a map. These provide an annual record of when and where effluent and slurry has been applied.

The following good management practice measures are consistently used:

- The travelling irrigator system is always operated at high speed system. This results in an application depth of 8 – 9 mm per application;
- The slurry tanker with the trailing shoe is operated with the aid on an on-board GPS system. The volume of effluent applied per hectare is controlled. This ensures a low application depth is achieved (< 2.5 mm).
- A visual assessment of uniformity and intensity of effluent application is carried out daily to ensure each system is operating properly;
- Care is taken to monitor drainage to ensure there are no adverse effects from effluent application;
- Irrigation records can be used not only in any discussions with compliance authorities, but as data for use in nutrient/fertiliser application planning.

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

Maintenance Log Book

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

i. Pond levels

ii. Pump servicing and maintenance

iii. Fail safe/controller maintenance

8.5 Effluent irrigation decisions

Drainage monitoring and crack formation monitoring is carried out on an ongoing basis, which helps to inform decision making on effluent discharge.

The following effluent decisions are made on farm prior to the discharge of effluent:

Slurry

- Check Heddon Bush soil moisture site to determine if the current soil moisture is suitable for irrigation;
- Ensure ground is dry enough (cannot use tractor with slurry tanker and trailing shoe machine if ground conditions are unsuitable as the slurry tanker weighs over 50 T when full of slurry);
- Check for any cracks in the discharge area – if any cracks present do not discharge slurry where the cracks are, either move to an area with no cracks or do not discharge;
- Check wind direction to ensure the wind direction is not towards neighbouring houses;
- Use GPS system to control the volume applied per hectare. Increase speed of tractor if a smaller application depth is required.

Dairy shed effluent

- Check Heddon Bush soil moisture site to determine if the current soil moisture is suitable for irrigation;
- Check for any cracks in the discharge area – if any cracks present do not discharge slurry where the cracks are, either move to an area with no cracks or do not discharge;
- Check wind direction to ensure the wind direction is towards neighbouring houses;
- Ensure travelling irrigator is operating on a high speed setting, which will apply effluent to a depth less than the soil moisture deficit.

8.6 Deep drainage of nitrogen – cracking and fissures

To reduce the occurrence of deep drainage of nitrogen and microbes, the formation of deep cracks and fissures will be prevented as much as possible. This will be achieved by:

- Keeping a higher pasture cover;
- Discharging effluent little and often to ensure the soil moisture is kept as high as possible, preventing the soil from drying out and cracking.

Before each effluent application a visual assessment will be carried out to check for any cracks in the soil. If cracks do occur the areas with cracking will be avoided and/or the activity will be moved to another part of the property where there are no cracks. If there are substantial cracks and no areas suitable to discharge effluent, then effluent will be stored until the soil moisture level improves and cracking disappears. Given the cracks are likely to occur after prolonged dry periods in the summer, the effluent storage facility is likely to provide adequate storage volume for these events.

9 Effluent System Management

9.1 Person in Charge

The person in charge of the effluent management system will be the farm manager; M Wright

9.2 Effluent System training

Training

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

Resources – Shed Operations Manual.

i. Effluent system operational guidelines - also displayed in the pump house;
ii. Irrigation map marked up with drainage outfalls, irrigation areas etc; and
iii. Copies of Environment Southland consents.

9.3 Effluent Minimisation

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

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

9.4 Effluent Pumping

The specified travelling irrigator pump will deliver 16 – 18 m^3/hr approximately depending on the distance of the irrigator from there pump and the height above the pump (i.e. static head).

9.5 Discharge Area

The proposed effluent discharge area is shown in figure 1, less buffers from dwellings, bores, waterways and boundaries. The maximum area is approximately 297 hectares less buffers.

9.6 Paddock Selection

Paddocks will be selected according to their moisture status and grazing management history. A sequence of paddocks can be pre-planned for effluent irrigation. As each area is grazed and then spelled for the required period it can then be irrigated.

Prior to irrigation occurring a visual assessment of the soil will be made along with data from Environment Southland's soils moisture irrigation site at www.es.govt.nz. If paddocks are pugged or are likely to have very low infiltration rates the effluent irrigation depth will be reduced or the paddock rescheduled for irrigation after the soil conditions have improved.

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

Effluent irrigation is to be avoided when the soil temperature is less than 5º C.

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

High and low risk

At least 50 hectares is considered to be in the low risk soil category for dairy effluent discharge with the remaining area considered to be in the high-risk soil category for dairy effluent discharge. The low risk area is found at the east.

There are low risk soils at the Horner support block also. These are found at the mid-west of the block.

Therefore the discharge of dairy effluent needs to be carefully managed with differed irrigation used when necessary.

Tile lines

These, where known, are marked on Figure 4, and irrigation should not be carried out directly over them if there is any risk of irrigation creating drainage.

Wind

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

9.7 Coverage Area

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

i. 20 metres of any surface watercourse;

ii. 100 metres of any potable water abstraction point;

iii. 20 metres of any boundary, (unless the adjoining landowner's consent is obtained to do otherwise);

iv. 200 metres of any residential dwelling other than residential dwellings on the property;

v. Effluent shall not be discharged onto any land area that has been grazed within the previous 7 – 10 days; and

vi. Effluent shall not be discharged over tiles/mole drains where the soil is at or near field capacity.

9.8 Effluent Irrigation - Conditions

Field Moisture Conditions

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

Near Field Capacity

When soils are near field capacity, the depth of application is to be limited to less than the soil moisture deficit. During operation of the system the irrigated area will be checked to ensure there is no ponding. If necessary, irrigation is to be deferred to the storage pond. The slurry tanker can achieve very low application depths, so can be used when soils are closer to field capacity.

Drier Ground

As the soil moisture deficit increases, the speed of the travelling irrigator can be reduced to increase the application depth of effluent.

9.9 Drainage Monitoring

Map

i. There will be a map in the cowshed that shows all known tile lines on the property along with their outfalls (and any open inlets);

ii. This is to be updated as the tile network is expanded or unknown installations are located; and

iii. It is to be updated when paddocks are re-moled.

Tile End Marks

i. All tile outfalls are marked on the watercourse banks with a yellow painted stake; and

ii. Each has a unique identifier.

Monitoring

i. Tile outfalls should be regularly monitored when effluent irrigation is occurring in their vicinity or when it is possible that there may be moles that run to the tiles when ground moisture conditions plus the proposed irrigation volumes are approaching field capacity; and

ii. If there is any discolouration of drainage water irrigation should stop immediately.

9.10 Solids' Removal

Timing

i. De-sludging the storage pond is best done when there are paddocks to be cultivated or lea awaiting cultivation; and

ii. Emptying will only be done when ground conditions are suitable.

Discharge of solids

Solids can either be spread thinly, less than 10 mm thick on short pasture or on crop ground where they can be worked in.

9.11 Off Season Water Diversion

All the sources of effluent are fitted with "not in use" clean water/rainwater diversion systems. These are separate from the roof water systems. The areas from which the rainwater is to be diverted should be well washed with clean water and inspected for any effluent residues prior to the diversion being enacted. The location of these diversion points is on the dairy shed plan in the shed office.

10. Monitoring, Maintenance and Operating Procedures

10.1 Daily

i. Minimise water use at the cow shed;

ii. Check the storage and irrigation system for operating faults during and following use;

iii. Evaluate the soil moisture situation and calculate the optimum settings for the next effluent application;

iv. Check and record in the log any tile outfalls draining from the irrigation area after effluent irrigation;

v. Update the effluent irrigation log with settings, location, depth and method of application;

vi. Check lane/track edge cutouts to ensure they are not blocked and there is no risk of large single point discharges. (especially after heavy rainfall events); and

vii. Check the trough in the paddock the cows are leaving to ensure it has not been leaking due to animal activity.

10.2 Weekly

Storage Facilities

i. Check inlet and outlet pipes are clear of blockages;

ii. Check and clean grates and sumps in dairy shed and yard as required; and

iii. Check galleries/floor drainage around storage structures.

Effluent Pump, Motor and Controls

i. Check pump and motor, grease if required;

ii. Check mechanical switch gear is operating efficiently;

iii. Note and follow up any unusual noises when the pump is operating;

iv. Check anti siphon devices for blockages; and

v. Note operating pressure during irrigation and confirm it is in the 'normal' range.

Pipelines

i. Check for leaks and blockages in pipes and joiners; and

ii. Check for hydrant leaks.

Safety

i. Check guards and fittings;

ii. Signage; and

iii. Equipment.

10.3 Annual Maintenance

i. Check pumps and motors and have them serviced by a qualified technician;

ii. Service slurry tanker system as required;

iii. Assess condition of pipeline, repair and replace parts as necessary;

iv. Update irrigation maps for new fences, tiling, moling etc;

v. Training of new staff in system operation; and

vi. Refresher and training of all staff on the property in the, purpose and use of safety equipment and fittings.

10.4 End of Season

i. Ensure the storage pond is pumped down as far as is practical;

ii. Turn on rainwater diversion for dairy shed;

iii. Drain pumps and/or set frost lamps;

iv. Check pumps and pipes for wear and tear and perform any maintenance required; and

v. Check the lining of the pond is still intact i.e. not damaged.

10.5 Beginning of Season

i. Turn off rainwater diversion; and

ii. Prime pumps and check their operation.

10.6 Breakdowns

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

- Contact repairer immediately to assess problem;
- Limit or cease water use in the dairy yard and scrape effluent where possible; and
- Complete repairs or install the back-up pump before the next milking, depending on the storage available. Where necessary arrange for a backup petrol, diesel or PTO driven pump.

ii. In the event of pipe blockages:

- For underground pipes: Clear if possible or if too difficult, contact blocked drain repairer to water blast;
- For drag hoses: open camlock joiners to locate and clear blocks in pipe sections; and
- If not able to clear blockages, replace the blocked section.

10.7 General:

i. Under no circumstances are storage facilities to be allowed to overflow;

ii. There shall be no ponding of effluent in the discharge area;

iii. Make full use of the discharge area;

iv. There shall be no discharge of effluent to frozen or snow covered ground;

v. The discharge will be managed to ensure aerosols, spray drift and odour do not travel past the property boundary; and

vi. The general state of the property is to be monitored, particularly areas where environmental contamination with effluent could be a problem. This includes races, silage storage and feeding areas. Preventative action should be taken before problems arise.

11 Other Environmental Issues

11.1 Lanes and Races

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

i. Ensuring that lanes and races are not used as feed pads, cow yards, or herd holding areas;

ii. Ensuring that riparian vegetation is adequate to treat storm water;

iii. Checking after heavy rain the lane/track edge cut-outs, to ensure they are not blocked and there is no risk of large single point discharges;

iv. Gateways – to avoid compaction around the gateways and reduce lane edge wear, where possible bring the cows out of the paddock at a different gate to which they were let in; and

v. Ensure that swales away from culverts are kept clear, and discharge is directed away from the waterway.

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

11.2 Silage pad

A concrete silage pad (1,200 m^2) is located adjacent to the wintering barn. It is constructed on a dry site. The silage pad has concrete walls and a dual drainage system; one for clean rainwater and one for silage leachate. Under the stack and immediately in front of it, the drains are opened into the leachate channel. This takes leachate to a sump from where it is pumped into the effluent storage pond and irrigated appropriately. The sumps in the rest of the pad are open to the farm drainage system so that clean rainwater can be diverted. Rain landing on the silage cover does not mix with leachate and is diverted to the farm drainage.

Only wilted silage is used to minimise the risk of creating leachate

11.3 Underpass

An underpass connects the block north of Wrey's Bush Highway with the dairy platform south of the highway. The underpass has its own effluent system, with a dedicated sprinkler. The sprinkler irrigates rainwater and effluent that collects on the underpass at low rate and depth to nearby paddocks.

Inspect the underpass regularly to ensure that the effluent system in operating correctly and that there is no ponding of rainwater/effluent at the underpass.

11.4 Cut and Carry

Grass harvesting at the Horner Block is carried out according to best practice management. Specialist equipment is used to minimize the risk of soil compaction. Harvesting is not carried out if the risk of soil compaction cannot be avoided.

Health and safety protocols are adhered to when operating machinery.

11.4 Animal Pests

i. Rabbits, hares, possums – regular culls using night shooting, poisoning etc.

ii. Magpies – trap, shoot etc.

12 Emergency Response

12.1 Storage Overflow

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

12.2 Ponding

Should light ponding be detected effluent irrigation will immediately stop. Checks should be made to ensure that there is no overland flow or that the ponding is not draining into tile lines etc.

12.3 Drainage

Overland Flow

See Ponding Section 12.2.

Discharge Ex-Tile

See Effluent in Open Drains Section 12.3.3

Effluent in Open Drains

i. Attempt to immediately contain the contaminants by damming the drain if practical. This can be done by dumping a bale(s) of baleage or hay in the drain and pressing down with the front end loader, depending on drain size;

ii. Alternately earth and silage wrap can often be used to help seal or form the required plug; and

iii. If possible pump out and disburse with the vacuum tanker.

12.4 General Procedures

i. Follow consent conditions/notes, mitigate where possible;

ii. Advise Regional Council where the consent requires this;

iii. Seek help; and

iv. Advise authorities.

12.5 Emergency Contacts

Manager – Mr. M Wright

Environment Southland – 0800 768 845 or 03 2115115

Dairy Green Limited – 03 215 4381

13 Review

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

i. Development targets for coming season/plan.

ii. Nutrient Management
   - Overseer Inputs
   - New Overseer report if applicable

iii. Good Management Practices

iv. Cultivation Areas

v. Intensive Winter Grazing

vi. Effluent System
   - High risk/low risk effluent irrigation areas due to new tiling etc.;
   - Any developments in infrastructure – i.e. new/more irrigators, extensions to effluent system, fencing changes;
   - Training/retraining, etc.

vii. Emergency Contacts

Version	Date	Reviewed	Distribution List
1.0	22 August 2017	JS	A & JJ de Wolde
1.2	15 July 2018	Nessa Legg, Dairy Green Limited	A & JJ de Wolde
1.3	25 Feb 2019	Nessa Legg, Dairy Green Limited	A & JJ de WW1de
2.			
3.			